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Lake Whatcom Model calibration with variable stoichiometry in sediments - REVISED

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Memorandum

to the Washington State Department of Ecology

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Lake Whatcom Model calibration with variable stoichiometry in sediments - REVISED

Memorandum discussing model calibration and enhancements made to the Lake Whatcom water quality model

by
Chris Berger and Scott Wells
Portland State University

Funded by the U.S. Environmental Protection Agency

Water Quality Program
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Draft Memorandum

February 8, 2007

To: Paul Pickett and Steve Hood, Washington Department of Ecology

From: Chris Berger and Scott Wells, PSU

Subject: Lake Whatcom Model calibration with variable stoichiometry in sediments - REVISED

This memorandum discusses model calibration and enhancements made to the Lake Whatcom water quality model. Model development and initial calibration were documented in the report "Lake Whatcom Water Quality Model" (Berger and Wells, 2005).

The Lake Whatcom water quality model has been converted from CE-QUAL-W2 version 3.2 to version 3.5 (Cole and Wells, 2006).

Sediment Variable Stoichiometery and Kinetics

Variable stoichiometry of sediments has been added to the Lake Whatcom water quality model. There are now sediment phosphorus, sediment nitrogen, and sediment carbon compartments. The sediment carbon stoichiometry is variable because organic matter and algae may have differing carbon stoichiometry. The decay rate of sediment in a model cell is the mass averaged decay rate of the labile particulate organic matter (LPOM) and refractory particulate organic matter (RPOM) groups. The governing equations for the sediment compartments were shown below. Keep in mind that CBOD and epiphyton were not simulated in the Lake Whatcom model. Further information about water quality cycles in CE-QUAL-W2 can be found in the model user's manual (Cole and Wells, 2006).

Sediment Phosphorus

$$S_{Psed} = \underbrace{\frac{\omega_{POMR} A_{bottom}}{Vol_{cell}} \Phi_{RPOM-P}}_{\text{RPOM -P sedimentation}} + \underbrace{\frac{\omega_{POML} A_{bottom}}{Vol_{cell}} \Phi_{LPOM-P}}_{\text{LPOM -P sedimentation}} + \sum \underbrace{\frac{\omega_a A_{bottom}}{Vol_{cell}} \delta_{Pa} \Phi_a}_{\text{algae sedimentation}} - \underbrace{\gamma_{om} K_s \Phi_{s-P}}_{\text{sediment decay}} + \underbrace{K_{epom} K_{em} \delta_{Pe} \Phi_e}_{\text{epiphyton mortality}} - \underbrace{\frac{\omega_{SED} A_{bottom}}{Vol_{cell}} \Phi_{s-P}}_{\text{sediment sedimentation}}$$

where:

γ_{OM} = rate multiplier for organic matter

δ_{Pe} = epiphyton stoichiometric coefficient for phosphorus

δ_{Pa} = algal stoichiometric coefficient for phosphorus

Δz = model cell thickness, *m*

ω_{POM} = POM settling velocity, $m\ sec^{-1}$

ω_a = algal settling velocity, $m\ sec^{-1}$

ω_{SED} = sediment settling velocity, $m\ sec^{-1}$

K_{sed} = sediment decay rate, sec^{-1}

Φ_a = algal concentration, $g\ m^{-3}$

$\Phi_{LPOM\text{-}P}$ = labile POM labile concentration, $g\ m^{-3}$
$\Phi_{RPOM\text{-}P}$ = refractory POM concentration, $g\ m^{-3}$
$\Phi_{s\text{-}P}$ = sediment phosphorus concentration, $g\ m^{-3}$
Vol_{cell} = volume of computational cell, m^3
A_{bottom}= Area of bottom, m^2
Φ_e = epiphyton concentration, $g\ m^{-3}$
K_{epom}= fraction of epiphyton that go to particulate fraction and settle into sediment at death
K_{em} = epiphyton mortality rate

Sediment Nitrogen

$$S_{Nsed} = \underbrace{\frac{\omega_{POMR} A_{bottom}}{Vol_{cell}} \Phi_{RPOM-N}}_{\text{RPOM - P sedimentation}} + \underbrace{\frac{\omega_{POML} A_{bottom}}{Vol_{cell}} \Phi_{LPOM-N}}_{\text{LPOM - P sedimentation}} + \sum \underbrace{\frac{\omega_a A_{bottom}}{Vol_{cell}} \delta_{Na} \Phi_a}_{\text{algae sedimentation}} - \underbrace{\gamma_{om} K_s \Phi_{s-N}}_{\text{sediment decay}} + \underbrace{K_{epom} K_{em} \delta_{Ne} \Phi_e}_{\textit{epiphyton mortality}} - \underbrace{\frac{\omega_{SED} A_{bottom}}{Vol_{cell}} \Phi_{s-N}}_{\text{sediment sedimentation}}$$

where:
γ_{OM} = rate multiplier for organic matter
δ_{Ne} = epiphyton stoichiometric coefficient for phosphorus
δ_{Na} = algal stoichiometric coefficient for phosphorus
Δz = model cell thickness, m
ω_{POM} = POM settling velocity, $m\ sec^{-1}$
ω_a = algal settling velocity, $m\ sec^{-1}$
ω_{SED} = sediment settling velocity, $m\ sec^{-1}$
K_{sed} = sediment decay rate, sec^{-1}
Φ_a = algal concentration, $g\ m^{-3}$
$\Phi_{LPOM\text{-}N}$ = labile POM concentration, $g\ m^{-3}$
$\Phi_{RPOM\text{-}N}$ = refractory POM concentration, $g\ m^{-3}$
$\Phi_{s\text{-}N}$ = sediment nitrogen concentration, $g\ m^{-3}$
Vol_{cell} = volume of computational cell, m^3
A_{bottom}= Area of bottom, m^2
Φ_e = epiphyton concentration, $g\ m^{-3}$
K_{epom}= fraction of epiphyton that go to particulate fraction and settle into sediment at death
K_{em} = epiphyton mortality rate

Sediment Carbon

$$S_{Csed} = \underbrace{\frac{\omega_{POMR} A_{bottom}}{Vol_{cell}} \gamma_{OM} \Phi_{RPOM}}_{\text{RPOM sedimentation}} + \underbrace{\frac{\omega_{POML} A_{bottom}}{Vol_{cell}} \gamma_{OM} \Phi_{LPOM}}_{\text{LPOM sedimentation}} + \sum \underbrace{\frac{\omega_a A_{bottom}}{Vol_{cell}} \delta_{Ca} \Phi_a}_{\text{algae sedimentation}} - \underbrace{\gamma_{om} K_s \Phi_{s-C}}_{\text{sediment decay}} + \underbrace{K_{epom} K_{em} \delta_{Ce} \Phi_e}_{\textit{epiphyton mortality}} - \underbrace{\frac{\omega_{SED} A_{bottom}}{Vol_{cell}} \Phi_{s-C}}_{\text{sediment sedimentation}}$$

where:
γ_{OM} = rate multiplier for organic matter
δ_{Ce} = epiphyton stoichiometric coefficient for carbon
δ_{Ca} = algal stoichiometric coefficient for carbon
δ_{COM} =organic matter stoichiometric coefficient for carbon
Δz = model cell thickness, *m*
ω_{POM} = POM settling velocity, $m\ sec^{-1}$
ω_a = algal settling velocity, $m\ sec^{-1}$
ω_{SED} = sediment settling velocity, $m\ sec^{-1}$
K_{sed} = sediment decay rate, sec^{-1}
Φ_a = algal concentration, $g\ m^{-3}$
Φ_{LPOM} = labile POM carbon concentration, $g\ m^{-3}$
Φ_{RPOM} = refractory POM carbon concentration, $g\ m^{-3}$
Φ_{s-C} = sediment carbon concentration, $g\ m^{-3}$
Vol_{cell} = volume of computational cell, m^3
A_{bottom}= Area of bottom, m^2
Φ_e = epiphyton concentration, $g\ m^{-3}$
K_{epom}= fraction of epiphyton that go to particulate fraction and settle into sediment at death
K_{em} = epiphyton mortality rate

Tributary and Groundwater Loadings

Tributary inputs were supplied by Paul Pickett of the Washington Department of Ecology. The development of the groundwater inputs were described in the first calibration report (Berger and Wells, 2006). As part of the calibration process, the constituent concentrations of the tributaries and groundwater were altered. These changes were summarized below:

- Ammonia-nitrogen concentrations in groundwater were reduced 90%
- Organic matter concentrations in groundwater were reduced 80%
- Nitrate-nitrite nitrogen concentrations in tributaries were reduced 30%
- Organic matter nitrogen concentrations in tributaries were reduced 20%
- Ammonia nitrogen concentrations in tributaries were reduced 20%
- Organic matter concentrations in tributaries were reduced 20%

Hydrodynamic Calibration

Water level data provided by the City of Bellingham were compared with model results were shown in Figure 1. Table 1 shows water level statistics. Water levels were calibrated by adding a distributed flow file for branch 1 to compensate for the error in inflow/outflow measurements and to also account for inflows and/or losses directly into the lake.

Table 1. Water level error statistics.

n, # of data comparisons	Mean Error M	Absolute Mean Error m	Root Mean Square Error m
685	0.002	0.026	0.052

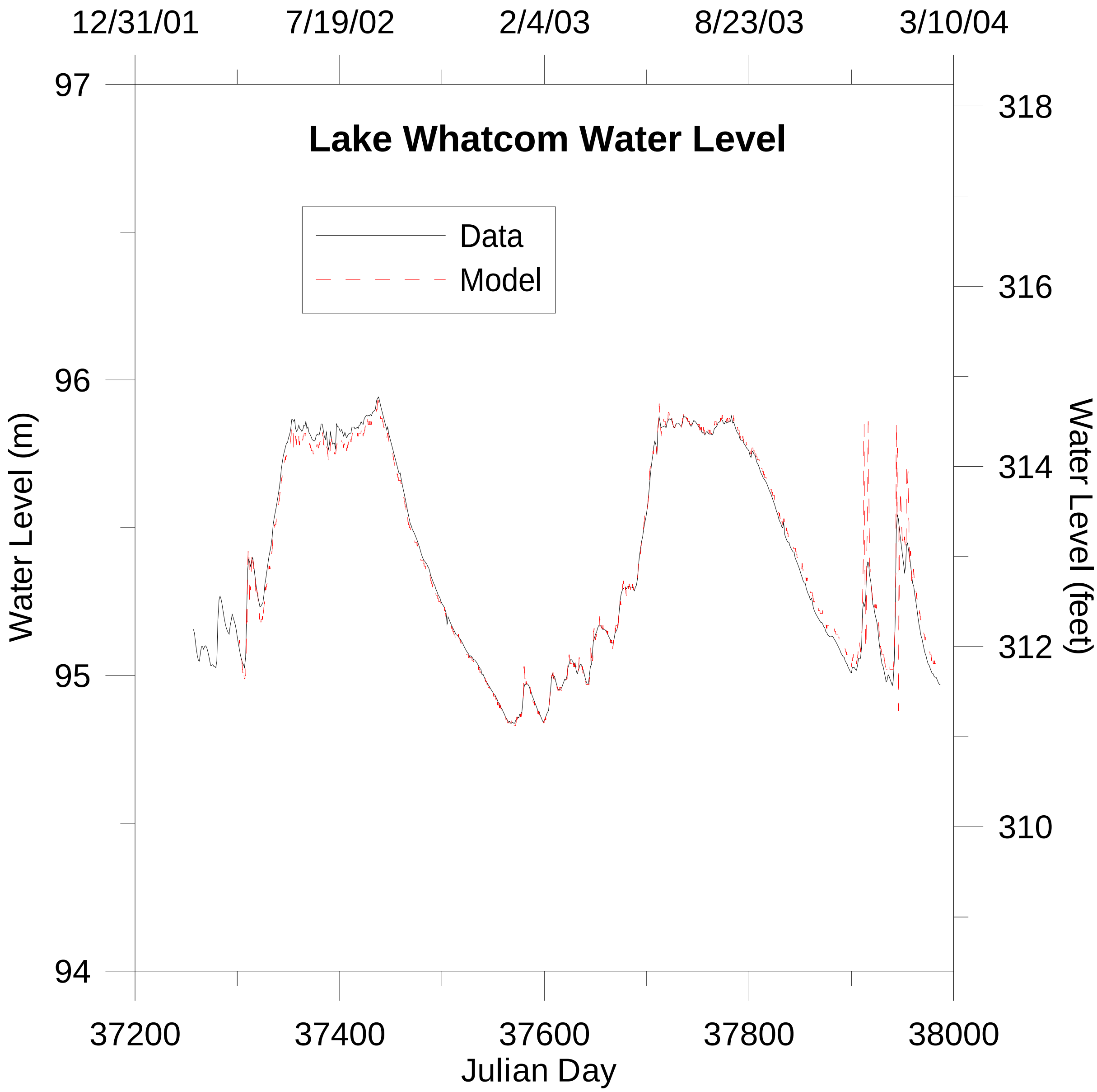

Figure 1. Water level prediction compared with data for Lake Whatcom.

Temperature Calibration

The primary model parameters affecting temperature calibration was wind sheltering coefficients. Comparisons between model predictions and temperatures were shown in Appendix B. Table 2 list error statistics between model predictions and data for all the sampling locations in the lake. Error statistics were calculated by comparing measured data at a particular depth with the model prediction (interpolated between layers) at that depth. The root mean square error average was less than 1 degrees Celsius for all sites. Figure 2 shows the correlation between model predictions and data. The r-squared value for model versus data was 0.996.

Table 2. Temperature profile error statistics.

Site	Mean Error (Celsius)	Absolute Mean Error (Celsius)	Root Mean Square Error (Celsius)
LW1	-0.01	0.81	0.96
LW2	0.15	0.72	0.87
LW3	-0.18	0.66	0.77
LW4	-0.30	0.74	0.83
Intake	0.11	0.67	0.72
Average	-0.05	0.72	0.83

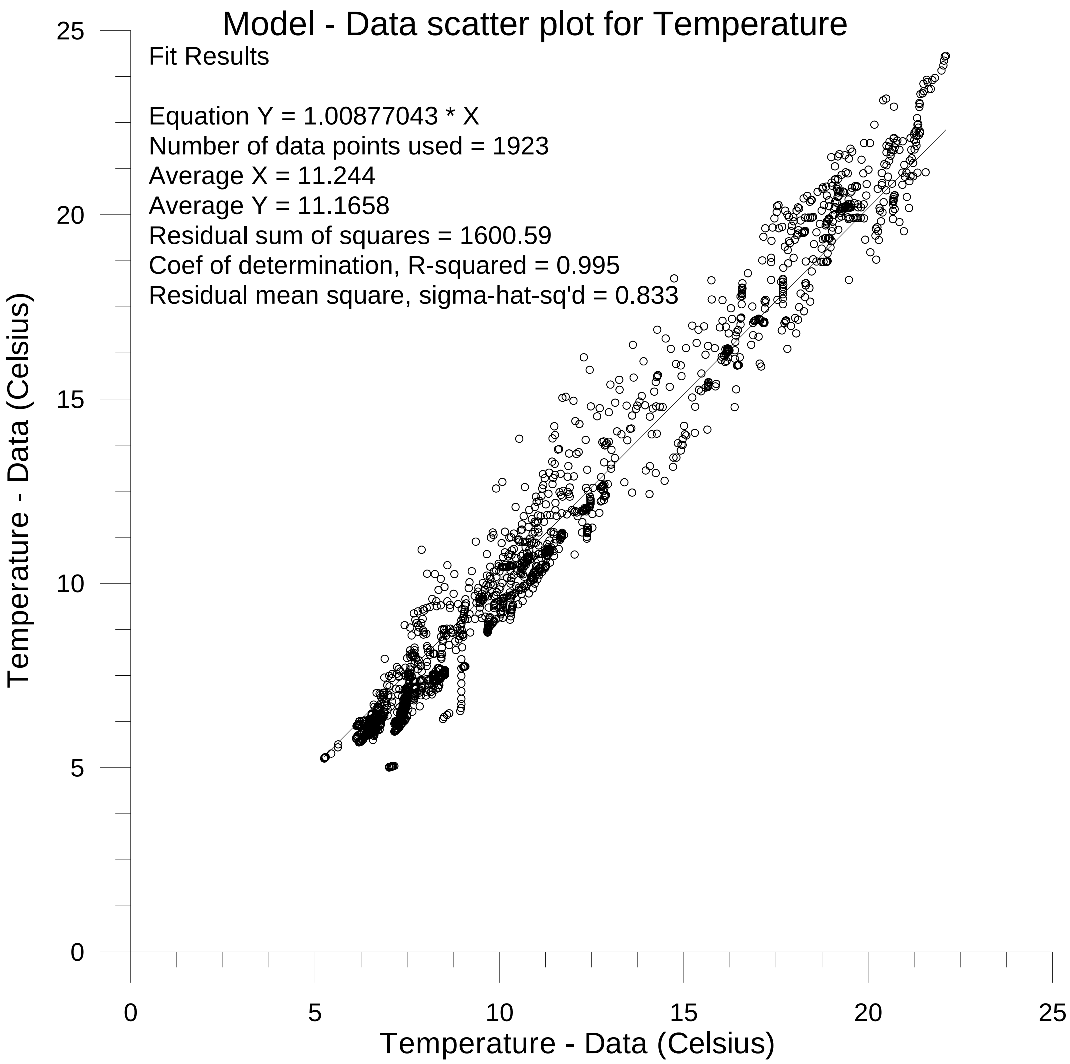

Figure 2. Model versus data scatter plot for temperature.

Water Quality Calibration

The calibrated water quality coefficients were shown in Table 3. These are variables that can be adusted to calibrate a CE-QUAL-W2 model.

Table 3. W2 Model Water Quality Parameters

Variable	Description	Units	Typical values*	Calibration Values
Hydrodynamics and Longitudinal Transport				
AX	Longitudinal eddy viscosity (for momentum dispersion)	m^2/sec	1	1
DX	Longitudinal eddy diffusivity (for dispersion of heat and constituents)	m^2/sec	1	1
Temperature				
CBHE	Coefficient of bottom heat exchange	Wm^2/sec	0.30	0.30
TSED	Sediment (ground) temperature	^oC	12.8	11.5
WSC	Wind sheltering coefficient		0.85	0.6-3.3
BETA	Fraction of incident solar radiation absorbed at the water surface		0.45	0.45
Water Quality				
EXH20	Extinction for water	/m	0.25	0.25 for wb 1 0.28 for wb 2
EXSS	Extinction due to inorganic suspended solids	m^3/m/g	0.01	0.1
EXOM	Extinction due to organic suspended solids	m^3/m/g	0.17	0.10 for wb 1 0.08 for wb 2
EXA	Extinction due to organic algal type 1	m^3/m/g	0.1	0.1
SSS	Suspended solids settling rate	m/day	2	1.5
AG1	Algal growth rate for algal type 1	/day	1.1	1.65
AM1	Algal mortality rate for algal type 1	/day	0.01	0.07
AE1	Algal excretion rate for algal type 1	/day	0.01	0.04
AR1	Algal dark respiration rate for algal type 1	/day	0.02	0.04
AS1	Algal settling rate for algal type 1	/day	0.14	0.1
ASAT1	Saturation intensity at maximum photosynthetic	W/m^2	150	50

Variable	Description	Units	Typical values*	Calibration Values
	rate for algal type 1			
APOM1	Fraction of algal biomass lost by mortality to detritus for algal type 1		0.8	0.9
AT11	Lower temperature for algal growth for algal type 1	^{o}C	10	4
AT21	Lower temperature for maximum algal growth for algal type 1	^{o}C	30	10
AT31	Upper temperature for maximum algal growth for algal type 1	^{o}C	35	14
AT41	Upper temperature for algal growth for algal type 1	^{o}C	40	25
AK11	Fraction of algal growth rate at ALGT1 for algal type 1		0.1	0.2
AK21	Fraction of maximum algal growth rate at ALGT2 for algal type 1		0.99	0.6
AK31	Fraction of maximum algal growth rate at ALGT3 for algal type 1		0.99	0.99
AK41	Fraction of algal growth rate at ALGT4 for algal type 1		0.1	0.1
ALGP-A1	Stoichiometric equivalent between organic matter and phosphorus for algal type 1		0.011	0.003
ALGN-A1	Stoichiometric equivalent between organic matter and nitrogen for algal type 1		0.08	0.08
ALGC-A1	Stoichiometric equivalent between organic matter and carbon for algal type 1		0.45	0.45
AG2	Algal growth rate for algal type 2	/day	1.1	1.8
AM2	Algal mortality rate for algal type 2	/day	0.01	0.06
AE2	Algal excretion rate for algal type 2	/day	0.01	0.04
AR2	Algal dark respiration rate for algal type 2	/day	0.02	0.04
AS2	Algal settling rate for algal	/day	0.14	0.1

Variable	Description	Units	Typical values*	Calibration Values
	type 2			
ASAT2	Saturation intensity at maximum photosynthetic rate for algal type 2	W/m^2	150	75
APOM2	Fraction of algal biomass lost by mortality to detritus for algal type 2		0.8	0.8
AT12	Lower temperature for algal growth for algal type 2	^oC	10	8
AT22	Lower temperature for maximum algal growth for algal type 2	^oC	30	12
AT32	Upper temperature for maximum algal growth for algal type 2	^oC	35	16
AT42	Upper temperature for algal growth for algal type 2	^oC	40	30
AK12	Fraction of algal growth rate at ALGT1 for algal type 2		0.1	0.1
AK22	Fraction of maximum algal growth rate at ALGT2 for algal type 2		0.99	0.6
AK32	Fraction of maximum algal growth rate at ALGT3 for algal type 2		0.99	0.99
AK42	Fraction of algal growth rate at ALGT4 for algal type 2		0.1	0.1
ALGP-A2	Stoichiometric equivalent between organic matter and phosphorus for algal type 2		0.011	0.0025
ALGN-A2	Stoichiometric equivalent between organic matter and nitrogen for algal type 2		0.08	0.08
ALGC-A2	Stoichiometric equivalent between organic matter and carbon for algal type 2		0.45	0.45
AG3	Algal growth rate for algal type 2	/day	1.1	1.85
AM3	Algal mortality rate for algal type 2	/day	0.01	0.06
AE3	Algal excretion rate for algal type 2	/day	0.01	0.04

Variable	Description	Units	Typical values*	Calibration Values
AR3	Algal dark respiration rate for algal type 2	/day	0.02	0.04
AS3	Algal settling rate for algal type 2	/day	0.14	0.01
ASAT3	Saturation intensity at maximum photosynthetic rate for algal type 2	W/m^2	150	130
APOM3	Fraction of algal biomass lost by mortality to detritus for algal type 2		0.8	0.9
AT13	Lower temperature for algal growth for algal type 2	^oC	10	8
AT23	Lower temperature for maximum algal growth for algal type 2	^oC	30	16
AT33	Upper temperature for maximum algal growth for algal type 2	^oC	35	20
AT43	Upper temperature for algal growth for algal type 2	^oC	40	30
AK13	Fraction of algal growth rate at ALGT1 for algal type 2		0.1	0.1
AK23	Fraction of maximum algal growth rate at ALGT2 for algal type 2		0.99	0.60
AK33	Fraction of maximum algal growth rate at ALGT3 for algal type 2		0.99	0.99
AK43	Fraction of algal growth rate at ALGT4 for algal type 2		0.1	0.1
ALGP-A3	Stoichiometric equivalent between organic matter and phosphorus for algal type 2		0.011	0.002
ALGN-A3	Stoichiometric equivalent between organic matter and nitrogen for algal type 2		0.08	0.08
ALGC-A2	Stoichiometric equivalent between organic matter and carbon for algal type 2		0.45	0.45
LDOMDK	Labile DOM decay rate	/day	0.12	WB1:0.060 WB2:0.060
LRDDK	Labile to refractory decay rate	/day	0.001	0.01

Variable	Description	Units	Typical values*	Calibration Values
RDOMDK	Maximum refractory decay rate	/day	0.001	0.001
LPOMDK	Labile Detritus decay rate	/day	0.06	WB1:0.020 WB2:0.020
POMS	Detritus settling rate	m/day	0.35	WB1:1.0 WB2:0.3
RPOMDK	Refractory Detritus decay rate	/day		0.001
OMT1	Lower temperature for organic matter decay	^oC	4	4
OMT2	Lower temperature for maximum organic matter decay	^oC	20	20
OMK1	Fraction of organic matter decay rate at OMT1		0.2	0.2
OMK2	Fraction of organic matter decay rate at OMT2		0.99	0.99
PARTP	Phosphorous partitioning coefficient for suspended solids		1.2	0
AHSP1	Algal half-saturation constant for phosphorous – algae 1	g/m	0.009	0.002
AHSP2	Algal half-saturation constant for phosphorous – algae 2	g/m	0.009	0.0025
AHSP3	Algal half-saturation constant for phosphorous – algae 3	g/m	0.009	0.002
NH4DK	Ammonia decay rate (nitrification rate)	/day	0.12	0.25
AHSN	Algal half-saturation constant for ammonia	g/m^3	0.014	0.014
NH4T1	Lower temperature for ammonia decay	^oC	5	5
NH4T2	Lower temperature for maximum ammonia decay	^oC	20	25
NH4K1	Fraction of nitrification rate at NH4T1		0.1	0.1
NH4K2	Fraction of nitrification rate at NH4T2		0.99	0.99
NO3DK	Nitrate decay rate (denitrification rate)	/day	0.102	0.15
NO3T1	Lower temperature for nitrate decay	^oC	5	5

Variable	Description	Units	Typical values*	Calibration Values
NO3T2	Lower temperature for maximum nitrate decay	^oC	20	25
NO3K1	Fraction of denitrification rate at NO3T1		0.1	0.1
NO3K2	Fraction of denitrification rate at NO3T2		0.99	0.99
O2NH4	Oxygen stoichiometric equivalent for ammonia decay		4.57	4.57
O2OM	Oxygen stoichiometric equivalent for organic matter decay		1.4	1.4
O2AR	Oxygen stoichiometric equivalent for dark respiration		1.4	1.1
O2AG	Oxygen stoichiometric equivalent for algal growth		1.4	1.8
O2LIM	Dissolved oxygen concentration at which anaerobic processes begin	g/m^3	0.05	0.1
SEDB	Sediment burial rate	/day		0.007
* Cole and Wells (2006)				

The constituent model-error statistics for all consituents and sites were included in Table 4 through Table 12. Statistics calculated include mean error (ME), absolute mean error (AME), and root mean square error (RMS). Error statistics were calculated by comparing measured data at a particular depth with the model prediction (interpolated between layers) at that depth. "Appendix A: Vertical Profiles of Model Predictions and Data" contains the vertical profile model versus data comparisons. Scatter plots showing the model versus data comparisons were shown for dissolved oxygen and chlorophyll a in Figure 3 and Figure 4.

The percentage bio-volumes of the 3 algae groups were also compared with vertical profile data. Figure 545 through Figure 706 in "Appendix A: Vertical Profiles of Model Predictions and Data" show the model predicted bio-volumes and data. The algae 1 compartment simulates Chrysophyta (mostly diatoms), the algae 2 compartment simulates Chlorophyta (greens), and the algae 3 compartment represents cyanobacteria (blue-greens). Algae data were obtained from the Washington Department of Ecology and Western Washington University (Deluna, 2004).

Table 4. Model-data error statistics for ortho-phosphorus.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	0.0011	0.0031	0.0036
LW2	52	0.0002	0.0021	0.0023

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW3	25	-0.0001	0.0015	0.0017
LW4	11	-0.0003	0.0015	0.0017
INTAKE	54	-0.0008	0.0018	0.0019
	Average	0.0000	0.0020	0.0022

Table 5. Model-data error statistics for ammonia nitrogen.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	0.0179	0.0411	0.0456
LW2	52	0.0261	0.0357	0.0452
LW3	25	0.0066	0.0077	0.0095
LW4	11	0.0043	0.0058	0.0066
INTAKE	54	0.0232	0.0232	0.0240
	Average	0.0156	0.0227	0.0262

Table 6. Model-data error statistics for nitrite-nitrate nitrogen.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	0.02	0.07	0.08
LW2	52	0.00	0.07	0.08
LW3	25	-0.01	0.08	0.09
LW4	11	-0.04	0.07	0.08
INTAKE	54	0.03	0.05	0.06
	Average	0.00	0.07	0.08

Table 7. Model-data error statistics for dissolved oxygen.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	-0.26	0.77	0.89
LW2	52	-0.22	0.78	0.96
LW3	25	0.14	0.63	0.73
LW4	11	0.12	0.68	0.74
INTAKE	54	0.00	0.63	0.66
	Average	-0.05	0.70	0.80

Table 8. Model-data error statistics for alkalinity.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	0.47	1.87	2.02
LW2	52	2.24	2.64	2.76
LW3	25	1.85	1.92	2.22
LW4	11	1.41	1.54	1.83

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
INTAKE	54	3.14	3.14	3.16
	Average	1.82	2.22	2.40

Table 9. Model-data error statistics for total persulfate nitrogen.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	0.00	0.06	0.06
LW2	52	-0.02	0.06	0.08
LW3	25	-0.04	0.07	0.09
LW4	11	-0.07	0.08	0.09
INTAKE	54	0.01	0.04	0.04
	Average	-0.03	0.06	0.07

Table 10. Model-data error statistics for total phosphorus.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	-0.004	0.006	0.007
LW2	52	-0.002	0.005	0.006
LW3	25	-0.001	0.004	0.005
LW4	11	0.000	0.003	0.004
INTAKE	54	0.000	0.004	0.004
	Average	-0.001	0.004	0.005

Table 11. Model-data error statistics for chlorophyll a.

Site ID	Model Segment #	Mean Error (µg/l)	Mean Absolute Error (µg /l)	Root Mean Square Error (µg /l)
LW1	61	1.48	1.88	2.28
LW2	52	0.40	1.18	1.37
LW3	25	0.15	1.00	1.16
LW4	11	0.45	1.24	1.39
INTAKE	54	1.15	1.71	1.75
	Average	0.72	1.40	1.59

Table 12. Model-data error statistics for pH.

Site ID	Model Segment #	Mean Error (mg/l)	Mean Absolute Error (mg/l)	Root Mean Square Error (mg/l)
LW1	61	-0.09	0.25	0.32
LW2	52	0.00	0.22	0.25
LW3	25	0.24	0.31	0.34
LW4	11	0.26	0.30	0.33
INTAKE	54	-0.08	0.30	0.31
	Average	0.07	0.28	0.31

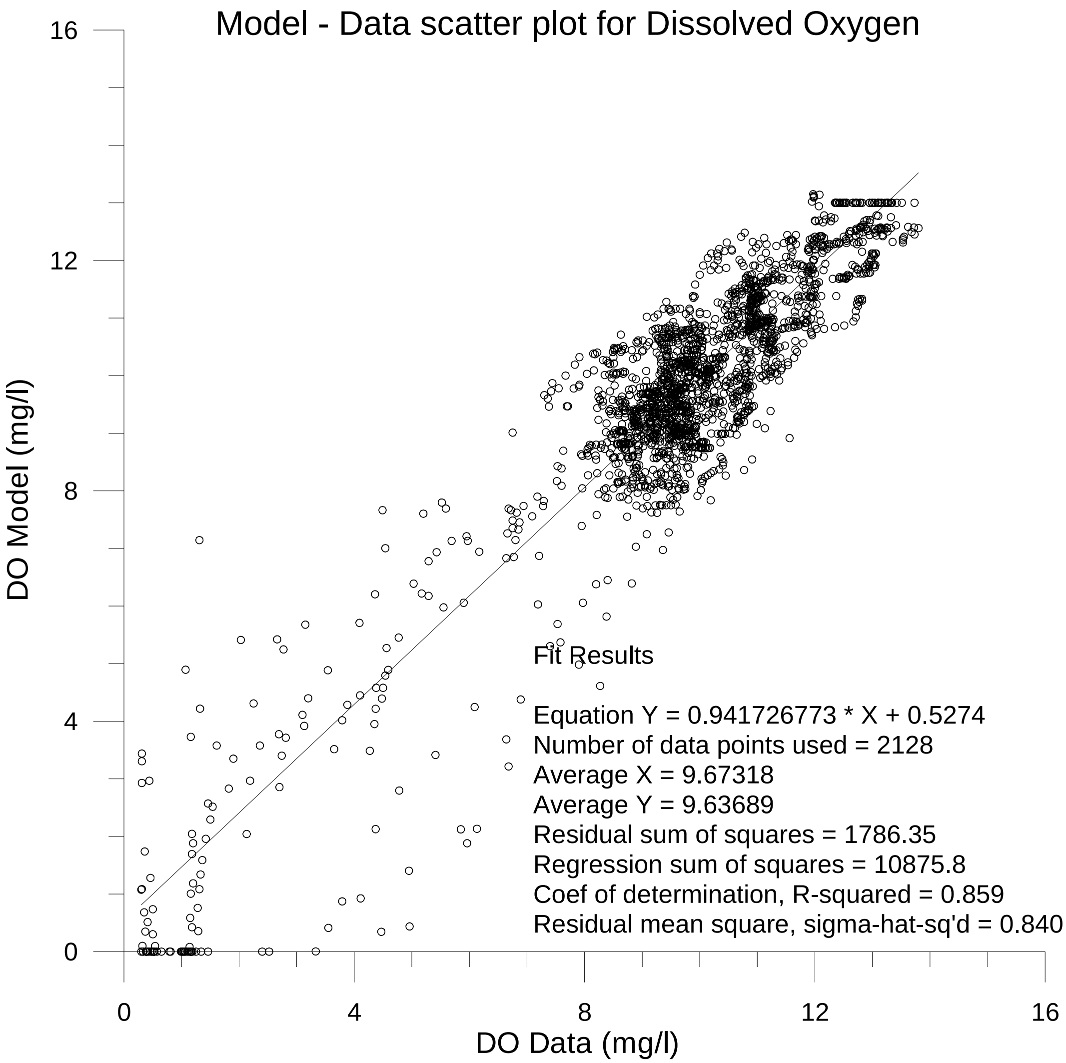

Figure 3. Model versus data scatter plot for dissolved oxygen.

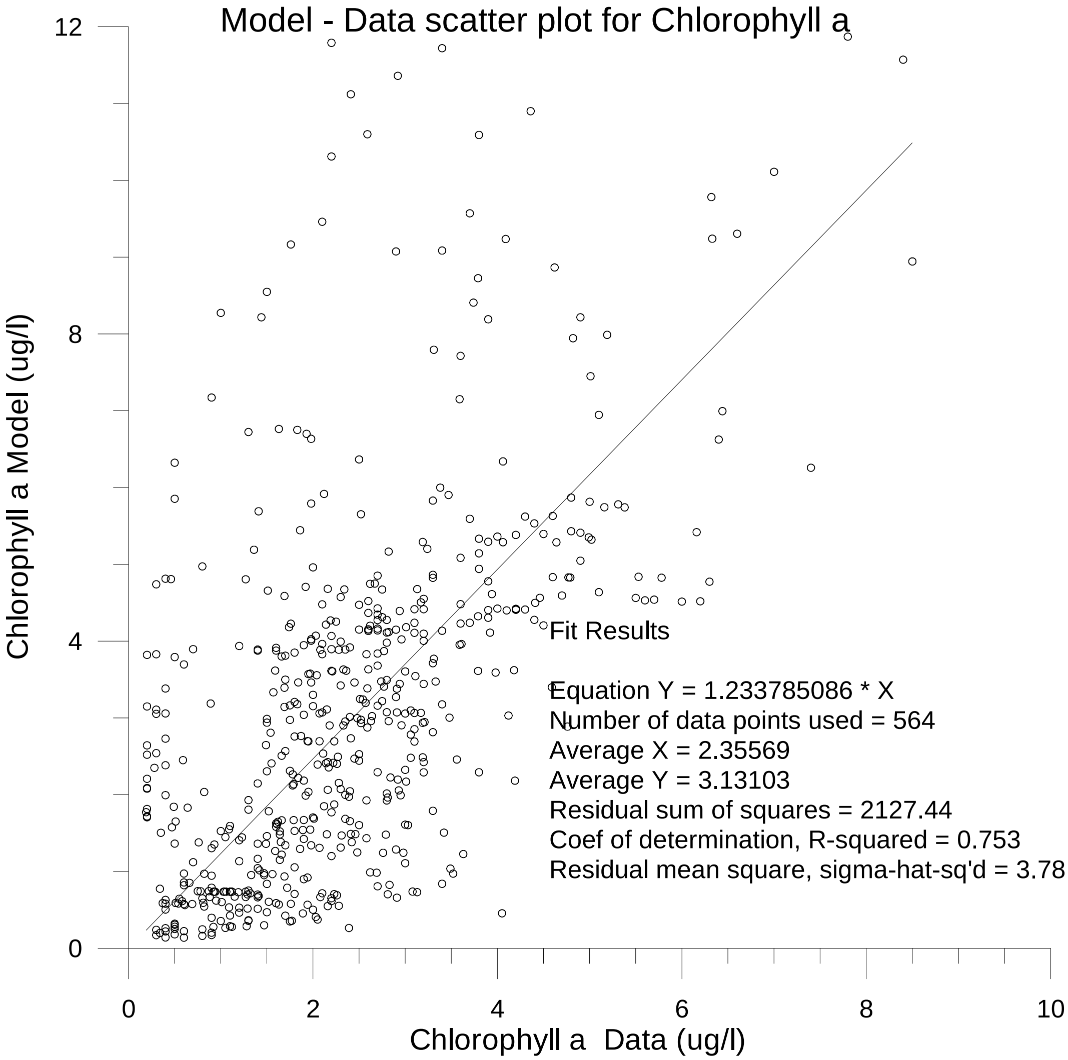

Figure 4. Model versus data scatter plot for chlorophyll a.

Summary

The Lake Whatcom water quality and hydrodynamic model has been upgraded from CE-QUAL-W2 Version 3.2 to version 3.5 (Cole and Wells, 2006; http://www.cee.pdx.edu/w2). Tributary loading have also been improved. The model now includes sediment carbon, phosophorus, and nitrogen compartments.

In general, the model reproduces the lake responses to the known boundary conditions. The average absolute mean error of model predictions was 0.72 degrees Celsius for temperature, 0.70 mg/l for dissolved oxygen, 1.40 ug/l for chlorophyll a, 0.28 for pH and 0.004 mg/l for total phosphorus.

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Berger, C. J. and S. A. Wells (2005). "Lake Whatcom Water Quality Model," Technical Report EWR-03-05, Department of Civil and Environmental Engineering, Portland State University, Portland, OR.

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Deluna, E. (2004), Water Quality and algae data provided by Elise Deluna, Western Washington University

Appendix A: Vertical Profiles of Model Predictions and Data

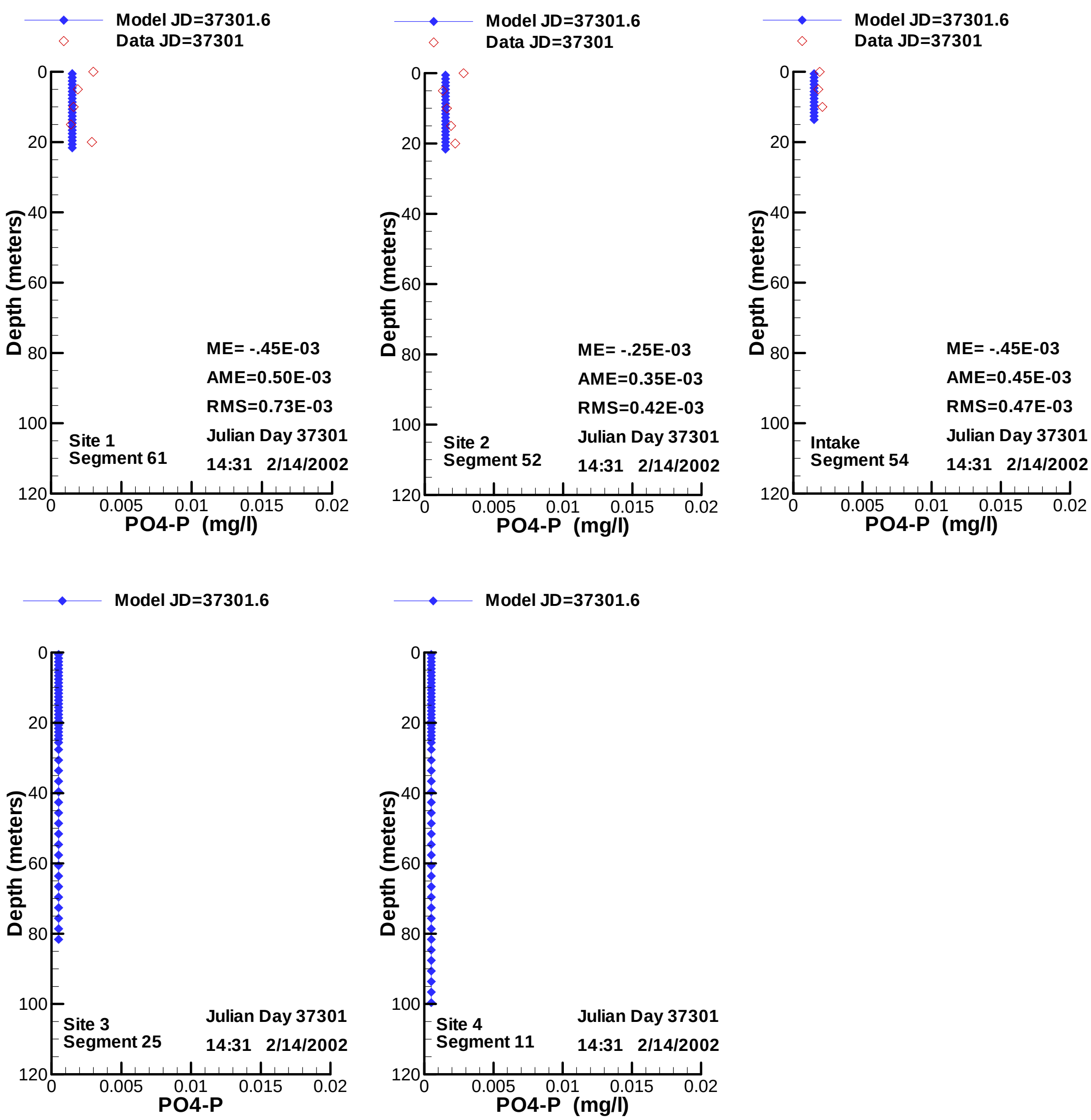

Figure 5. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 2/14/2002.

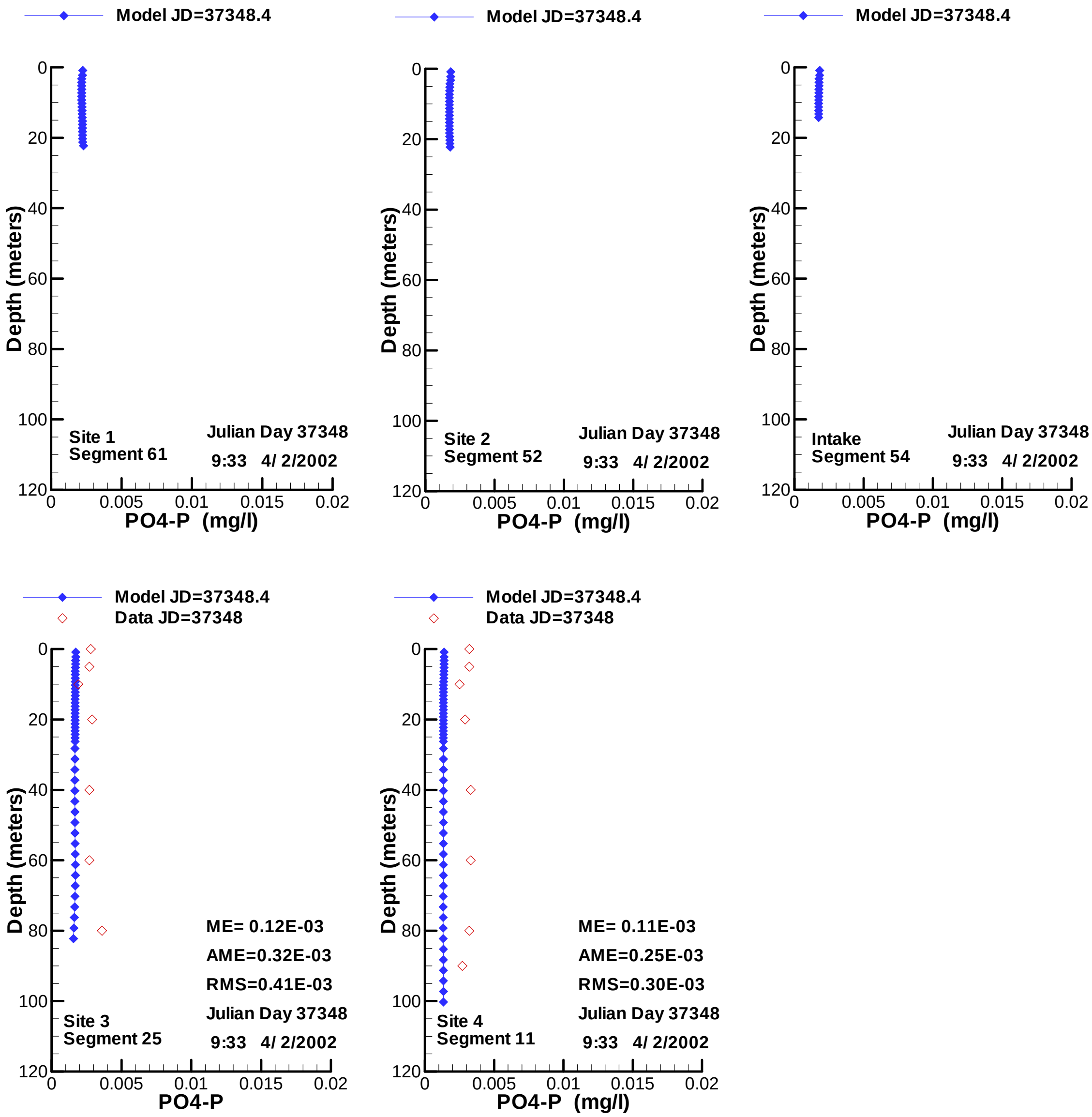

Figure 6. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 4/ 2/2002.

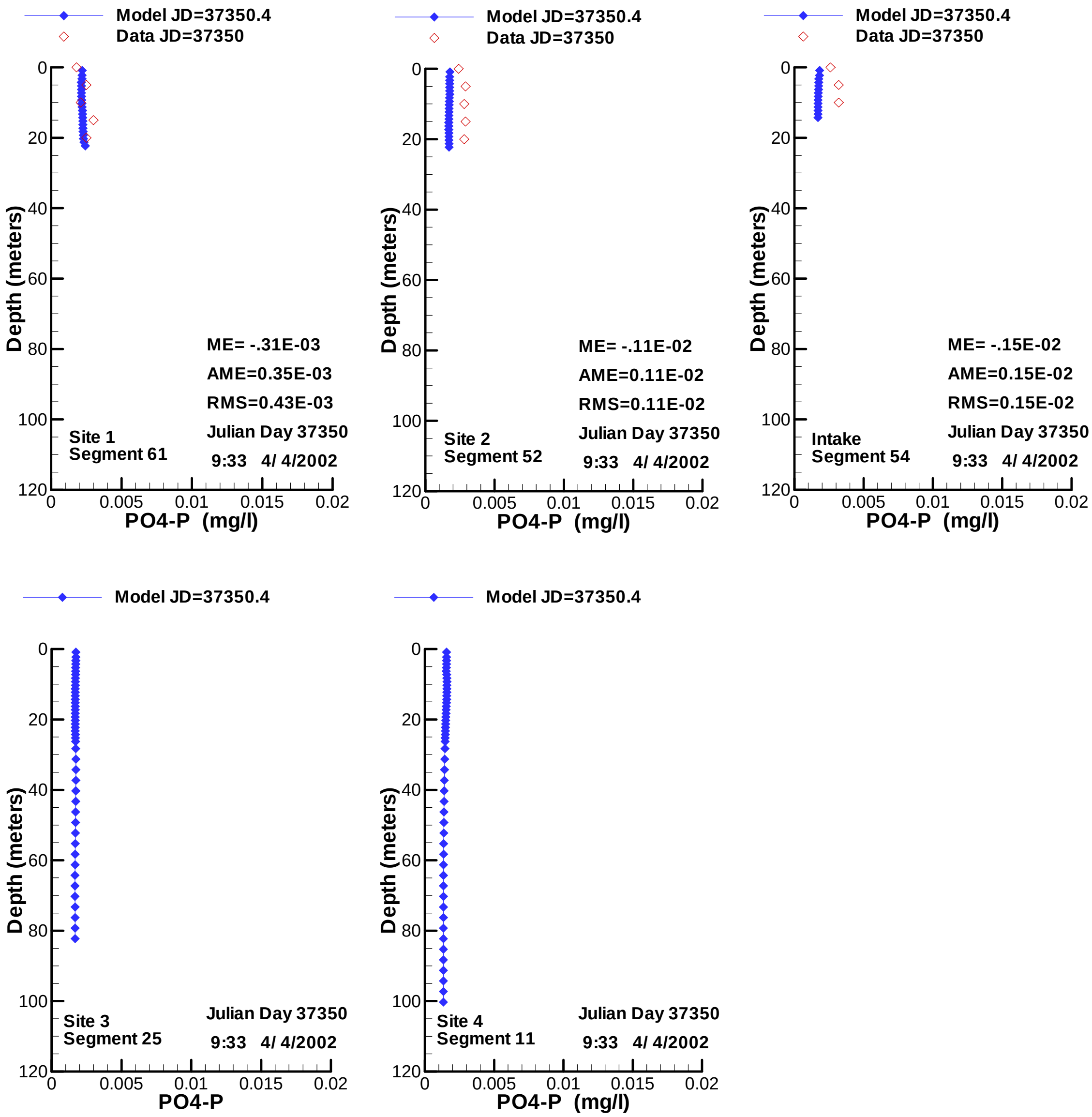

Figure 7. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 4/ 4/2002.

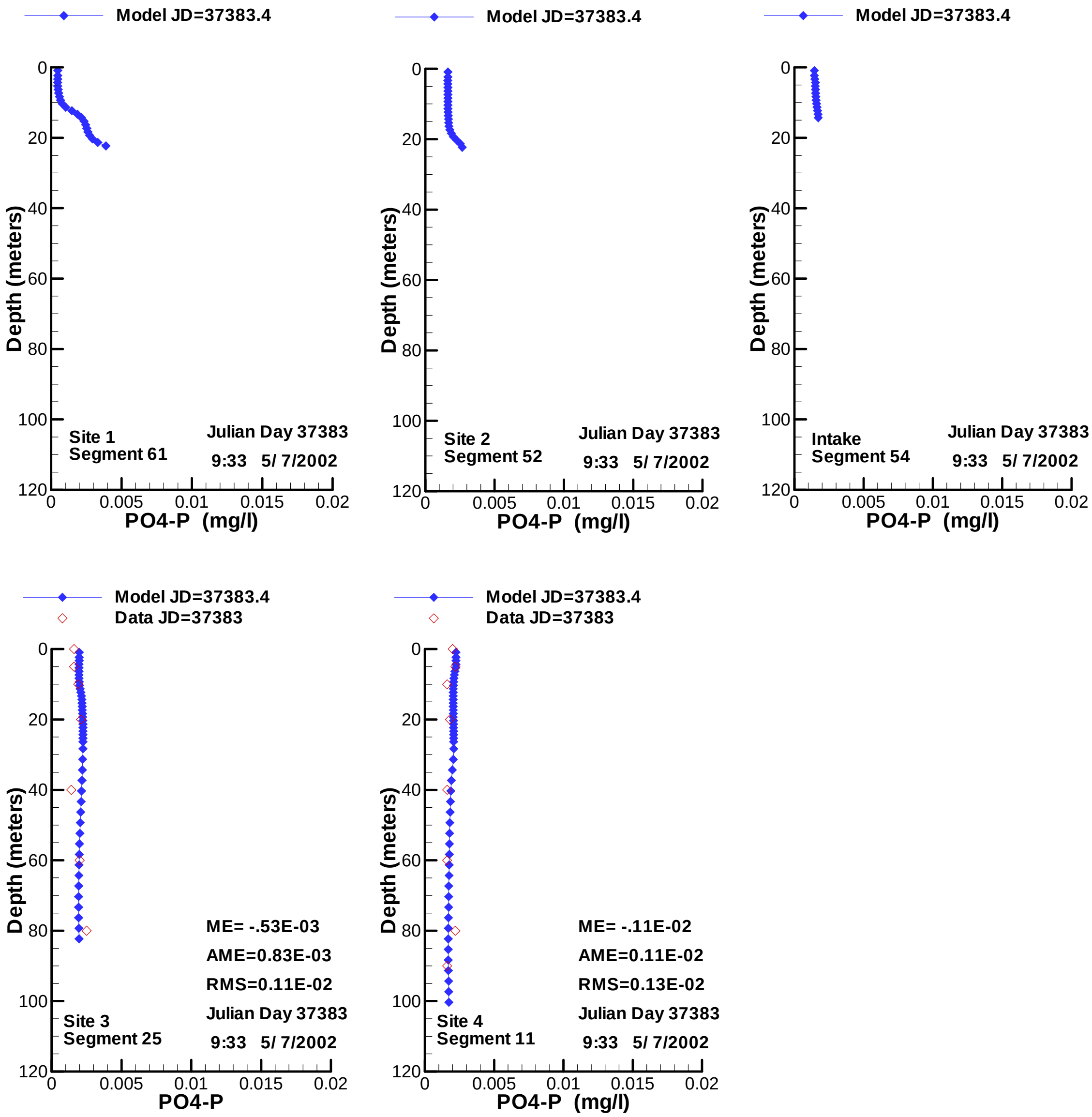

Figure 8. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 5/ 7/2002.

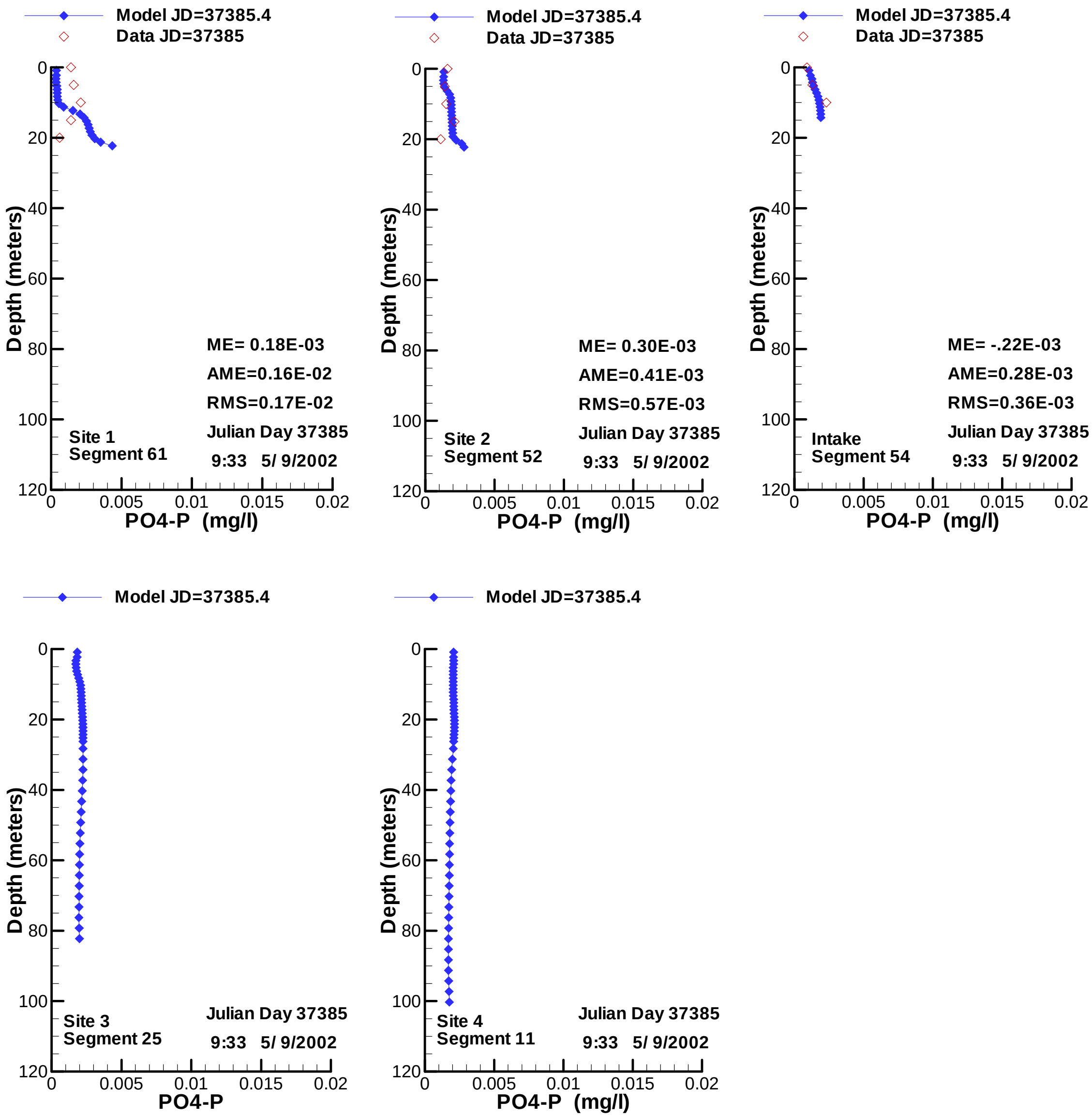

Figure 9. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 5/ 9/2002.

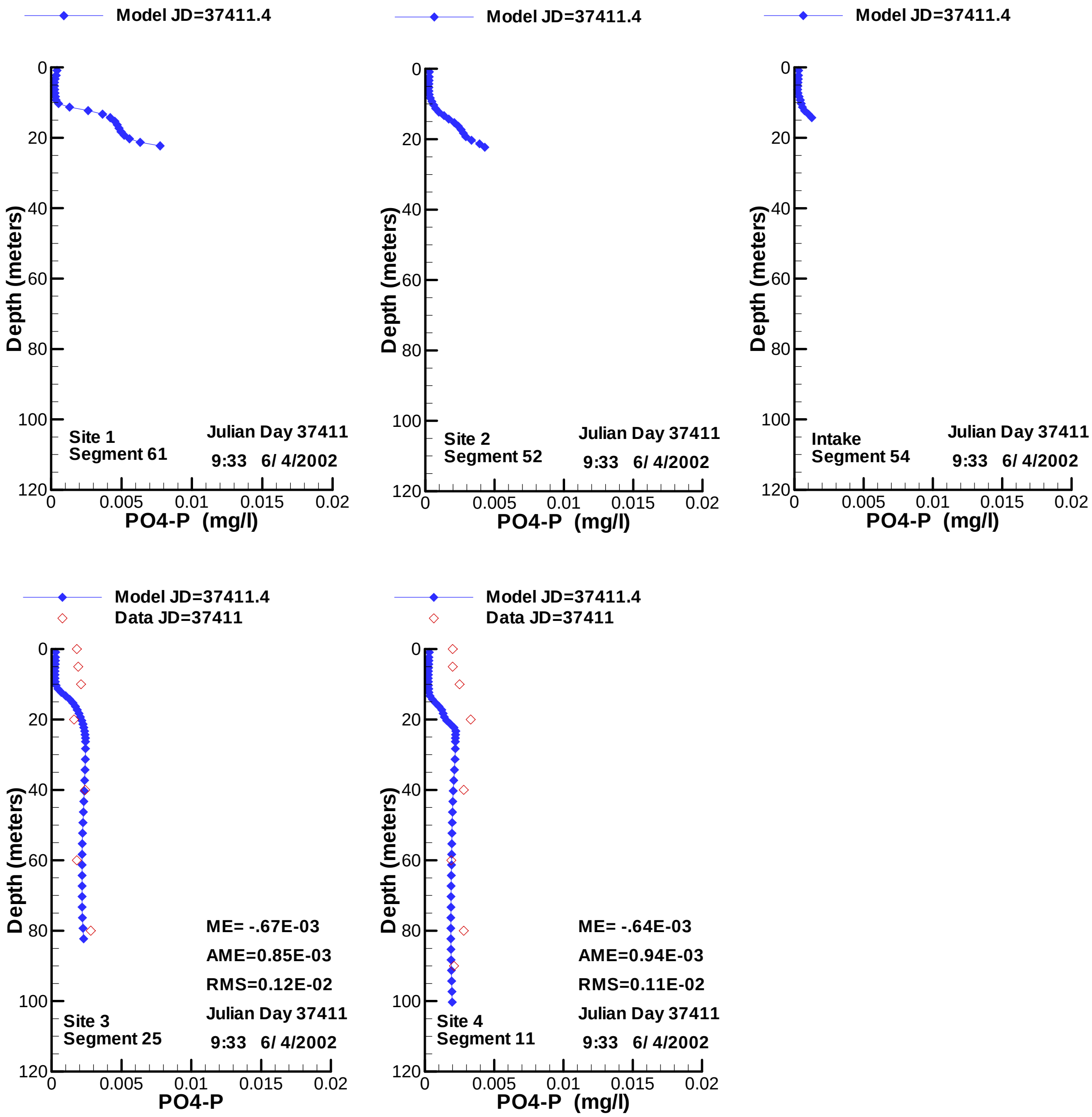

Figure 10. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 6/ 4/2002.

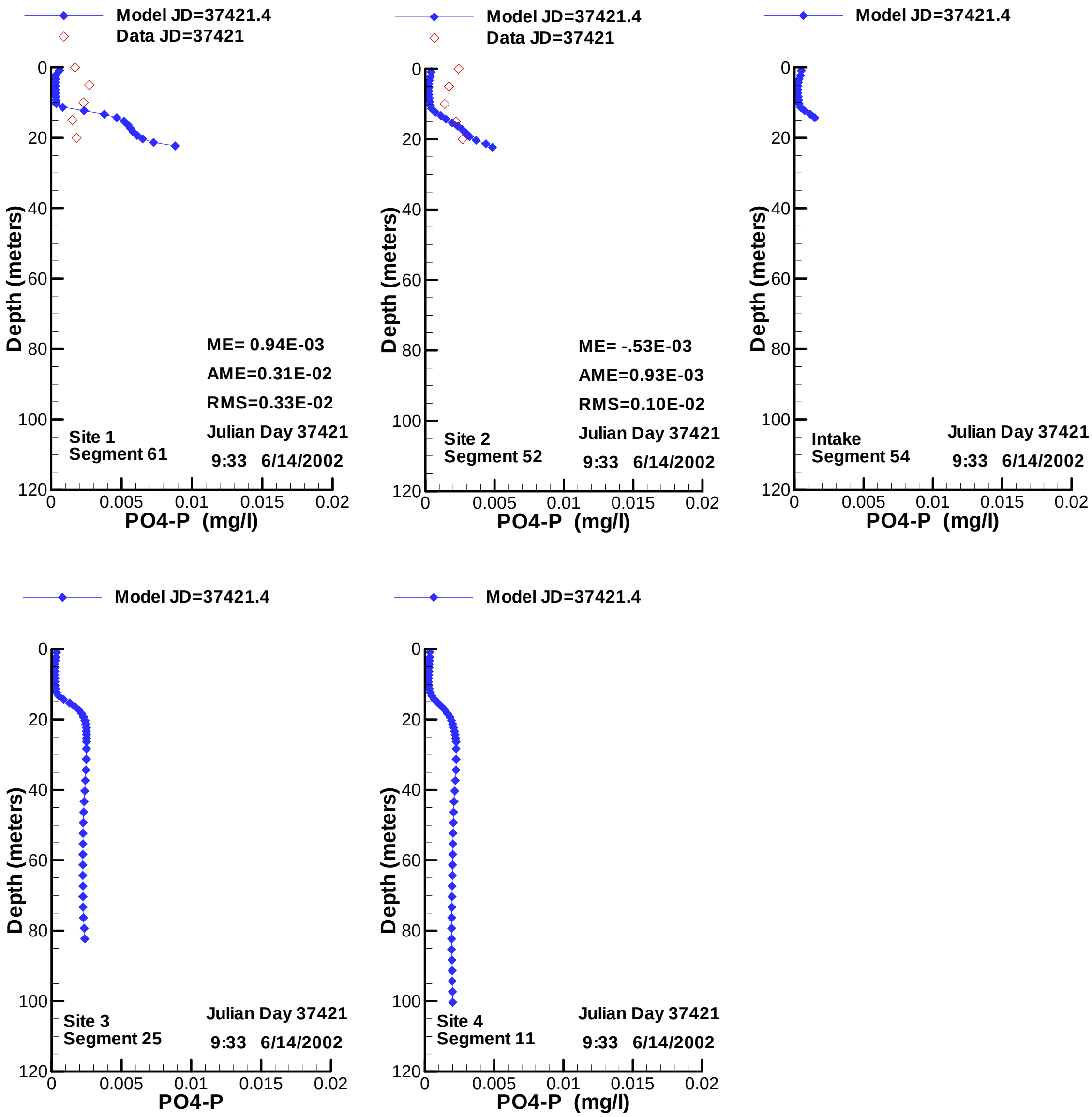

Figure 11. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 6/14/2002.

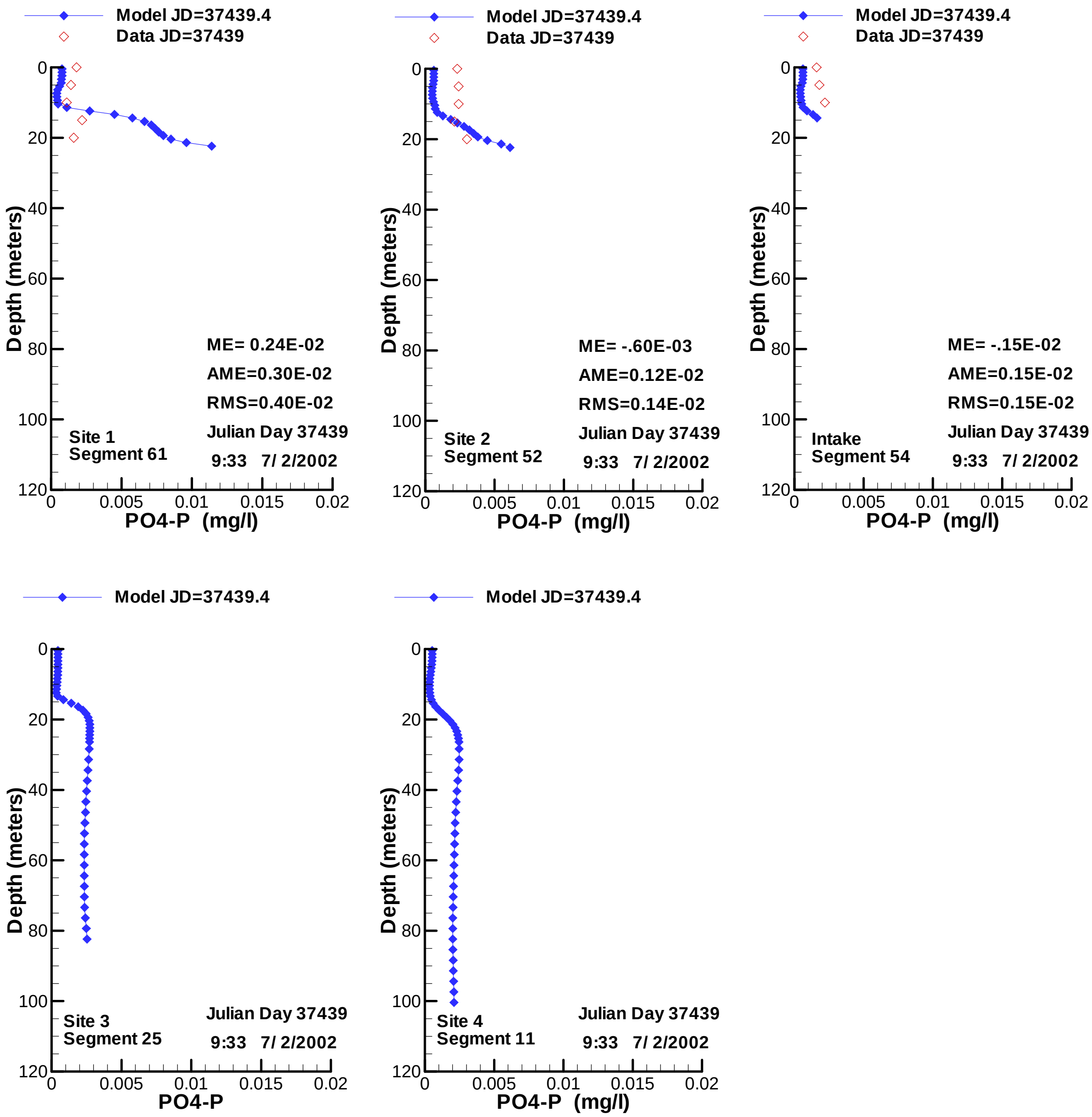

Figure 12. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/ 2/2002.

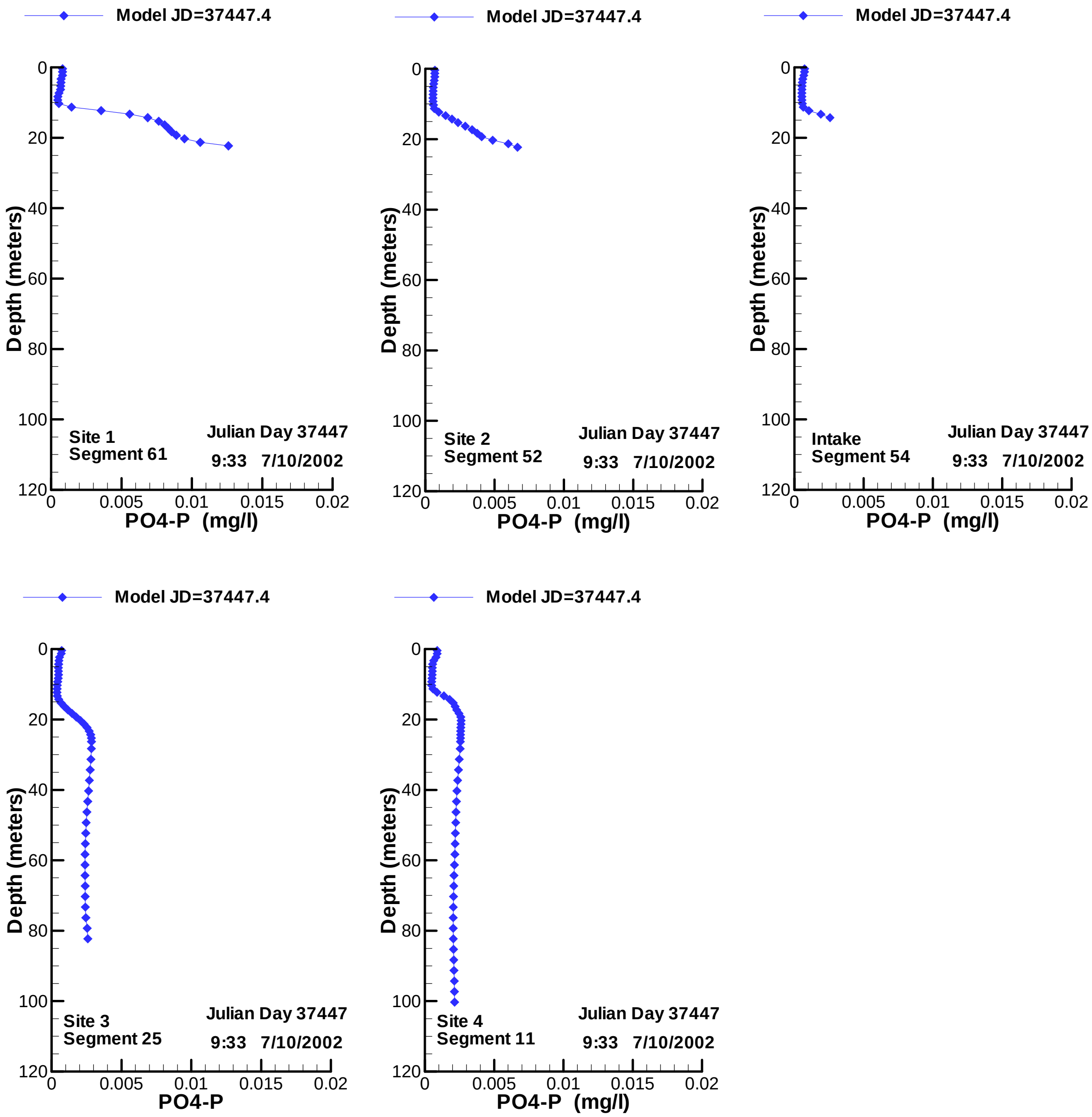

Figure 13. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/10/2002.

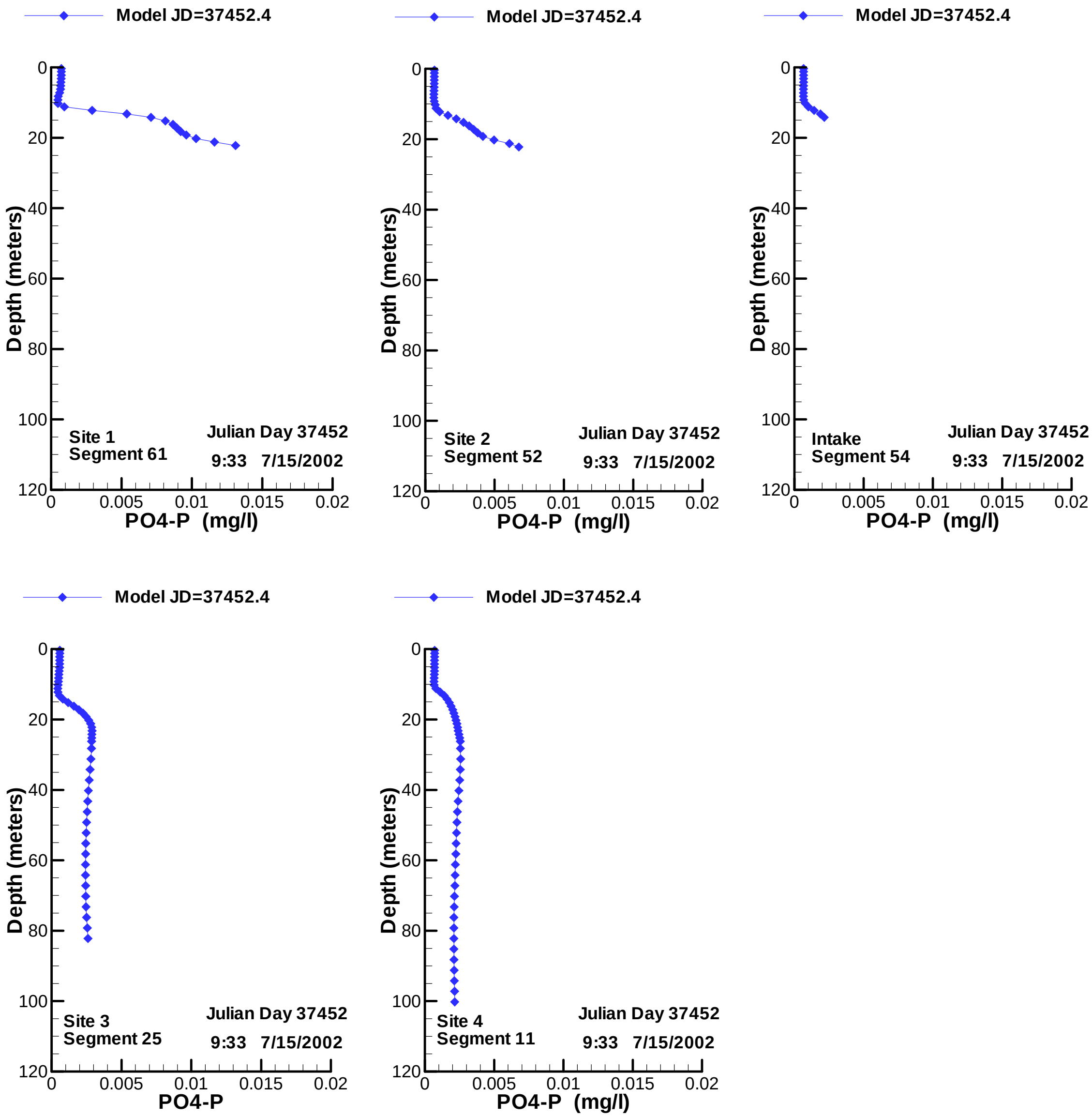

Figure 14. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/15/2002.

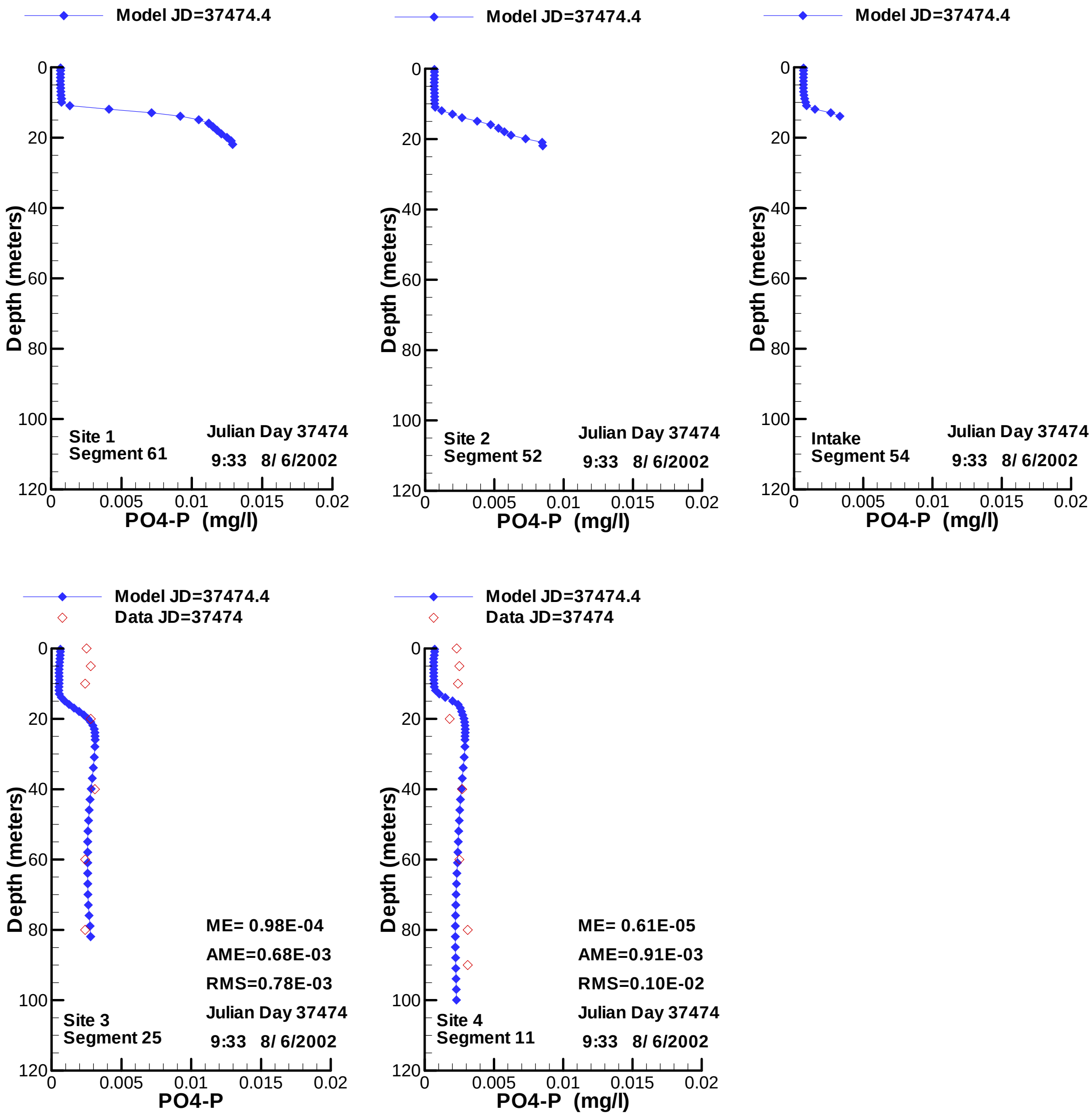

Figure 15. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/ 6/2002.

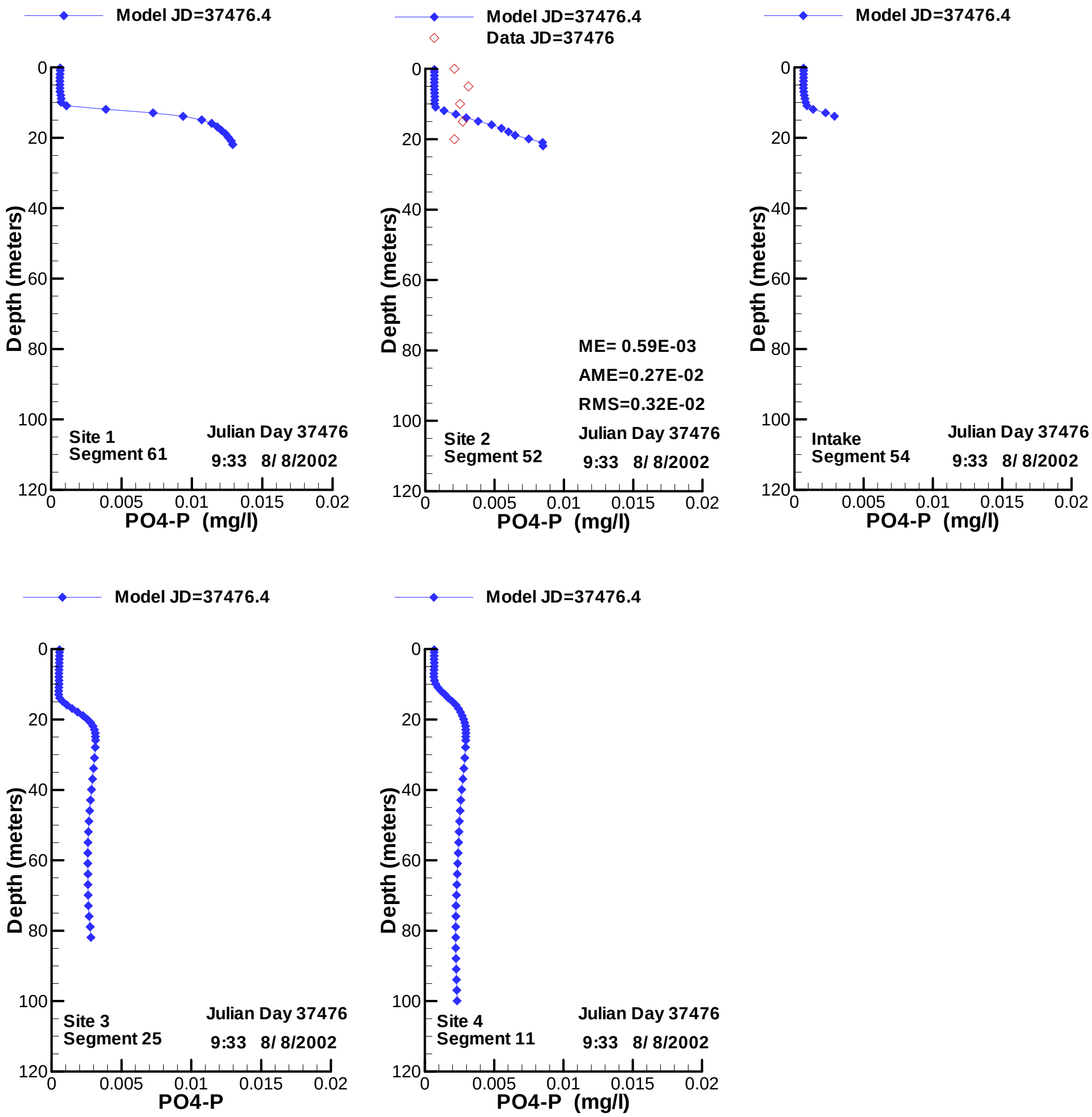

Figure 16. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/ 8/2002.

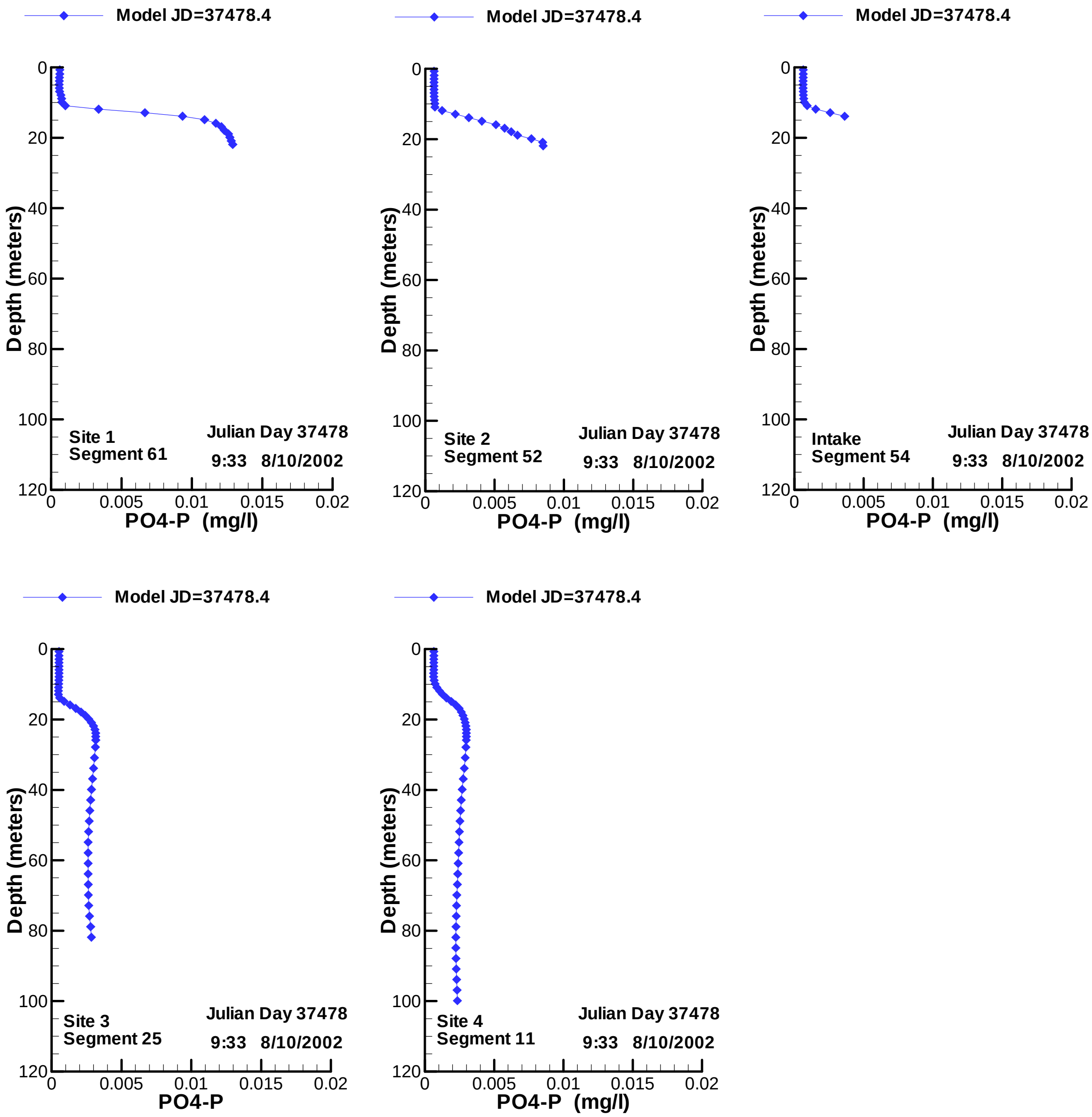

Figure 17. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/10/2002.

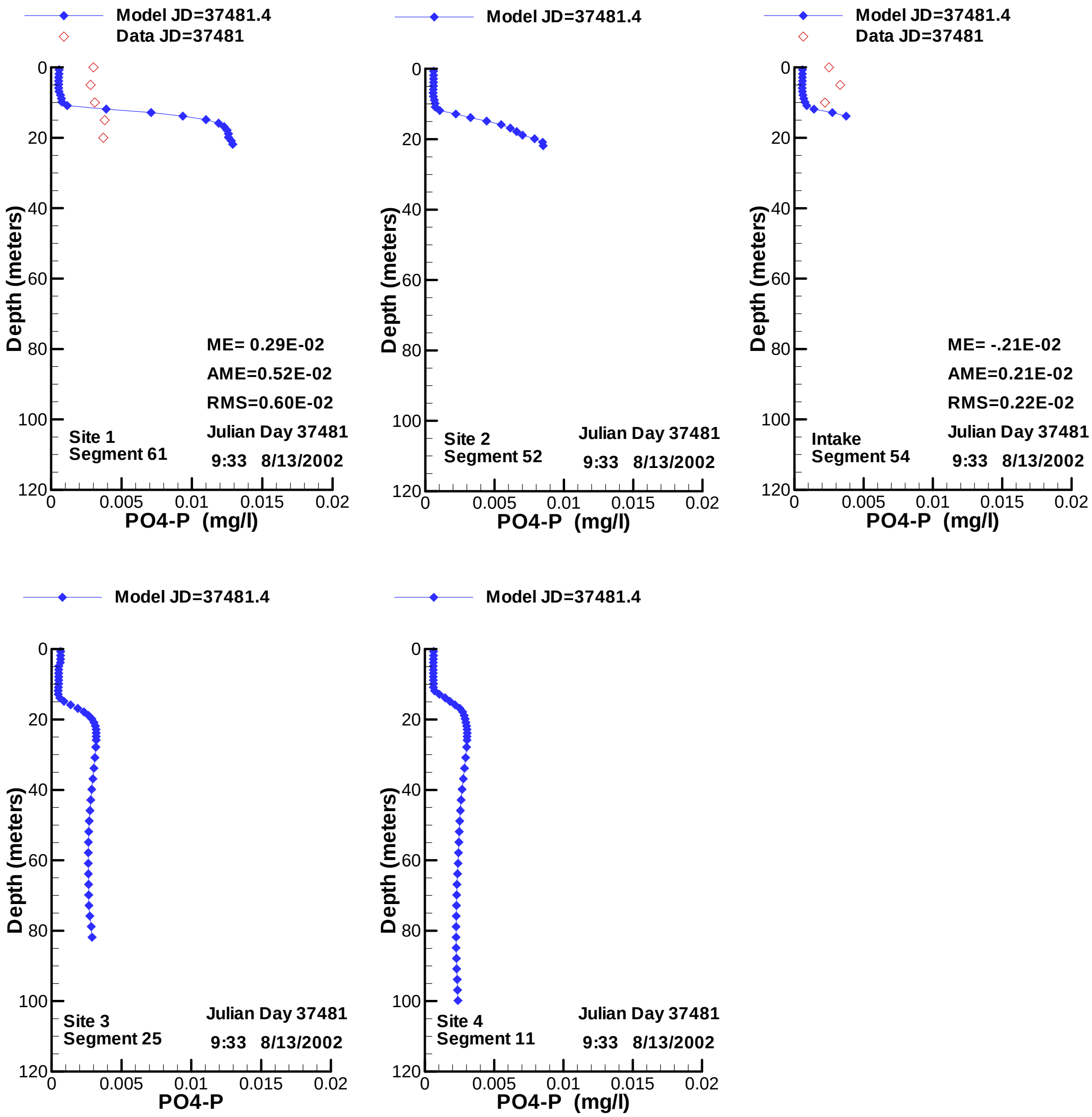

Figure 18. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/13/2002.

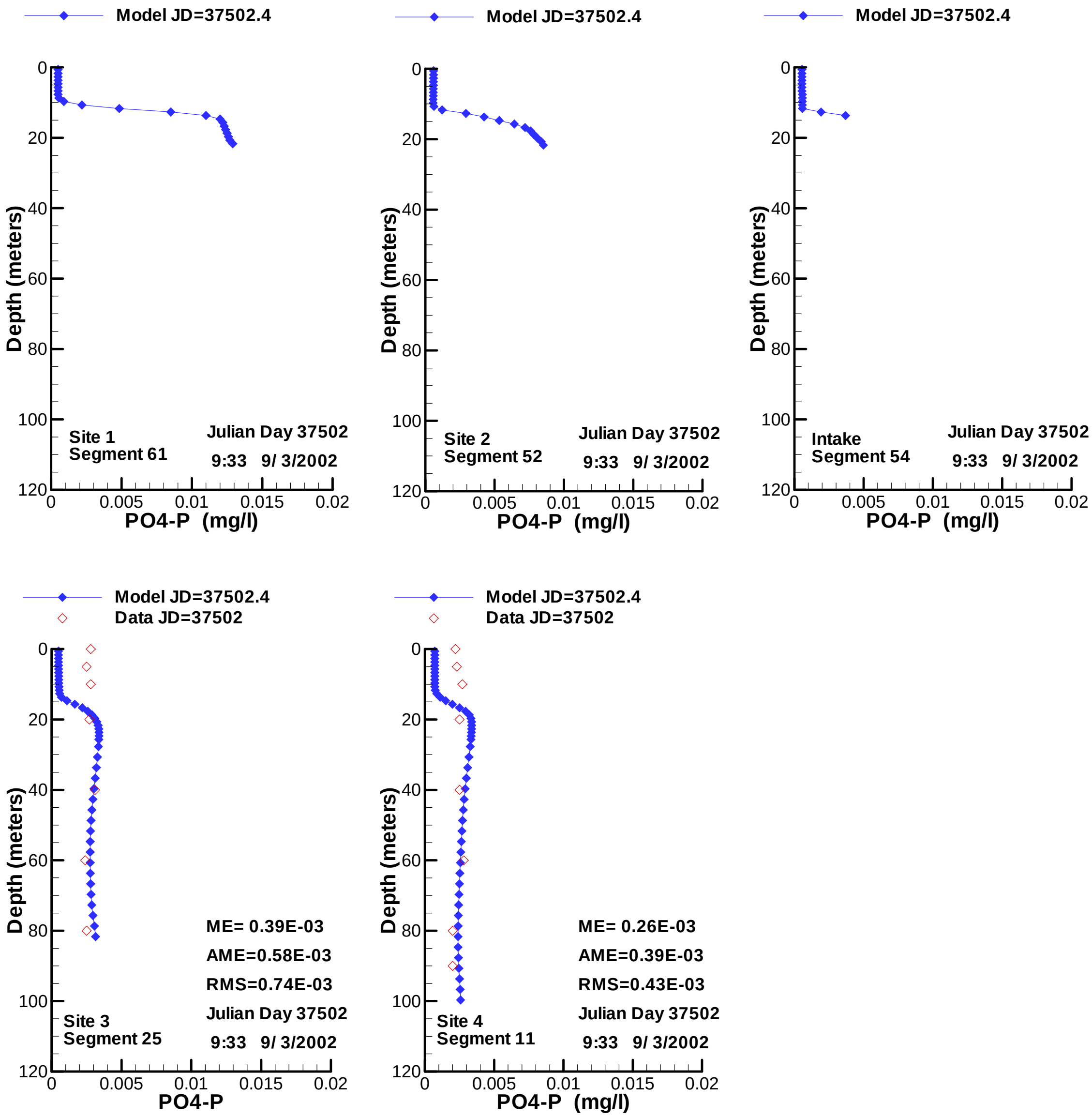

Figure 19. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/ 3/2002.

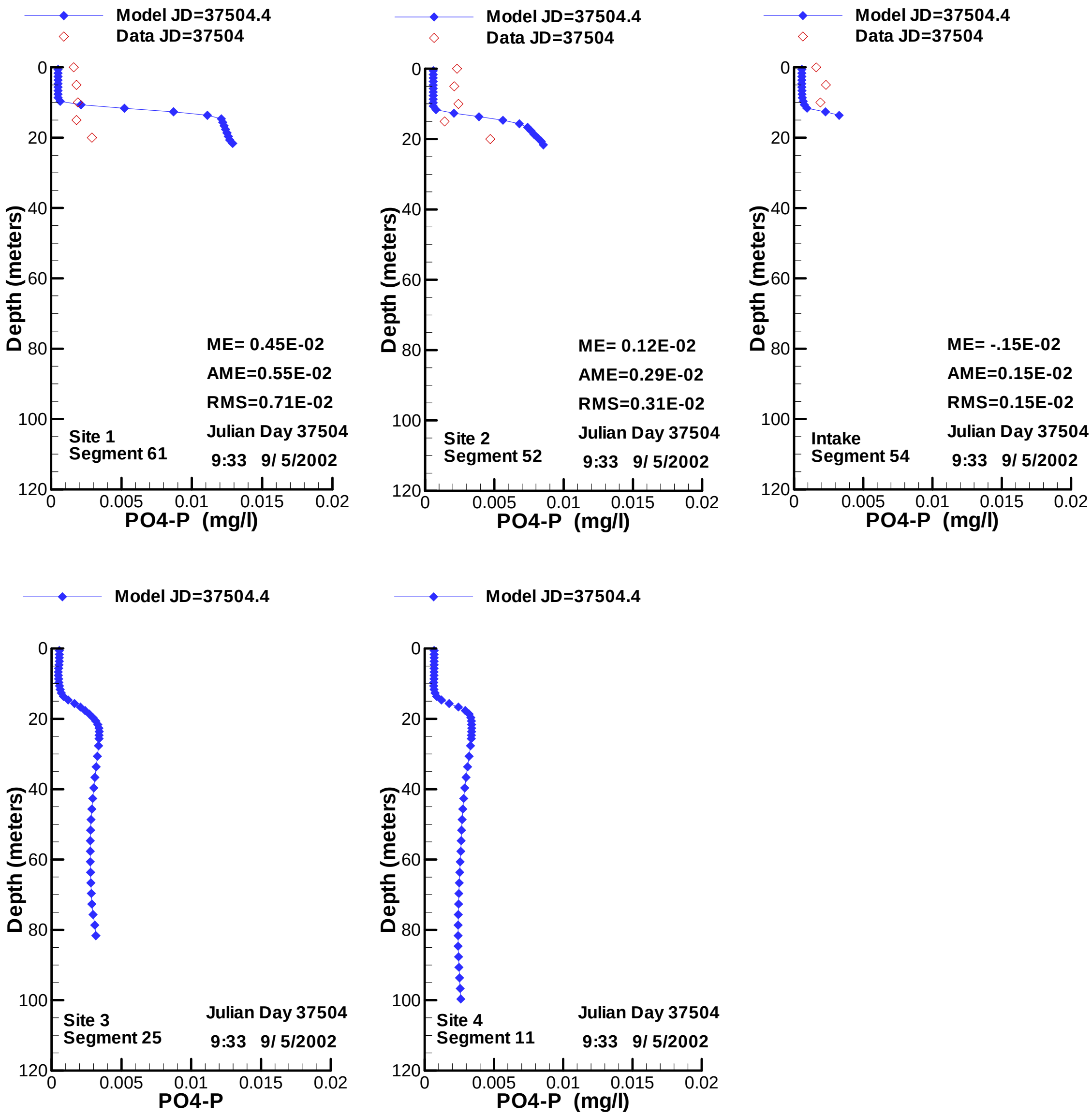

Figure 20. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/ 5/2002.

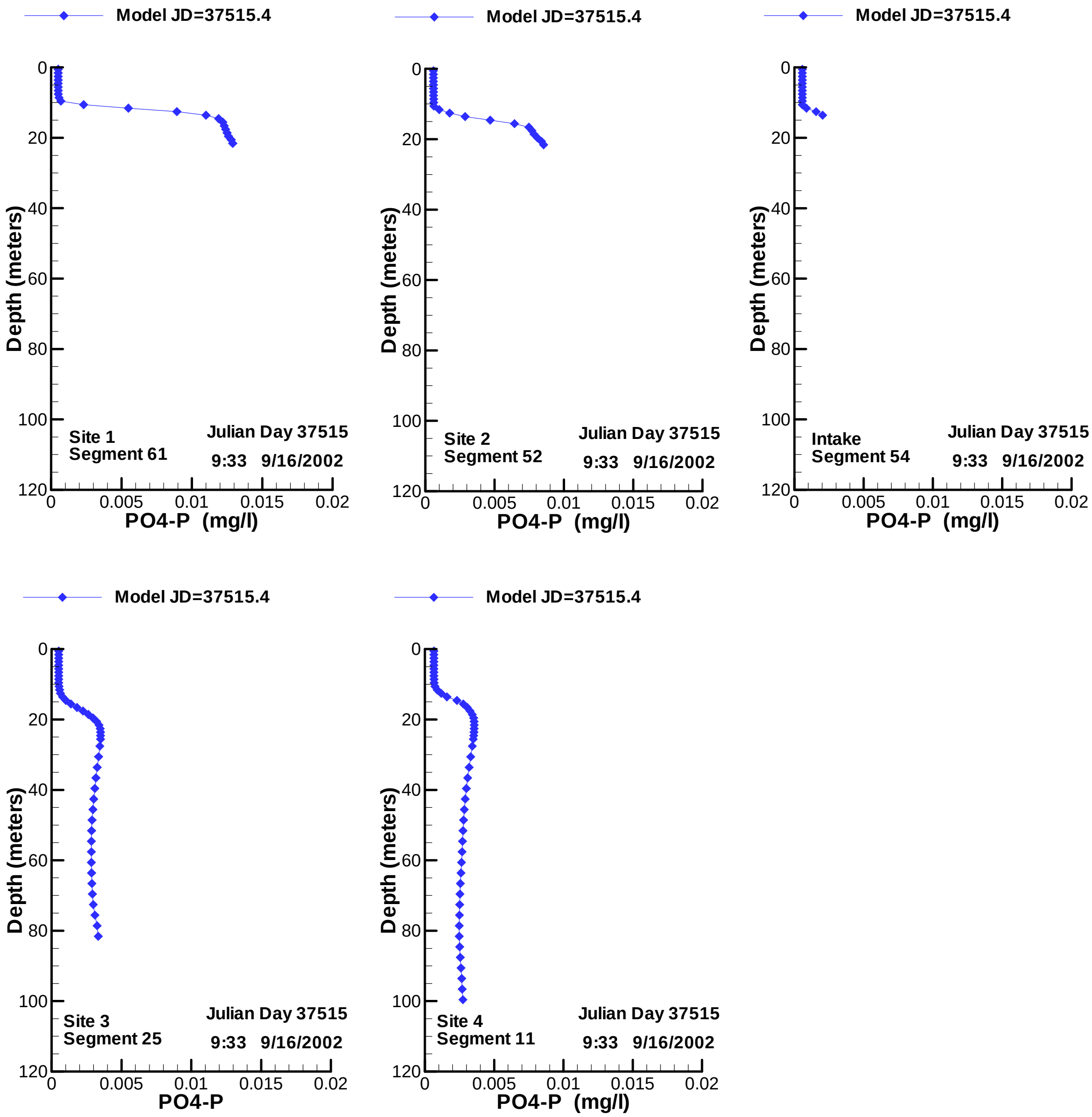

Figure 21. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/16/2002.

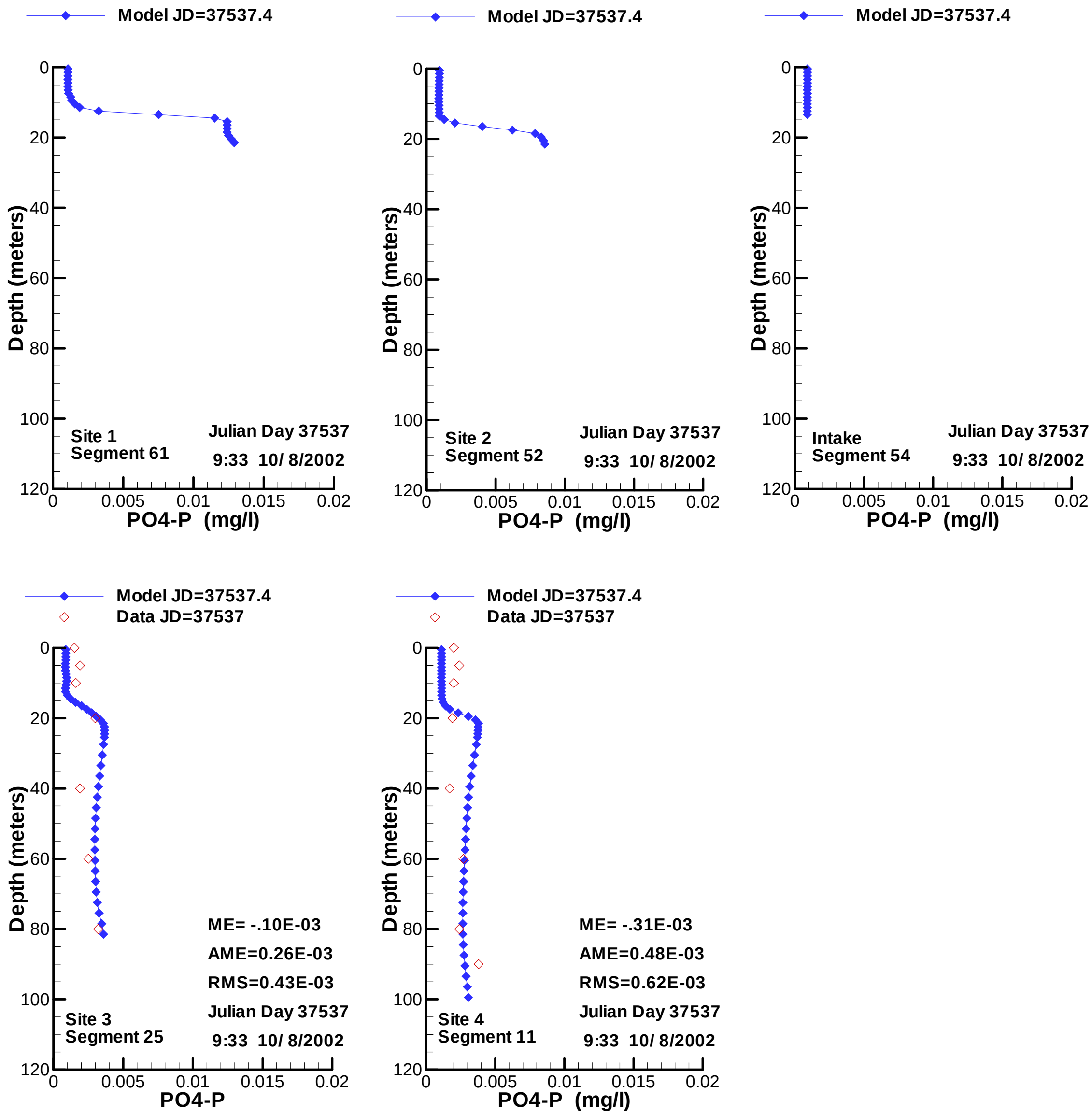

Figure 22. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 10/ 8/2002.

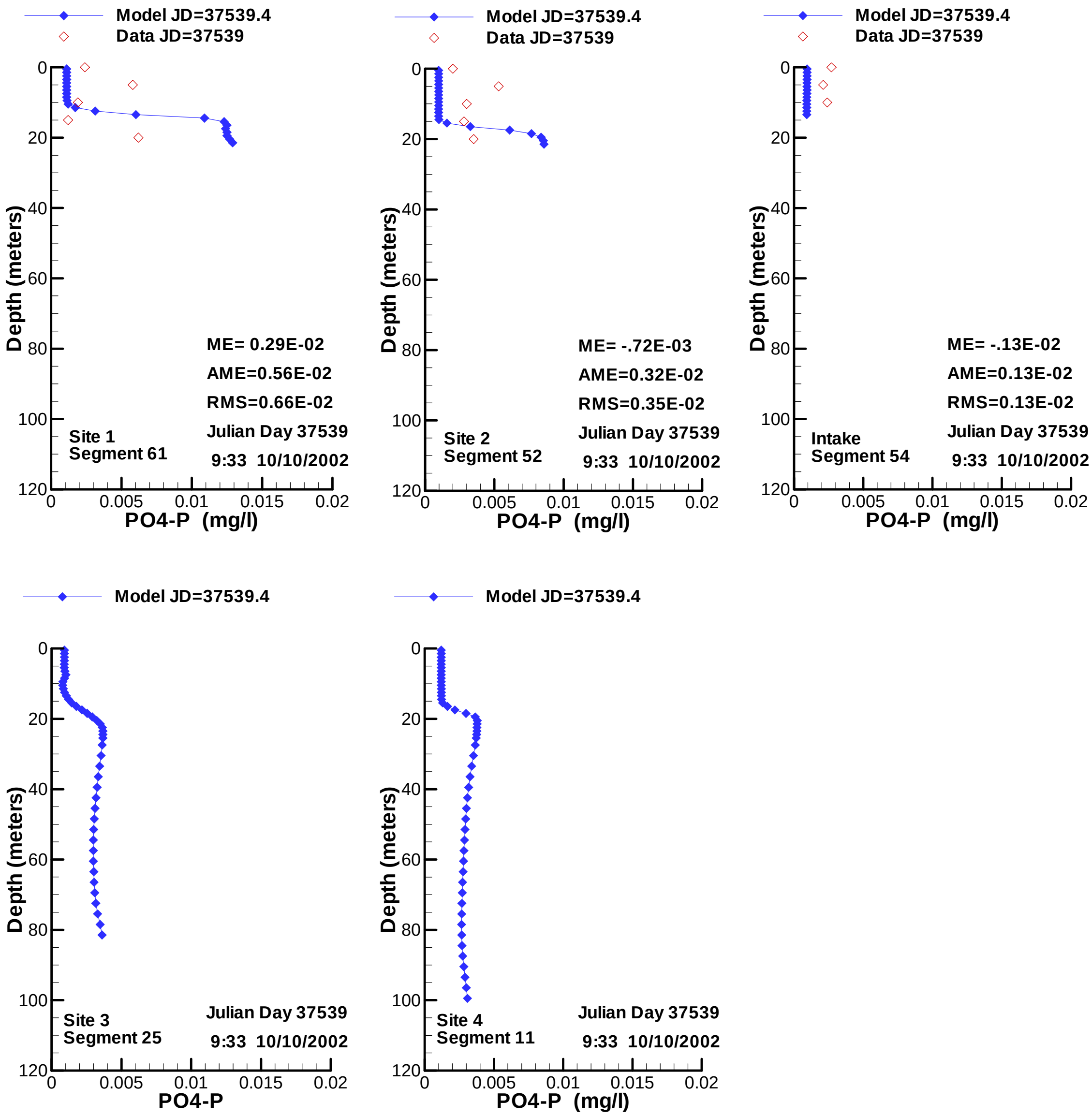

Figure 23. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 10/10/2002.

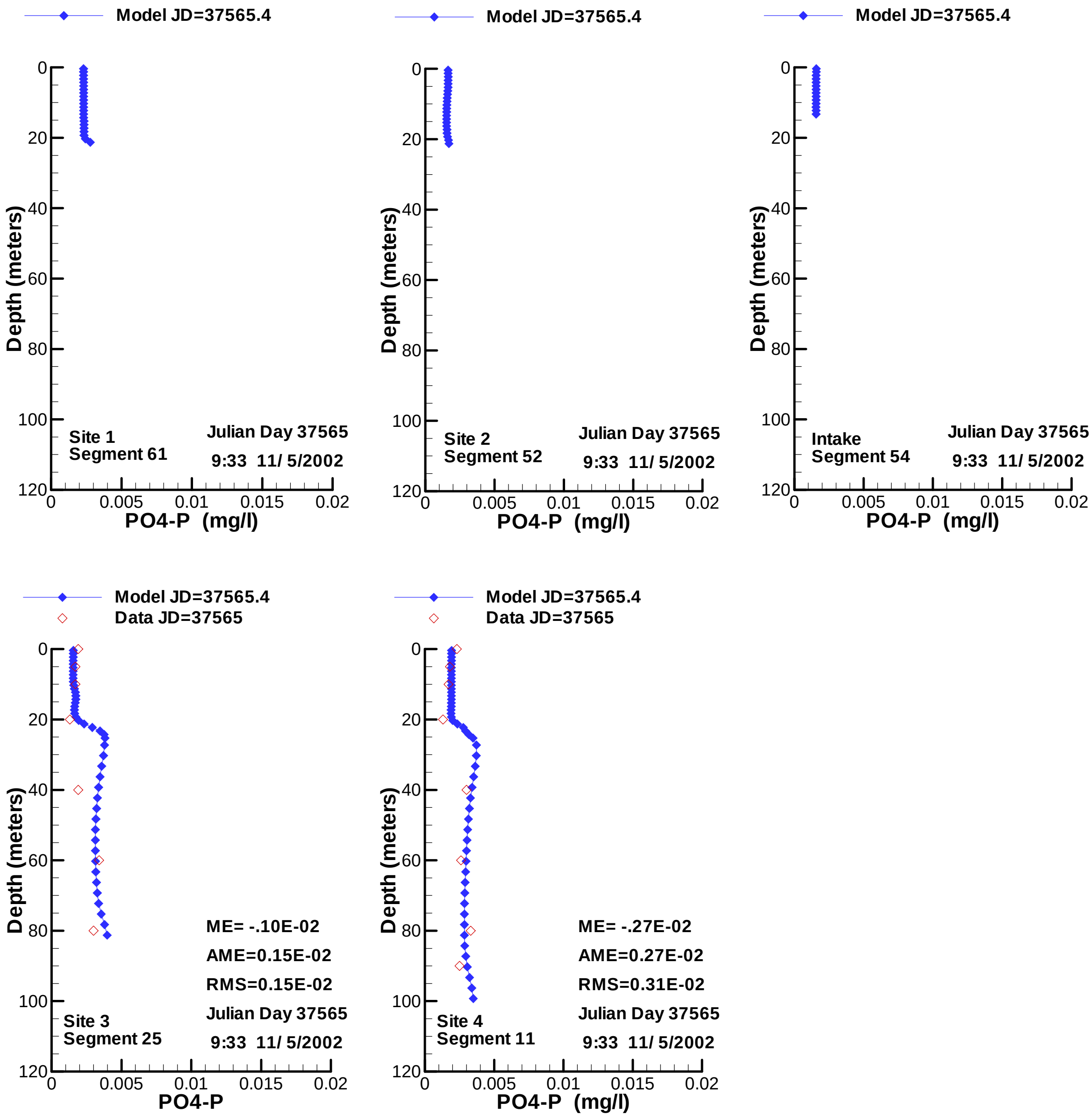

Figure 24. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 11/ 5/2002.

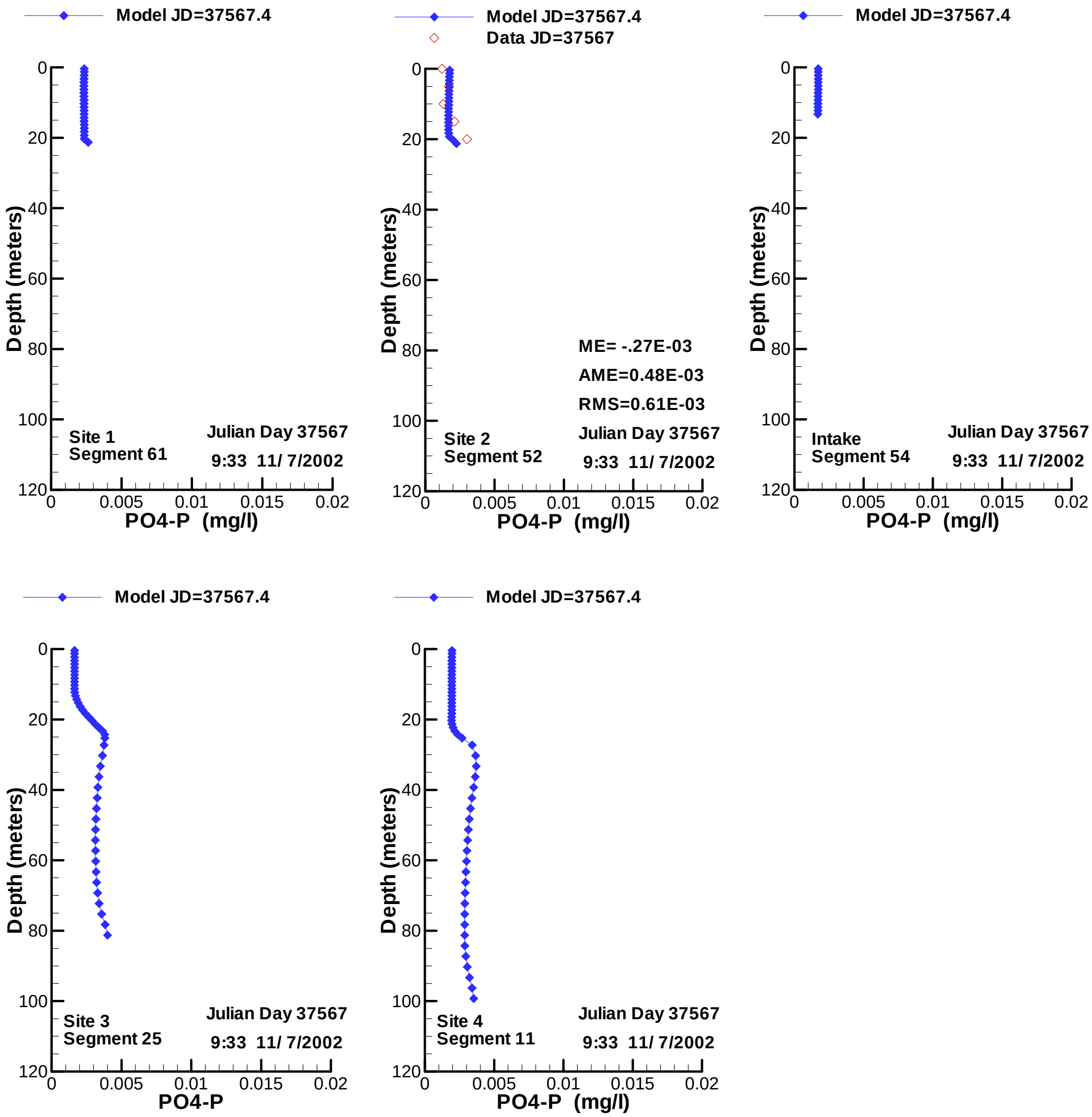

Figure 25. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 11/ 7/2002.

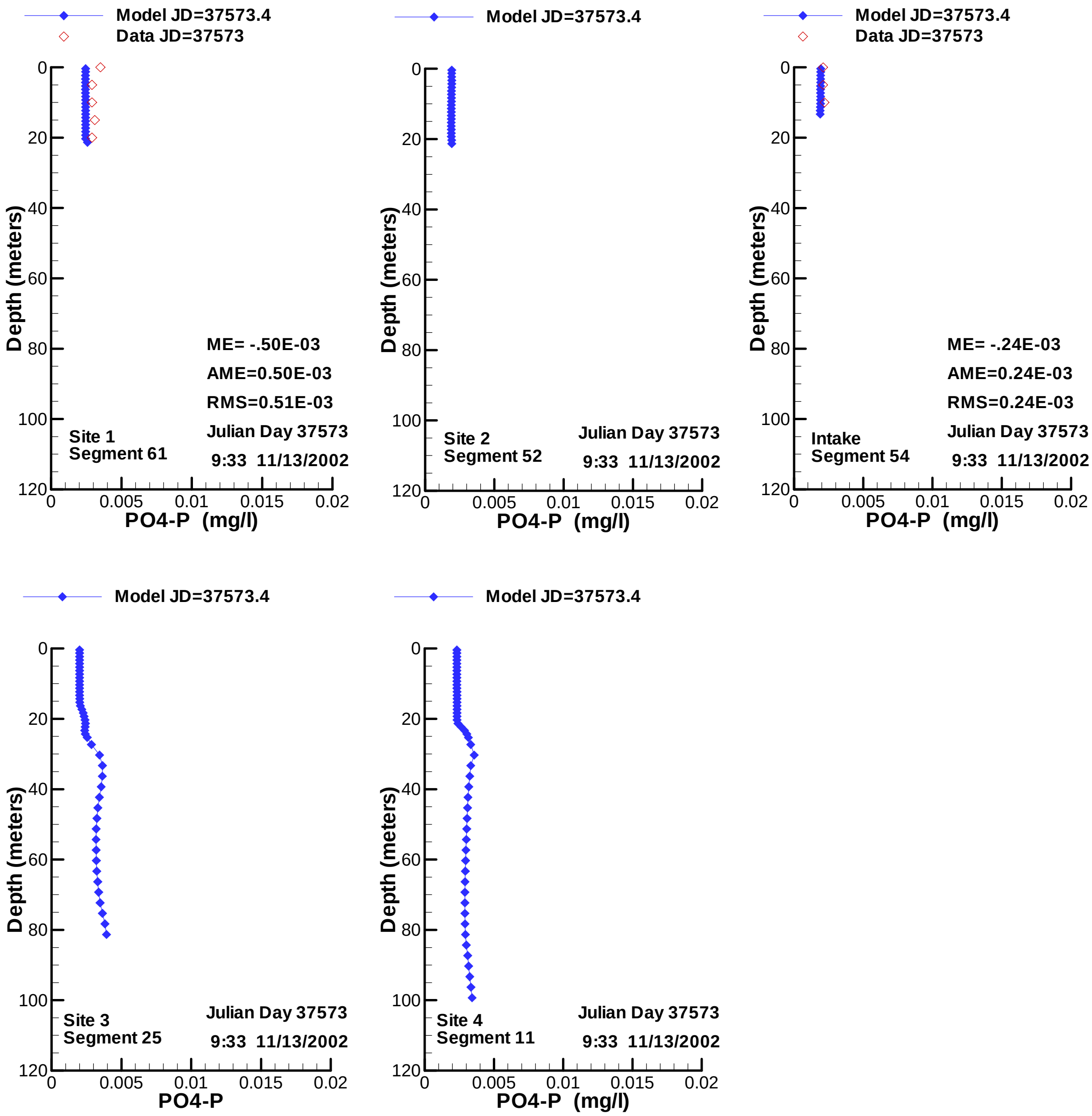

Figure 26. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 11/13/2002.

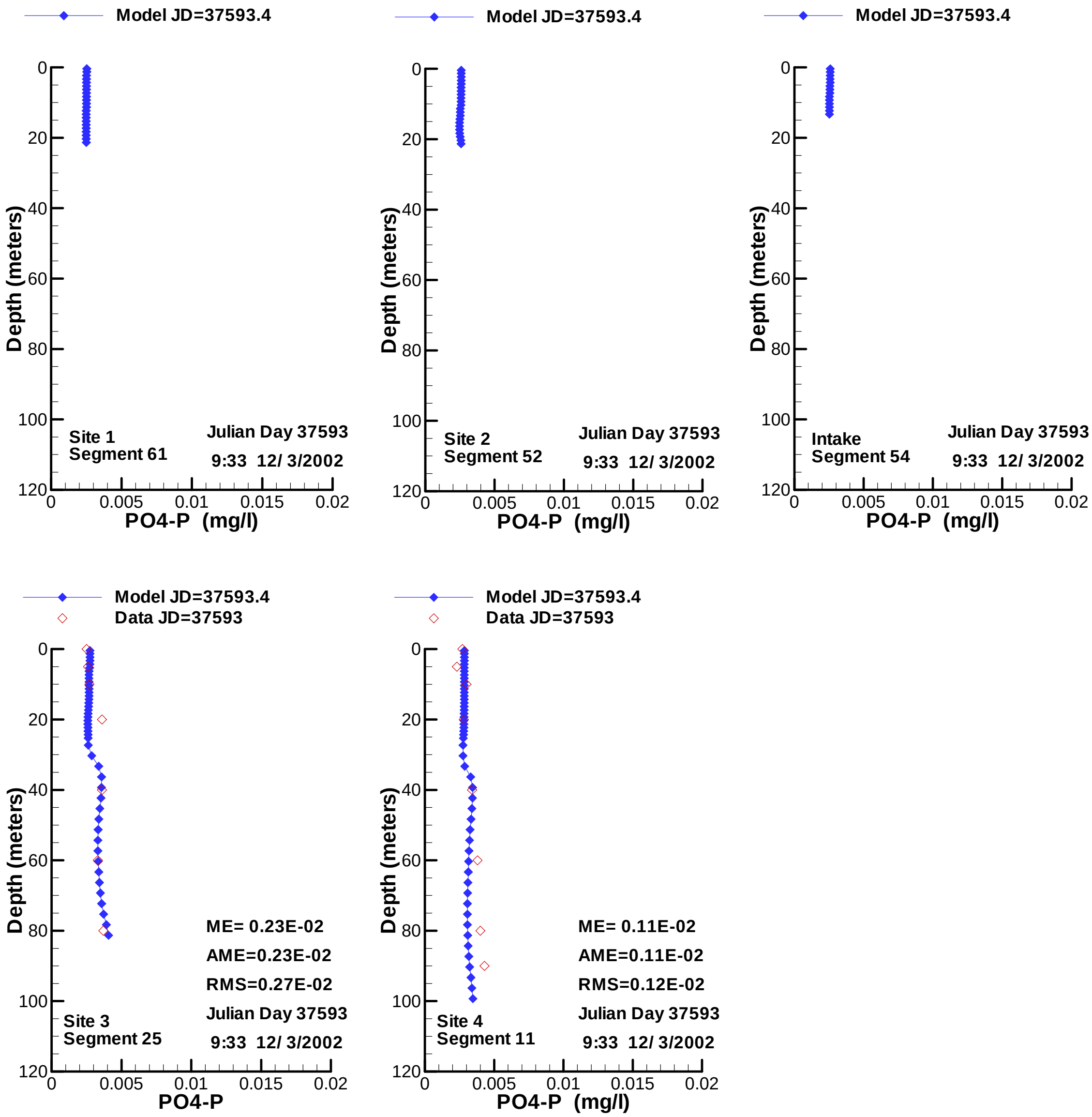

Figure 27. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 12/ 3/2002.

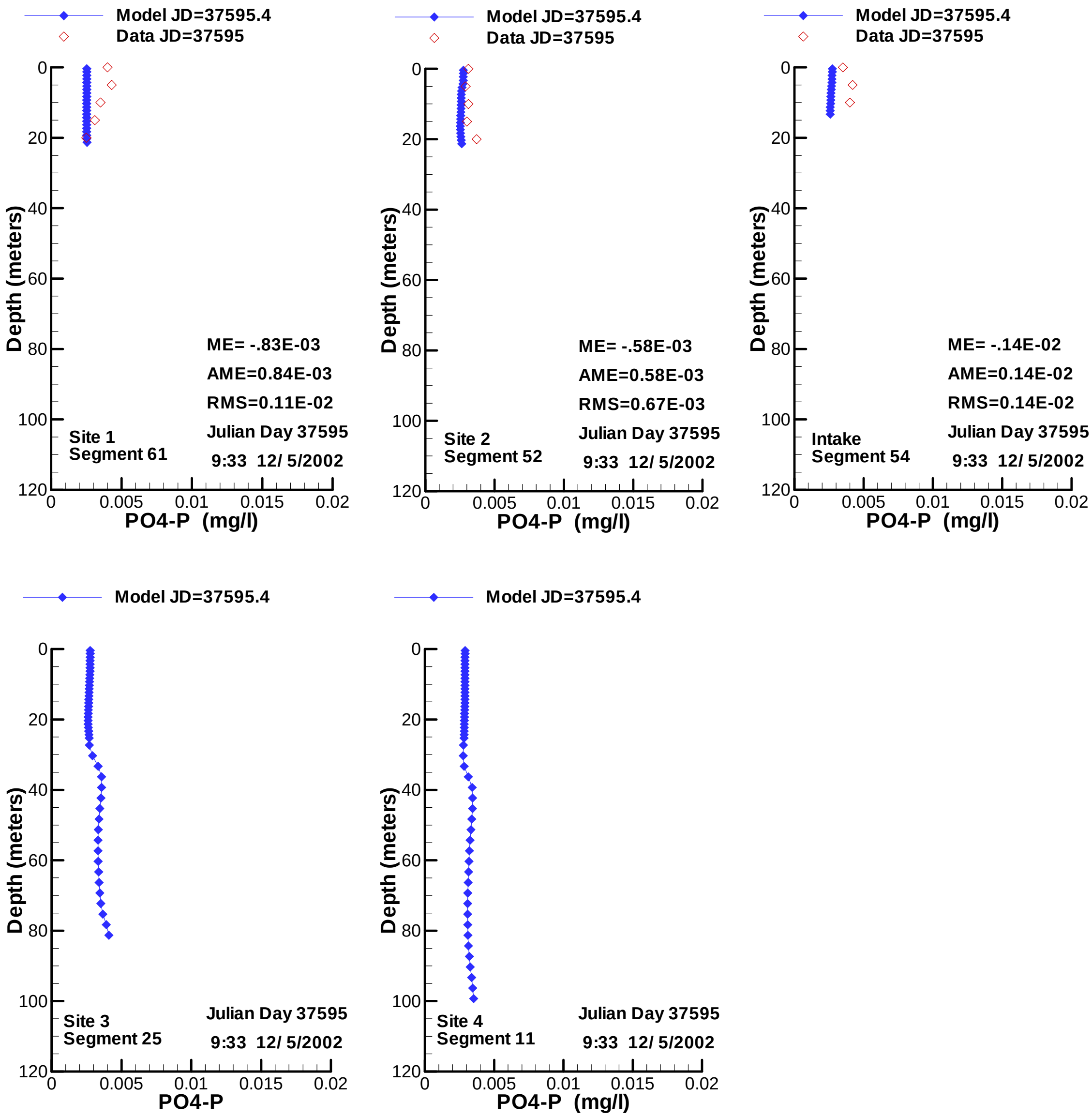

Figure 28. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 12/ 5/2002.

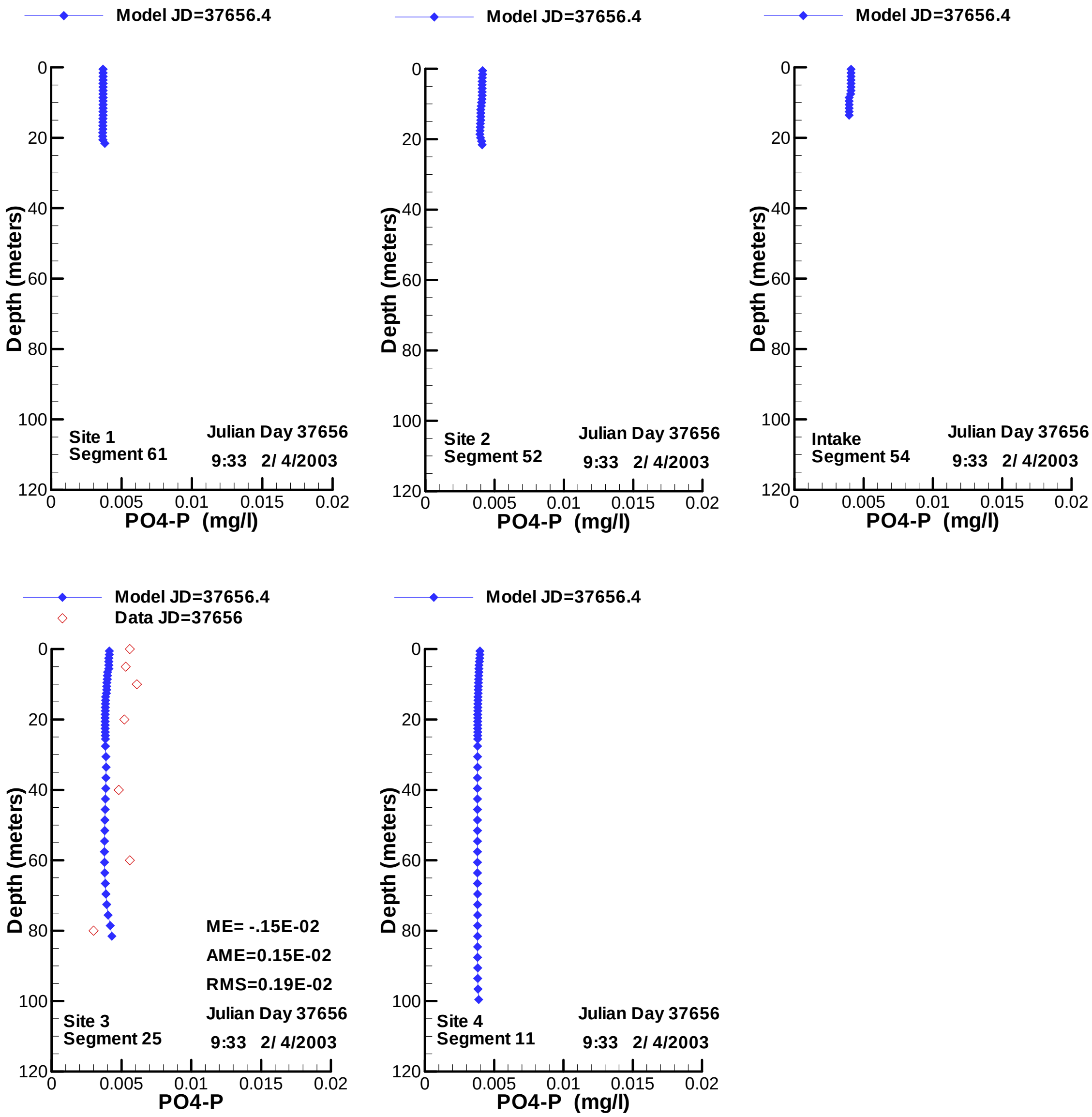

Figure 29. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 2/ 4/2003.

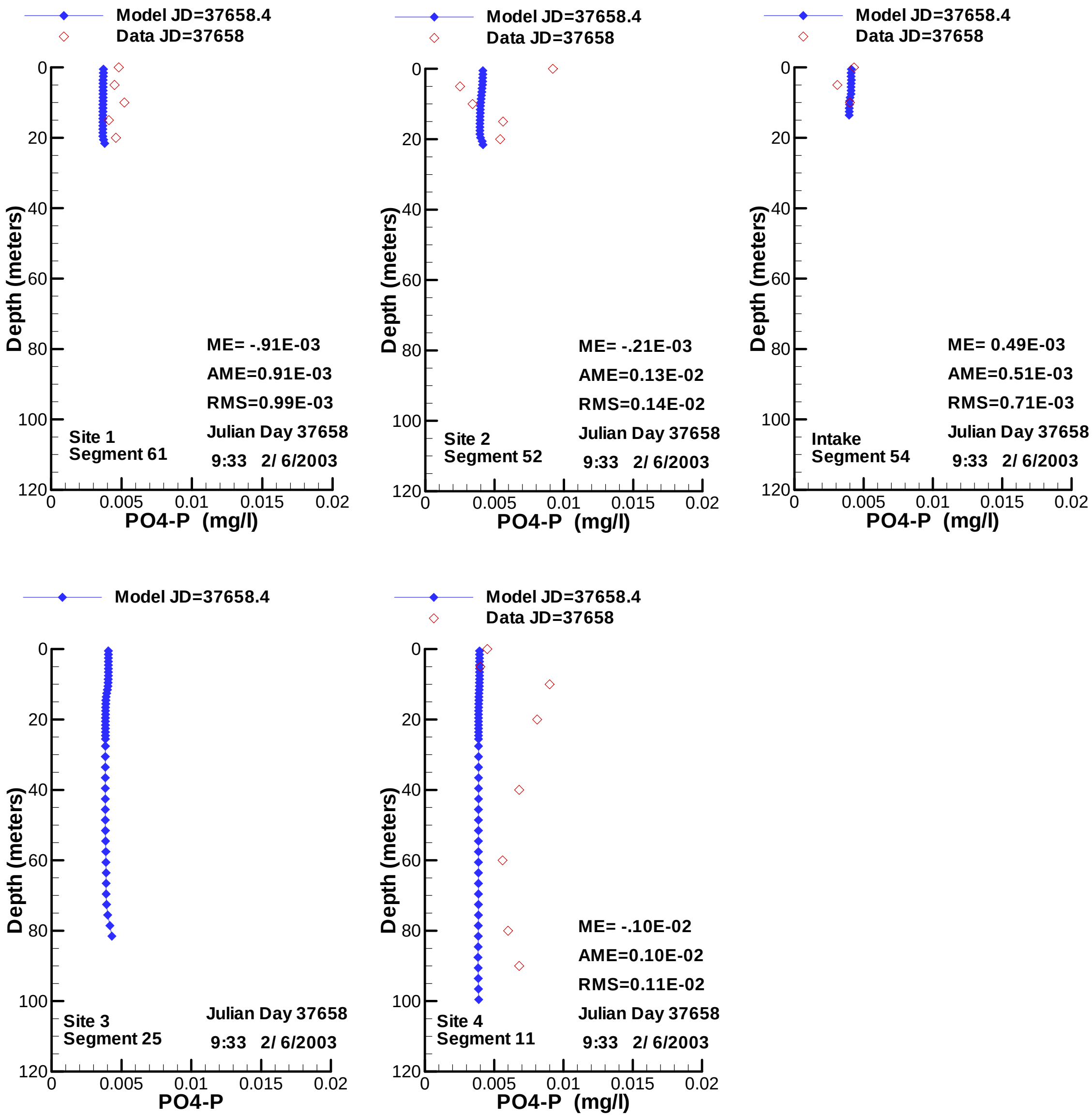

Figure 30. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 2/ 6/2003.

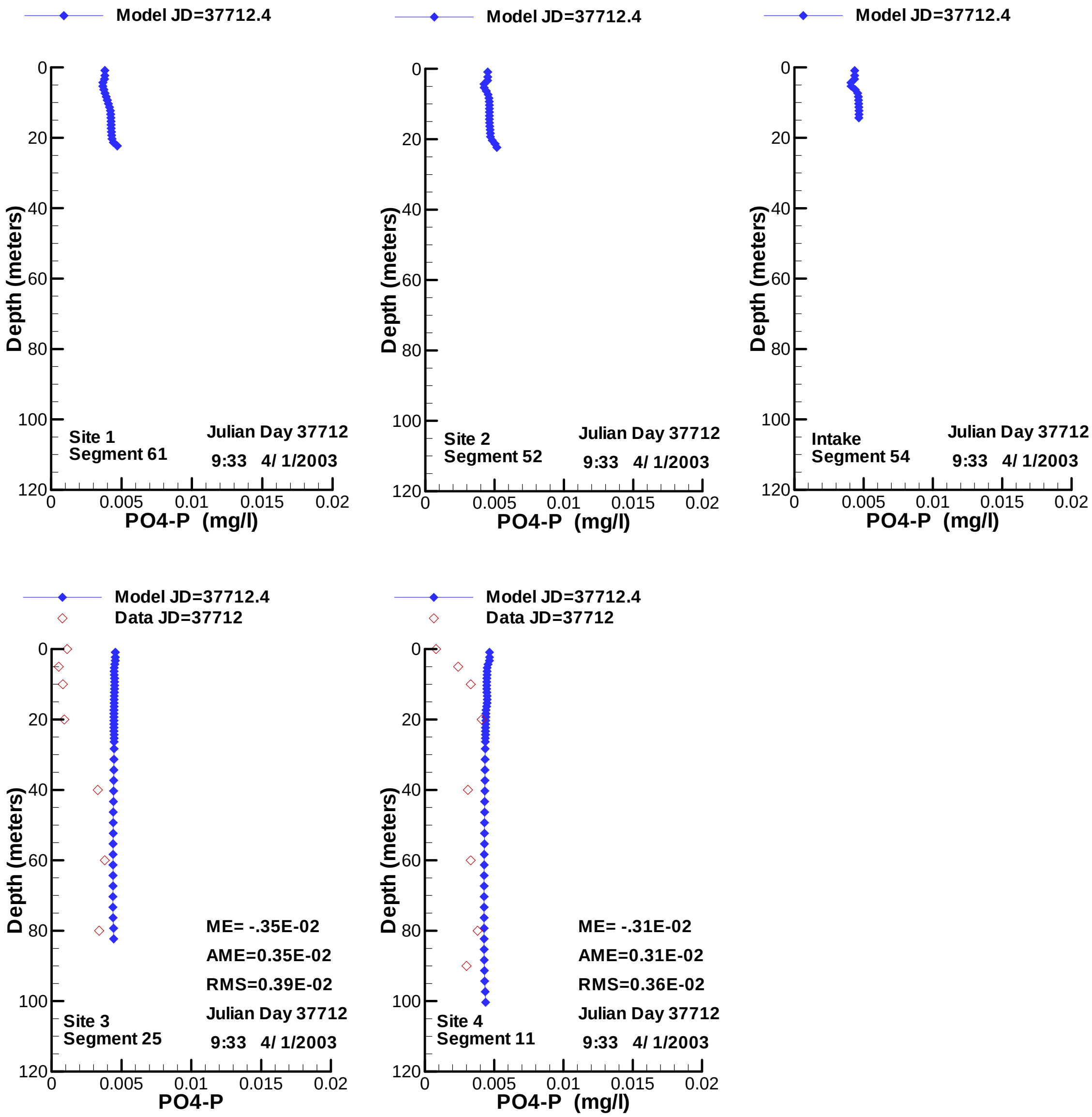

Figure 31. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 4/ 1/2003.

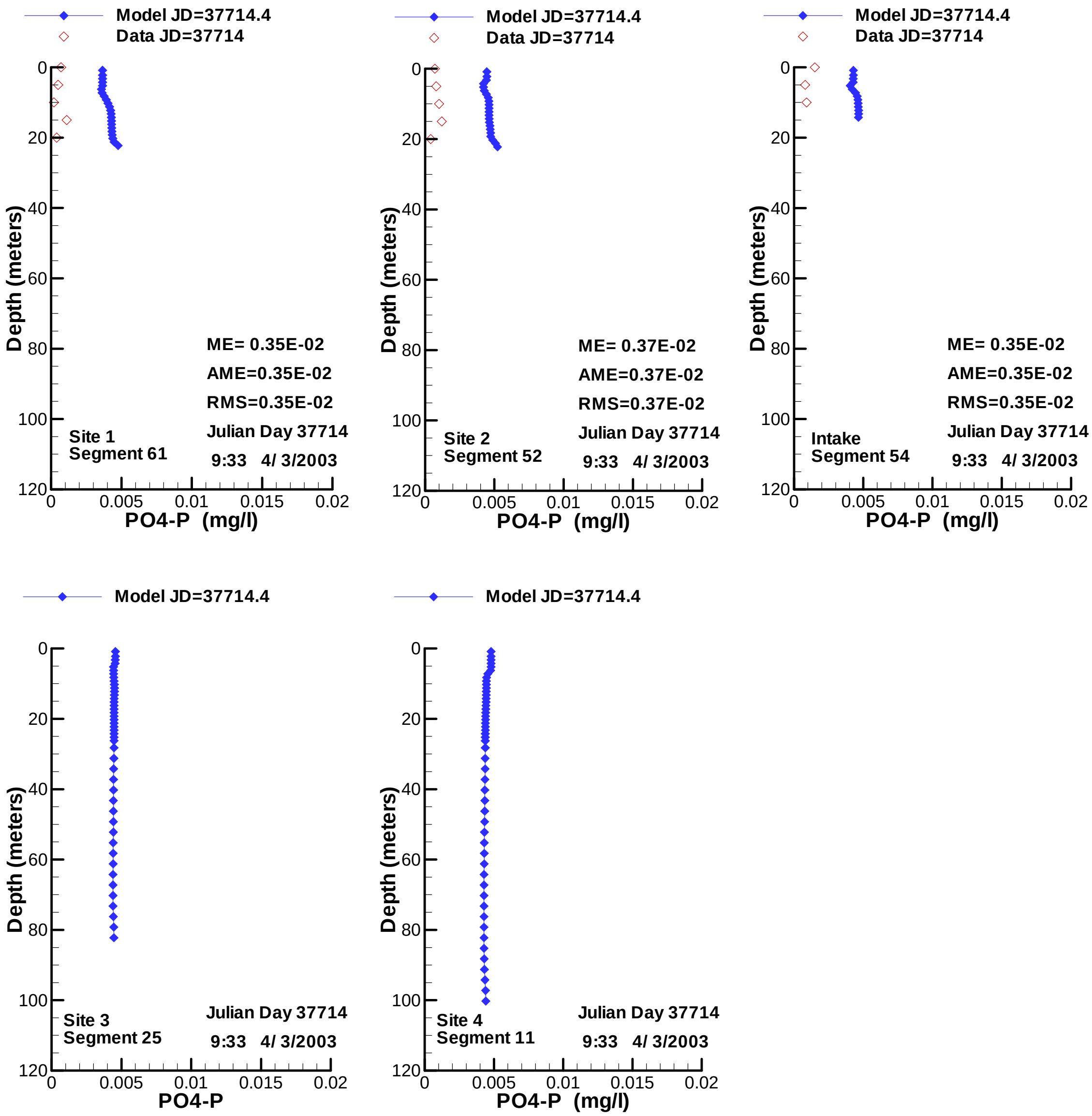

Figure 32. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 4/ 3/2003.

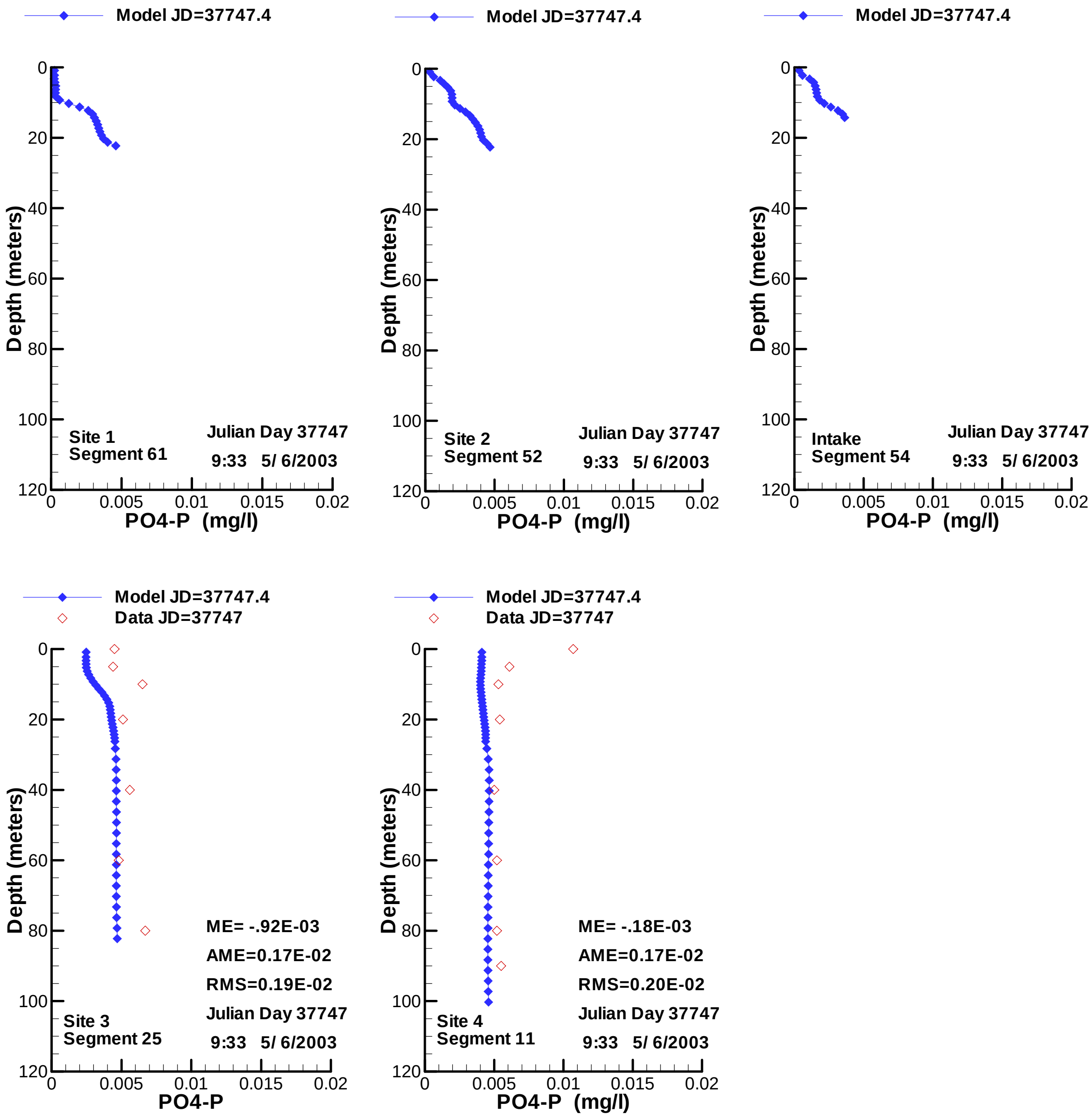

Figure 33. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 5/ 6/2003.

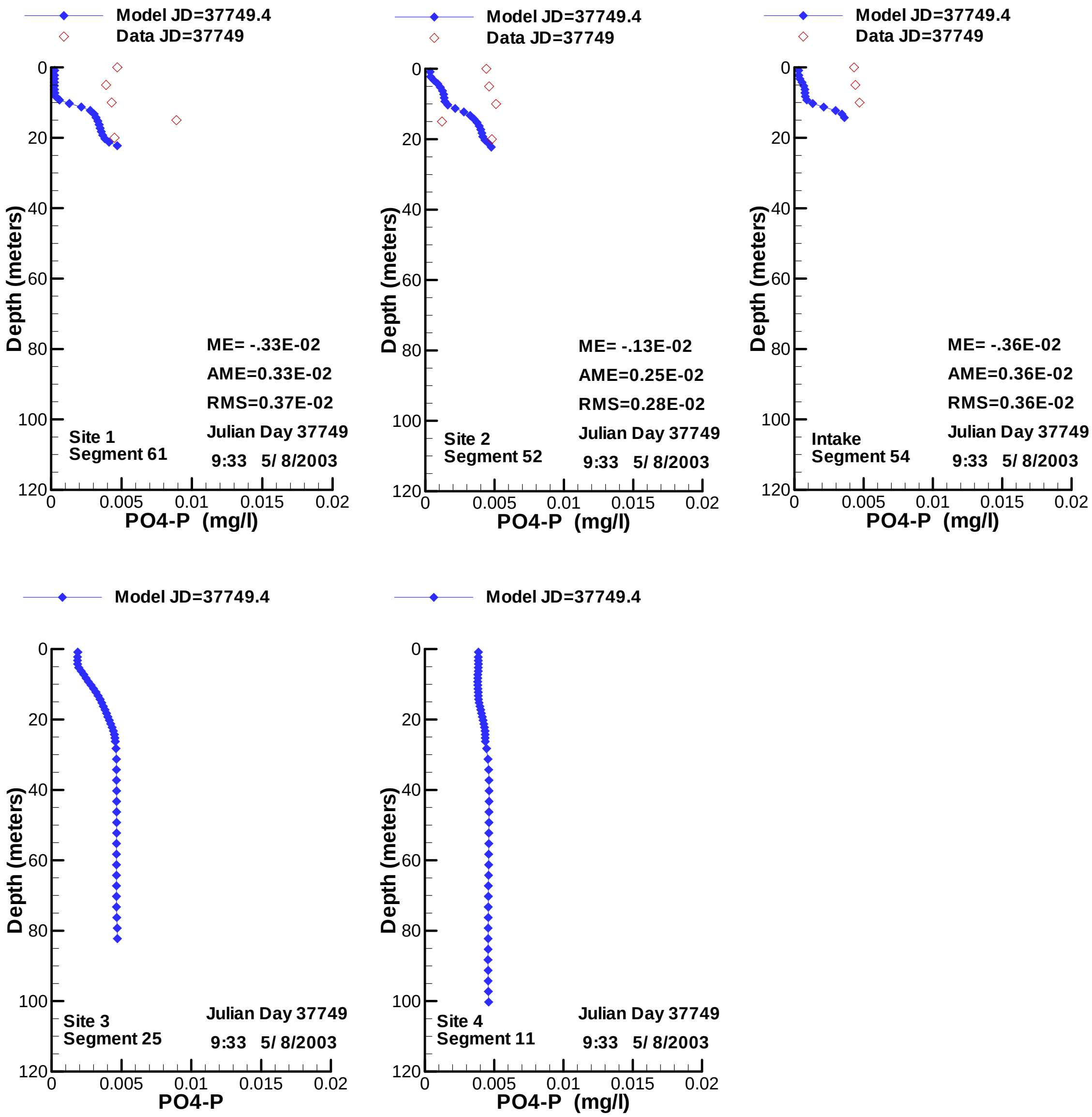

Figure 34. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 5/ 8/2003.

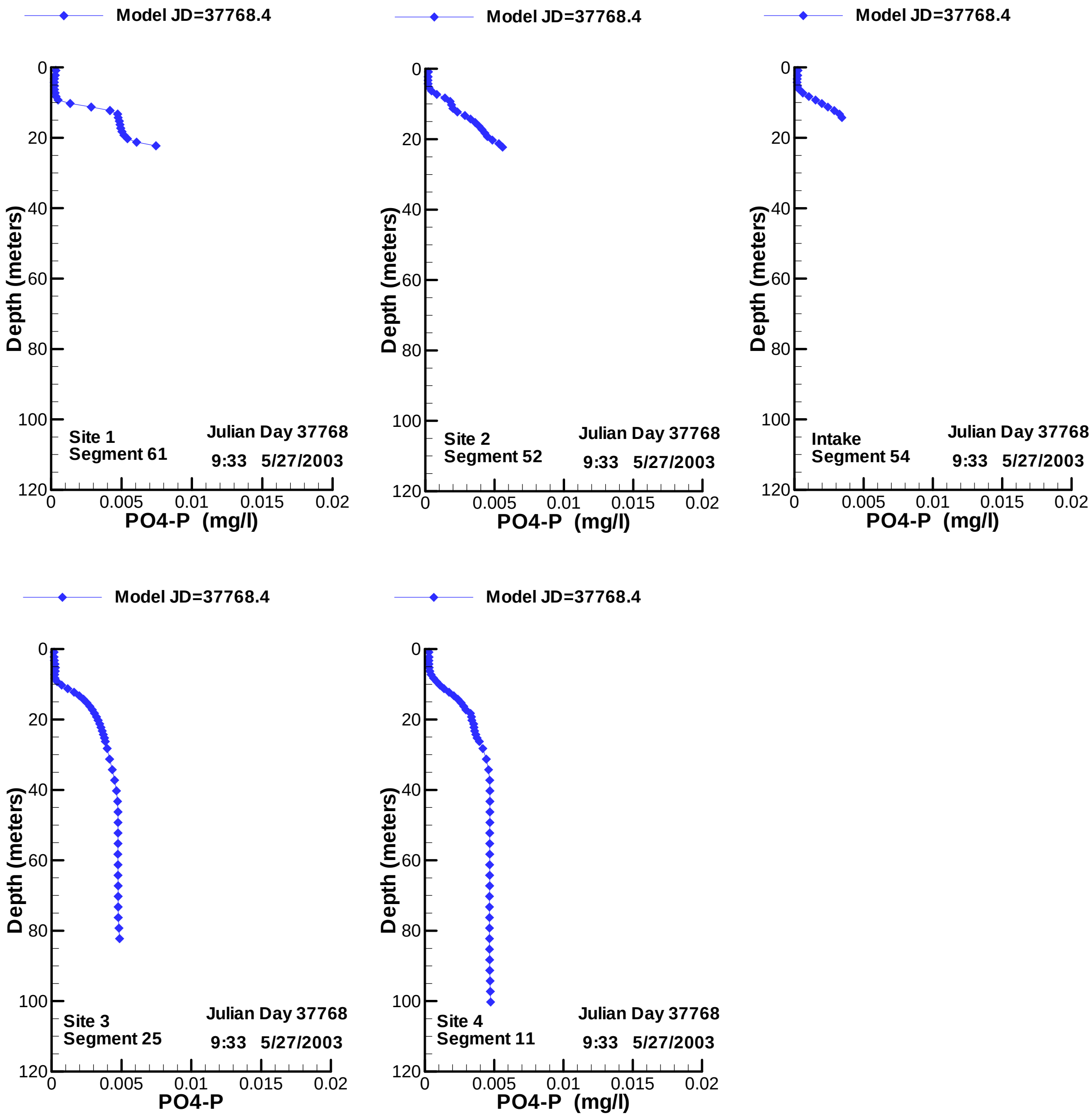

Figure 35. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 5/27/2003.

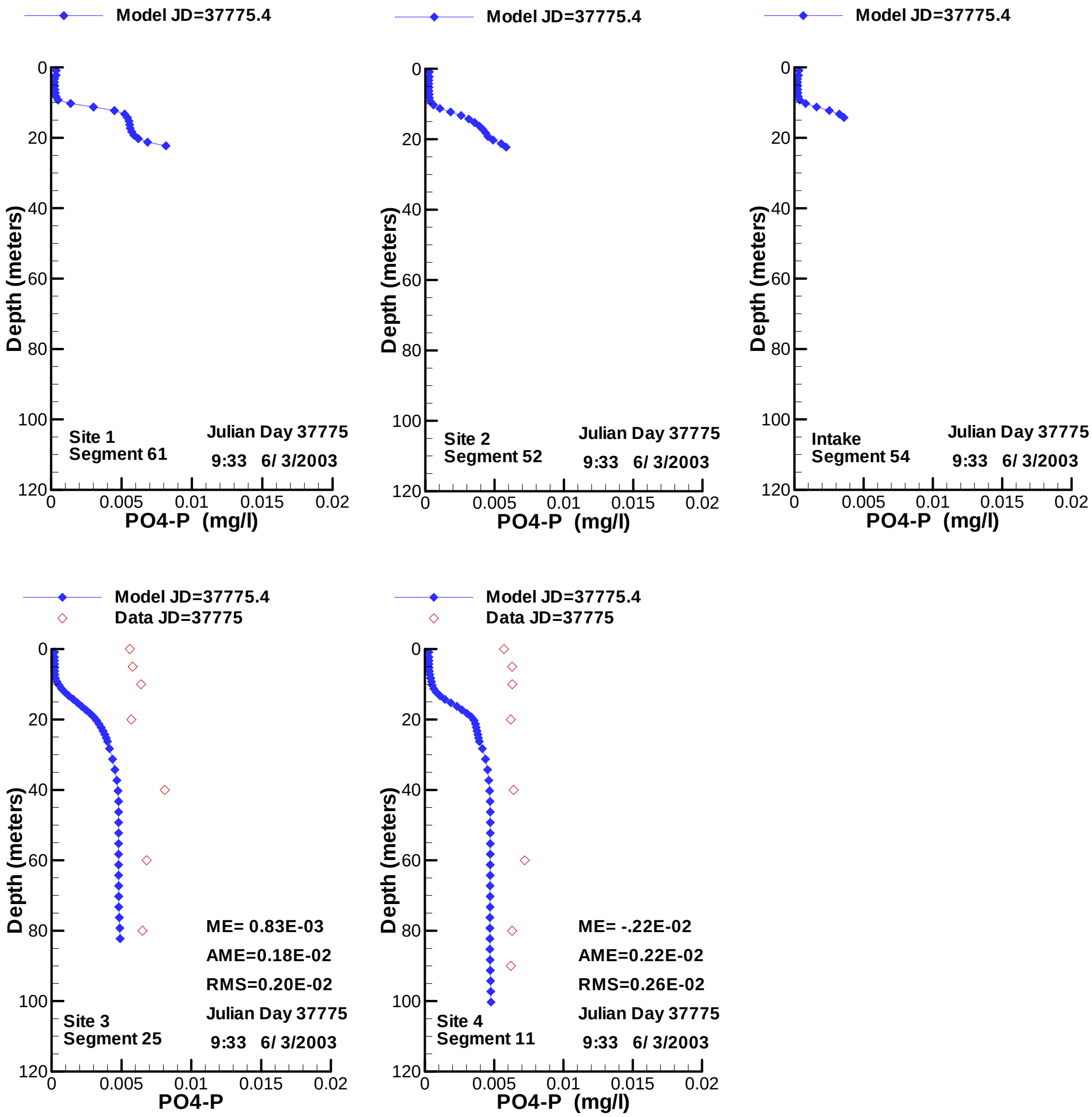

Figure 36. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 6/ 3/2003.

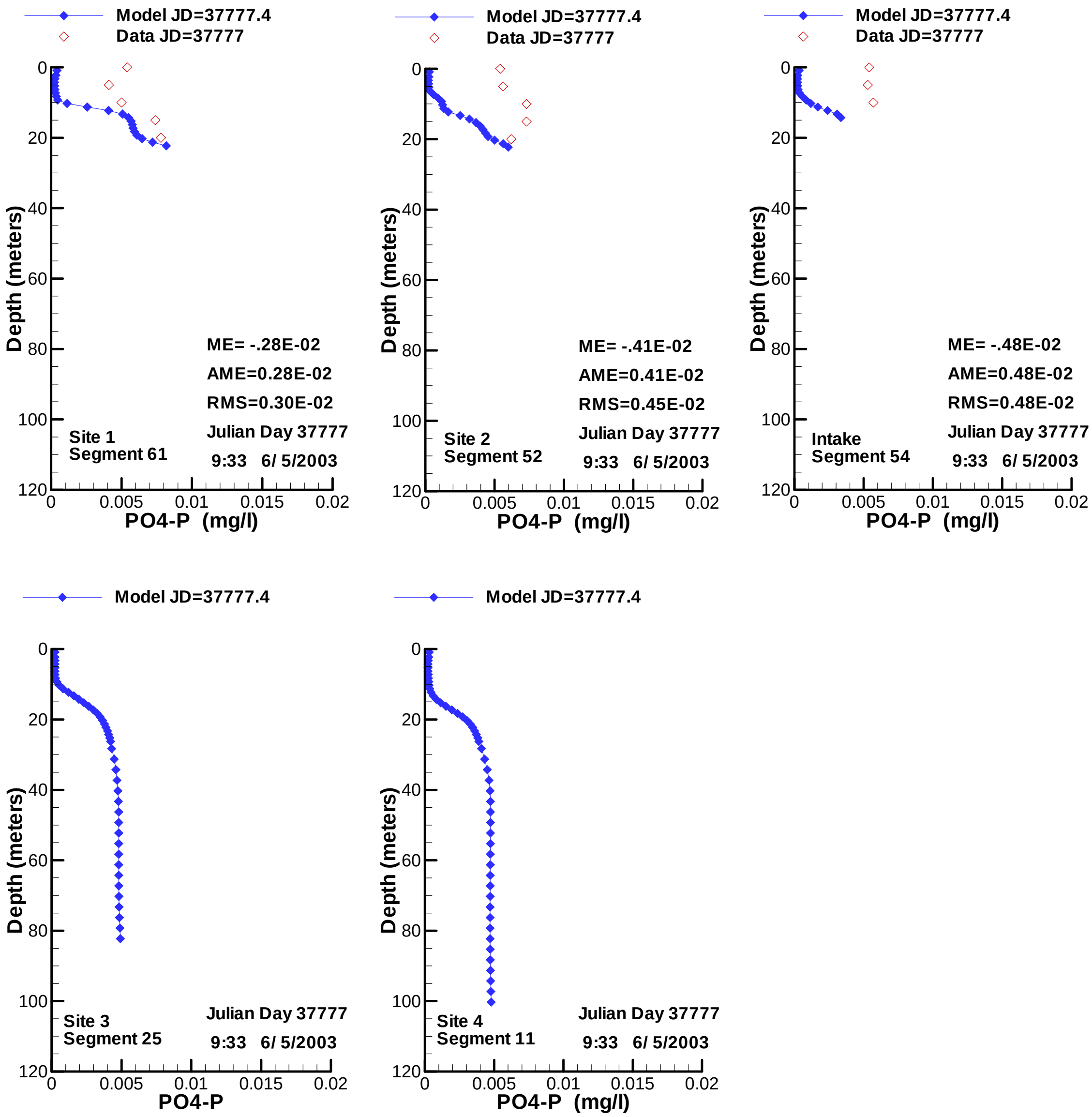

Figure 37. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 6/ 5/2003.

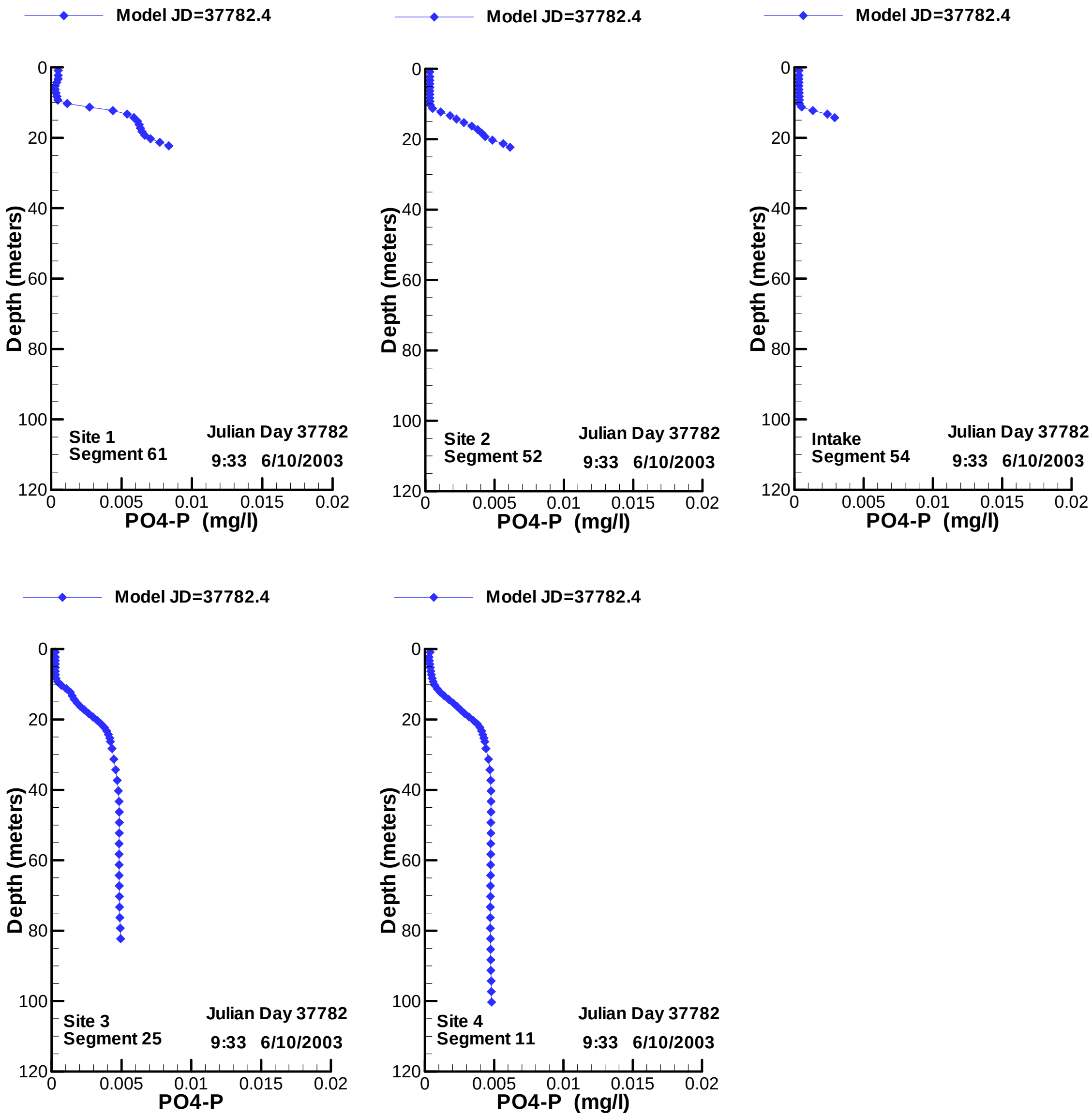

Figure 38. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 6/10/2003.

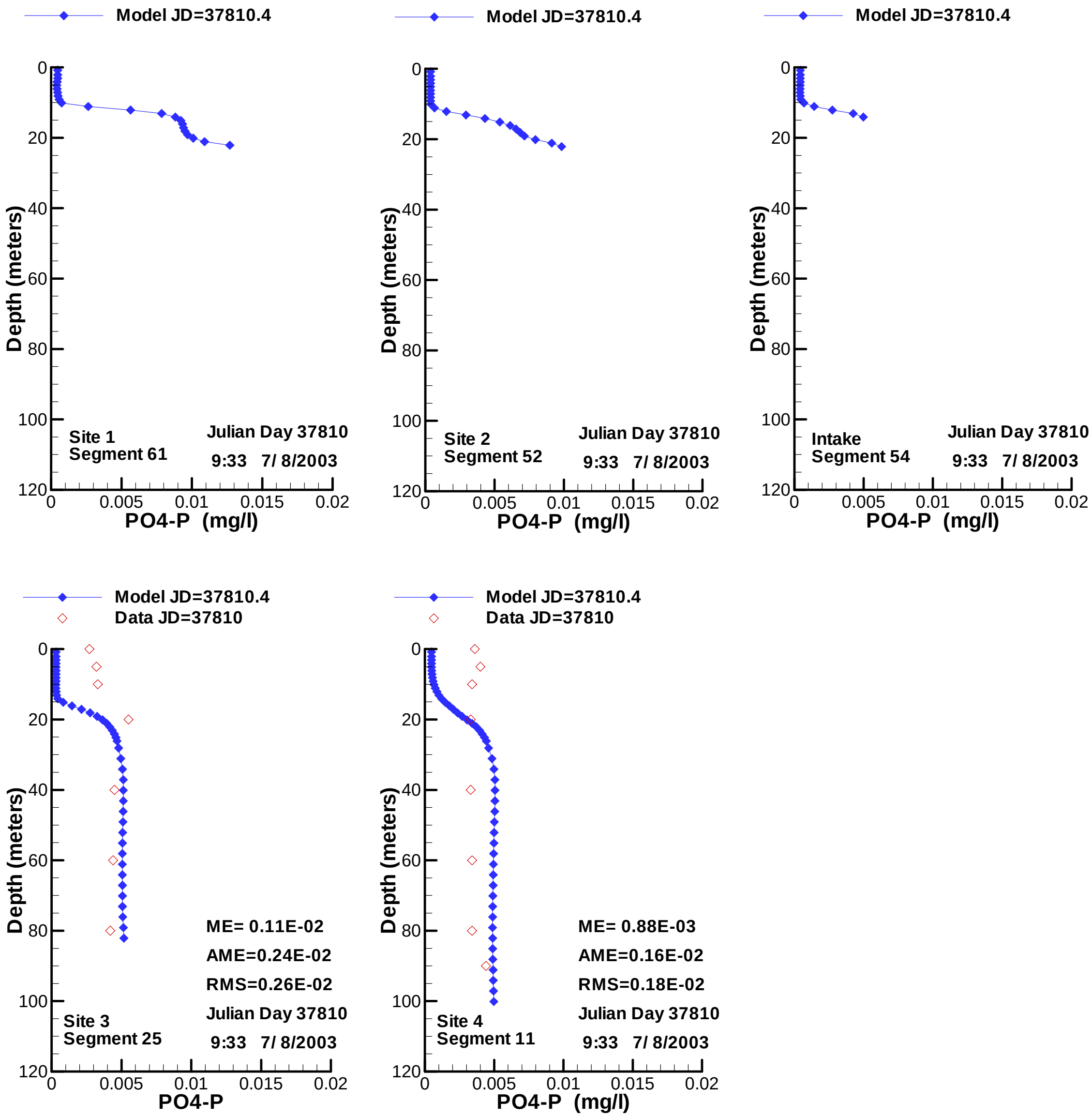

Figure 39. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/ 8/2003.

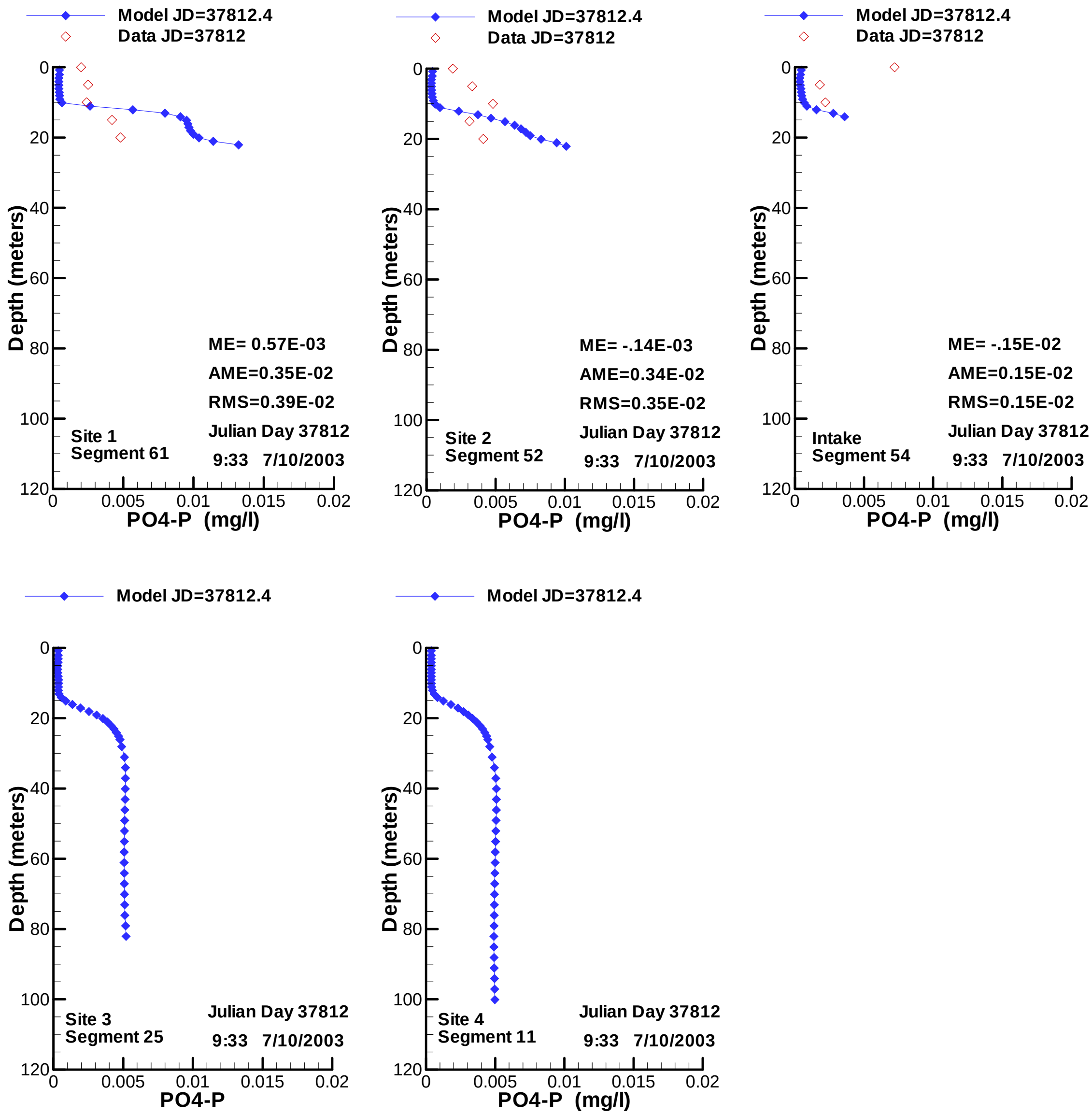

Figure 40. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/10/2003.

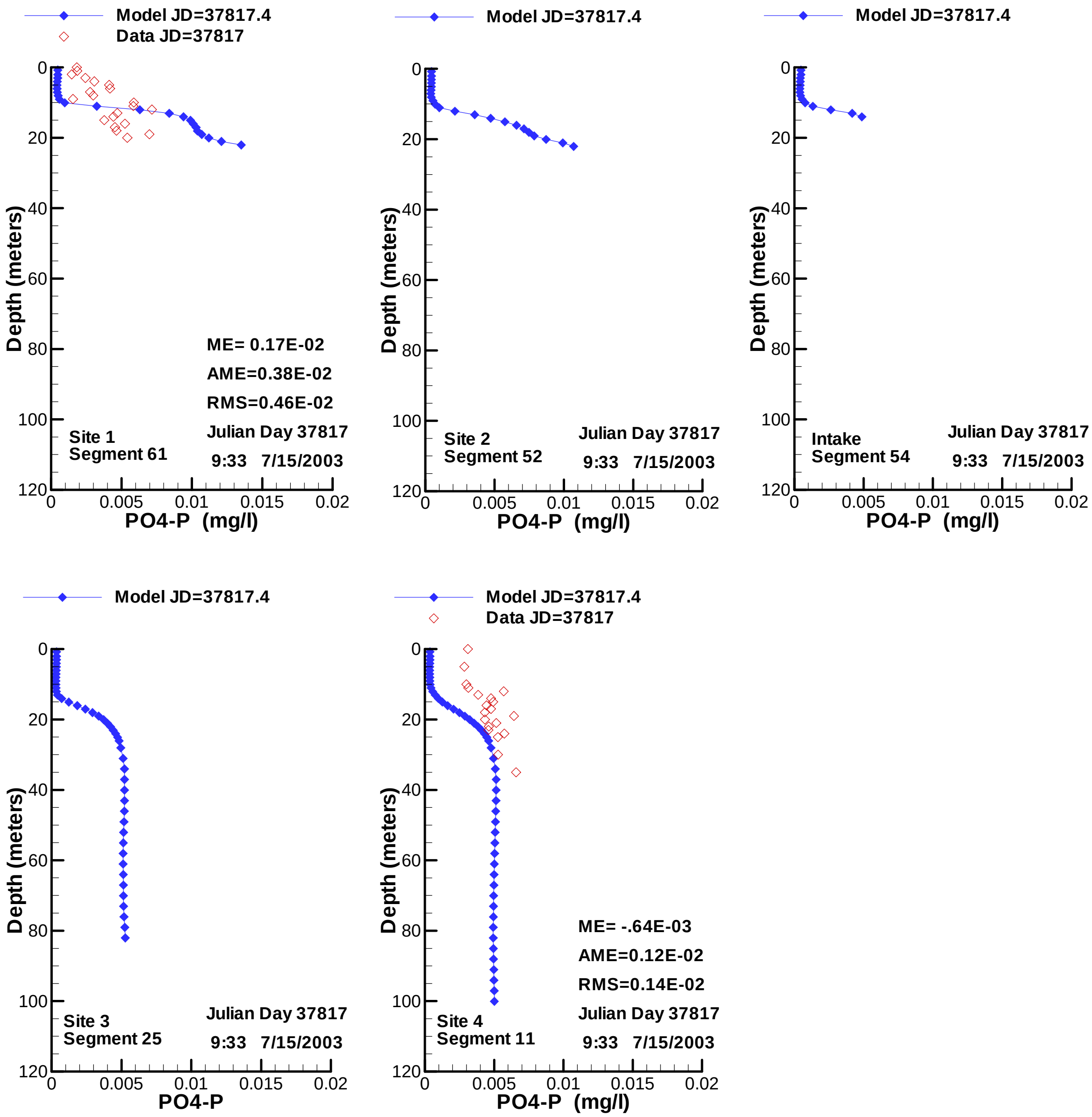

Figure 41. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/15/2003.

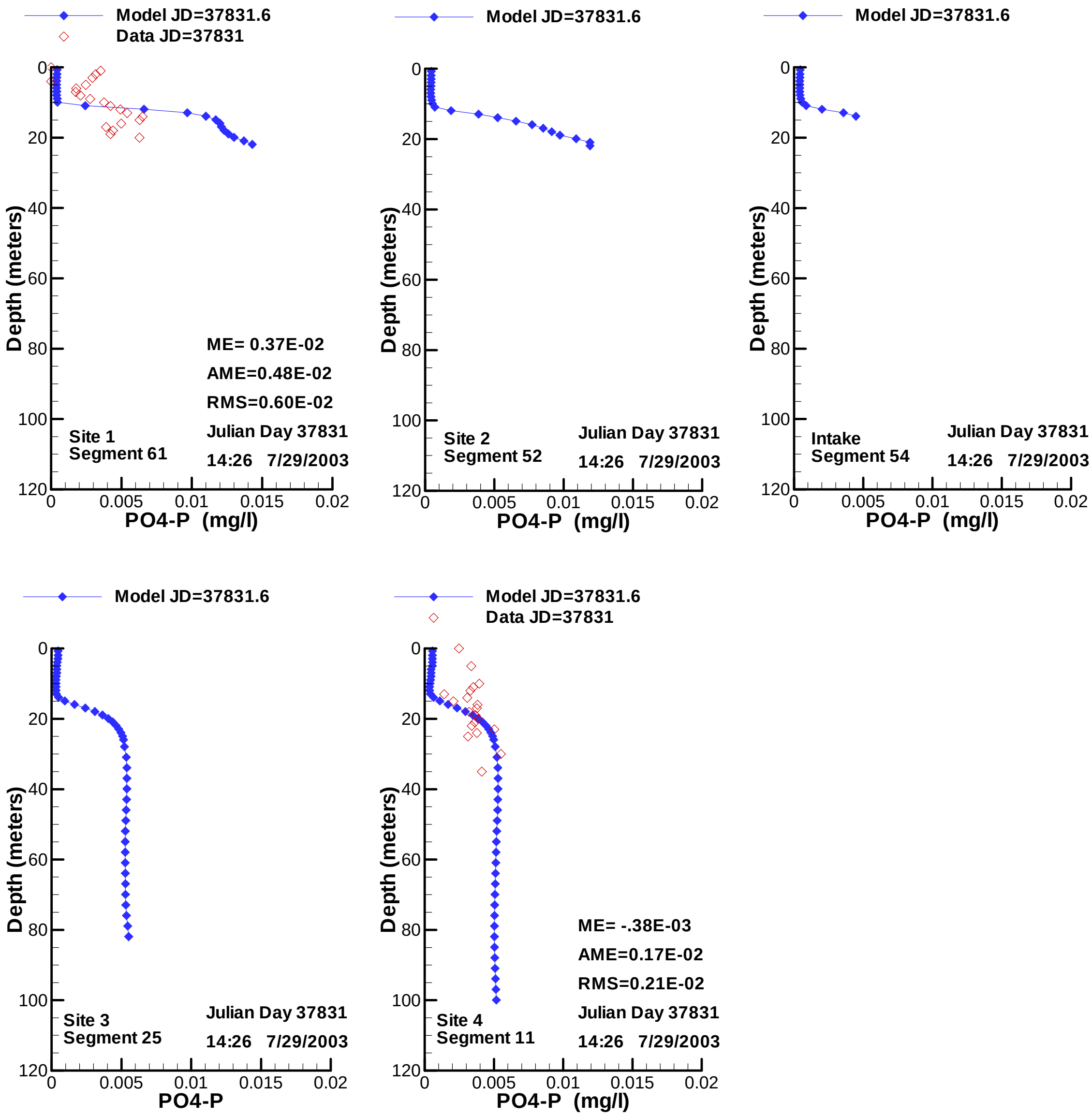

Figure 42. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 7/29/2003.

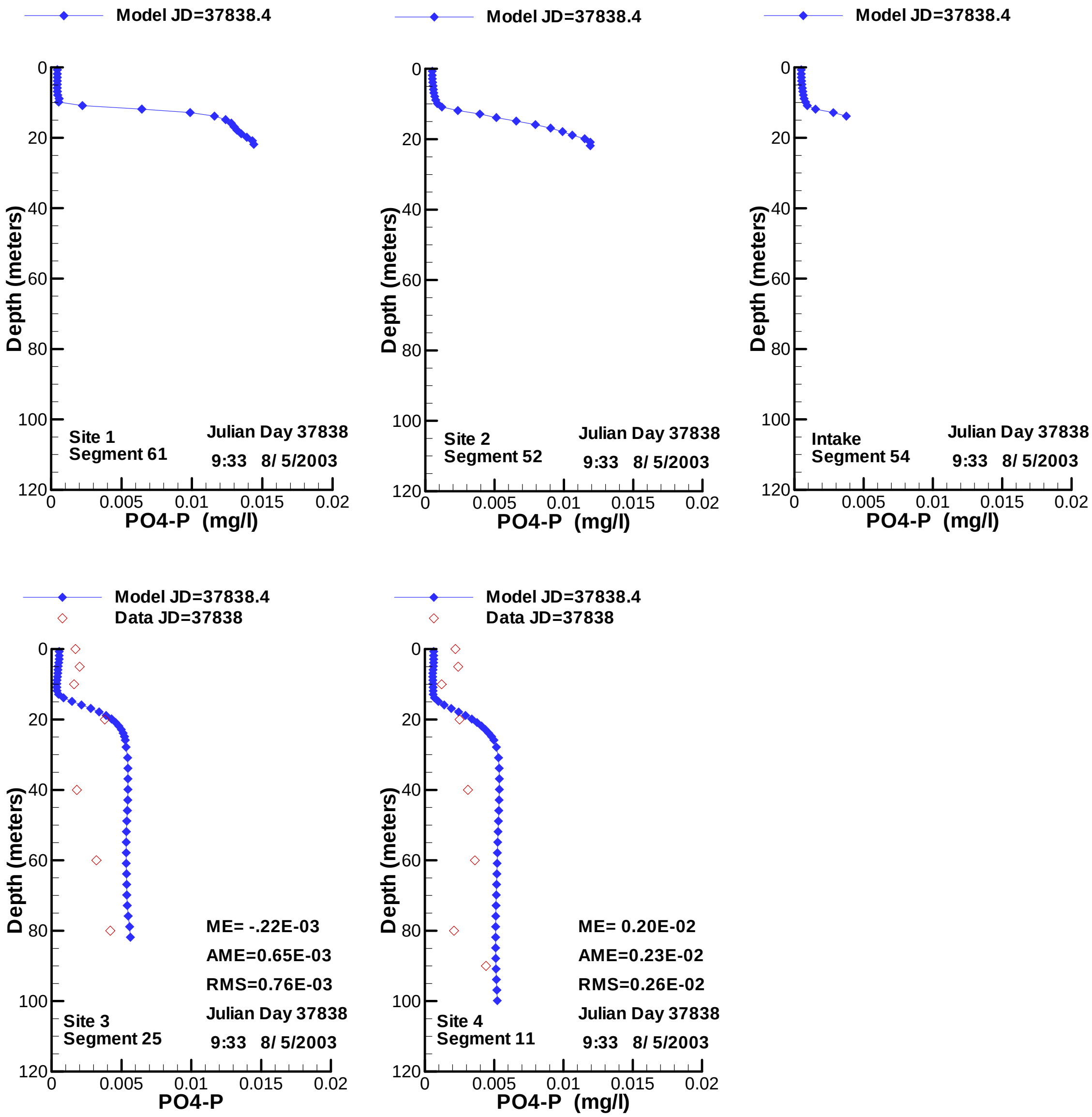

Figure 43. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/ 5/2003.

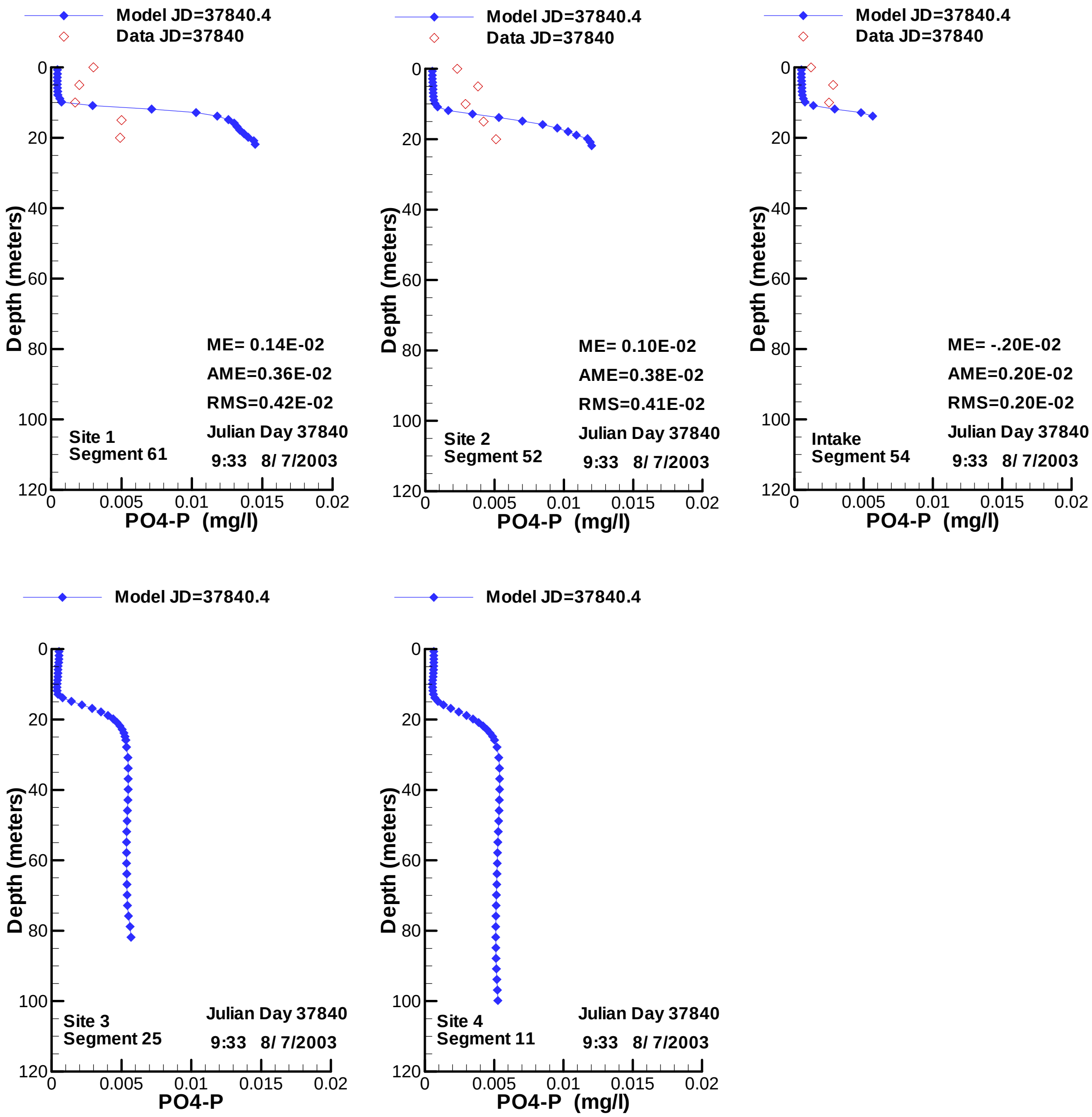

Figure 44. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/ 7/2003.

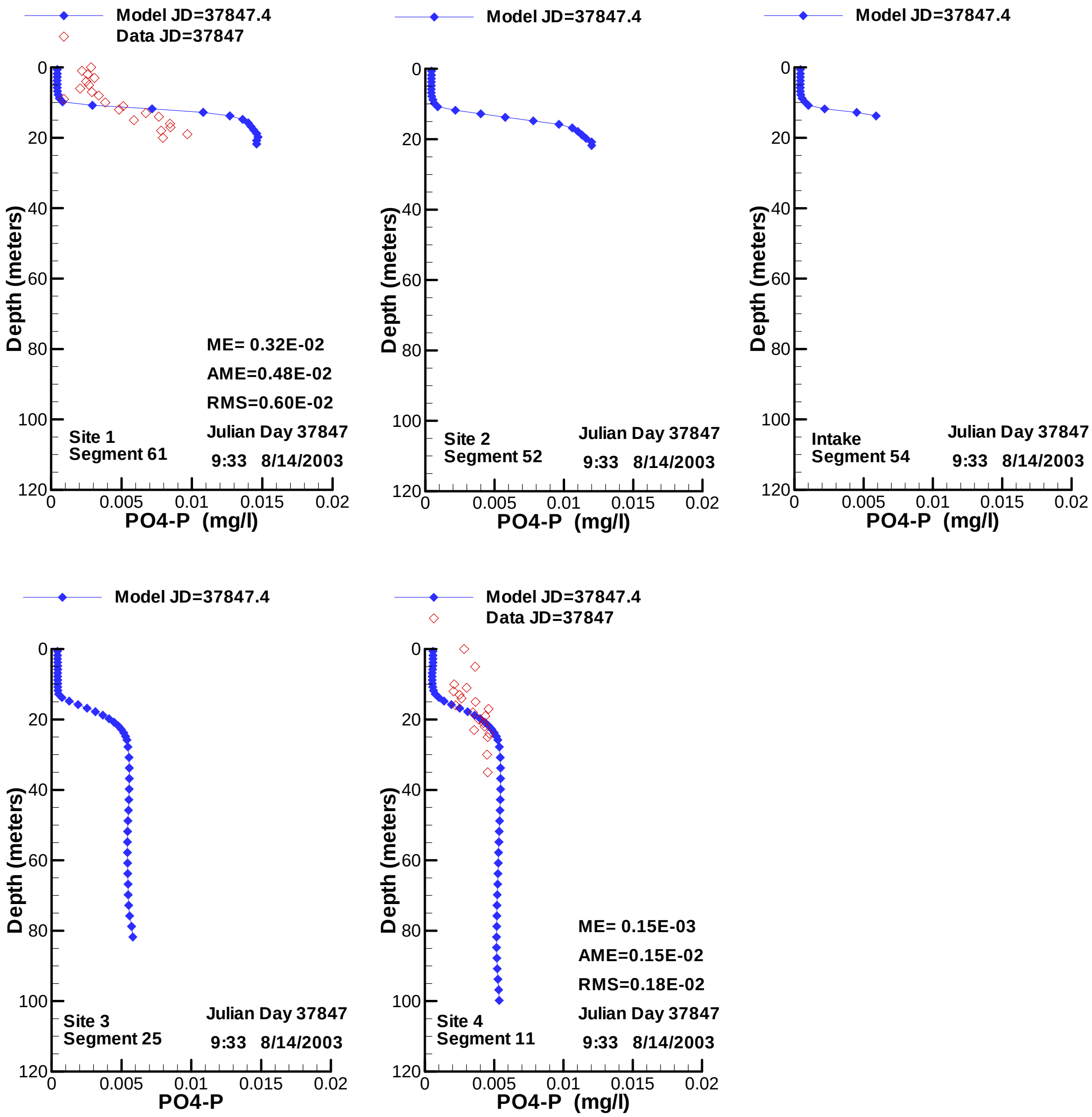

Figure 45. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/14/2003.

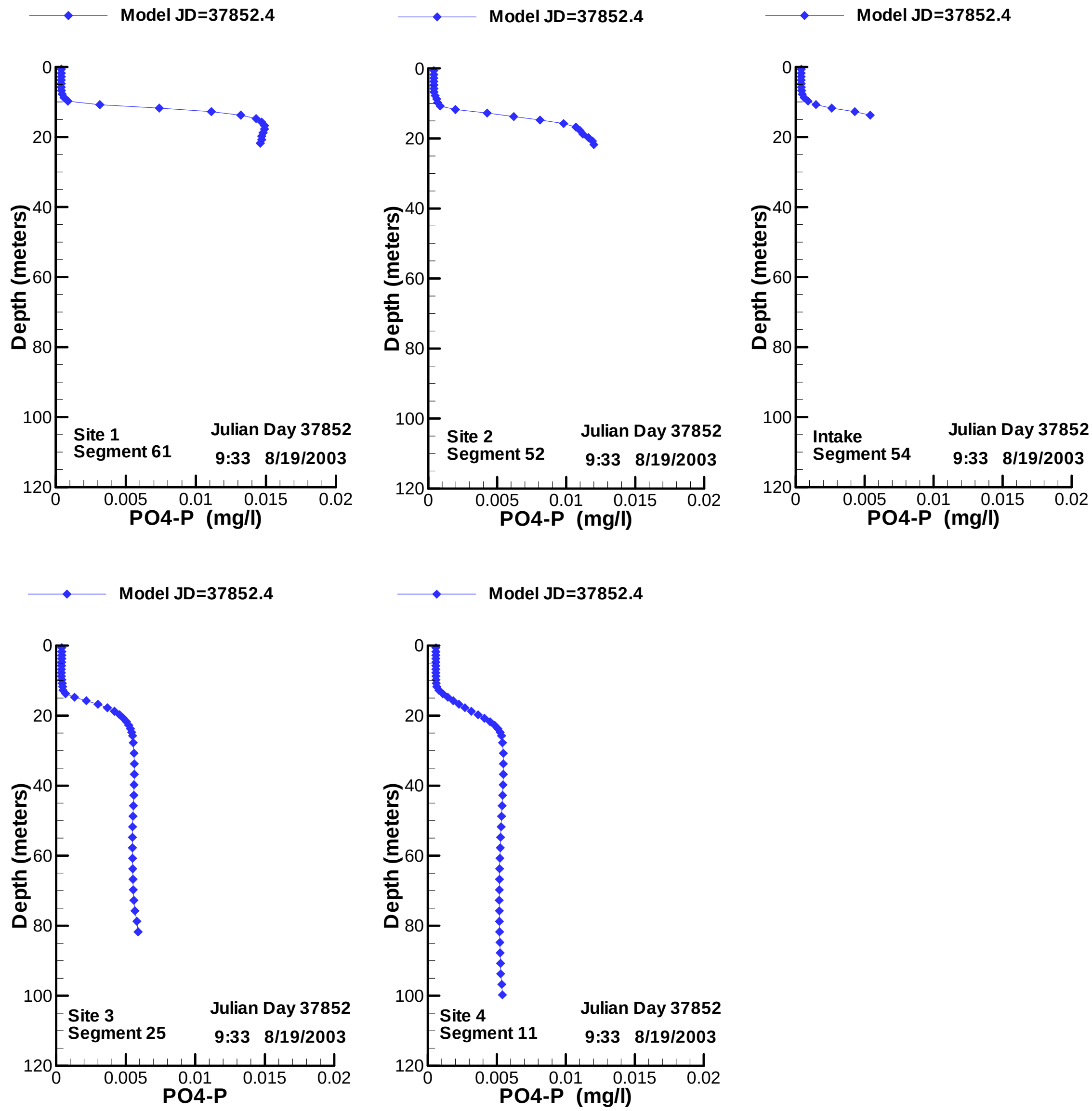

Figure 46. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/19/2003.

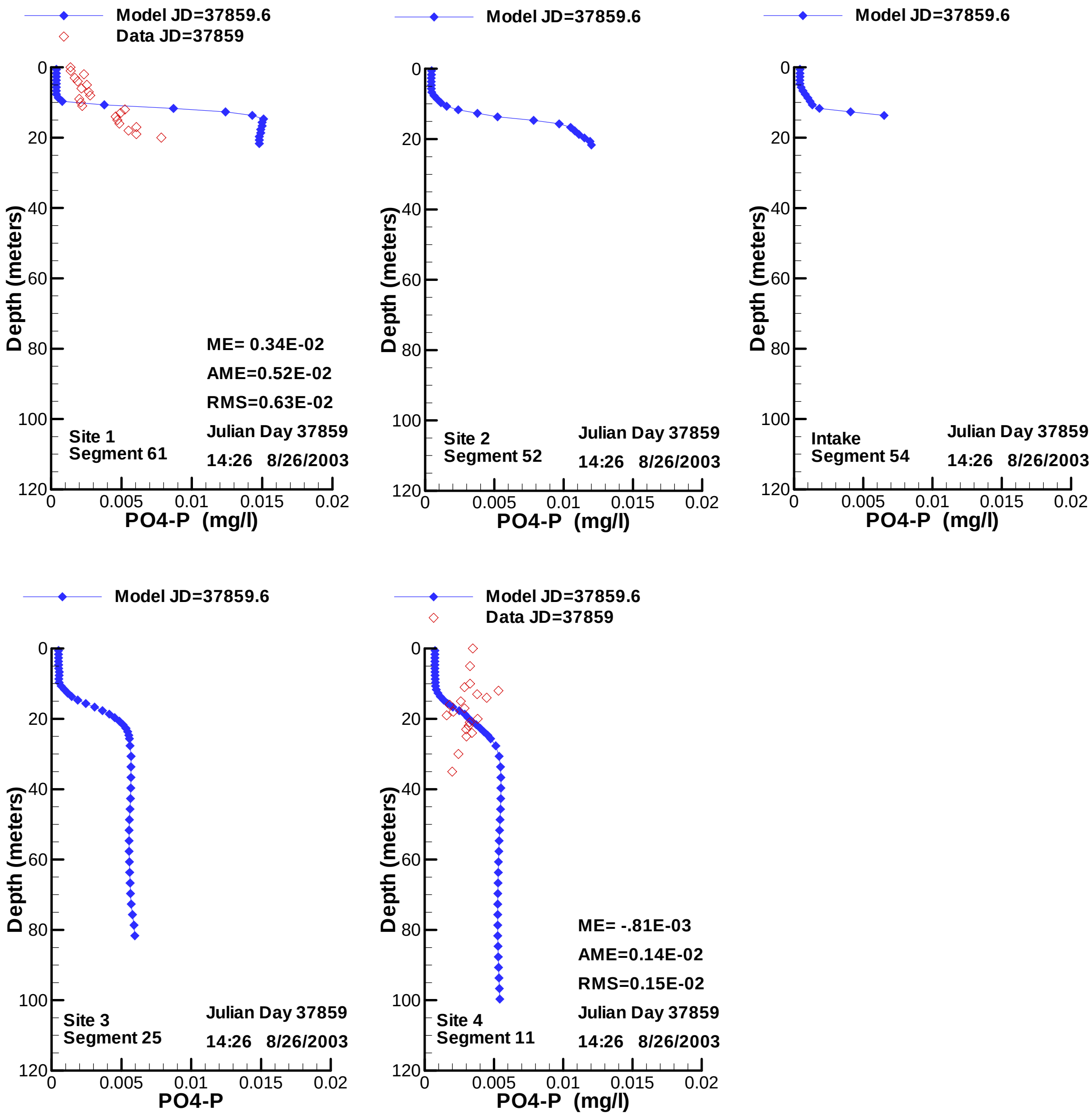

Figure 47. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 8/26/2003.

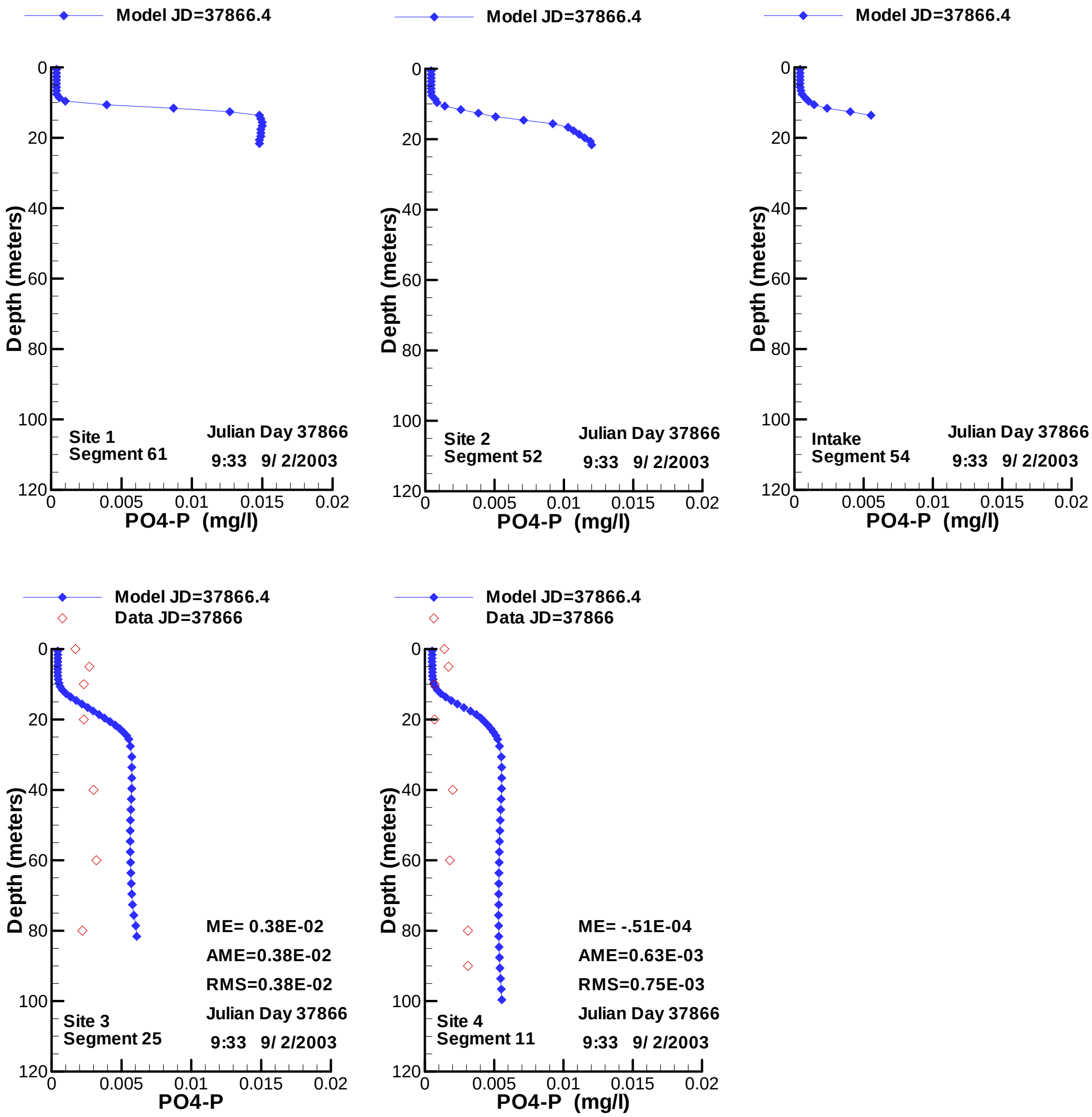

Figure 48. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/ 2/2003.

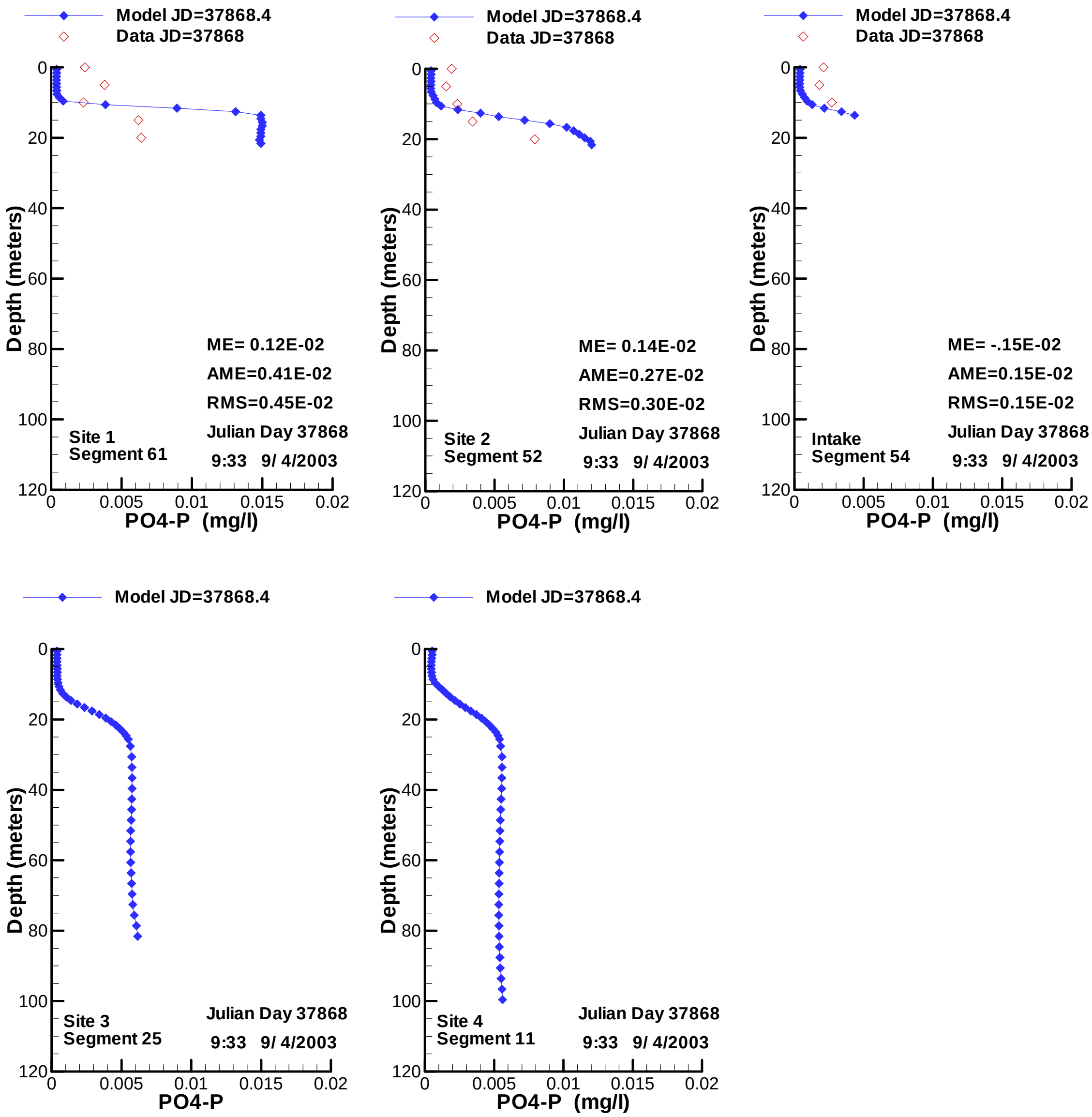

Figure 49. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/ 4/2003.

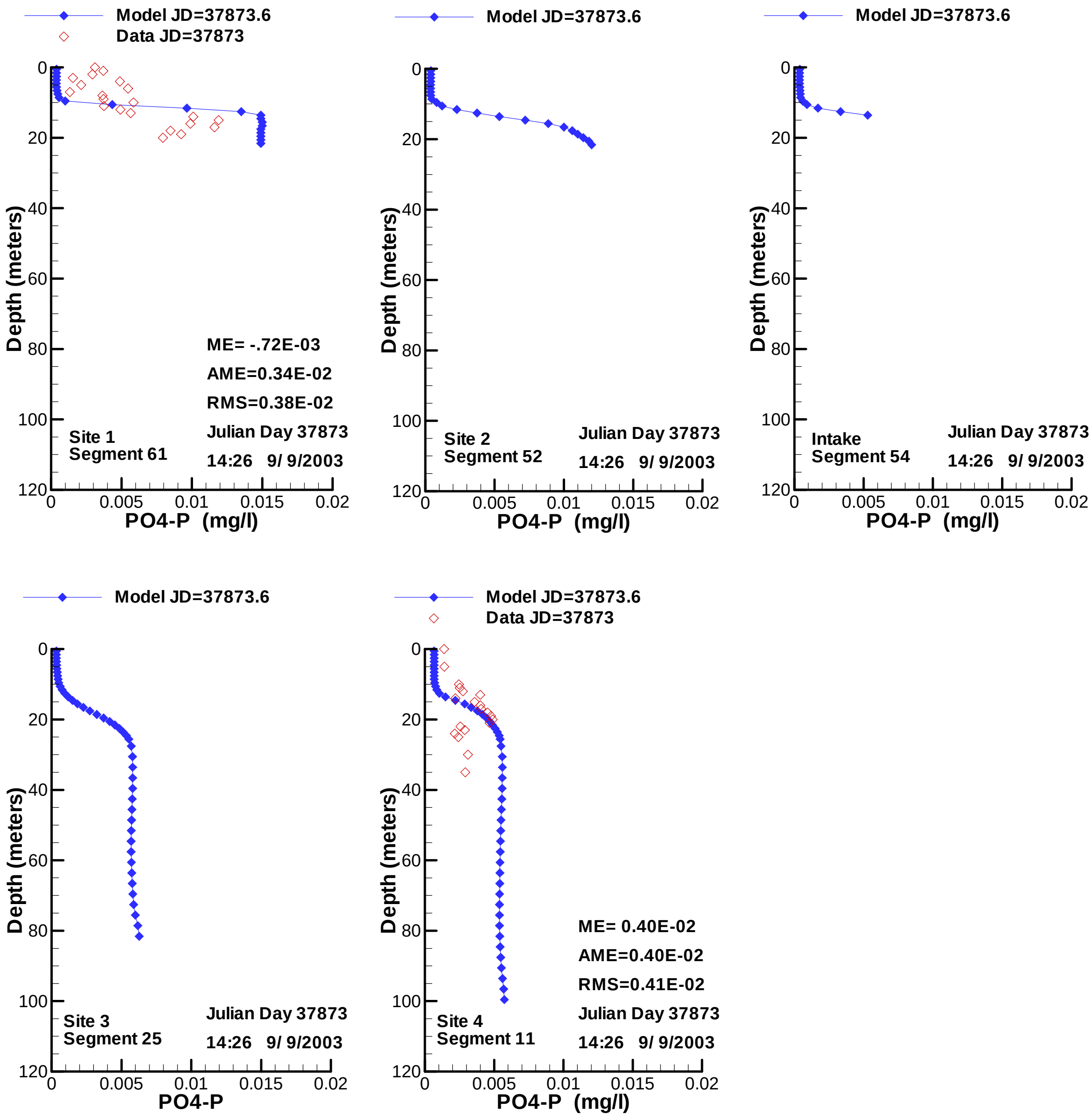

Figure 50. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/ 9/2003.

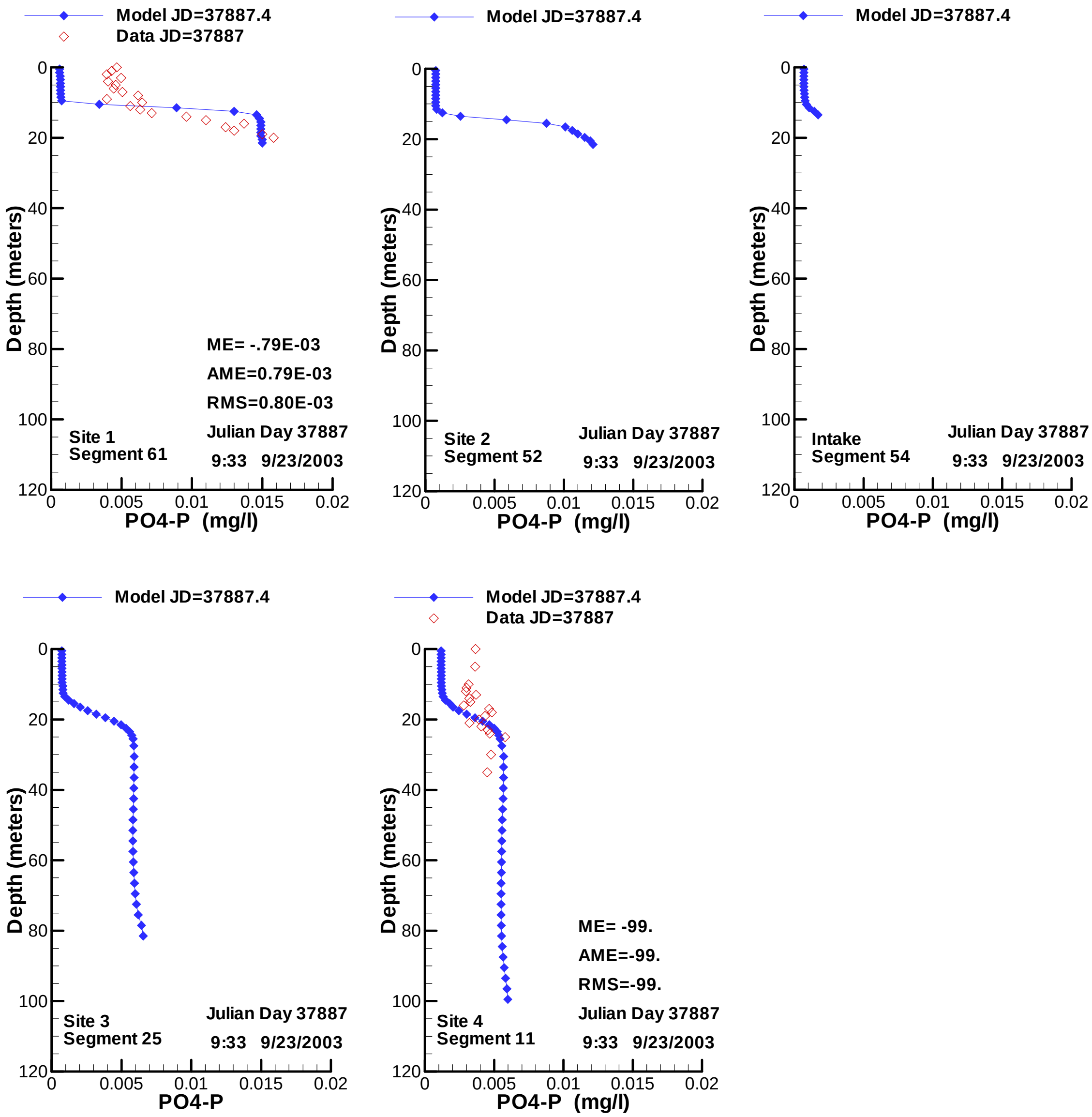

Figure 51. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 9/23/2003.

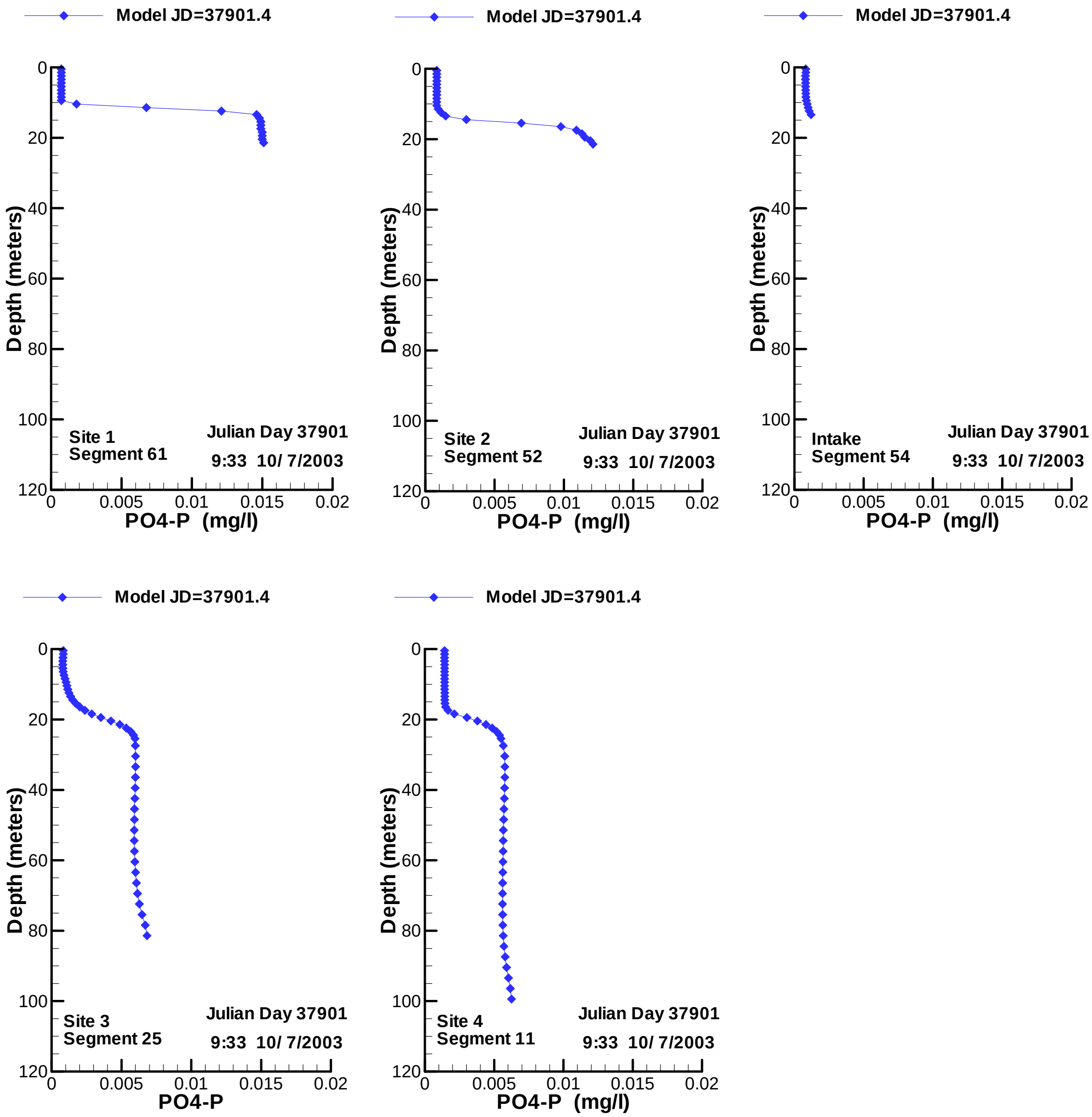

Figure 52. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 10/ 7/2003.

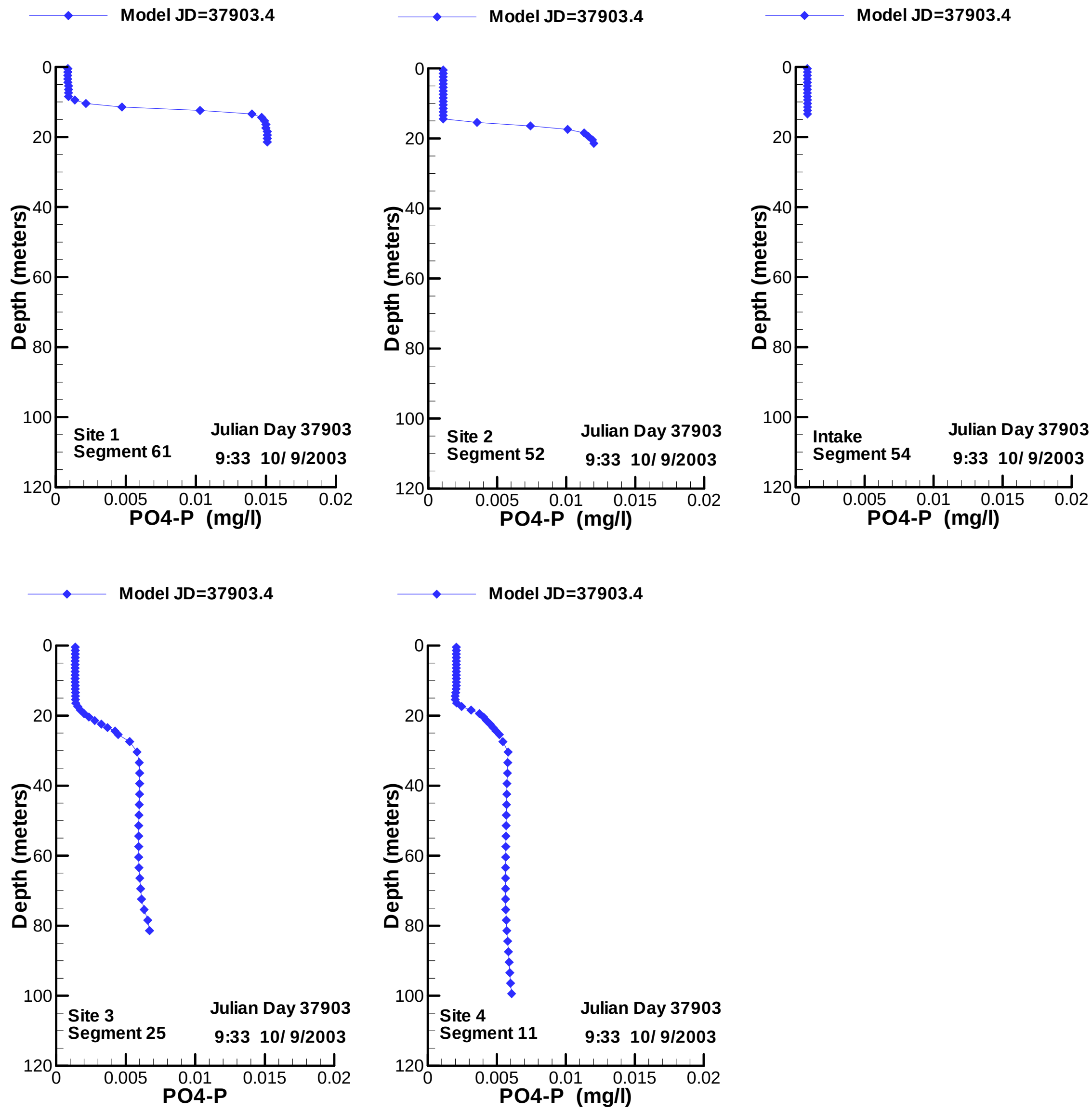

Figure 53. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 10/ 9/2003.

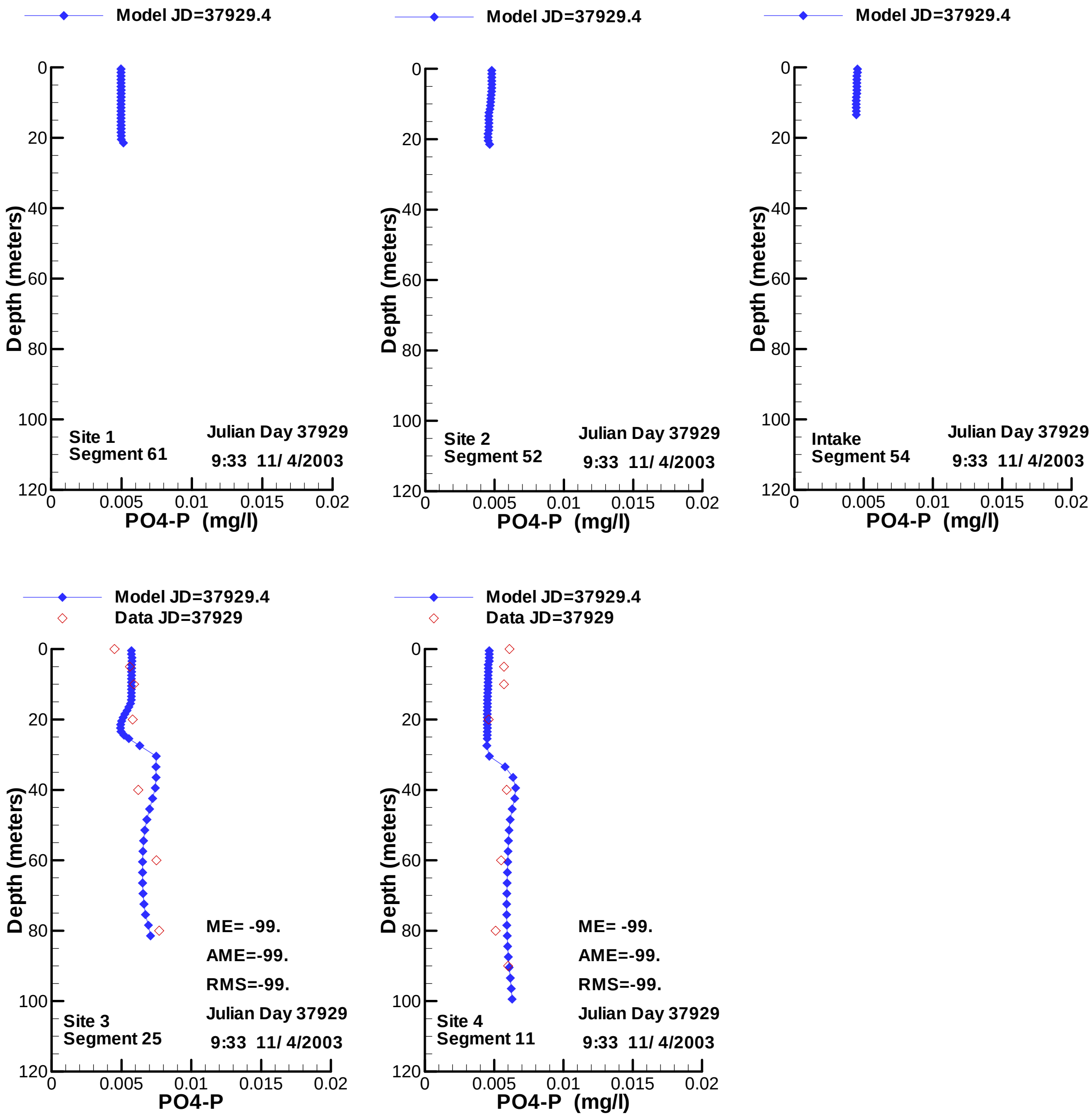

Figure 54. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 11/ 4/2003.

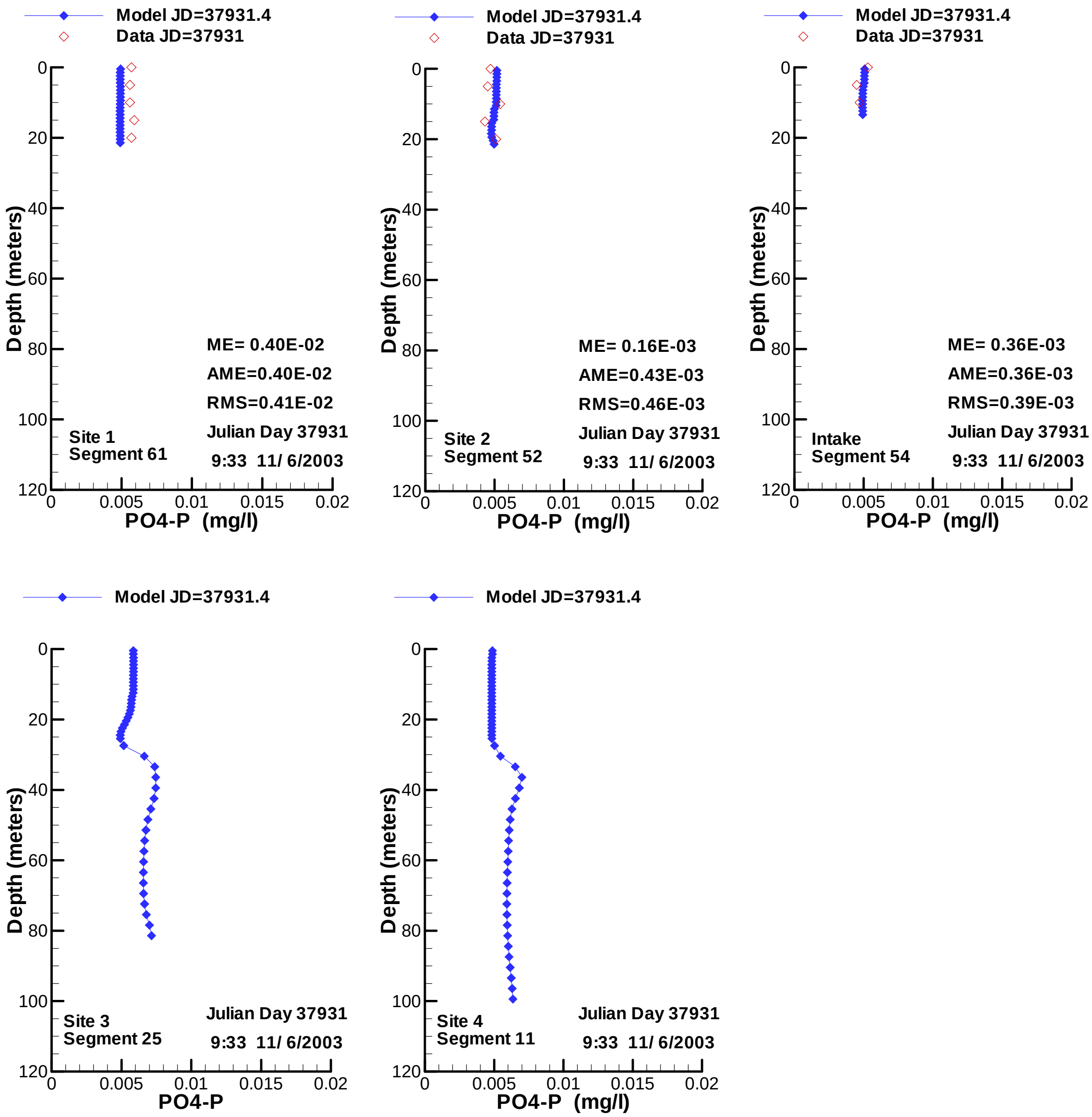

Figure 55. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 11/ 6/2003.

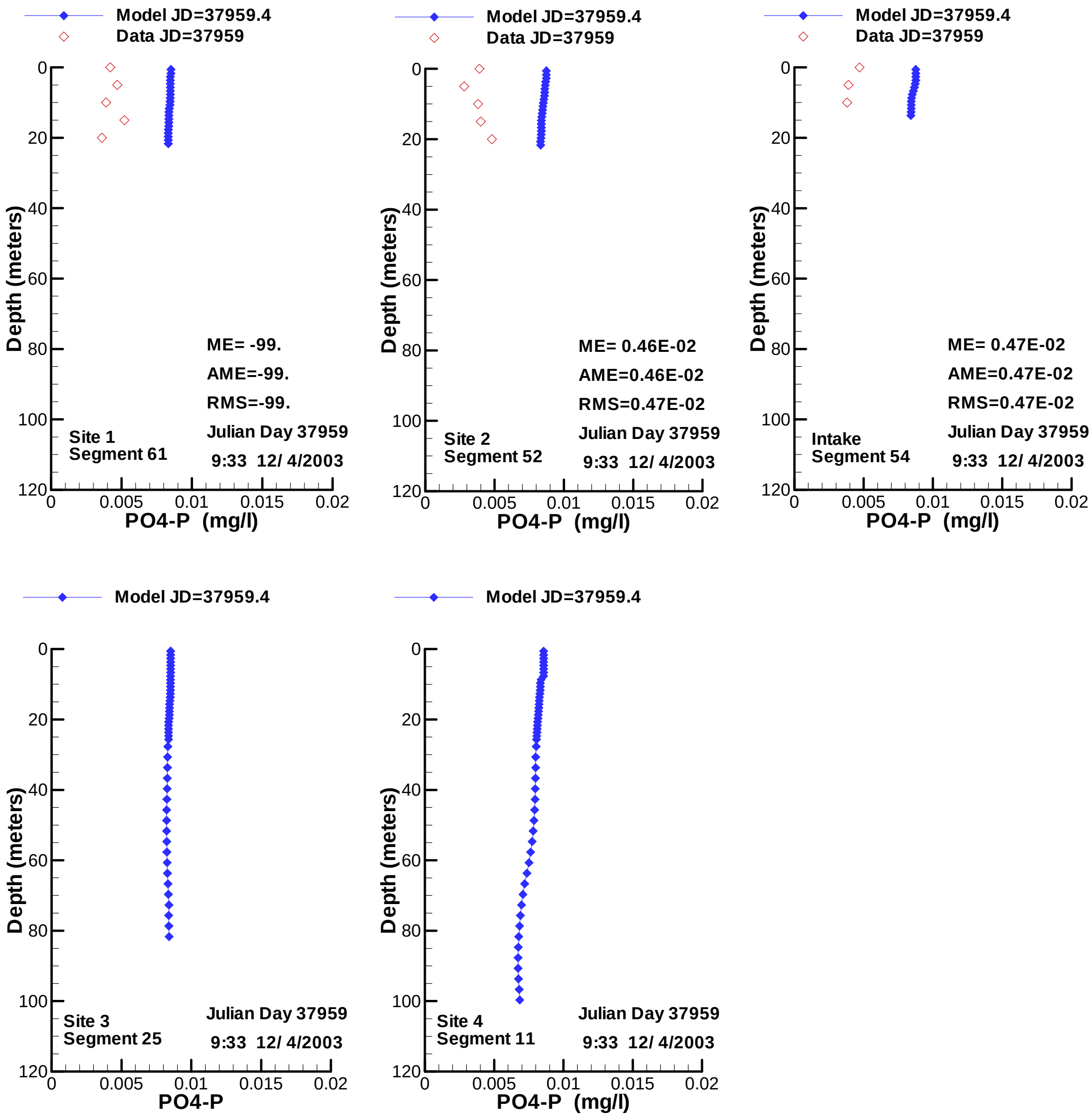

Figure 56. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 12/ 4/2003.

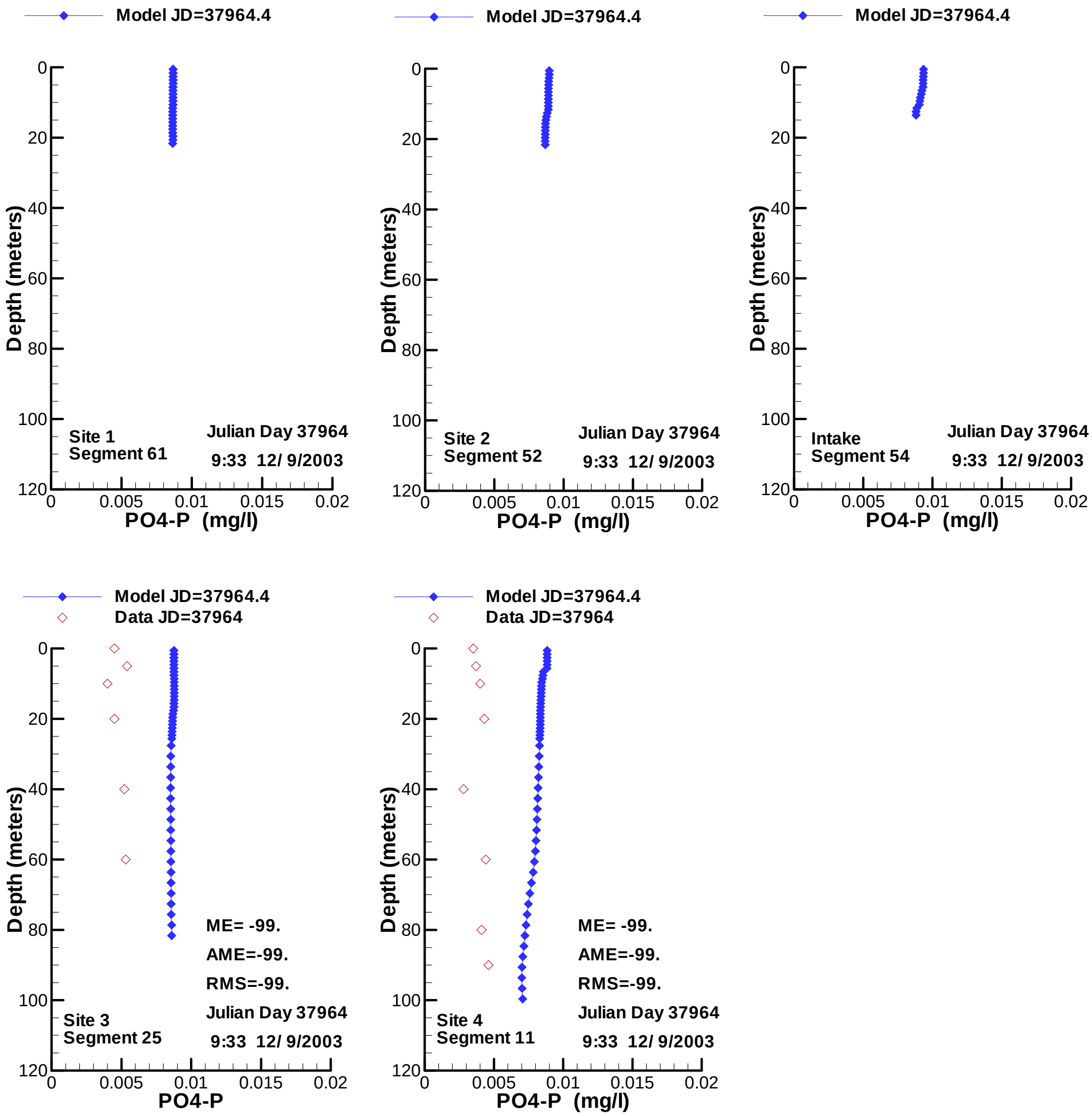

Figure 57. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 12/ 9/2003.

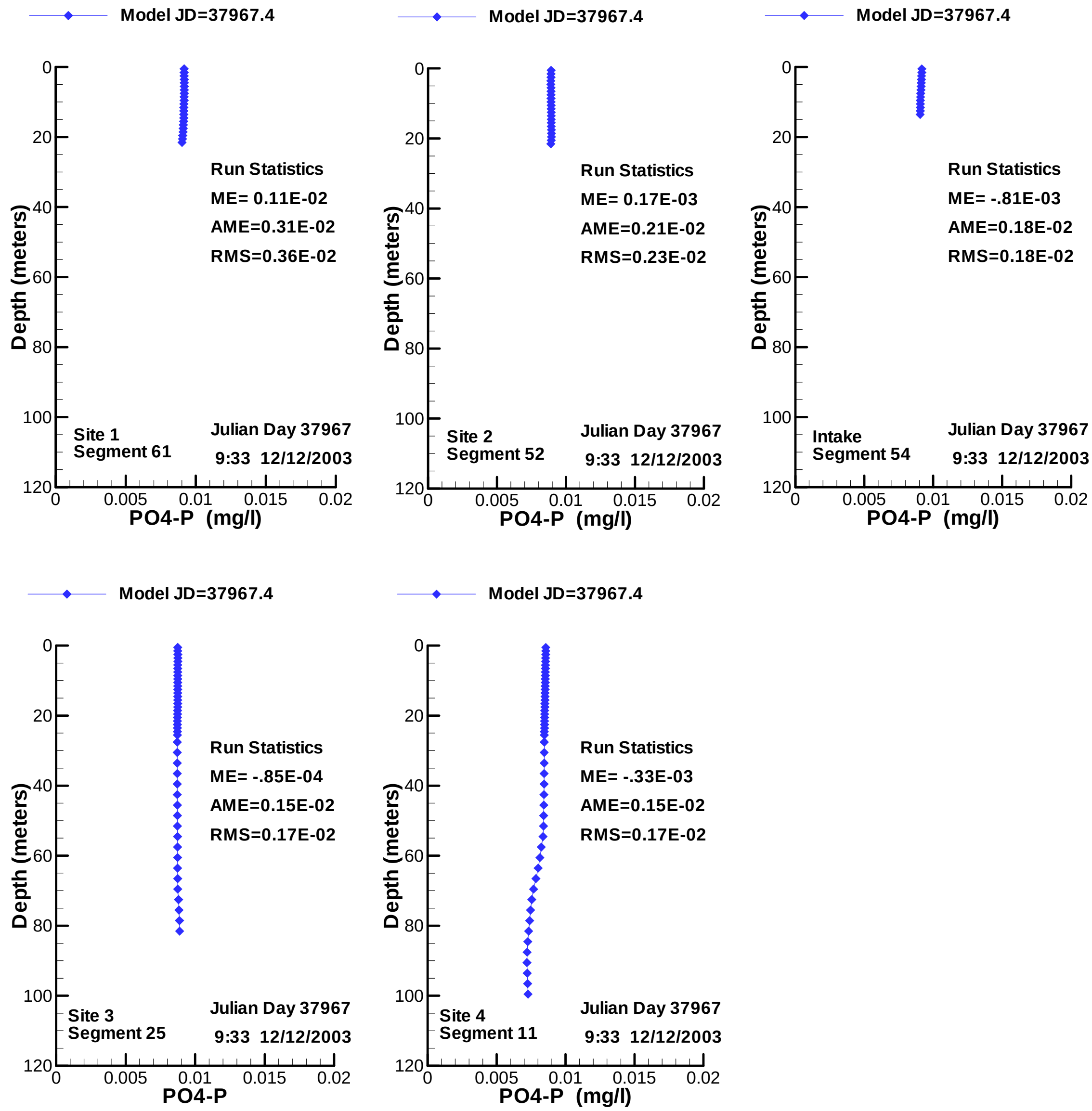

Figure 58. Vertical profiles of ORTHO-PHOSPHORUS compared with data for 12/12/2003.

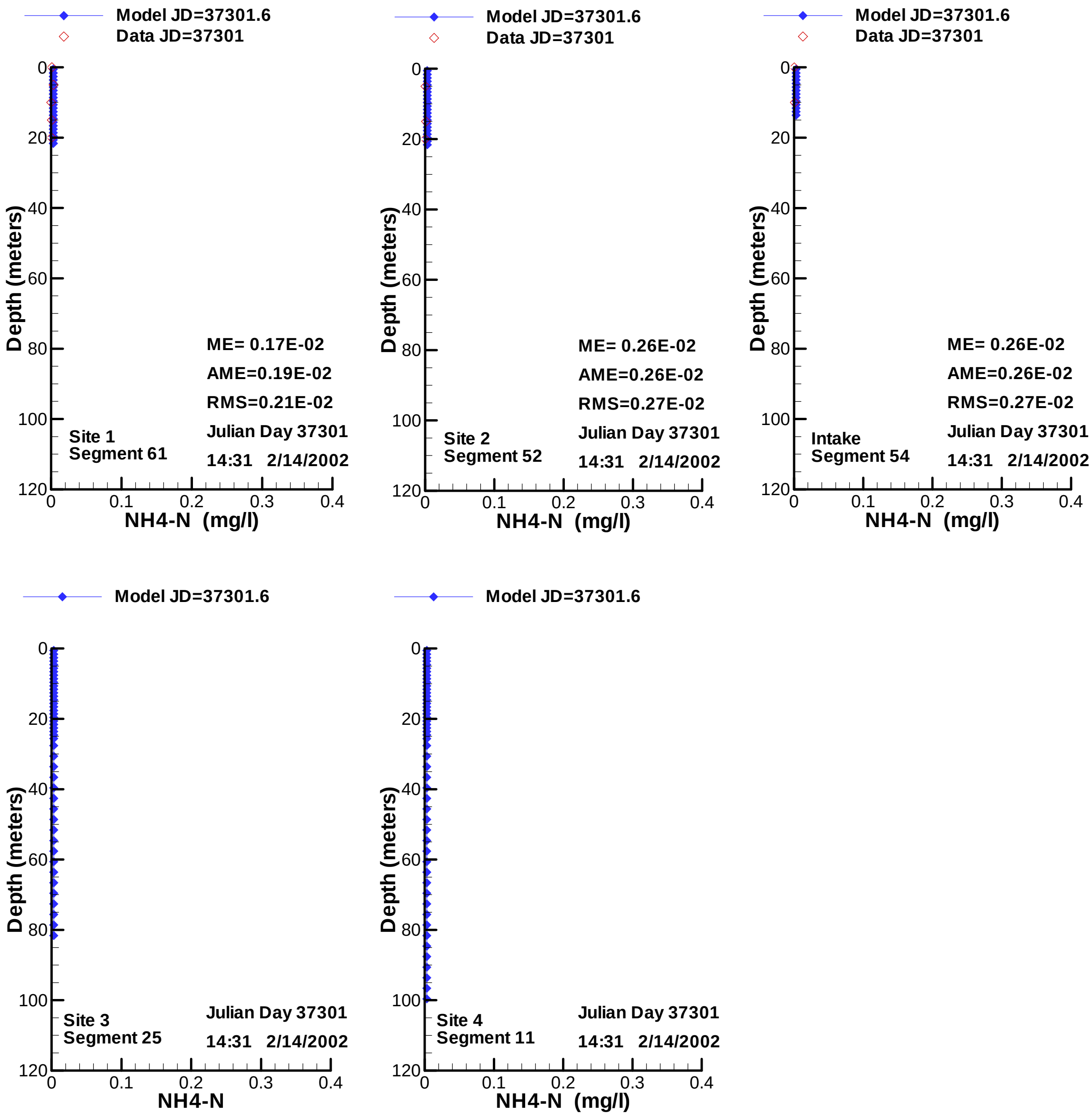

Figure 59. Vertical profiles of AMMONIA NITROGEN compared with data for 2/14/2002.

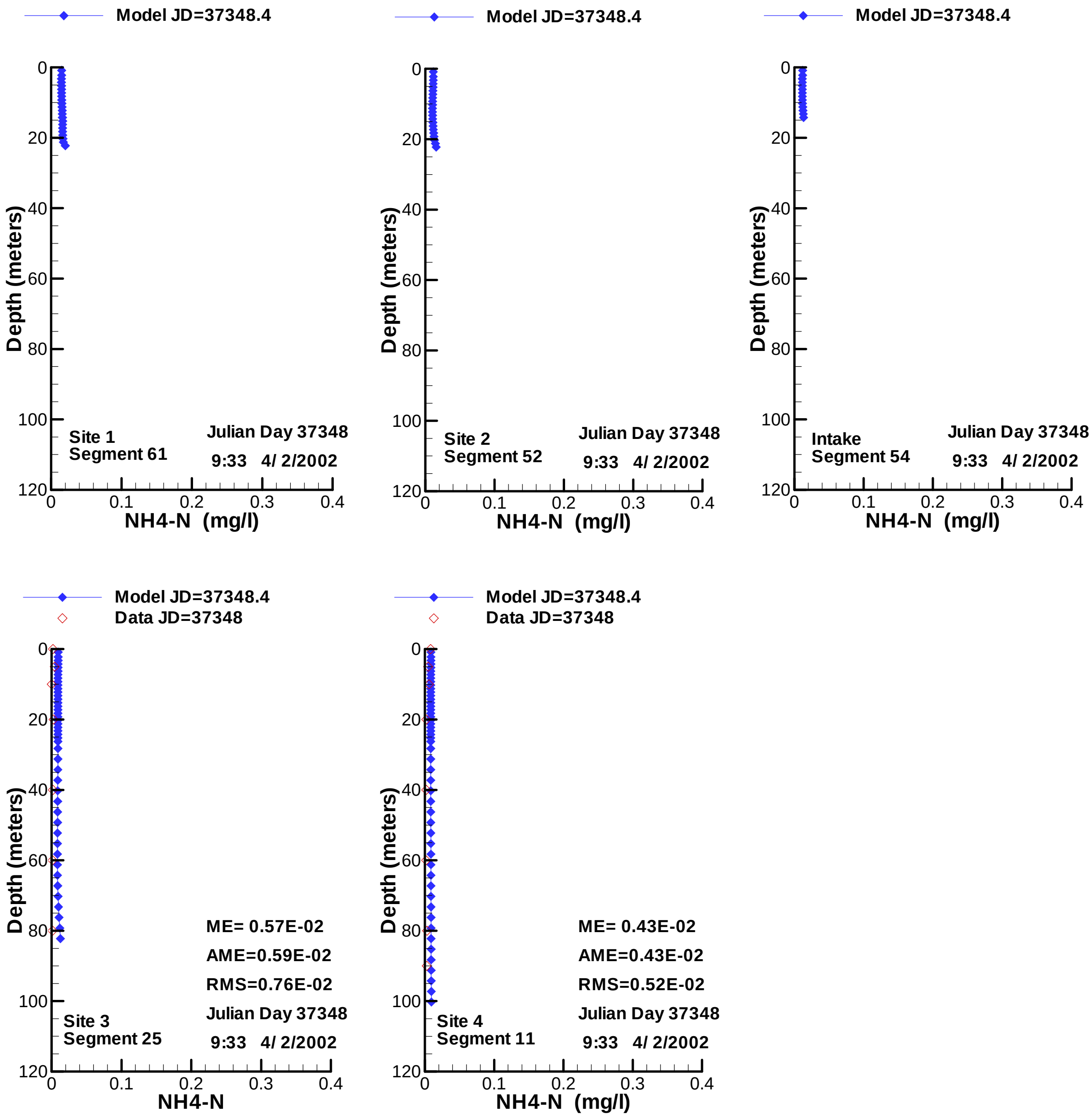

Figure 60. Vertical profiles of AMMONIA NITROGEN compared with data for 4/ 2/2002.

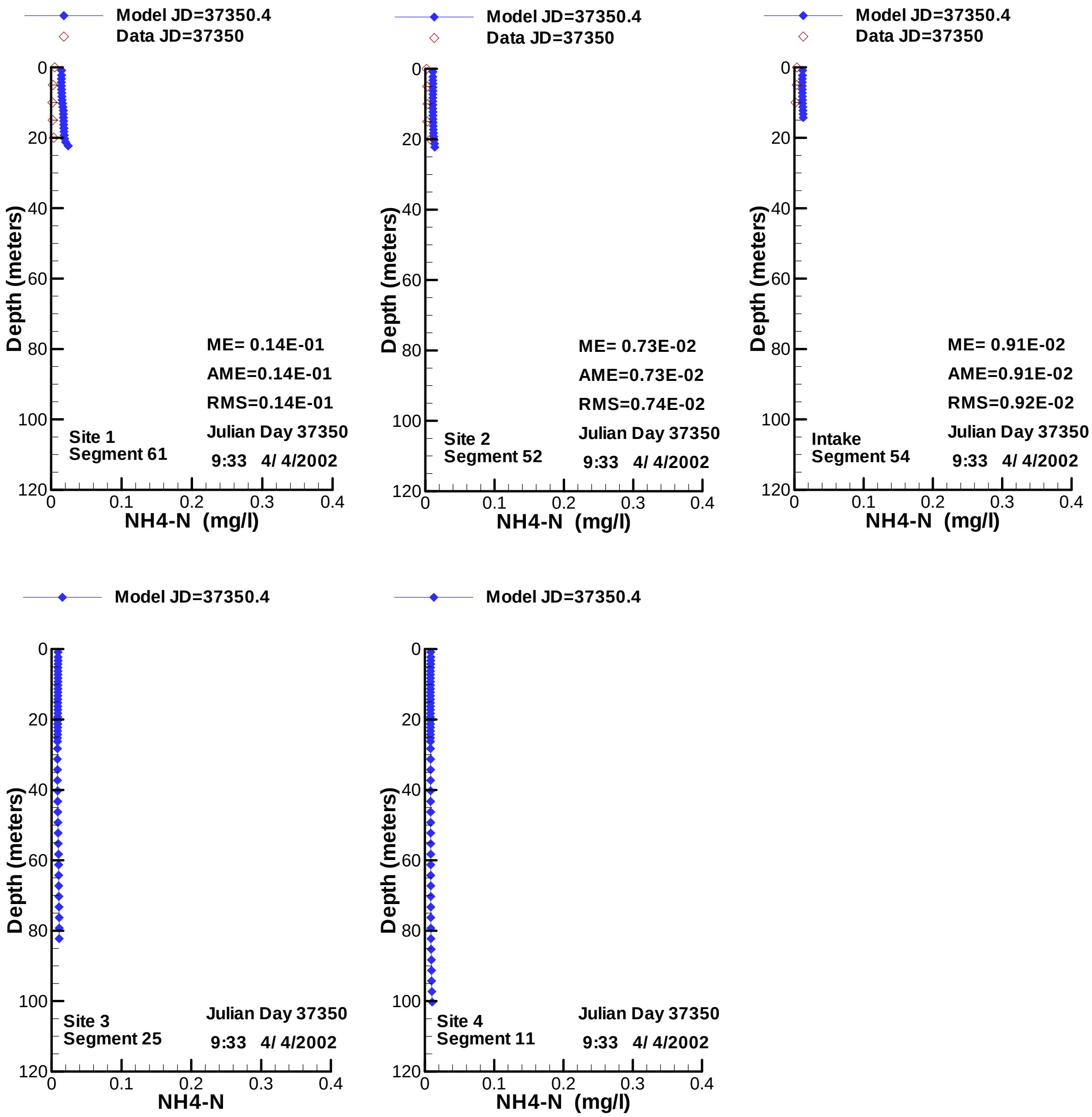

Figure 61. Vertical profiles of AMMONIA NITROGEN compared with data for 4/ 4/2002.

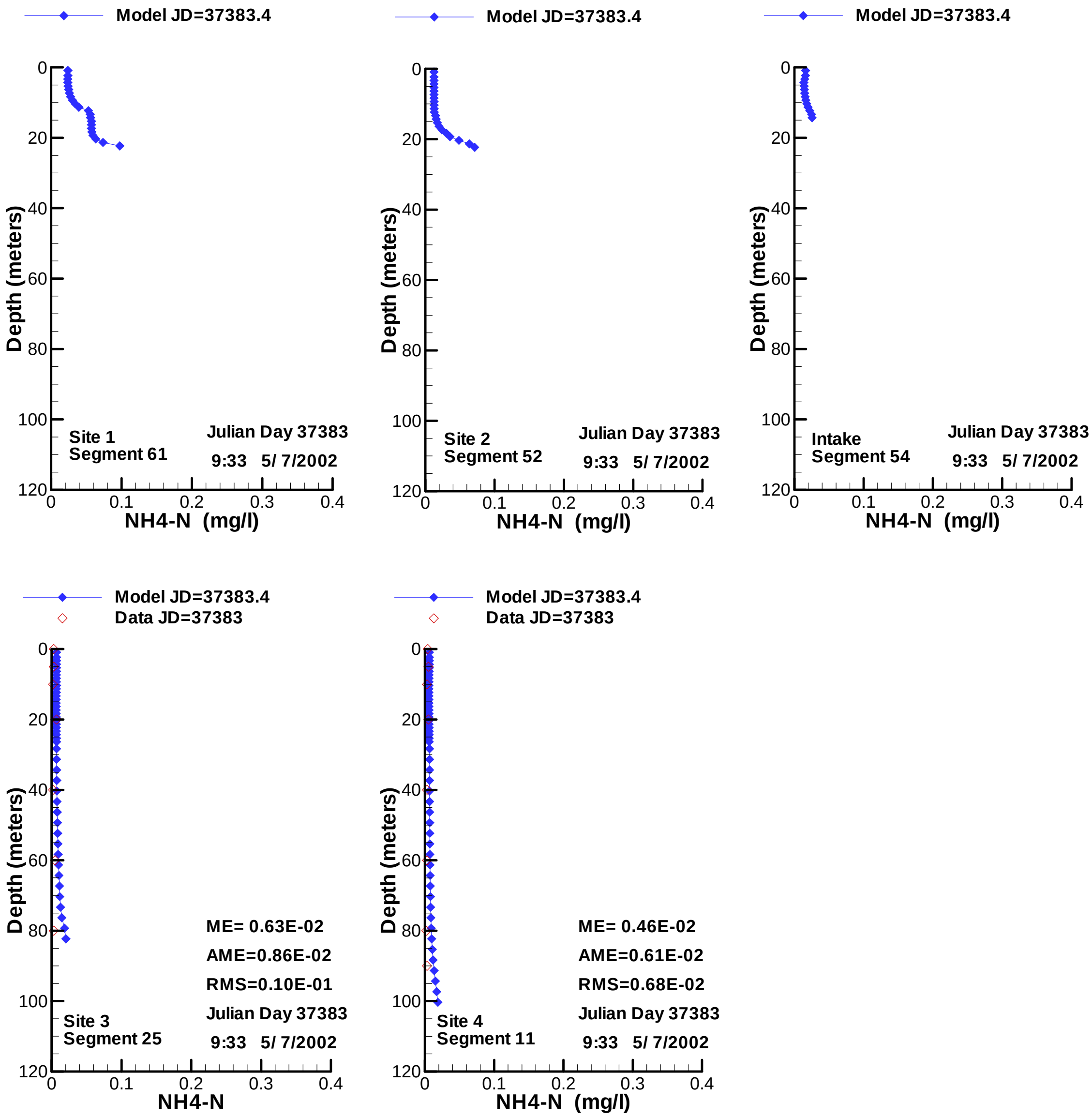

Figure 62. Vertical profiles of AMMONIA NITROGEN compared with data for 5/ 7/2002.

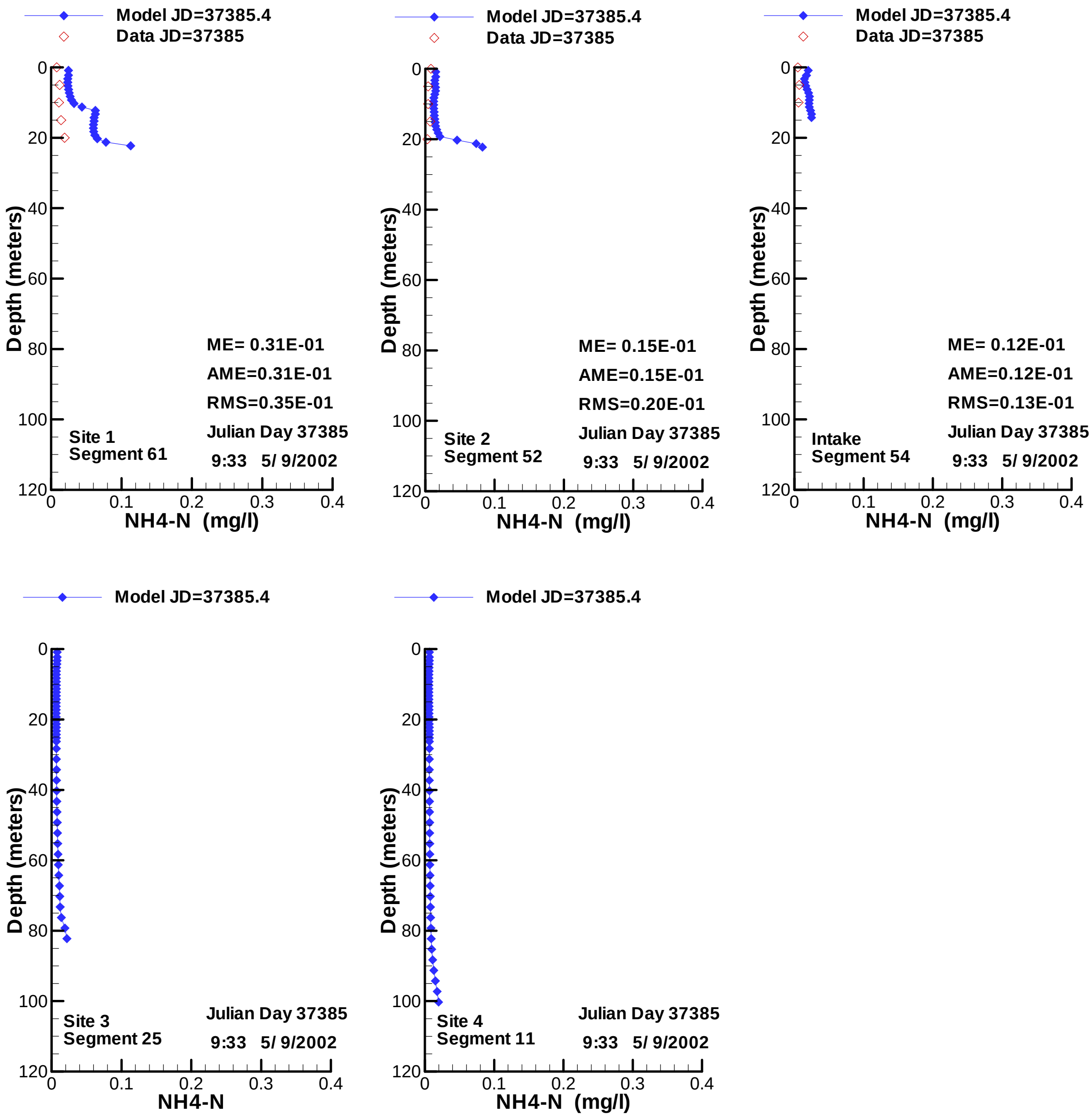

Figure 63. Vertical profiles of AMMONIA NITROGEN compared with data for 5/ 9/2002.

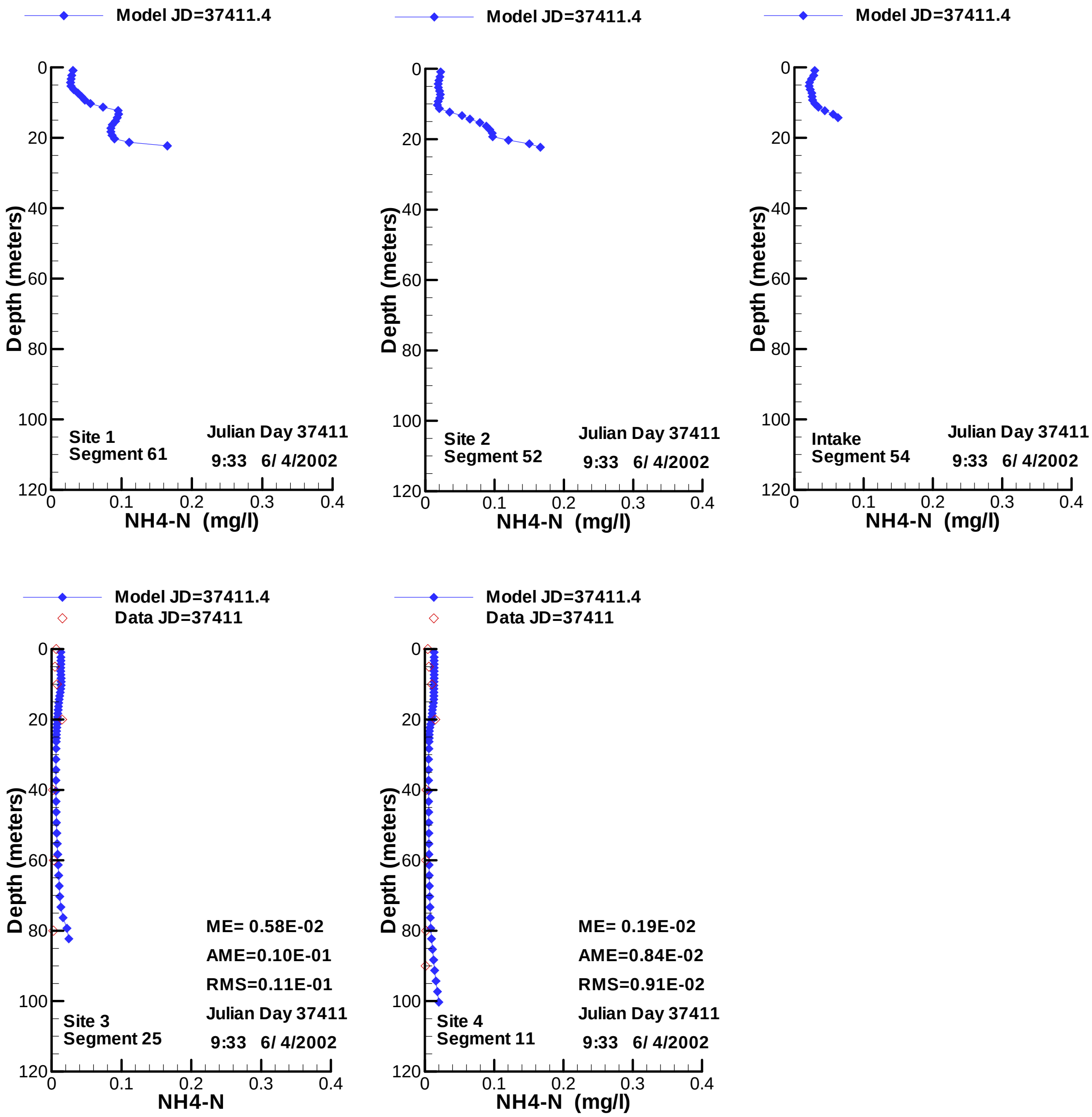

Figure 64. Vertical profiles of AMMONIA NITROGEN compared with data for 6/ 4/2002.

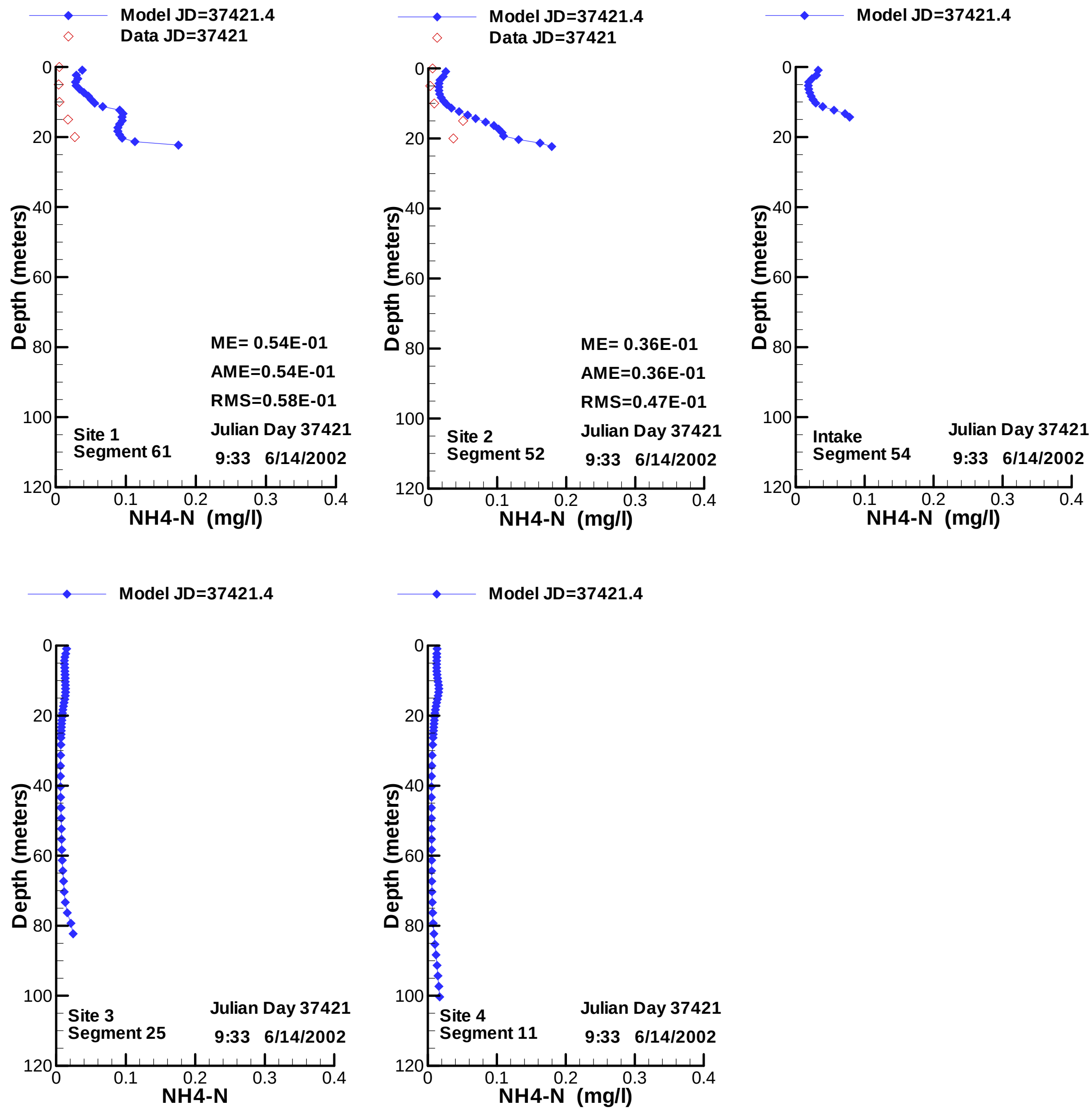

Figure 65. Vertical profiles of AMMONIA NITROGEN compared with data for 6/14/2002.

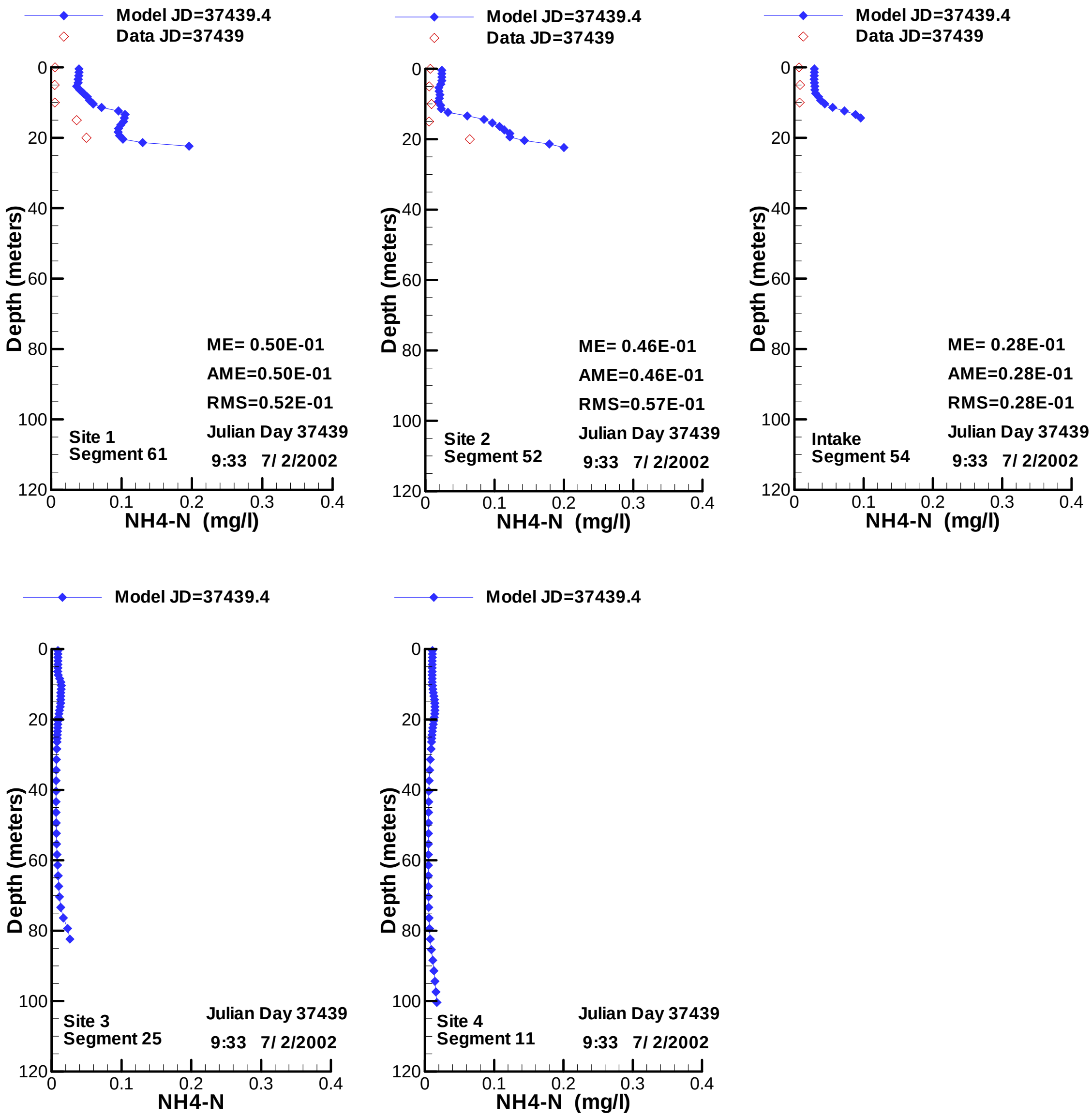

Figure 66. Vertical profiles of AMMONIA NITROGEN compared with data for 7/ 2/2002.

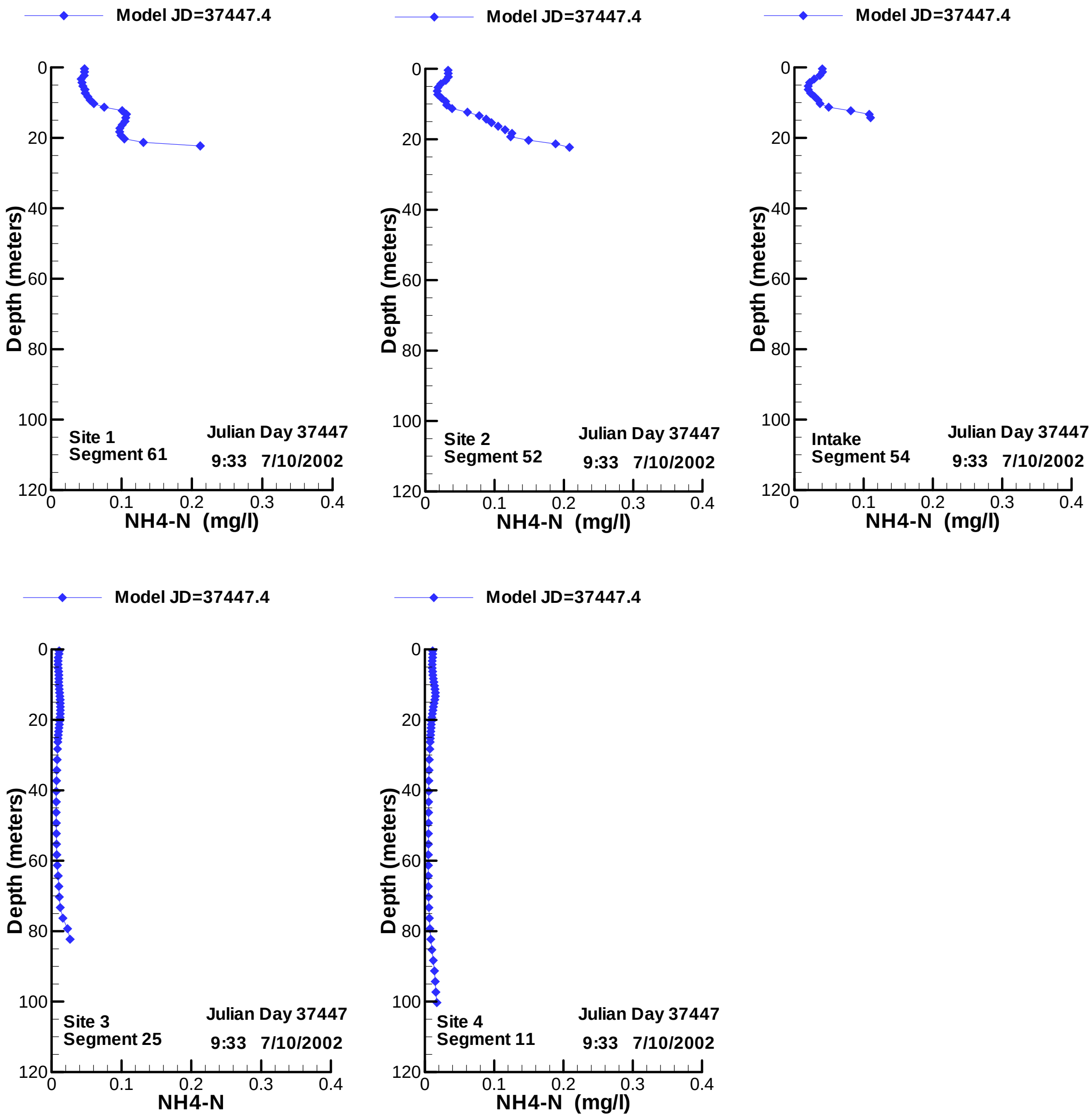

Figure 67. Vertical profiles of AMMONIA NITROGEN compared with data for 7/10/2002.

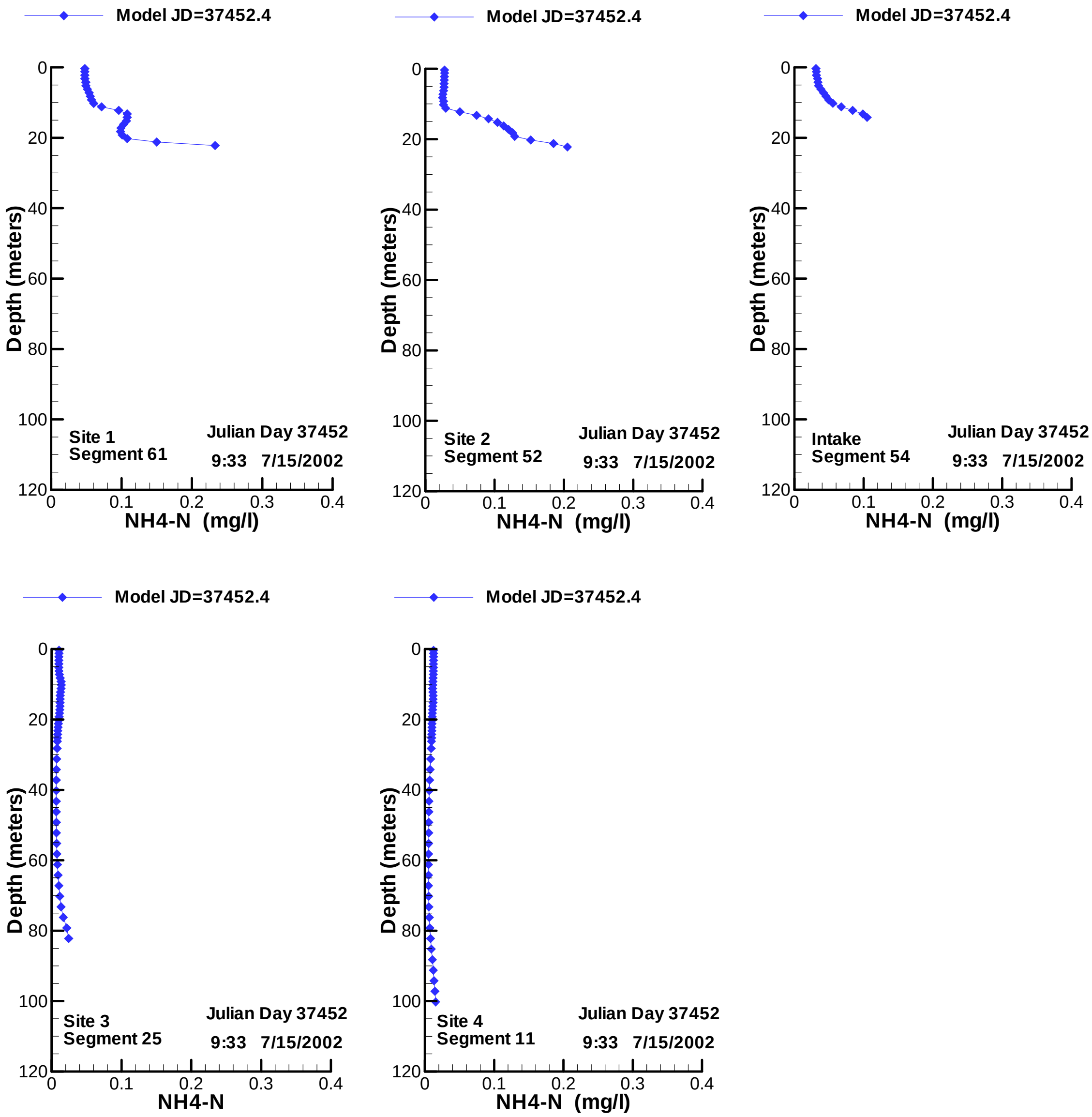

Figure 68. Vertical profiles of AMMONIA NITROGEN compared with data for 7/15/2002.

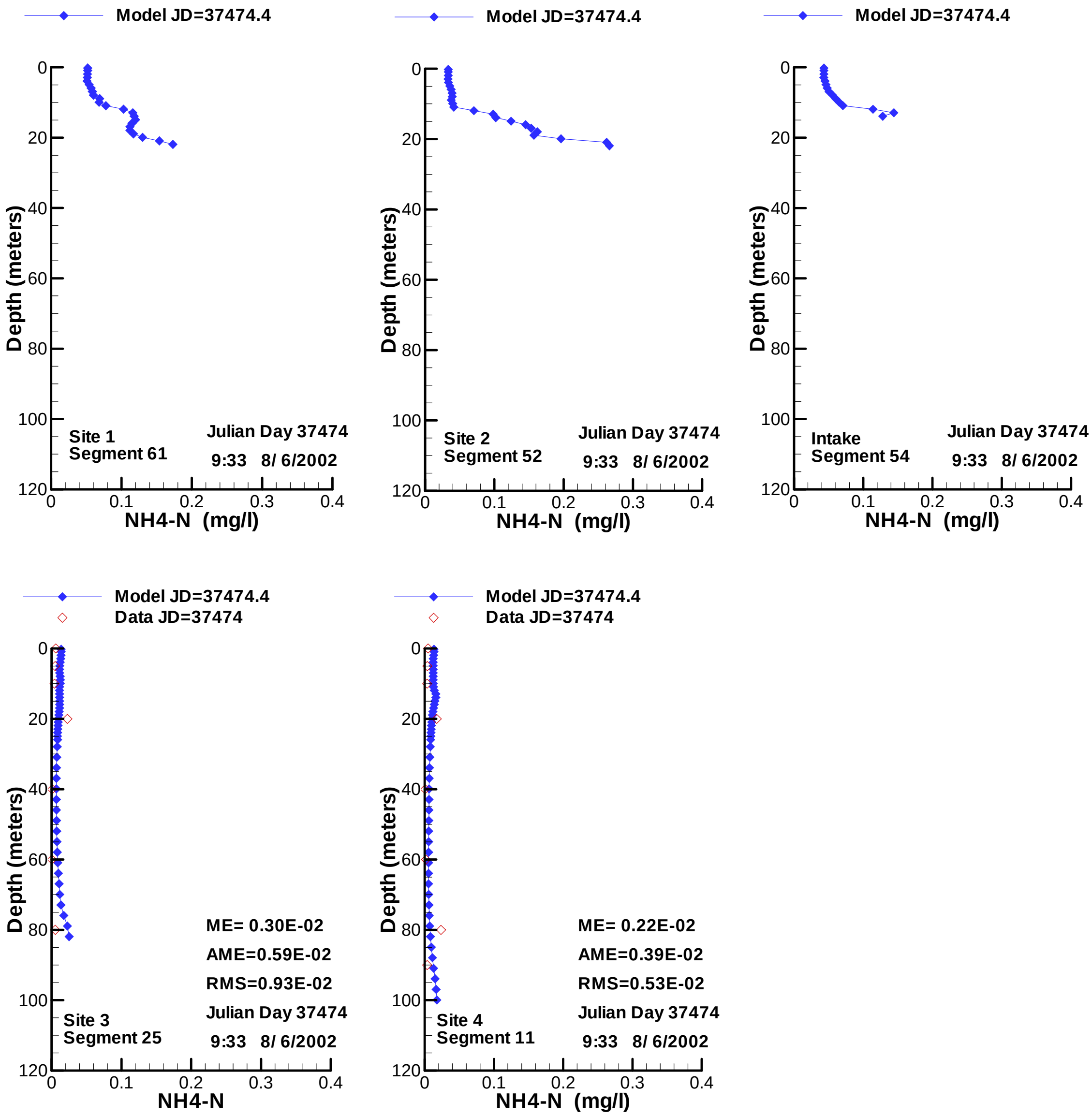

Figure 69. Vertical profiles of AMMONIA NITROGEN compared with data for 8/ 6/2002.

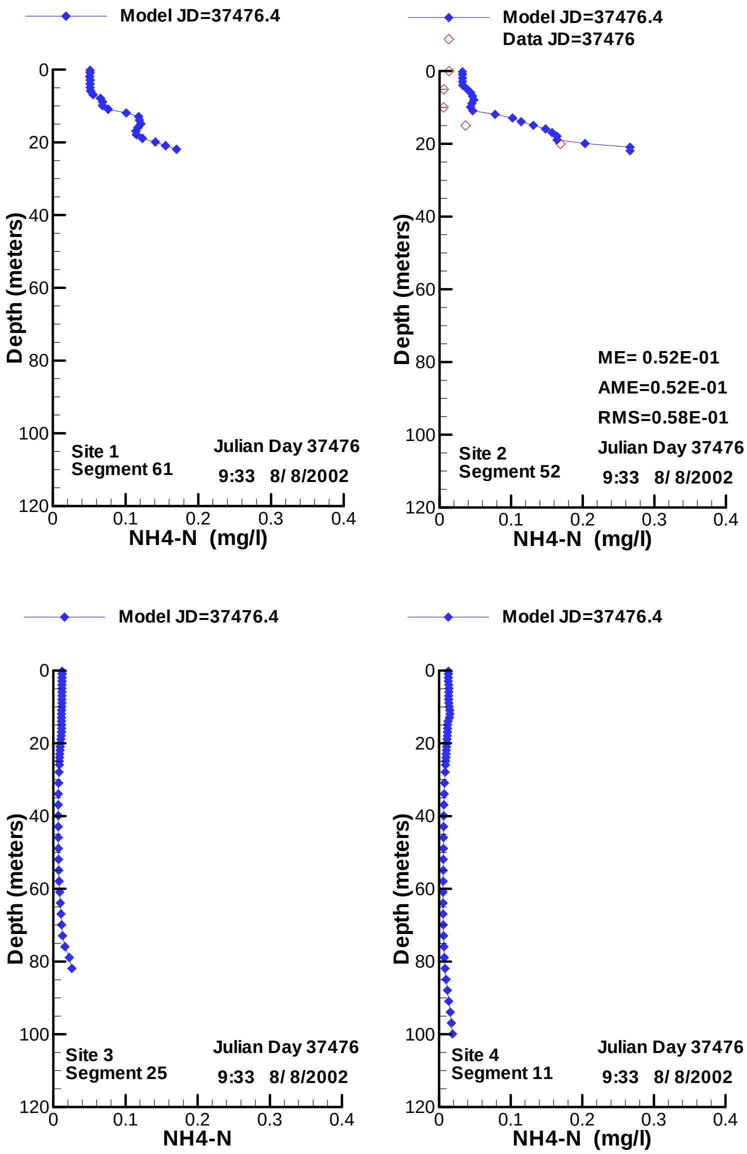

Figure 70. Vertical profiles of AMMONIA NITROGEN compared with data for 8/ 8/2002.

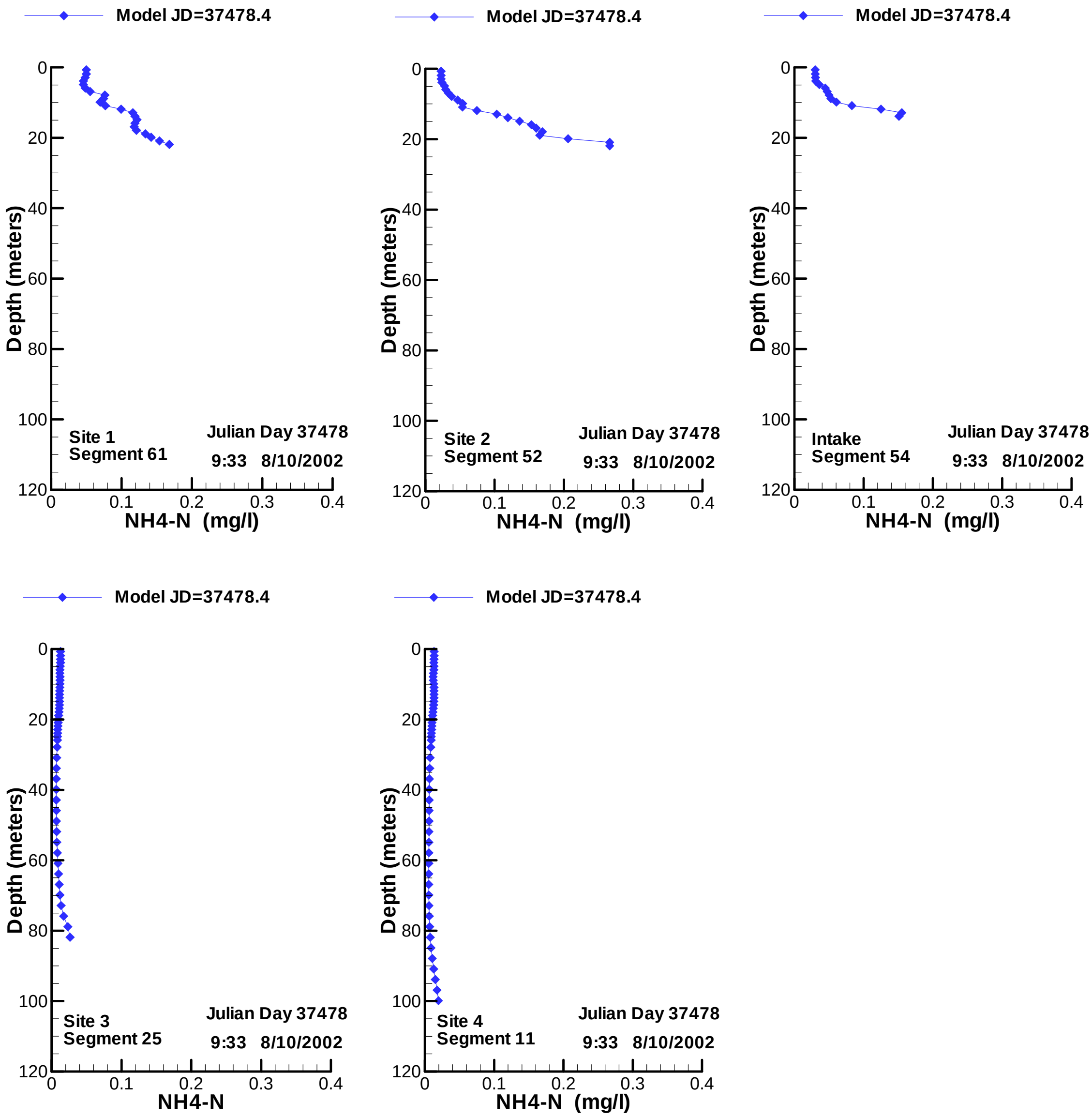

Figure 71. Vertical profiles of AMMONIA NITROGEN compared with data for 8/10/2002.

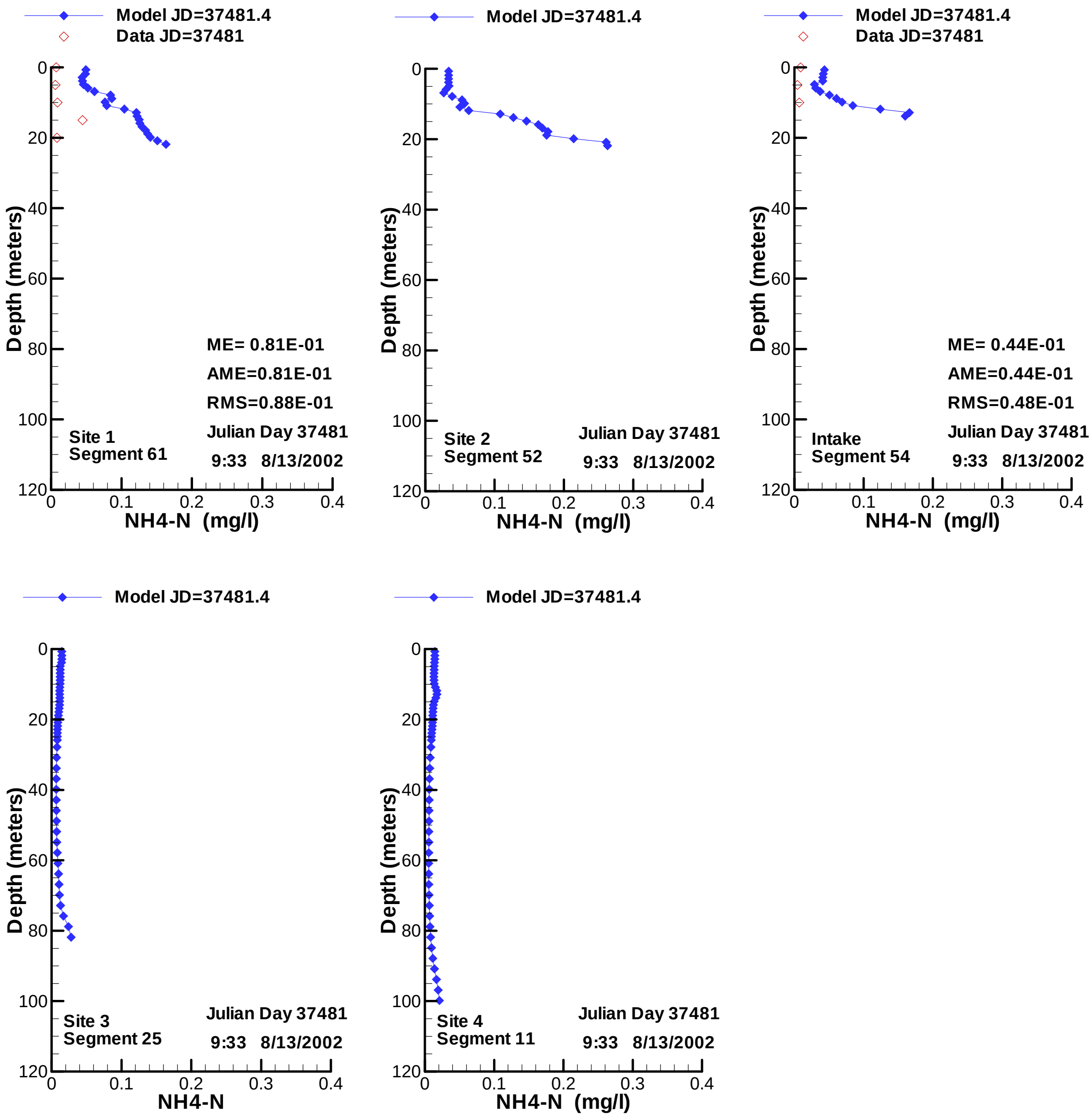

Figure 72. Vertical profiles of AMMONIA NITROGEN compared with data for 8/13/2002.

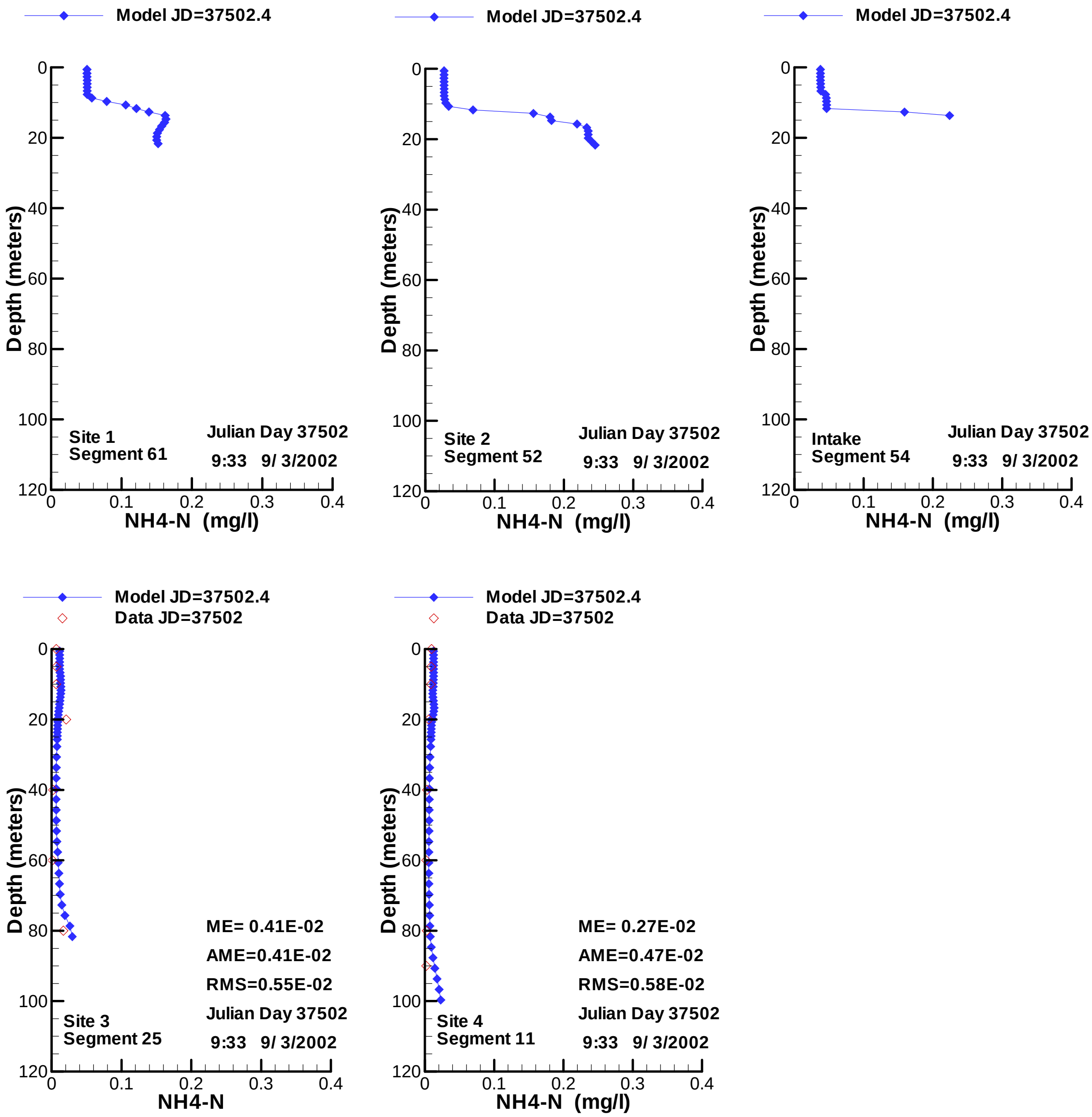

Figure 73. Vertical profiles of AMMONIA NITROGEN compared with data for 9/ 3/2002.

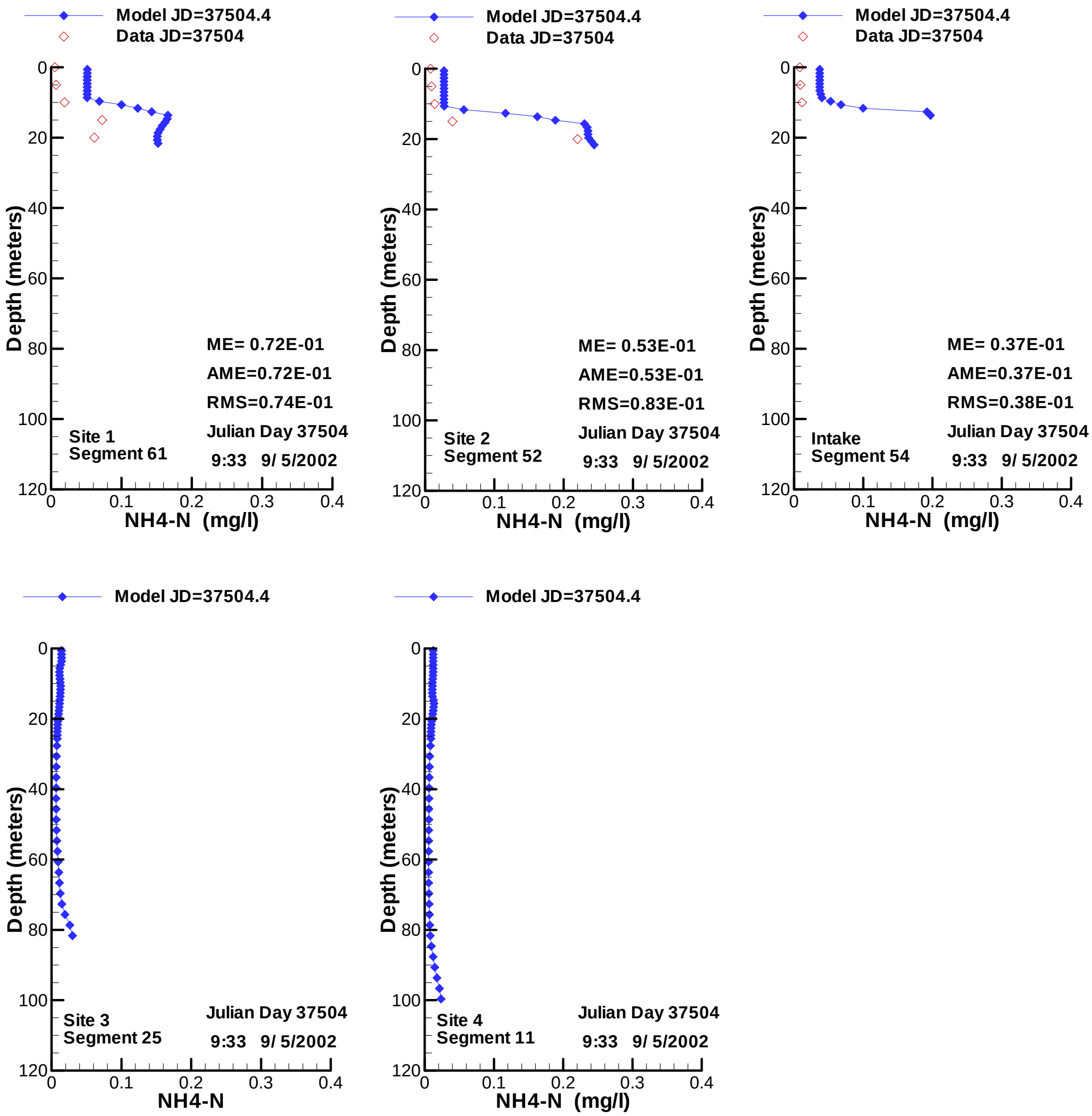

Figure 74. Vertical profiles of AMMONIA NITROGEN compared with data for 9/ 5/2002.

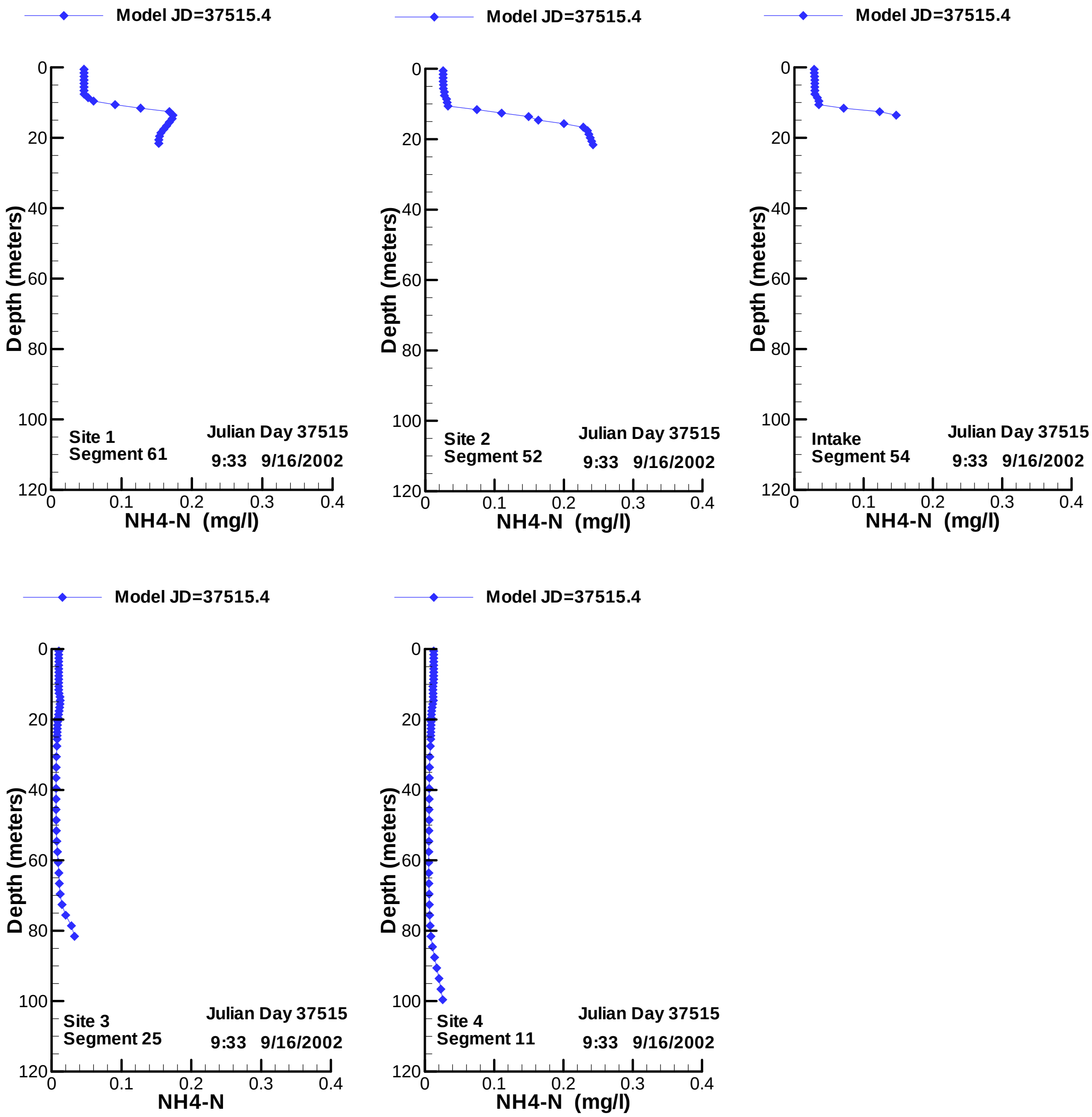

Figure 75. Vertical profiles of AMMONIA NITROGEN compared with data for 9/16/2002.

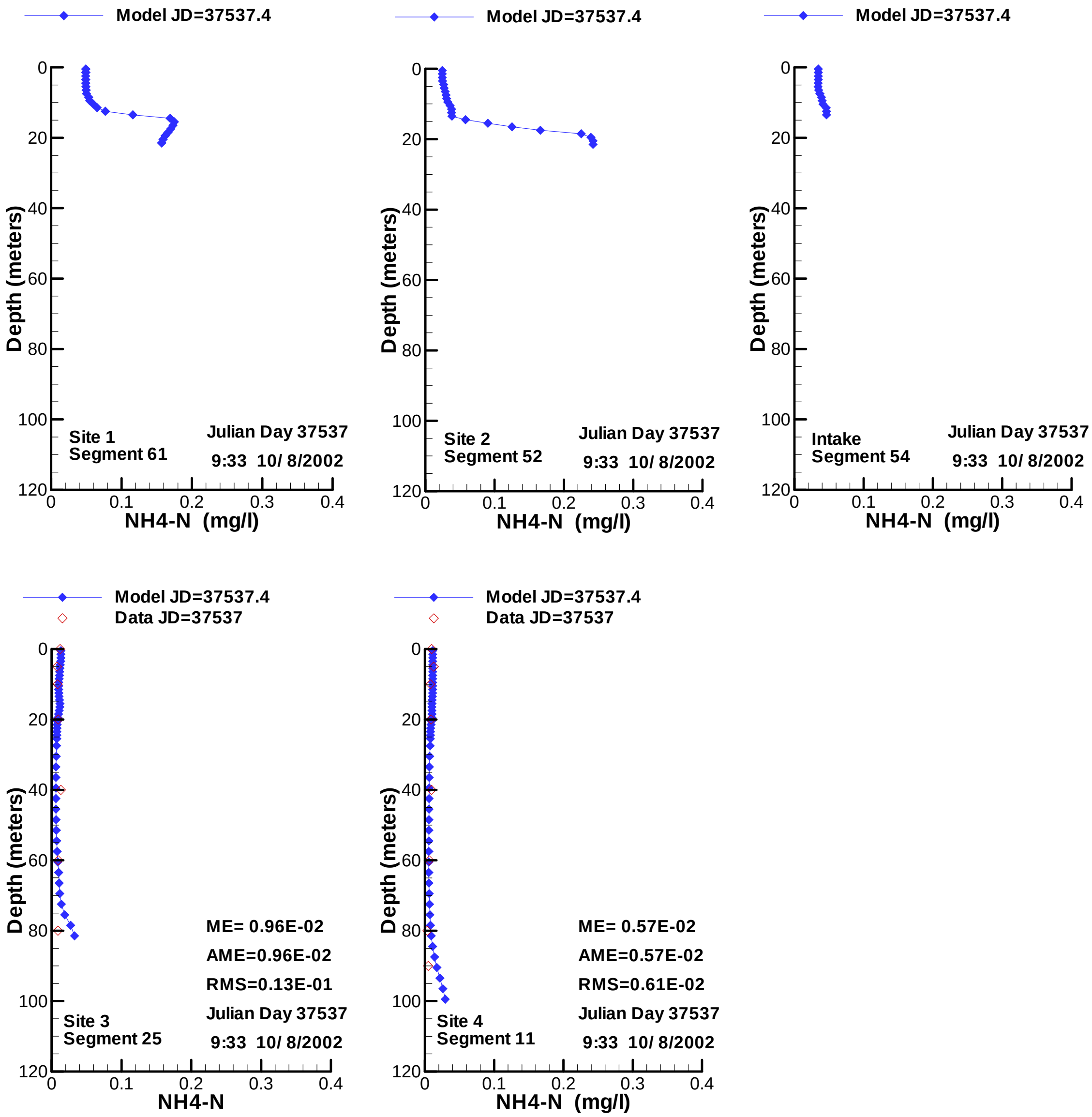

Figure 76. Vertical profiles of AMMONIA NITROGEN compared with data for 10/ 8/2002.

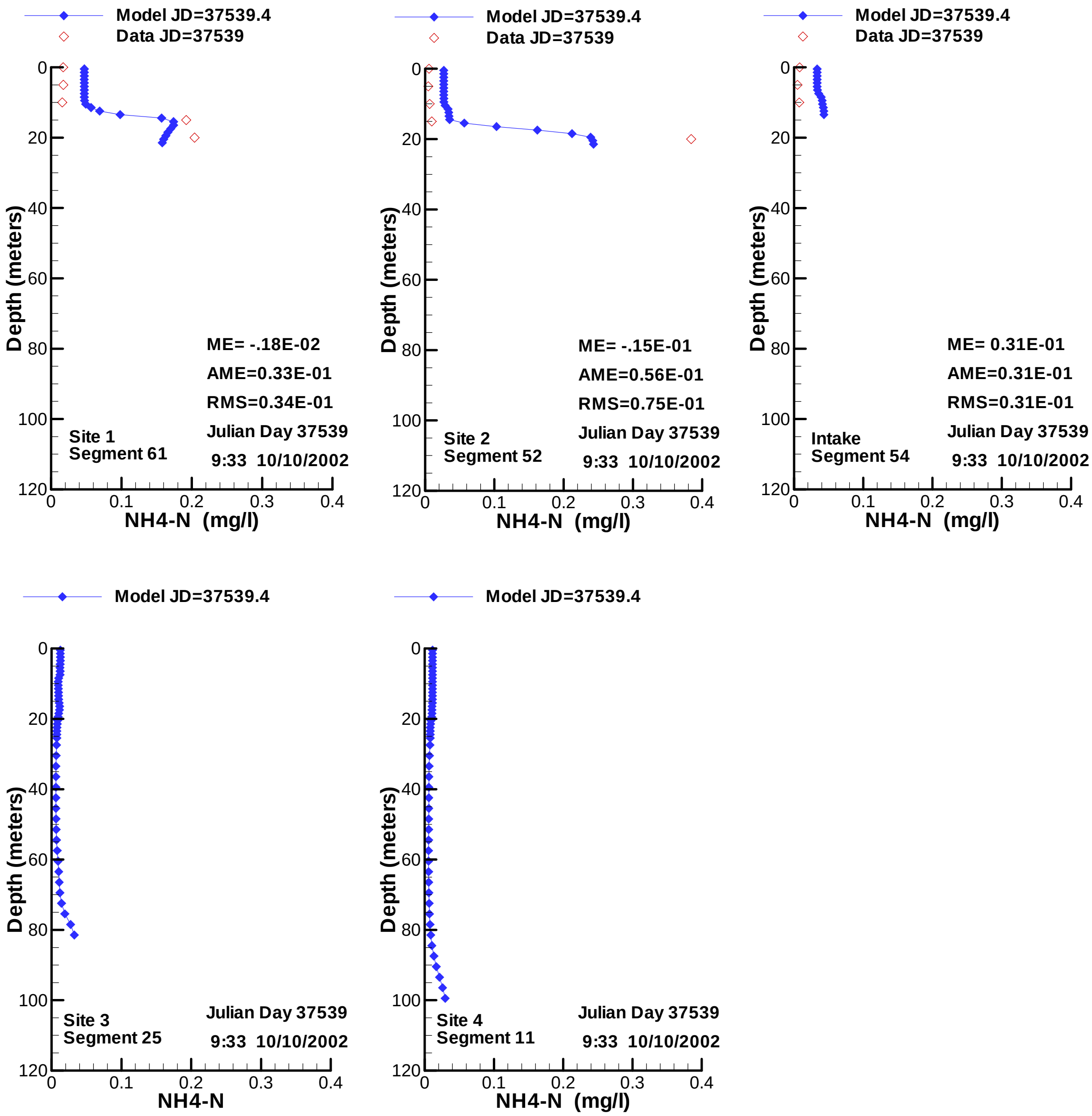

Figure 77. Vertical profiles of AMMONIA NITROGEN compared with data for 10/10/2002.

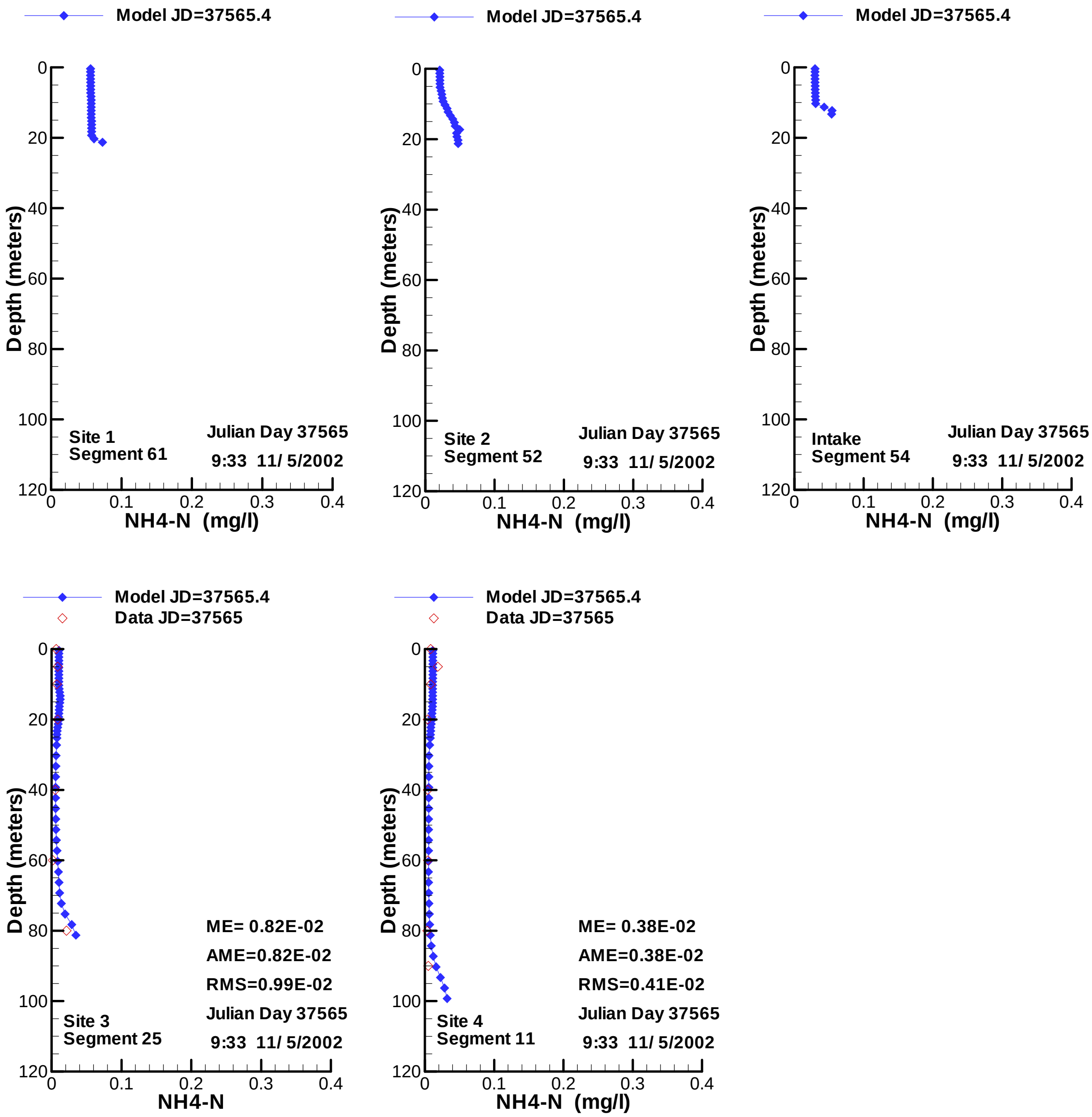

Figure 78. Vertical profiles of AMMONIA NITROGEN compared with data for 11/ 5/2002.

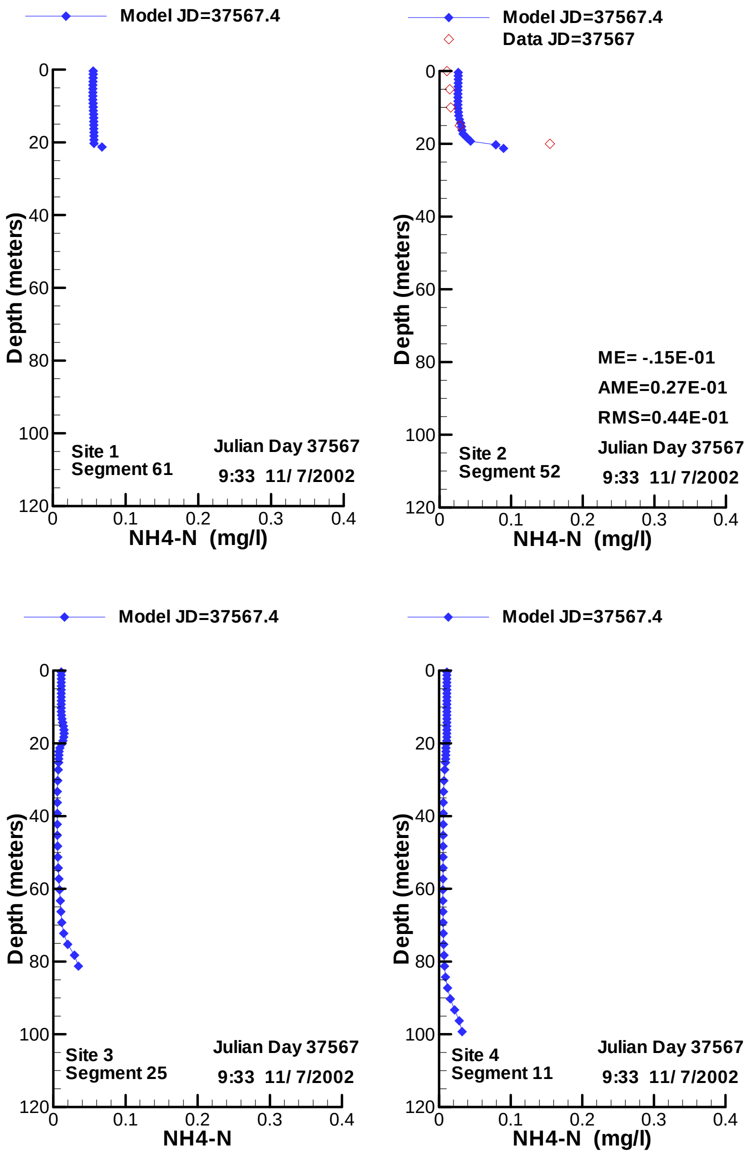

Figure 79. Vertical profiles of AMMONIA NITROGEN compared with data for 11/ 7/2002.

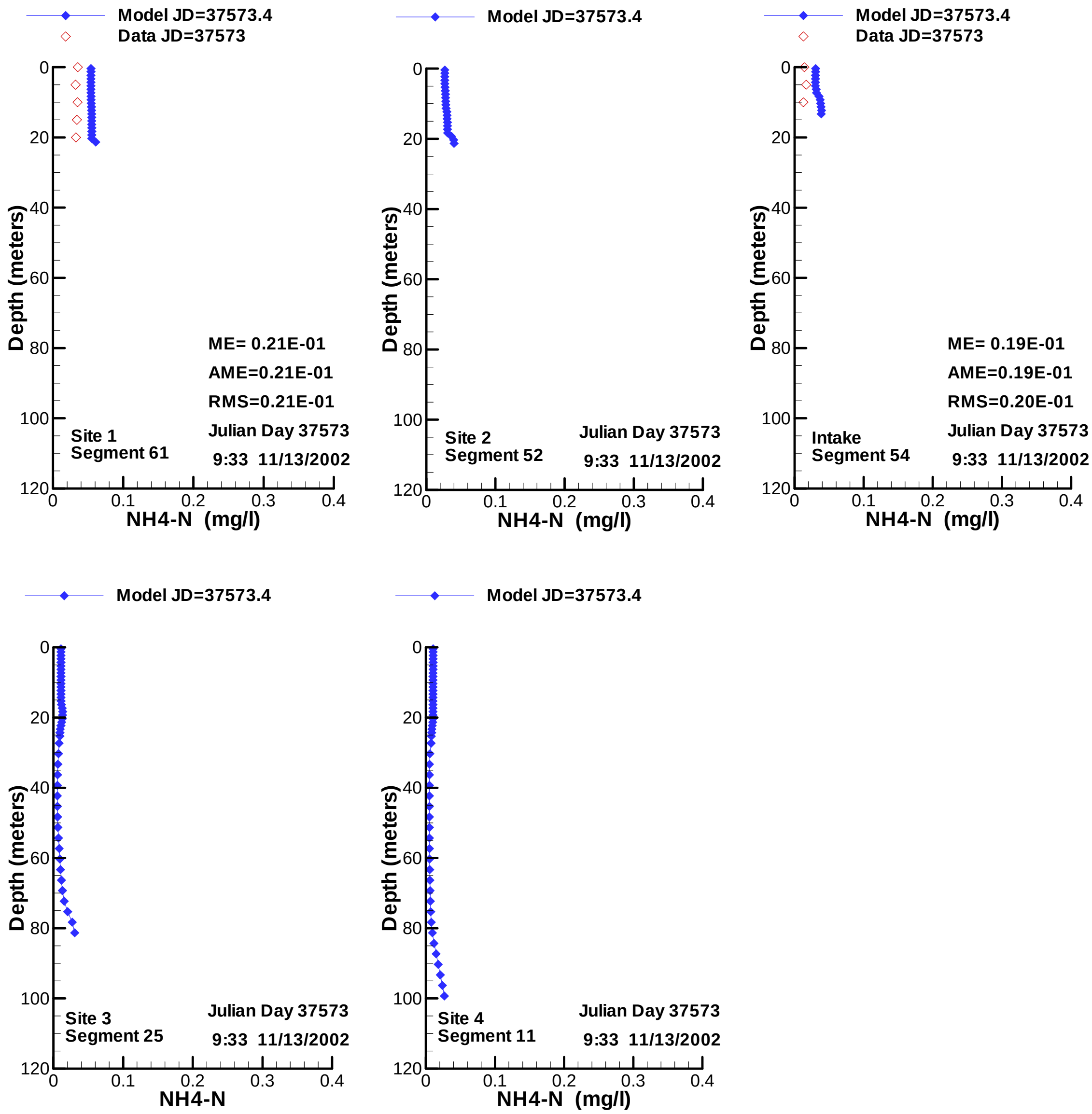

Figure 80. Vertical profiles of AMMONIA NITROGEN compared with data for 11/13/2002.

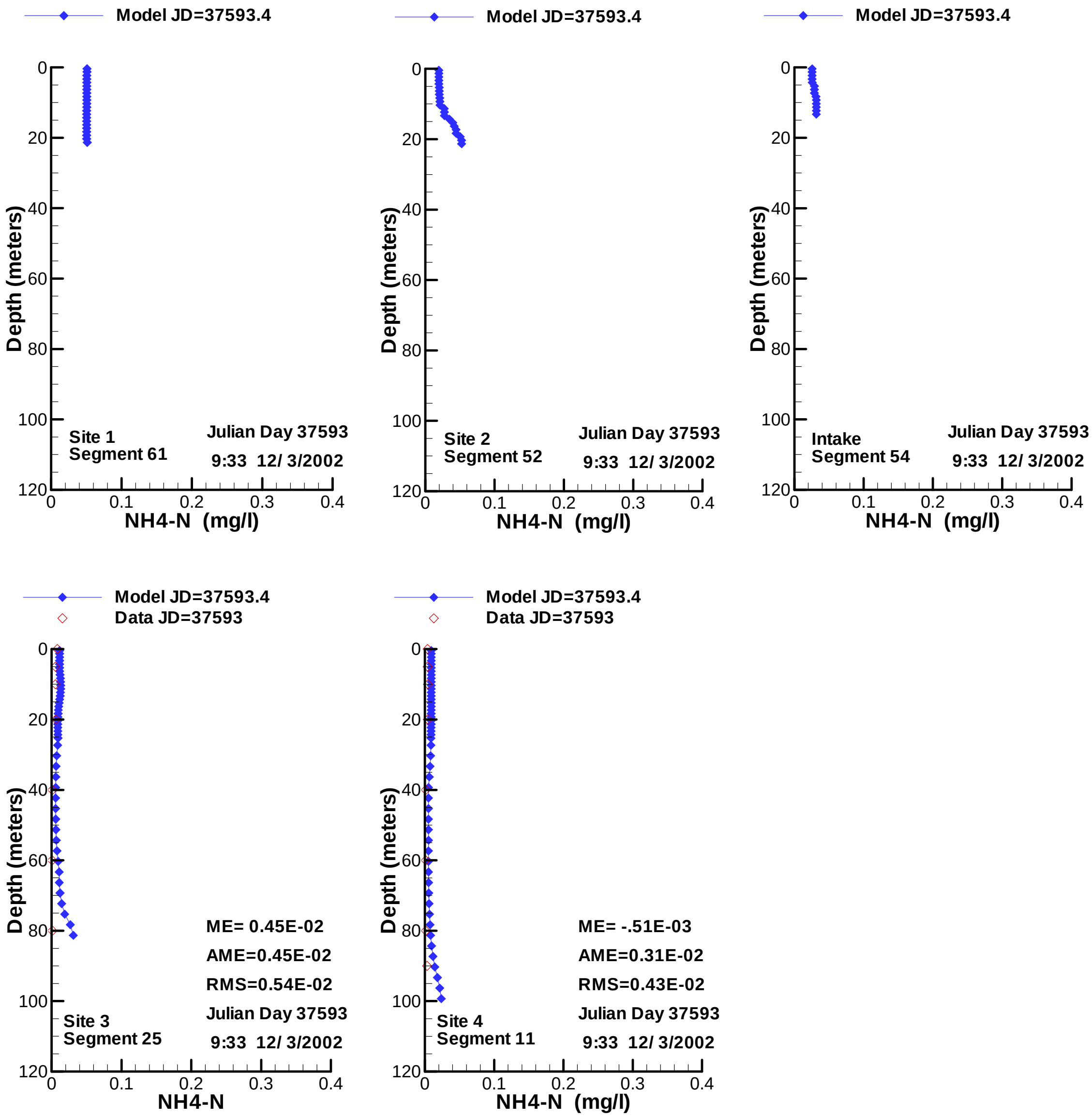

Figure 81. Vertical profiles of AMMONIA NITROGEN compared with data for 12/ 3/2002.

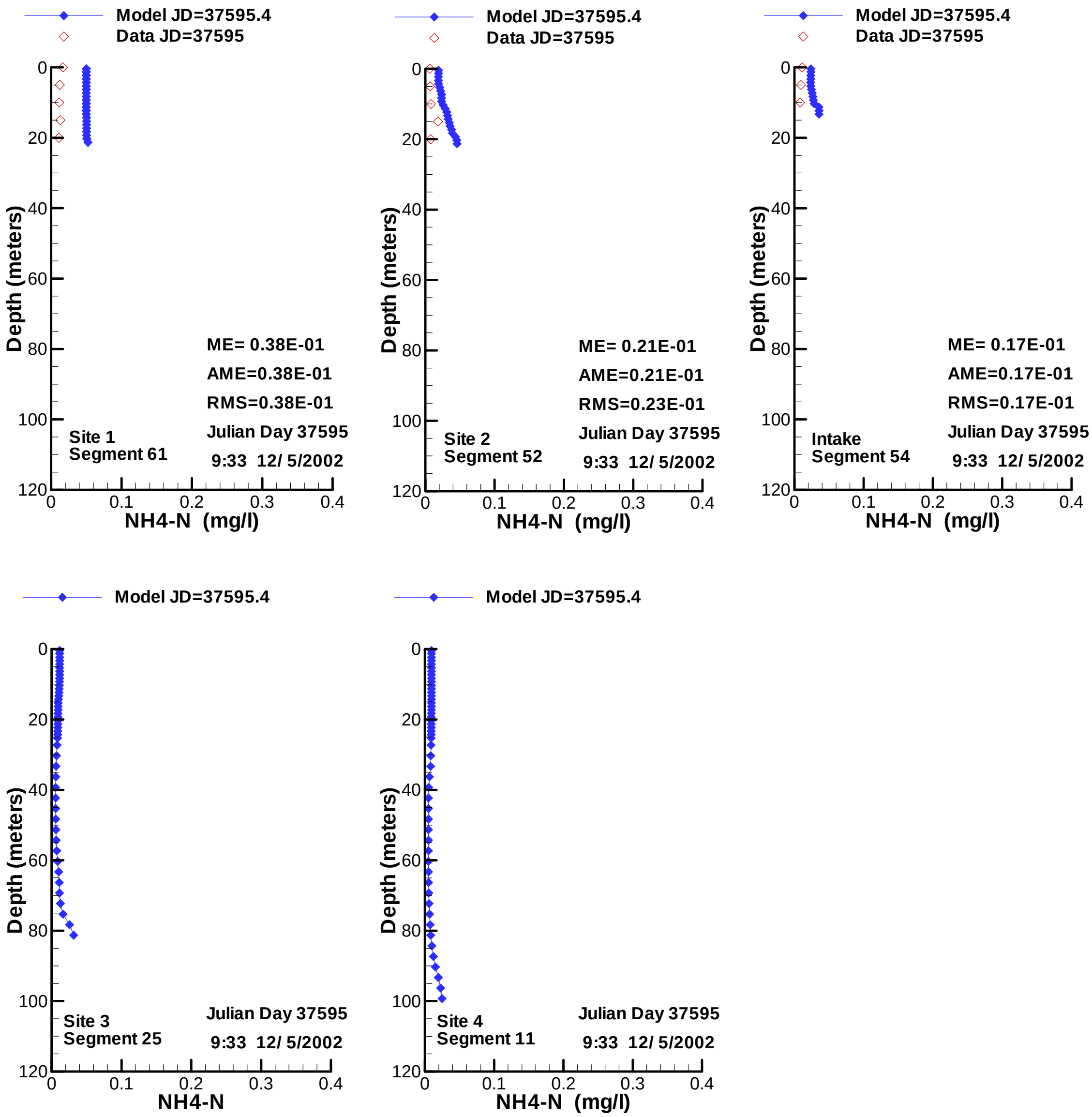

Figure 82. Vertical profiles of AMMONIA NITROGEN compared with data for 12/ 5/2002.

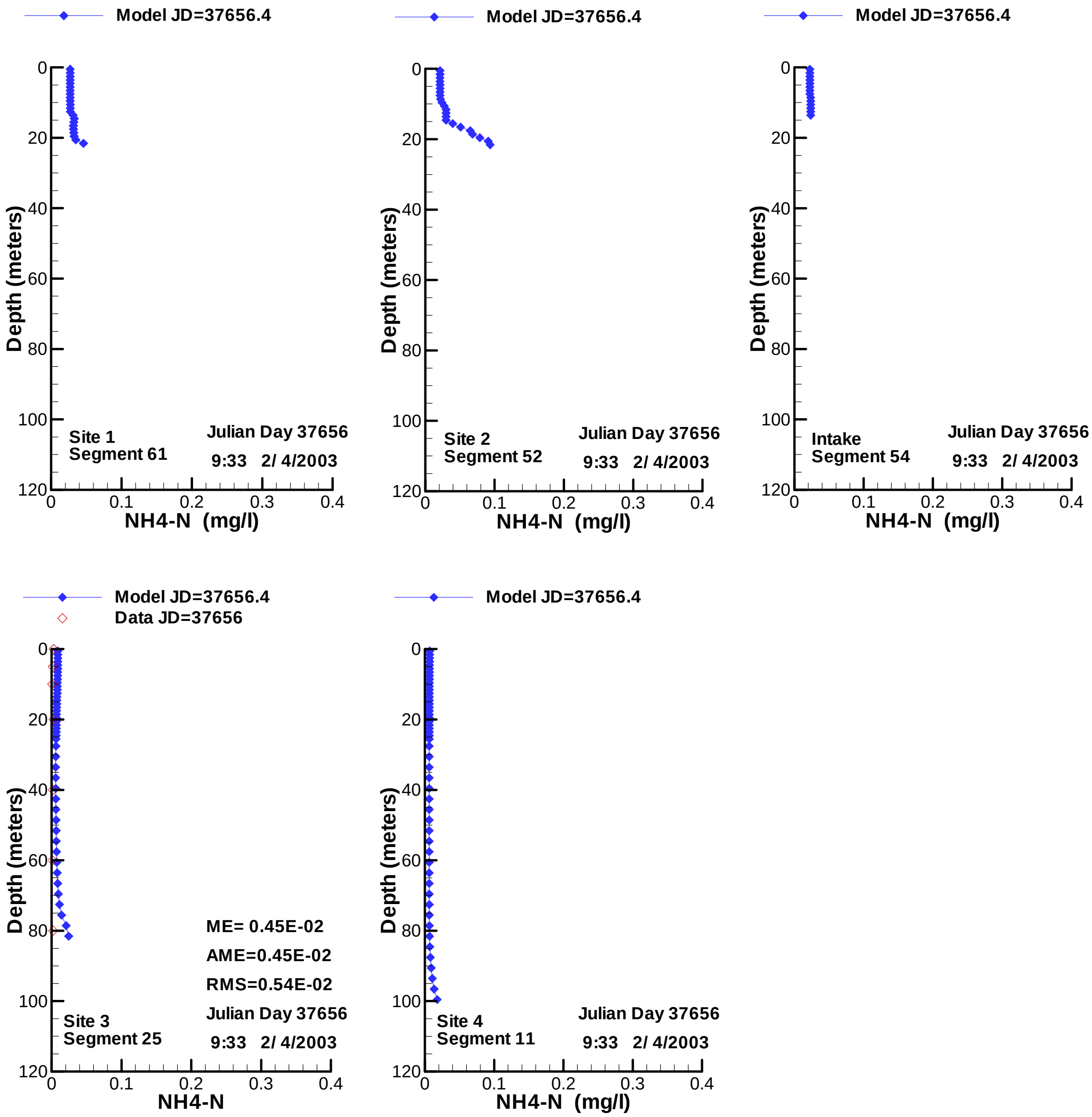

Figure 83. Vertical profiles of AMMONIA NITROGEN compared with data for 2/ 4/2003.

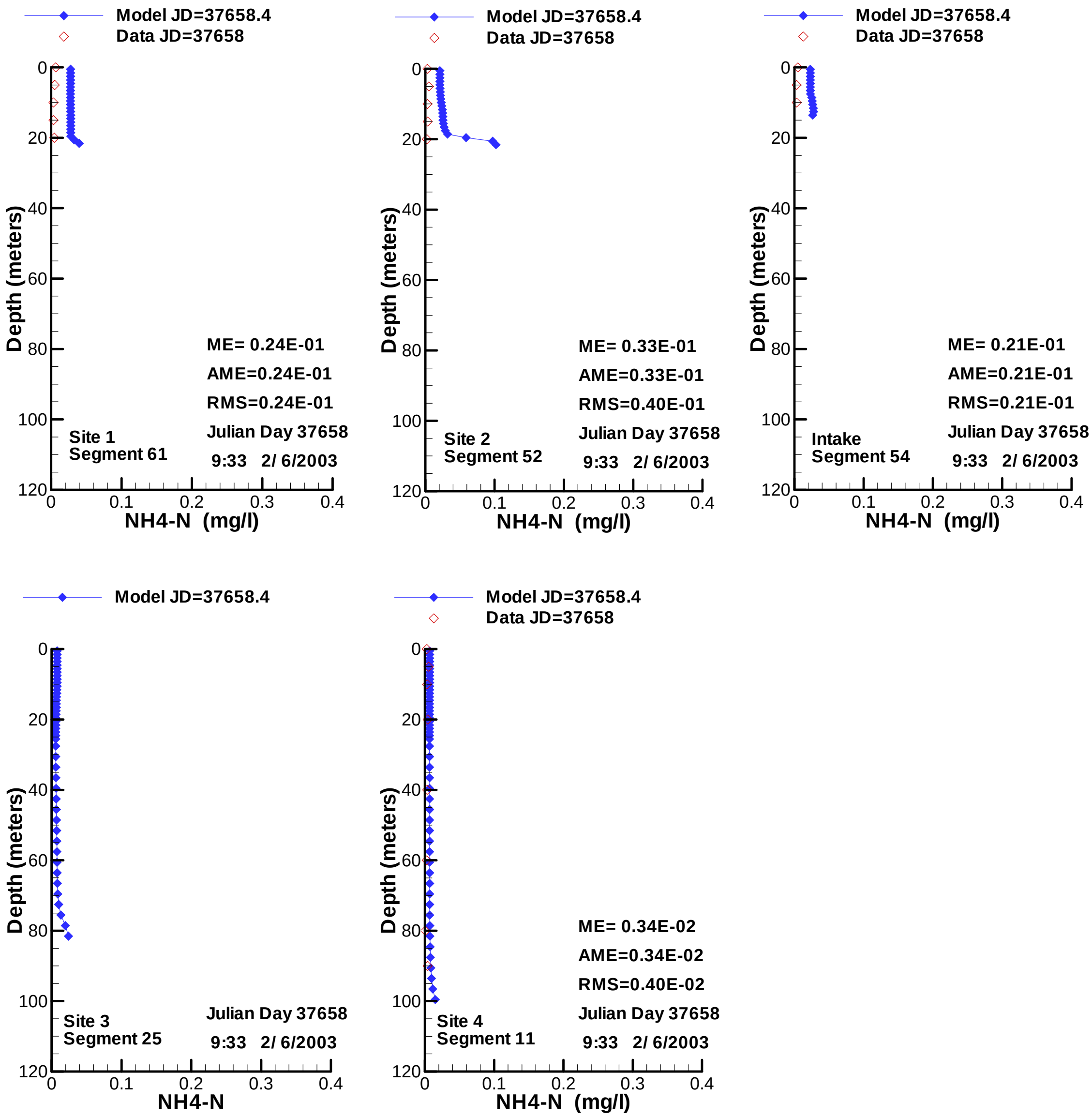

Figure 84. Vertical profiles of AMMONIA NITROGEN compared with data for 2/ 6/2003.

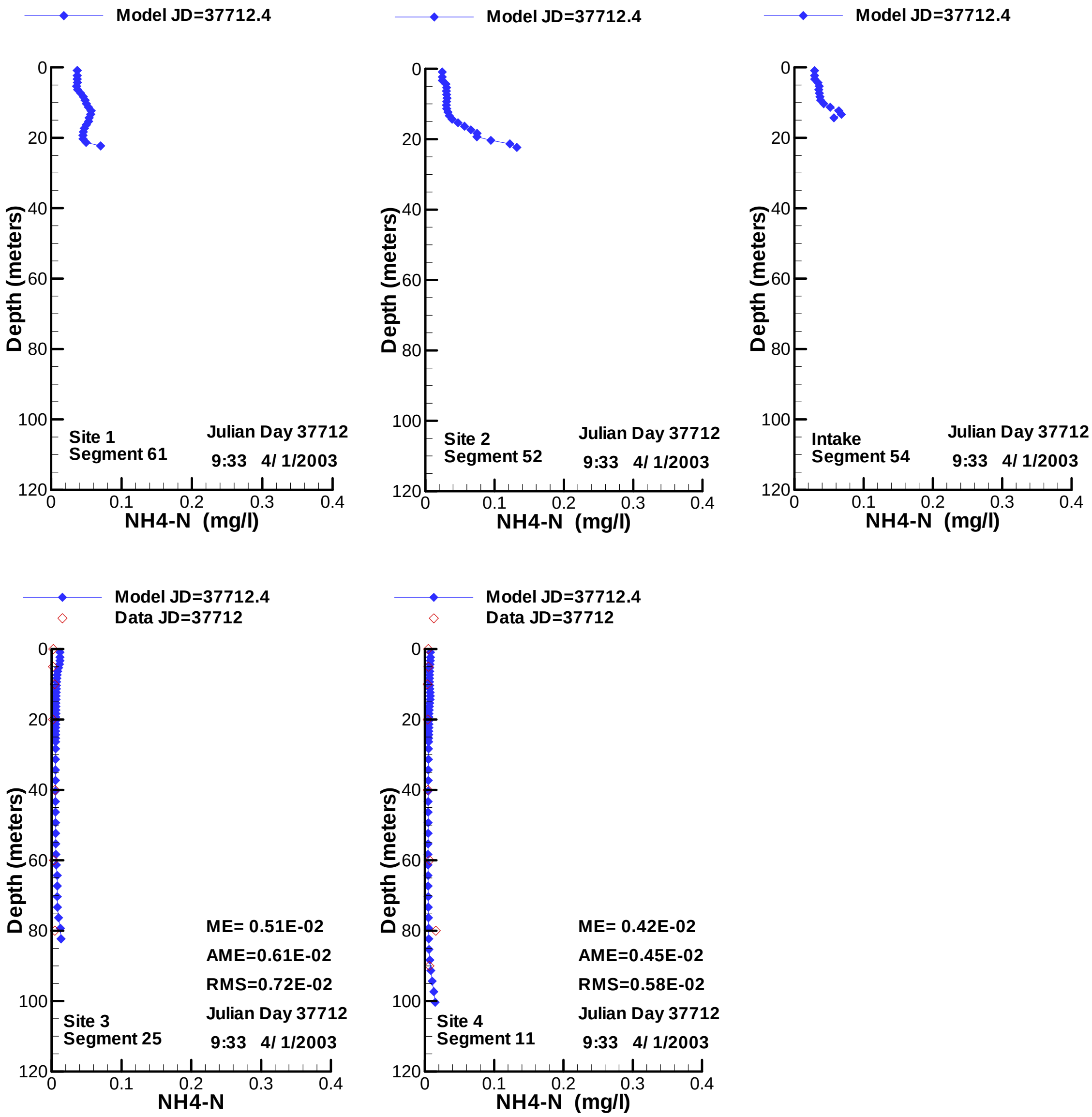

Figure 85. Vertical profiles of AMMONIA NITROGEN compared with data for 4/ 1/2003.

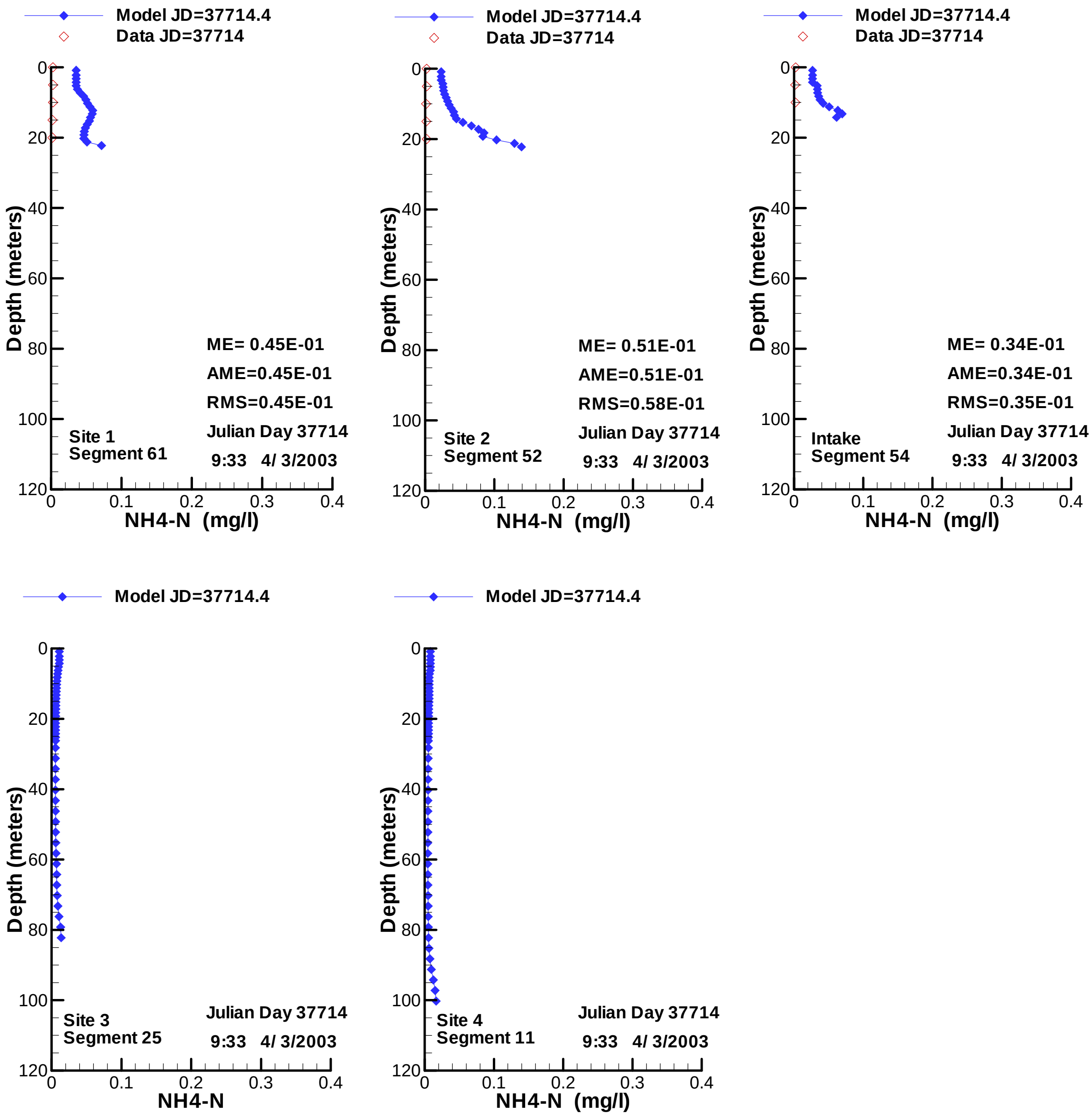

Figure 86. Vertical profiles of AMMONIA NITROGEN compared with data for 4/ 3/2003.

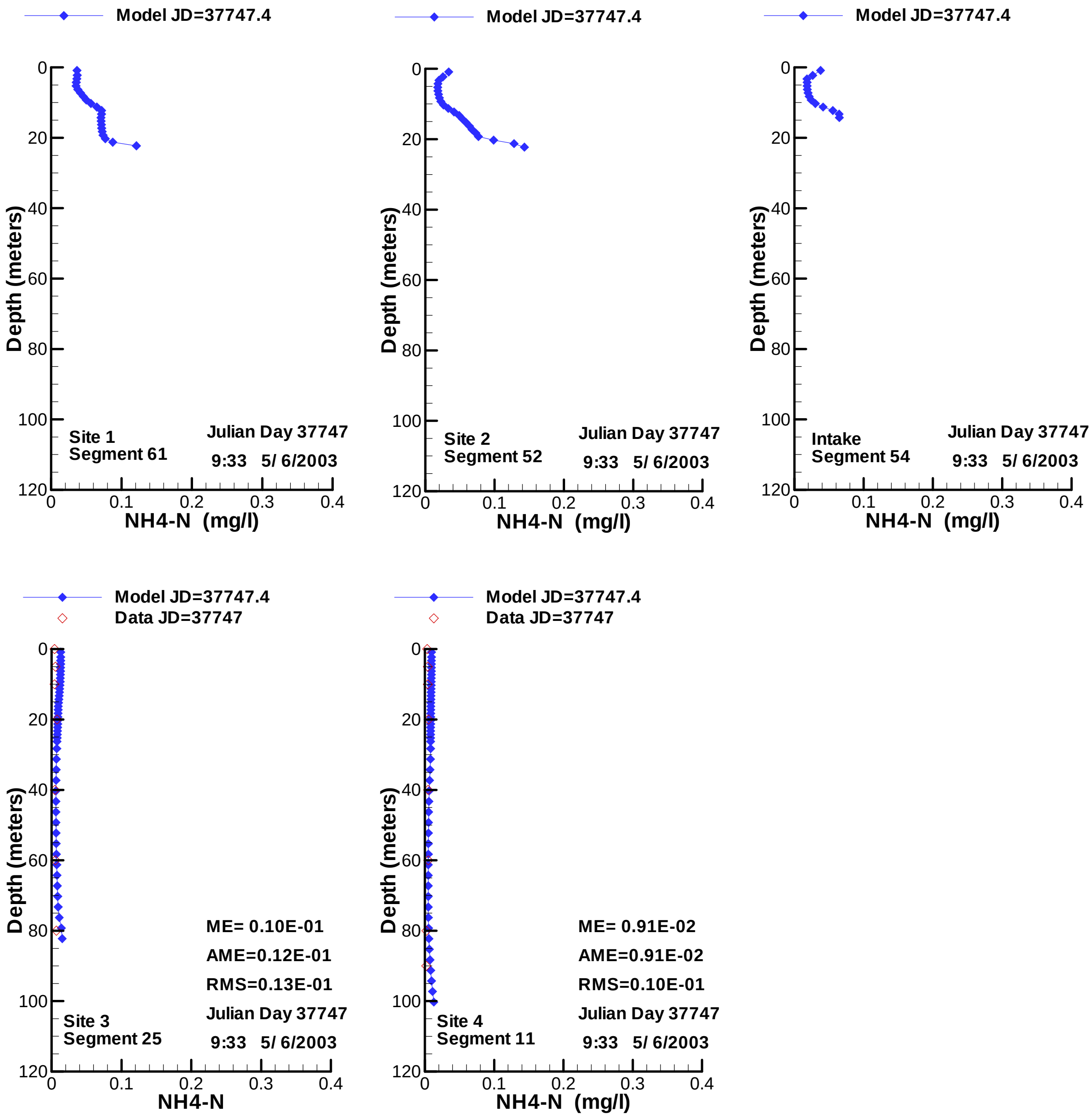

Figure 87. Vertical profiles of AMMONIA NITROGEN compared with data for 5/ 6/2003.

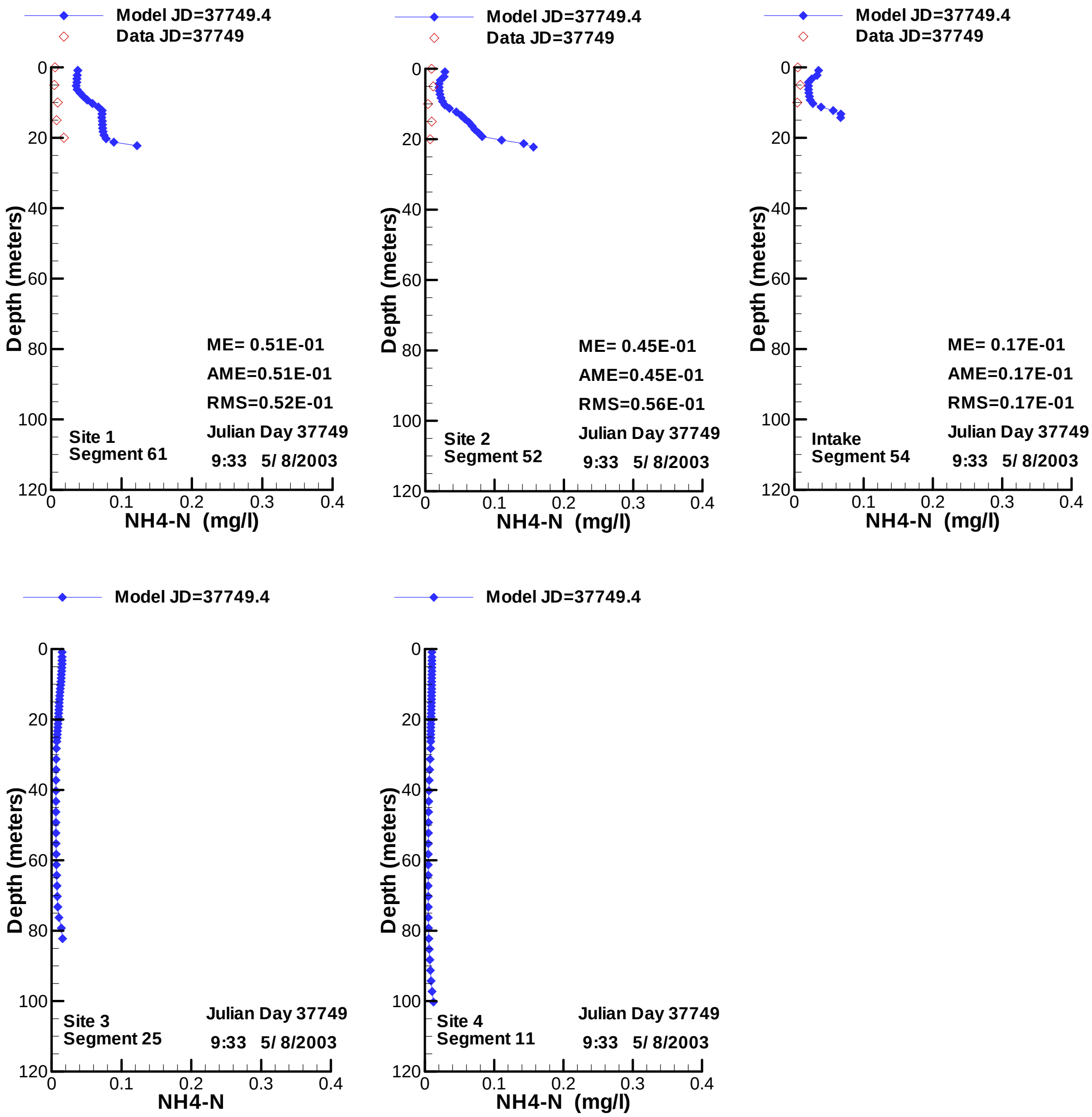

Figure 88. Vertical profiles of AMMONIA NITROGEN compared with data for 5/ 8/2003.

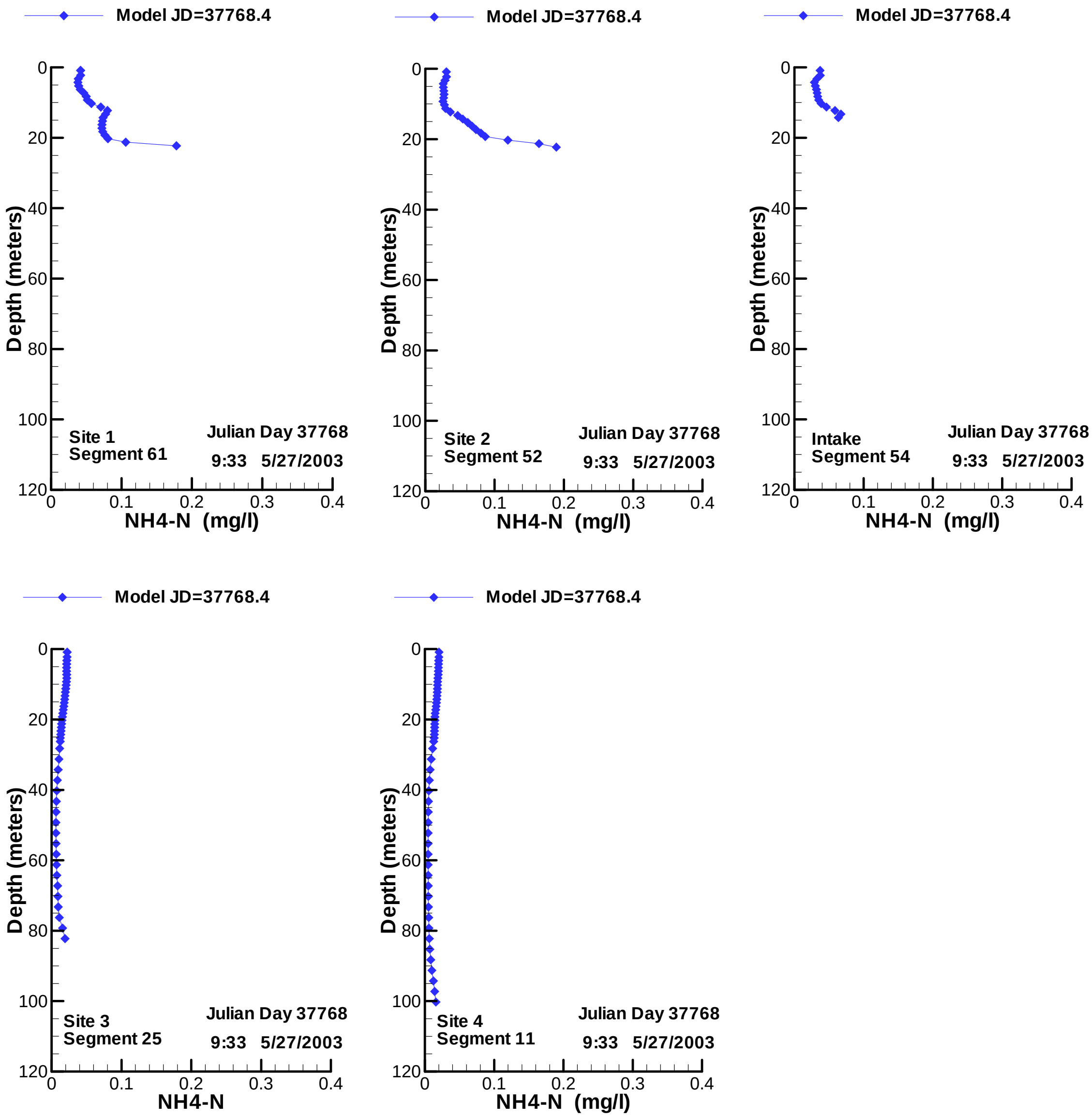

Figure 89. Vertical profiles of AMMONIA NITROGEN compared with data for 5/27/2003.

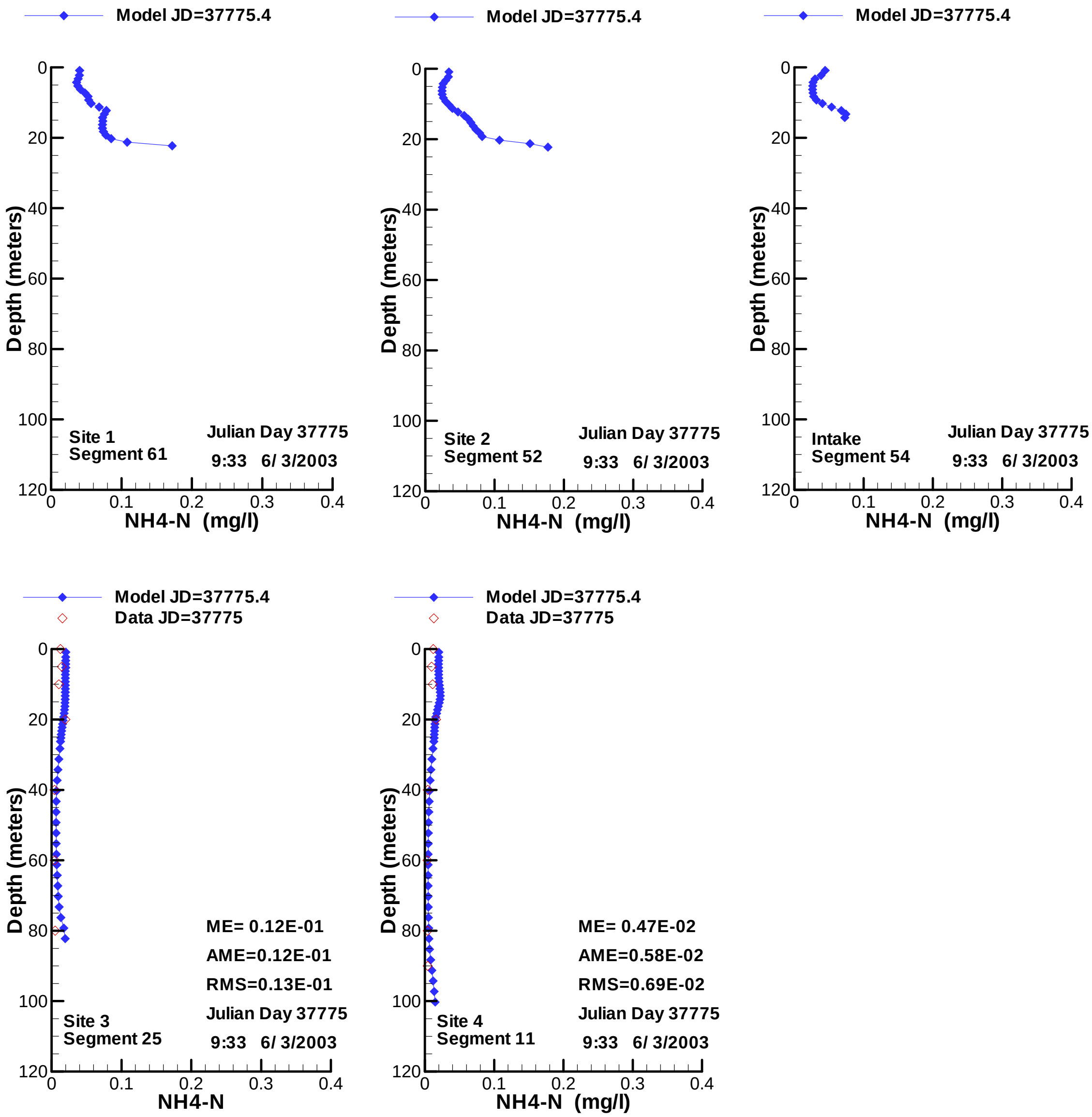

Figure 90. Vertical profiles of AMMONIA NITROGEN compared with data for 6/ 3/2003.

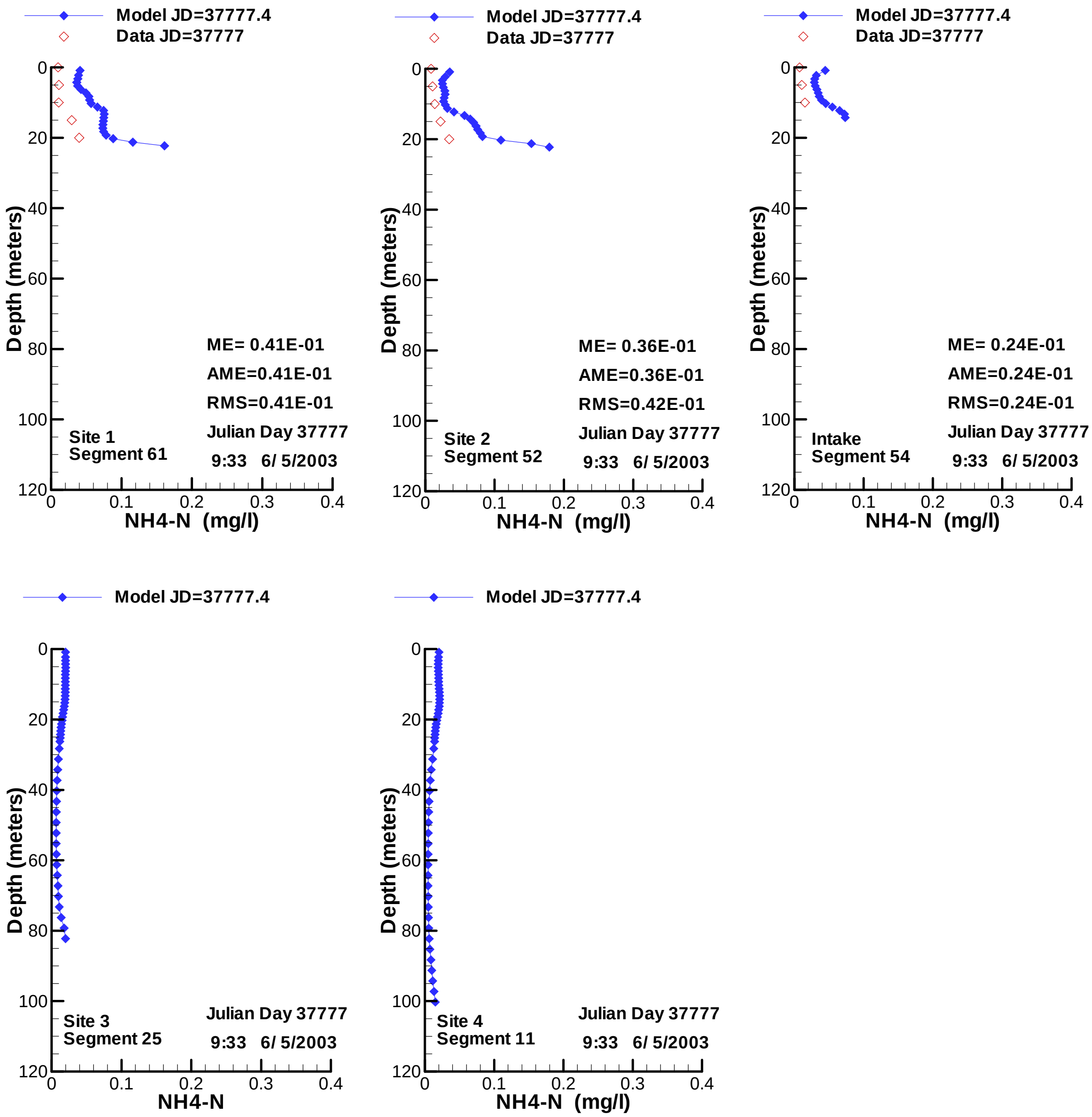

Figure 91. Vertical profiles of AMMONIA NITROGEN compared with data for 6/ 5/2003.

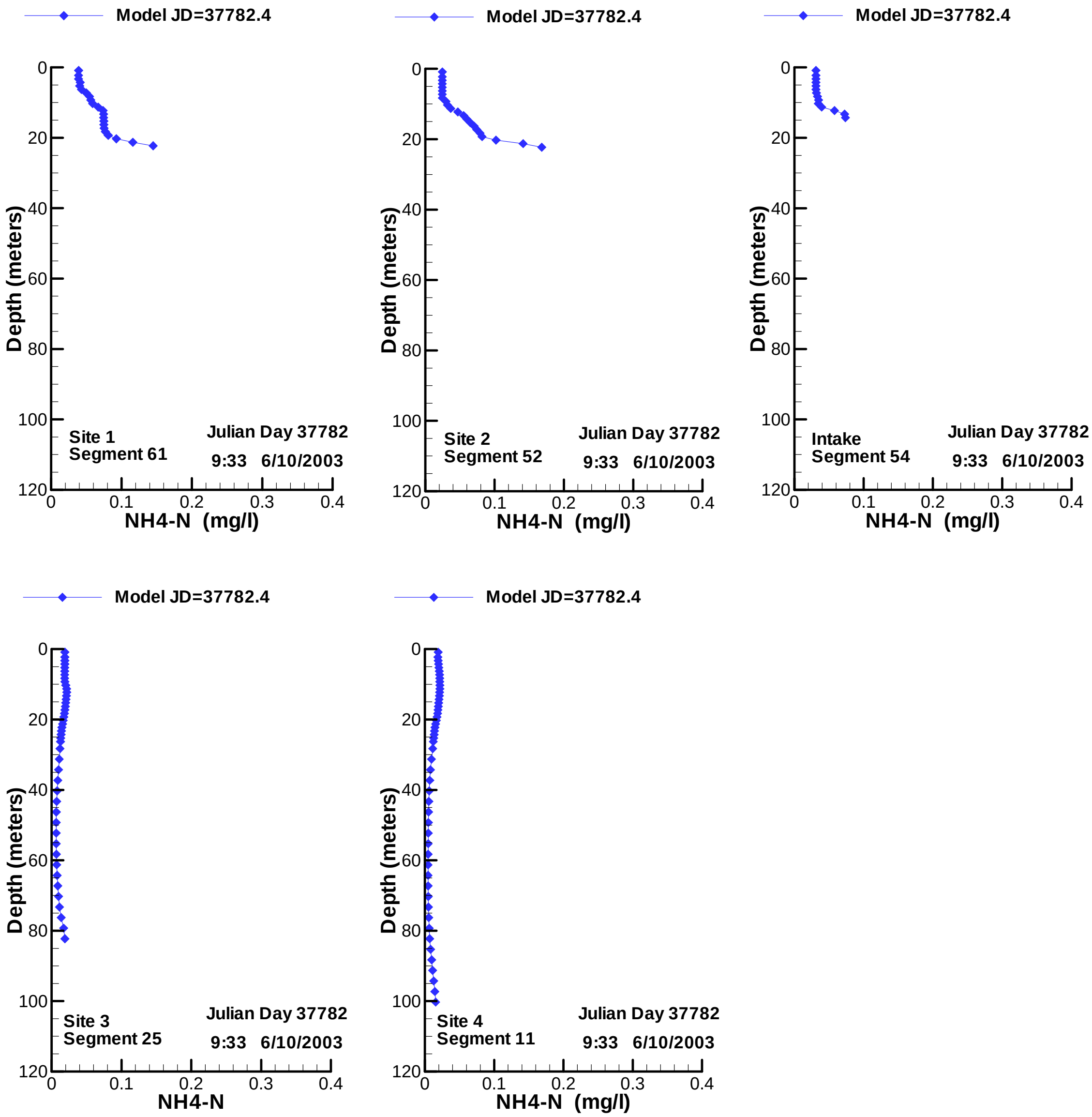

Figure 92. Vertical profiles of AMMONIA NITROGEN compared with data for 6/10/2003.

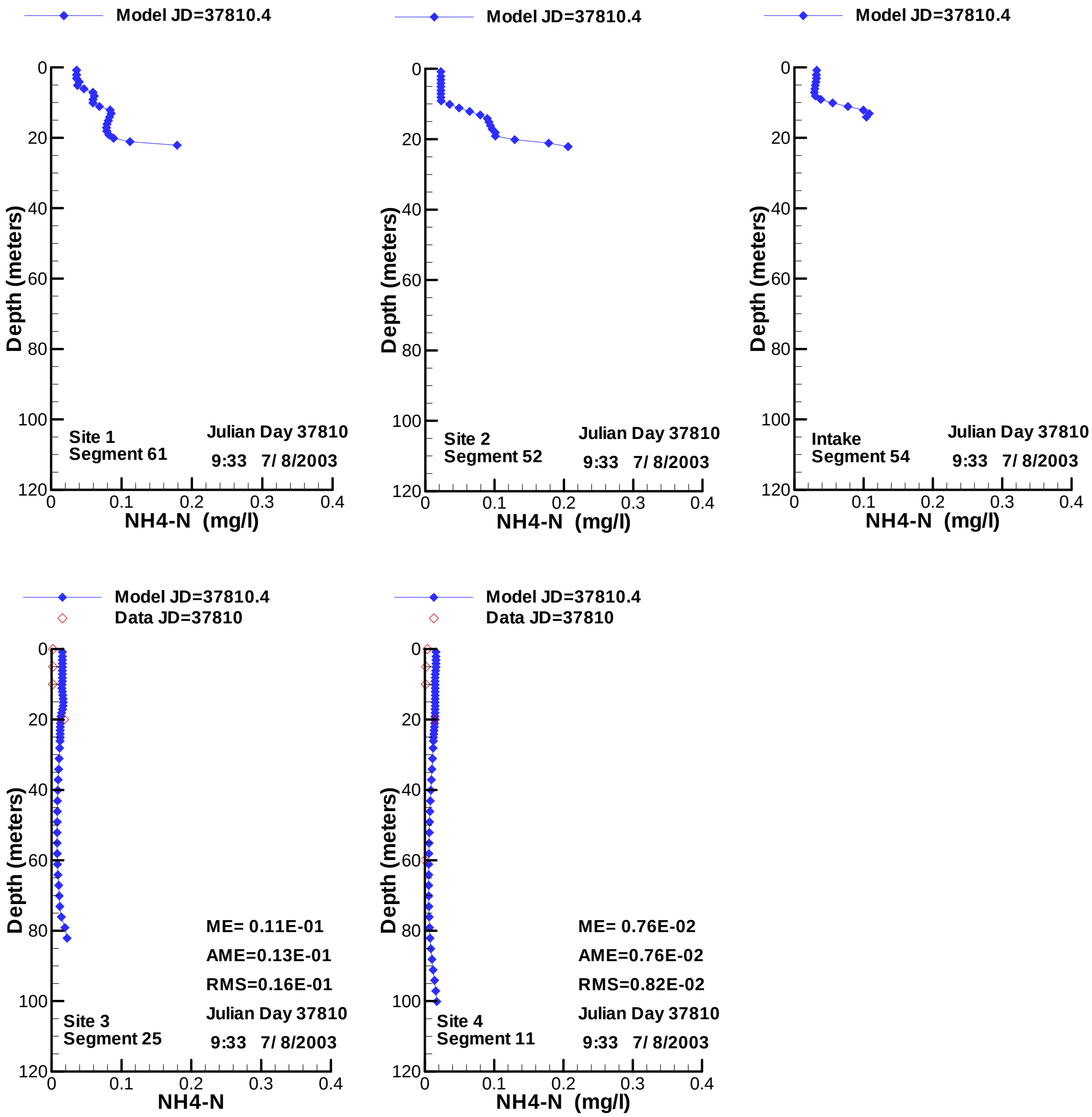

Figure 93. Vertical profiles of AMMONIA NITROGEN compared with data for 7/ 8/2003.

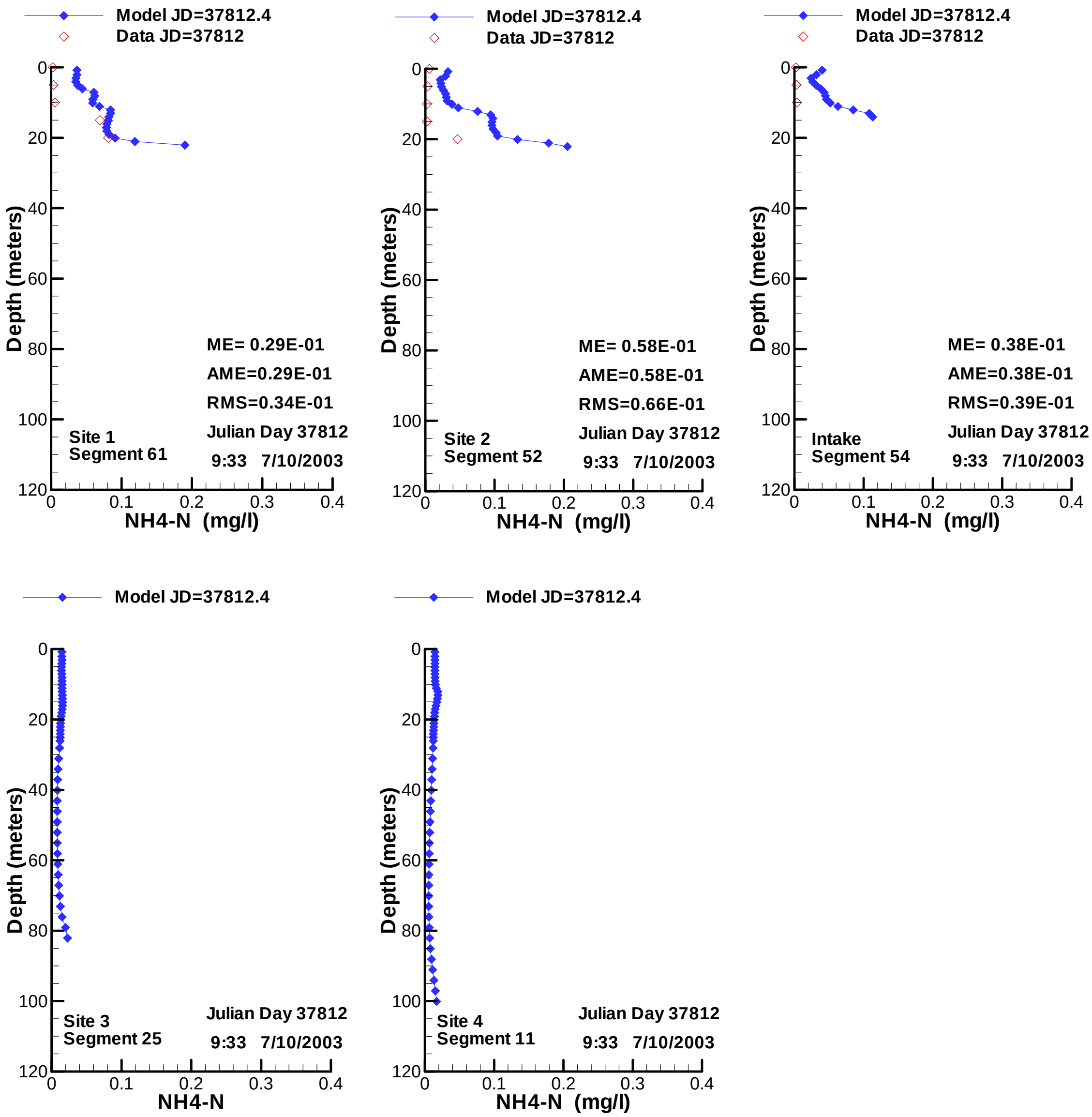

Figure 94. Vertical profiles of AMMONIA NITROGEN compared with data for 7/10/2003.

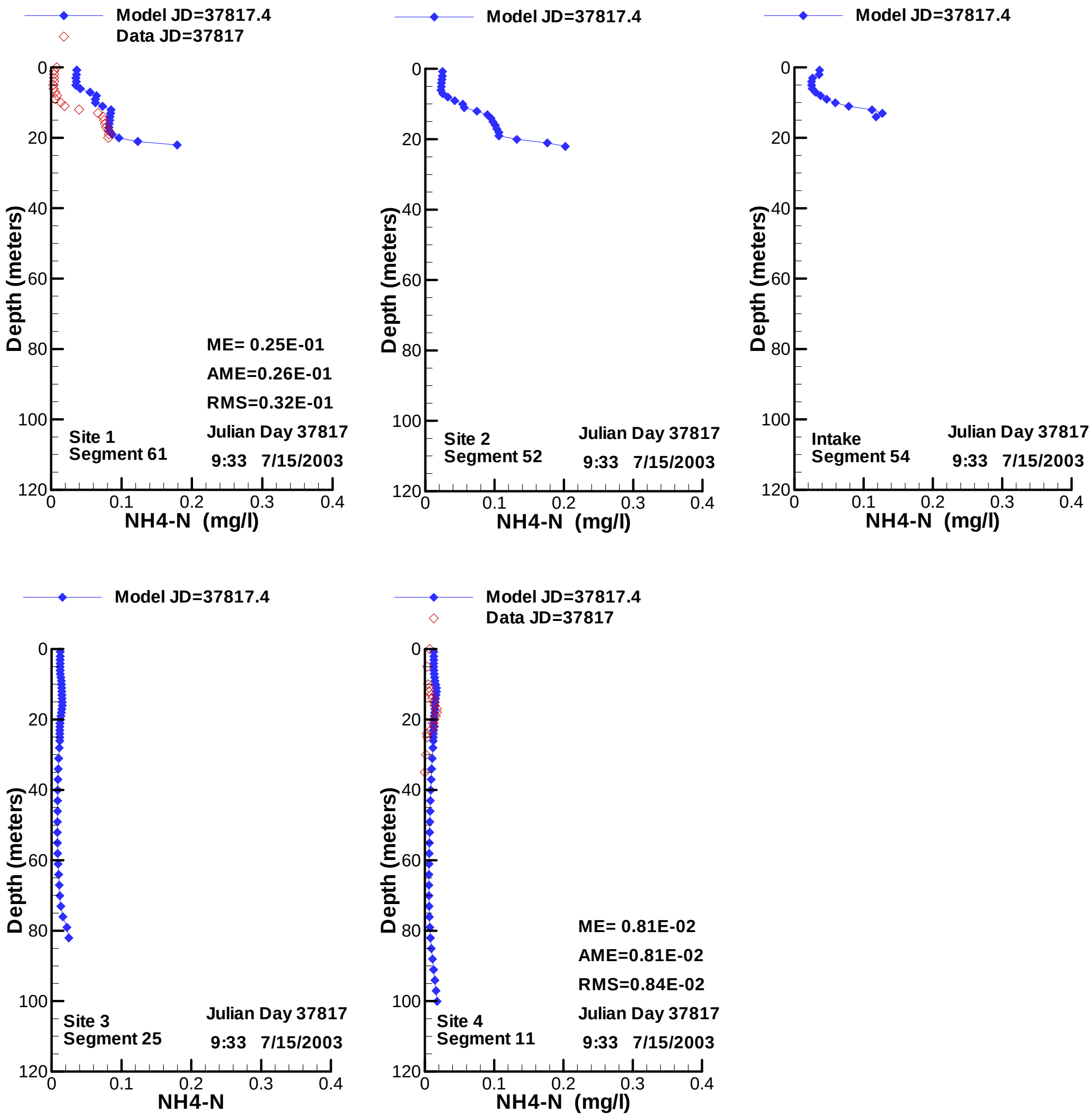

Figure 95. Vertical profiles of AMMONIA NITROGEN compared with data for 7/15/2003.

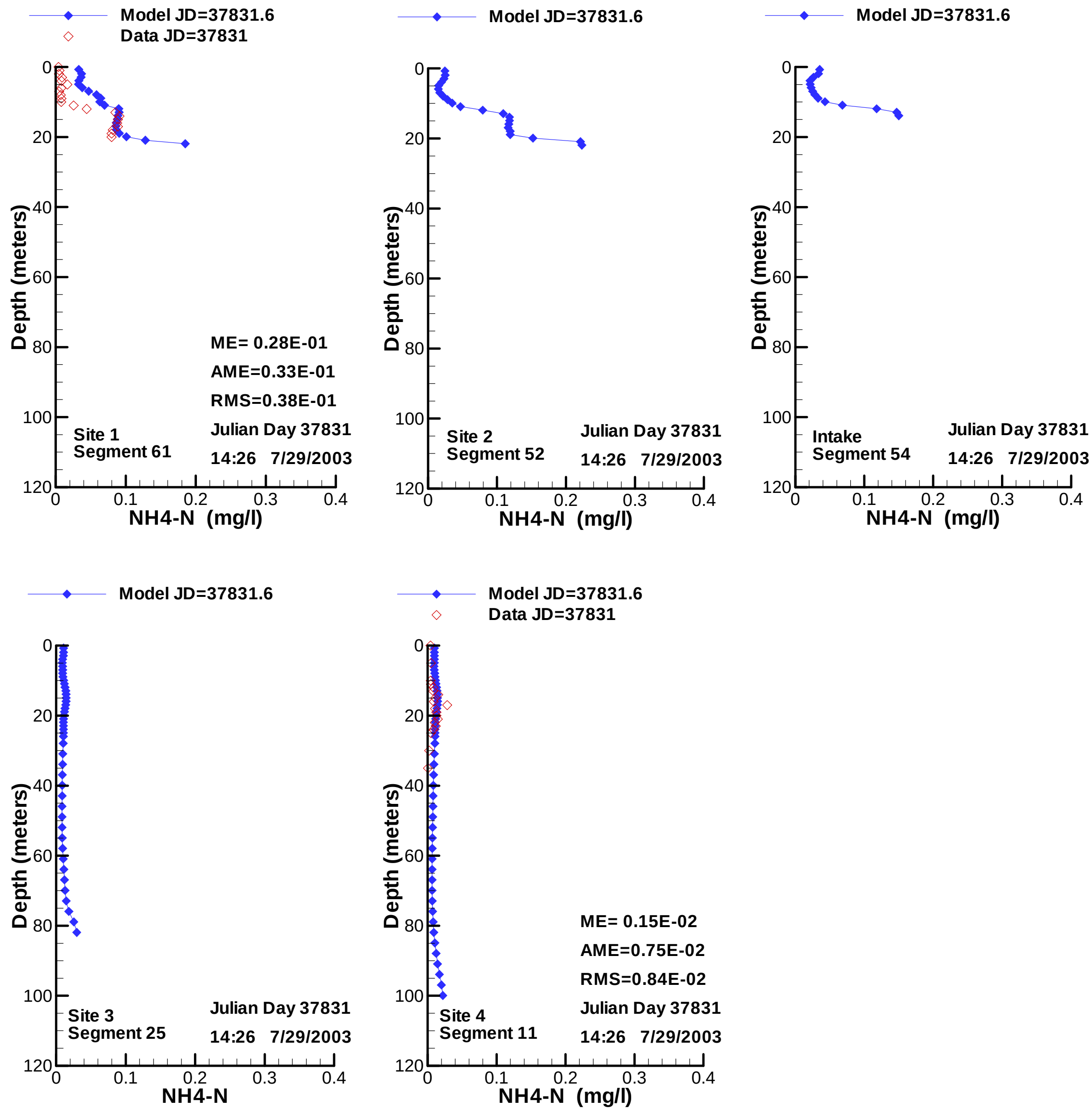

Figure 96. Vertical profiles of AMMONIA NITROGEN compared with data for 7/29/2003.

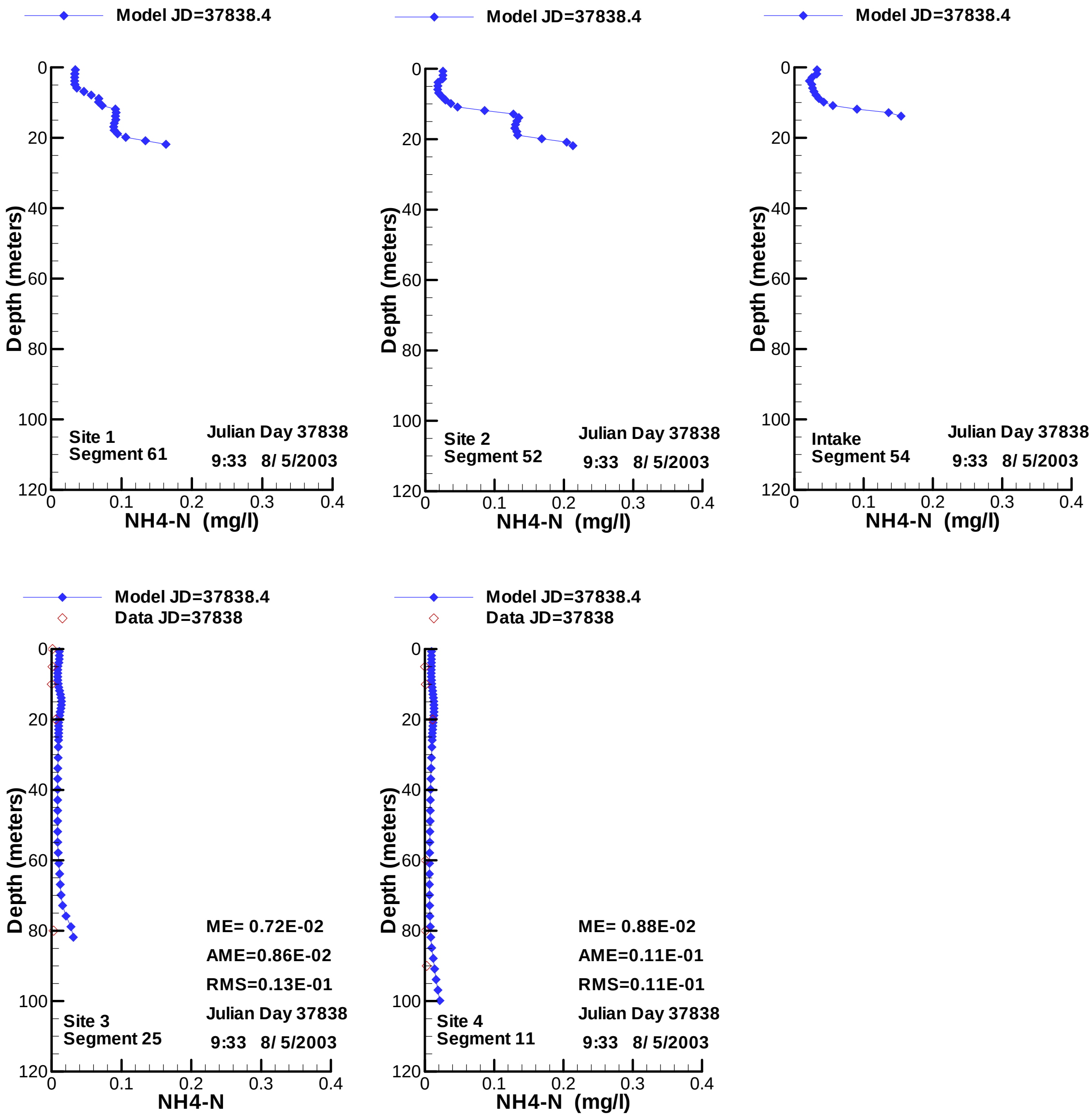

Figure 97. Vertical profiles of AMMONIA NITROGEN compared with data for 8/ 5/2003.

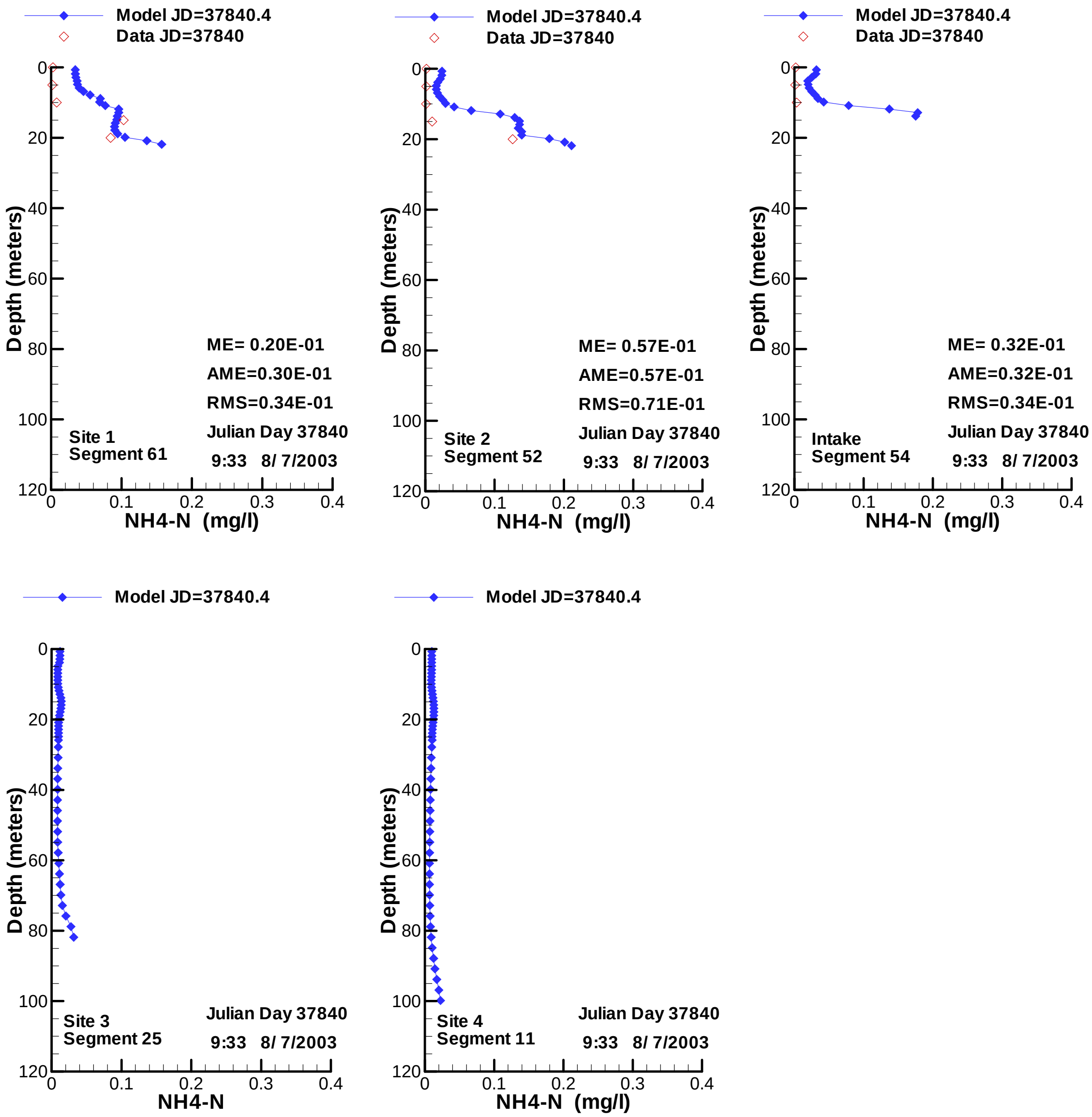

Figure 98. Vertical profiles of AMMONIA NITROGEN compared with data for 8/ 7/2003.

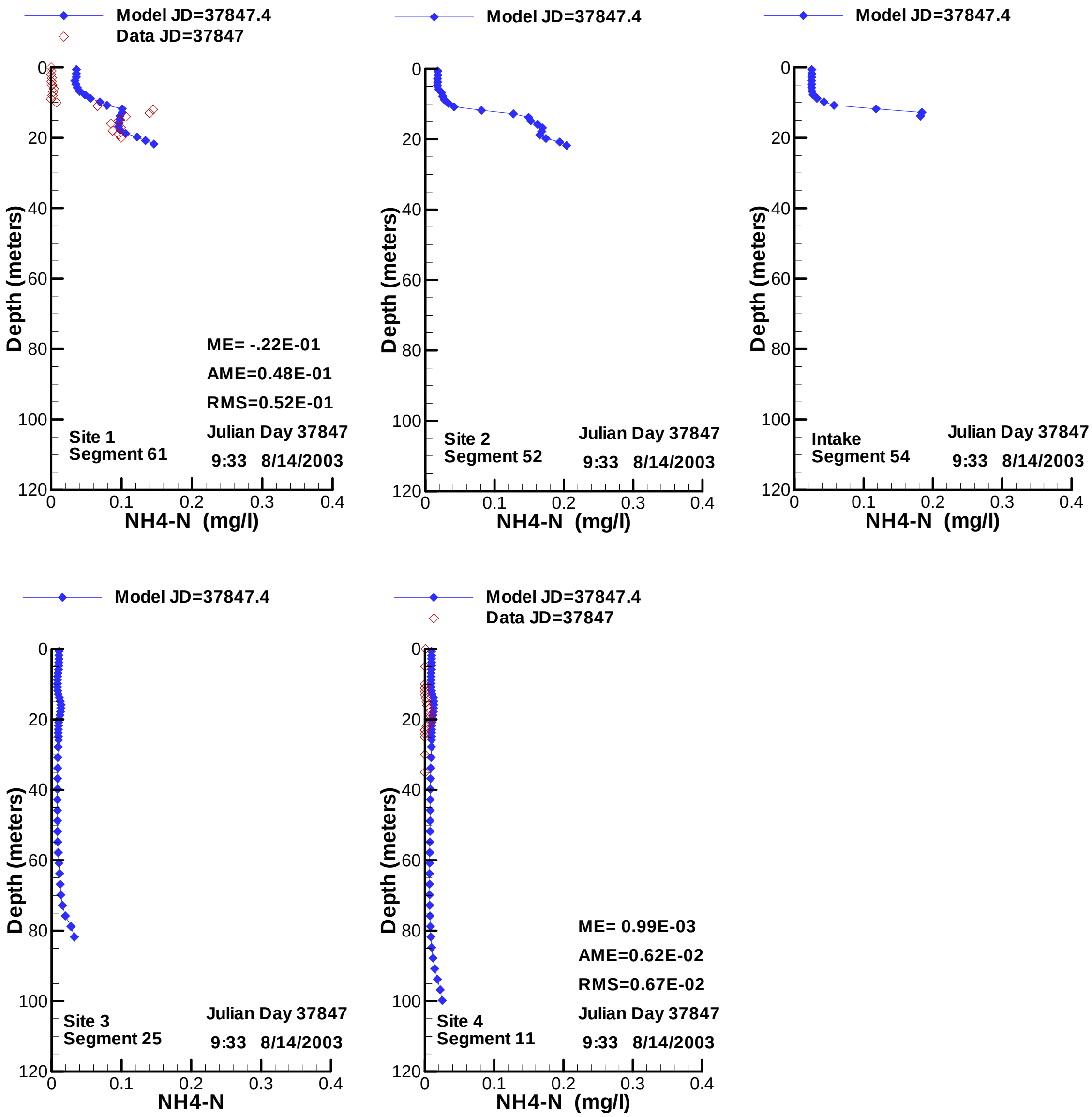

Figure 99. Vertical profiles of AMMONIA NITROGEN compared with data for 8/14/2003.

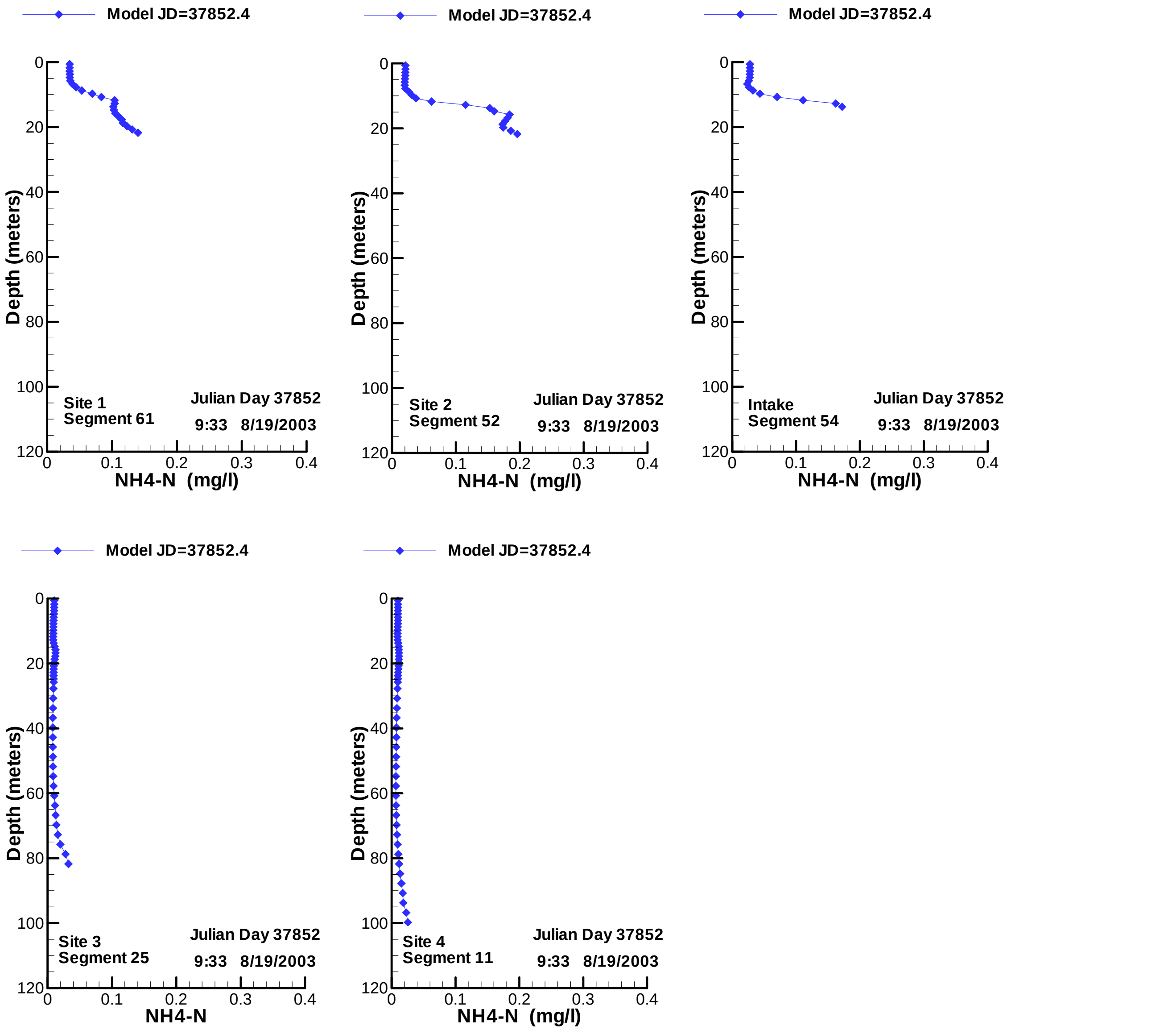

Figure 100. Vertical profiles of AMMONIA NITROGEN compared with data for 8/19/2003.

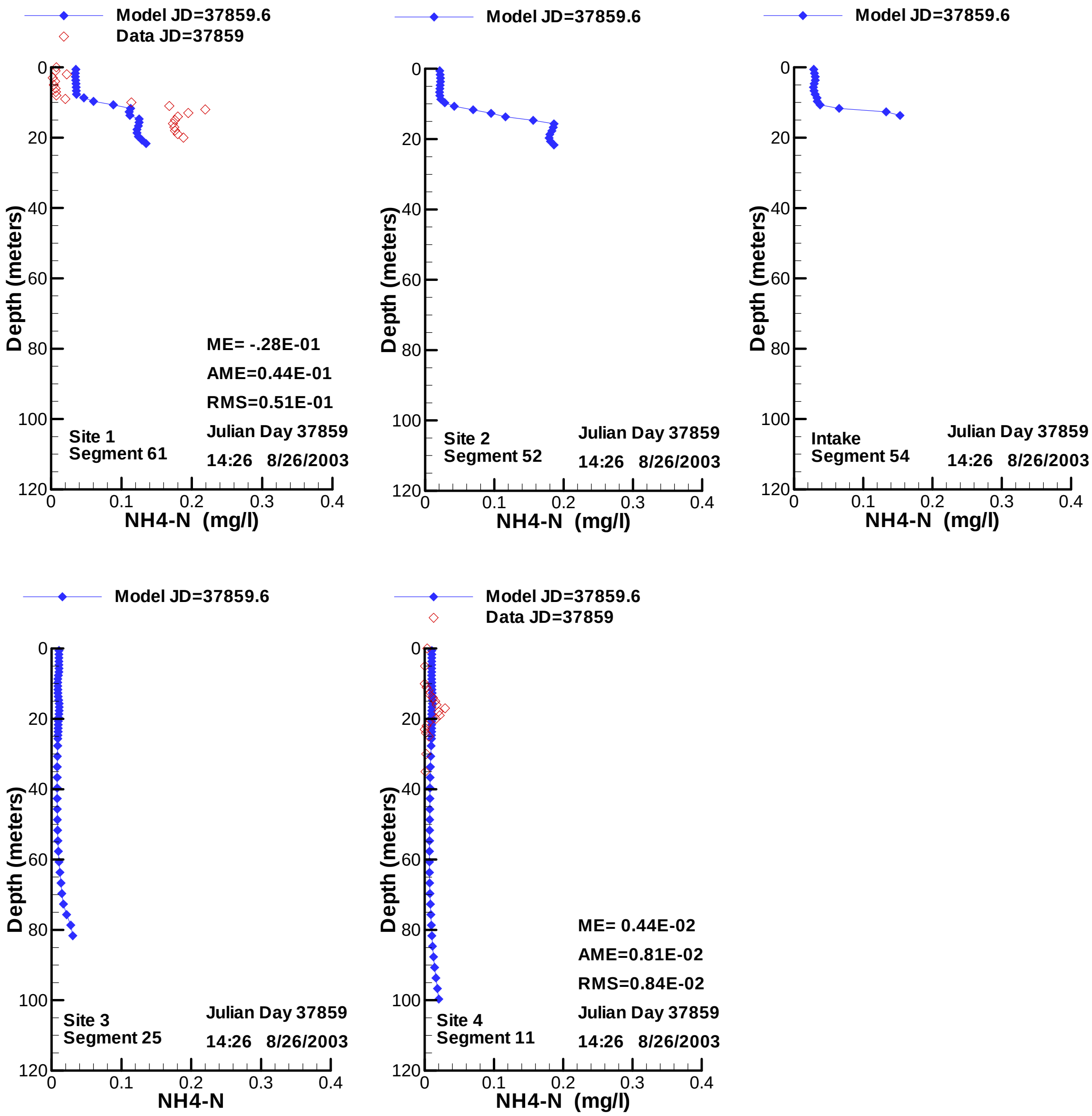

Figure 101. Vertical profiles of AMMONIA NITROGEN compared with data for 8/26/2003.

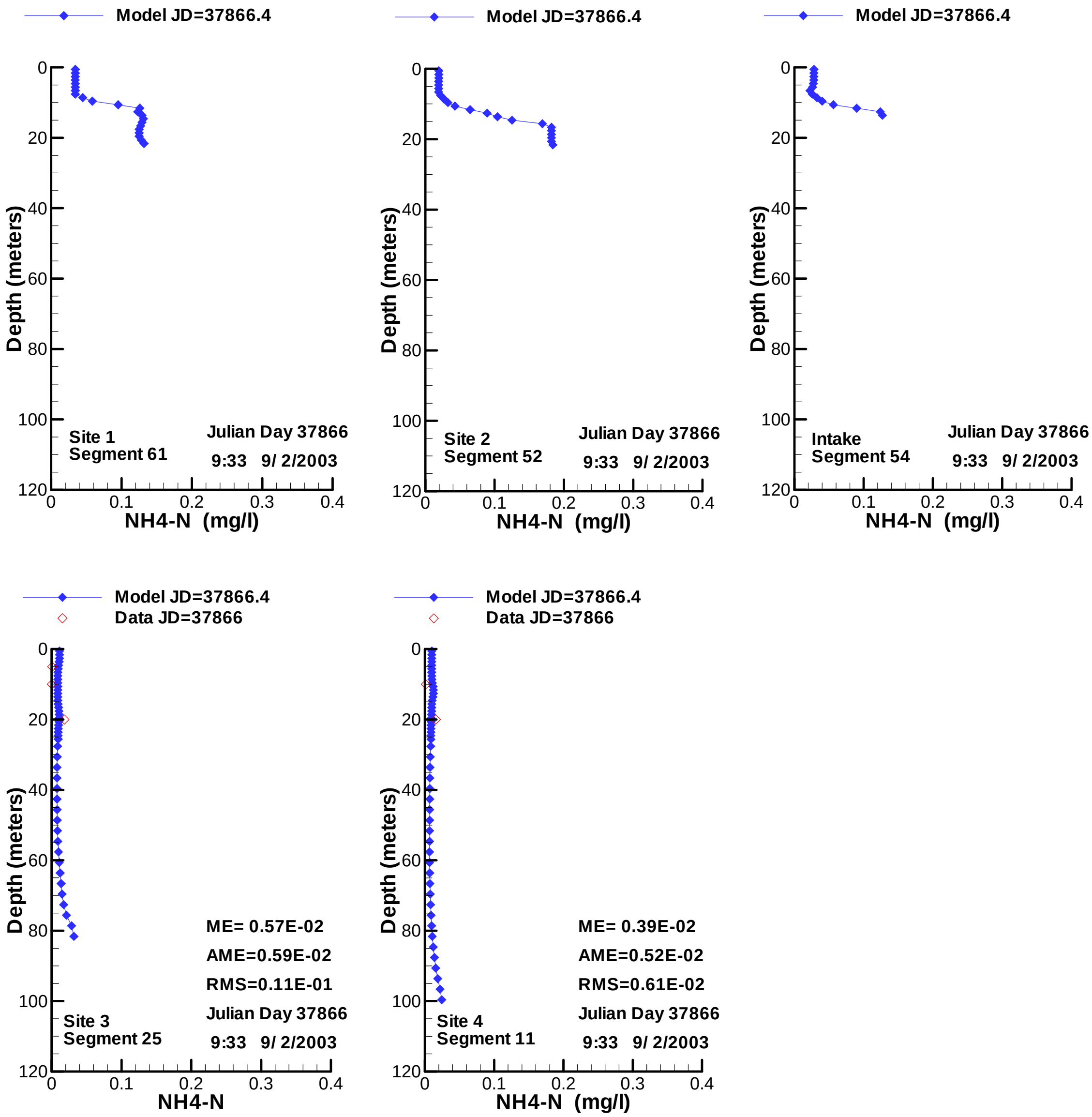

Figure 102. Vertical profiles of AMMONIA NITROGEN compared with data for 9/ 2/2003.

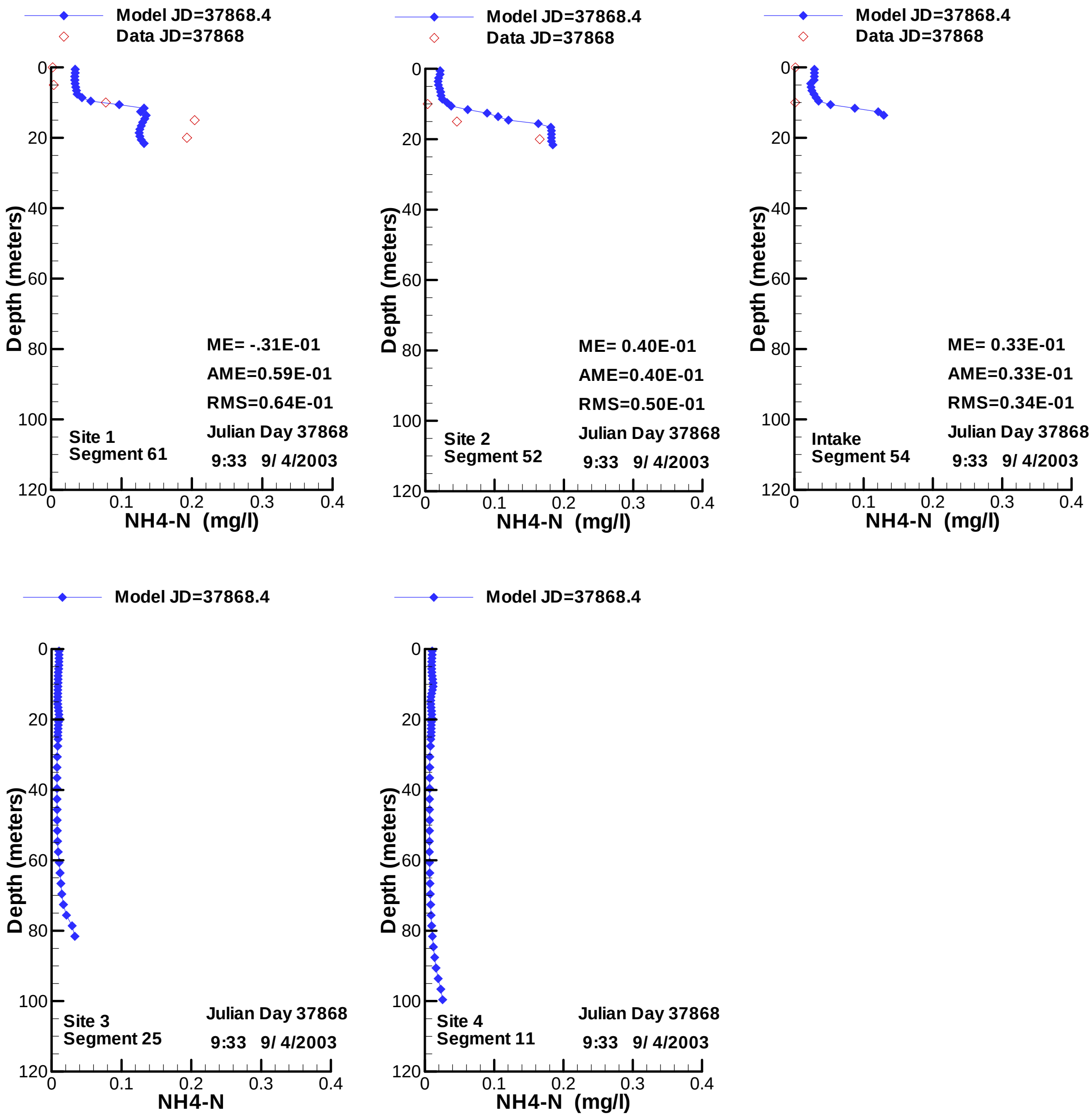

Figure 103. Vertical profiles of AMMONIA NITROGEN compared with data for 9/ 4/2003.

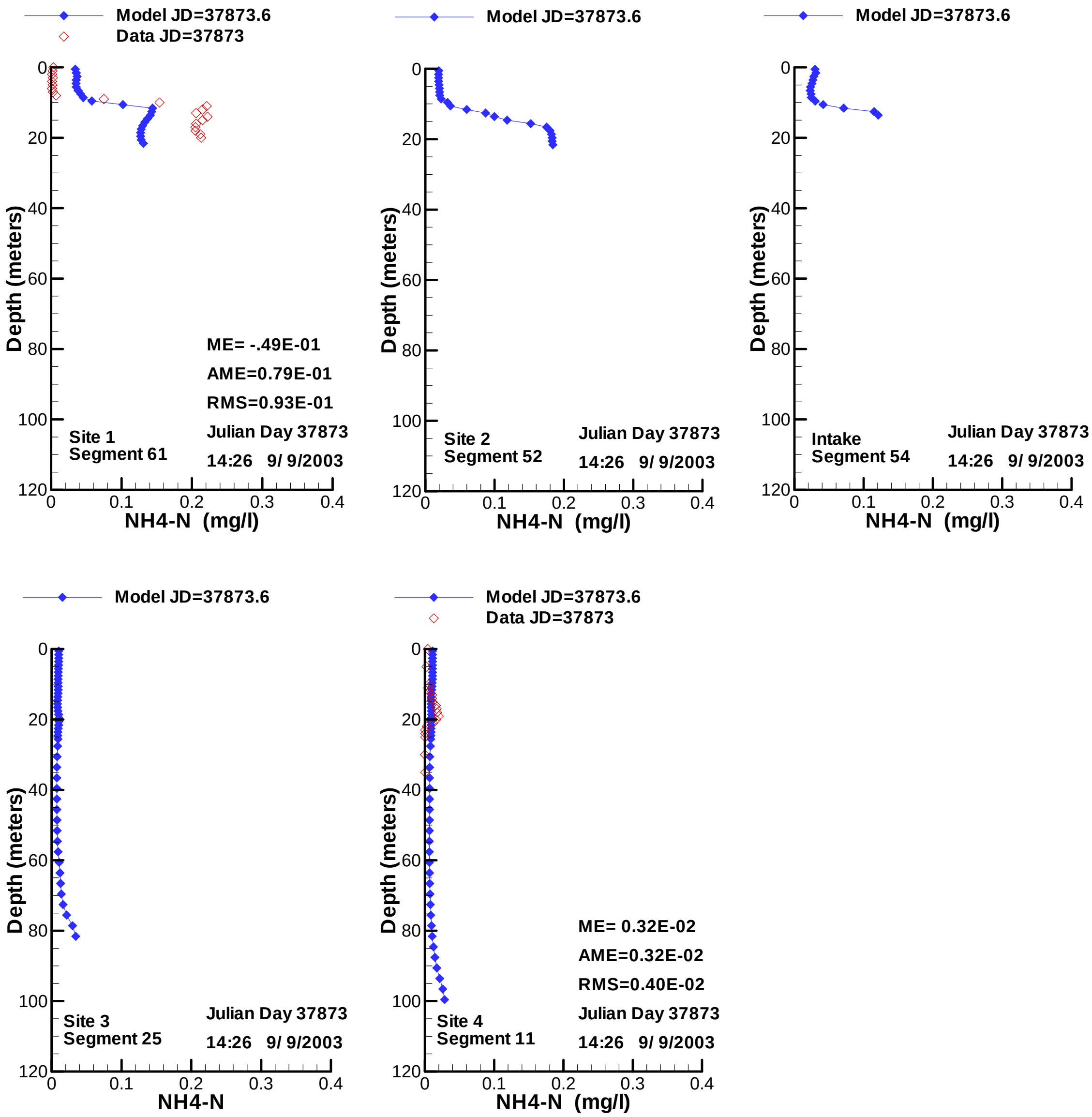

Figure 104. Vertical profiles of AMMONIA NITROGEN compared with data for 9/ 9/2003.

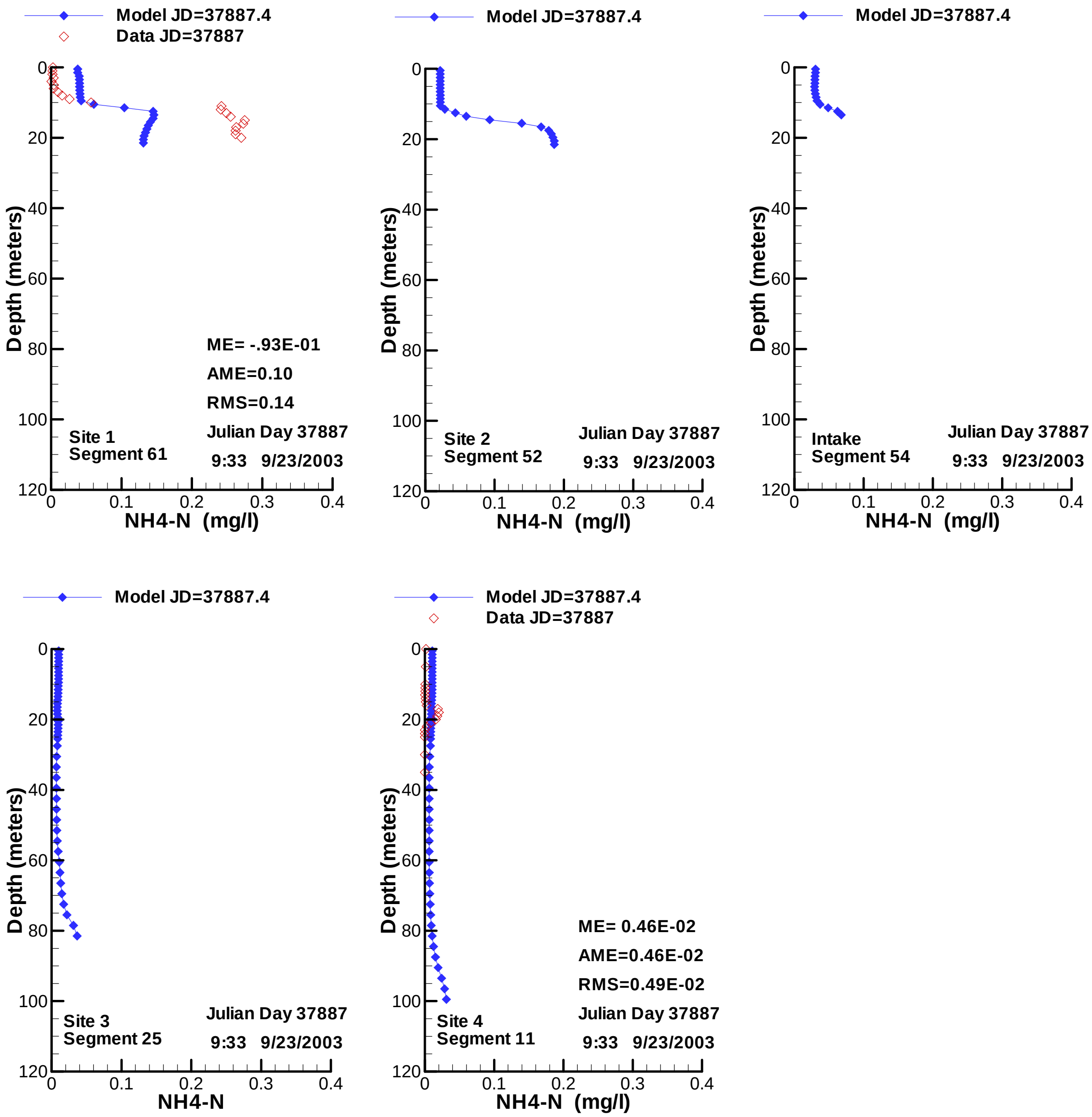

Figure 105. Vertical profiles of AMMONIA NITROGEN compared with data for 9/23/2003.

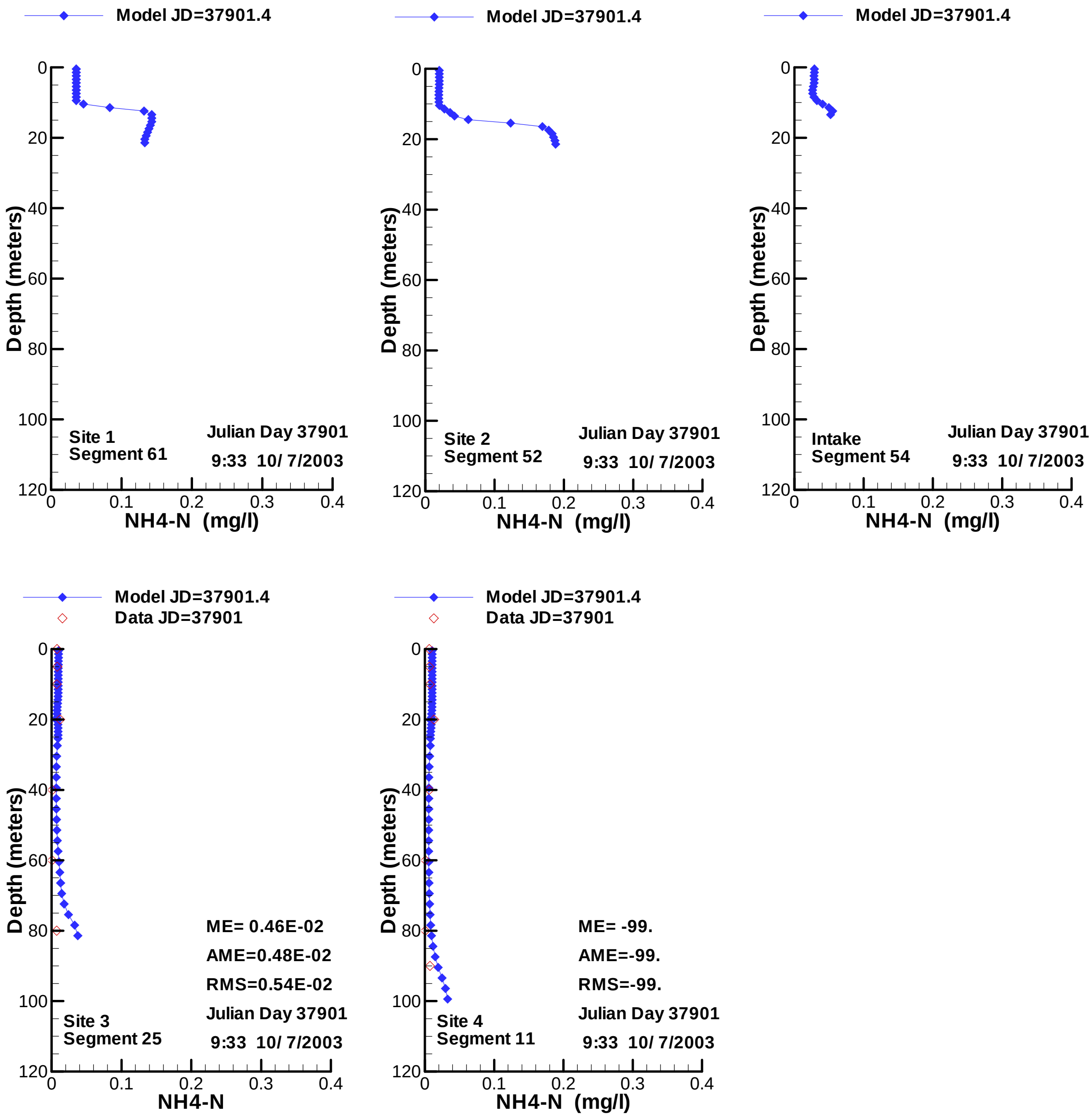

Figure 106. Vertical profiles of AMMONIA NITROGEN compared with data for 10/ 7/2003.

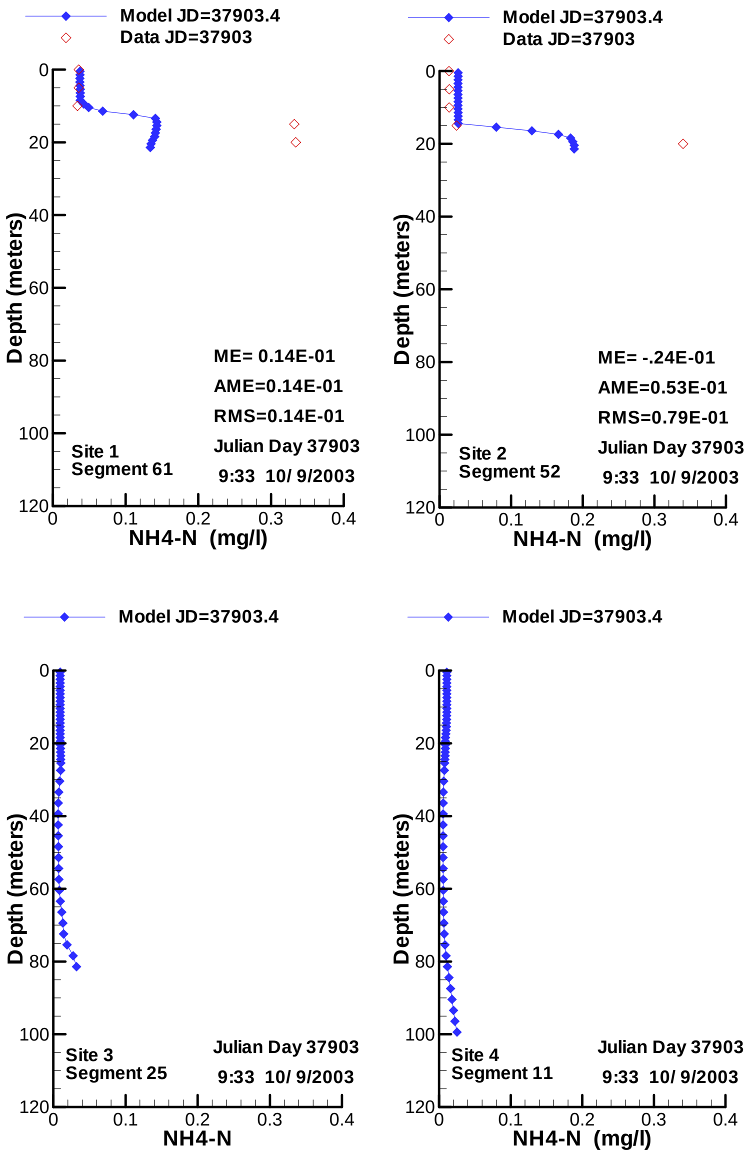

Figure 107. Vertical profiles of AMMONIA NITROGEN compared with data for 10/ 9/2003.

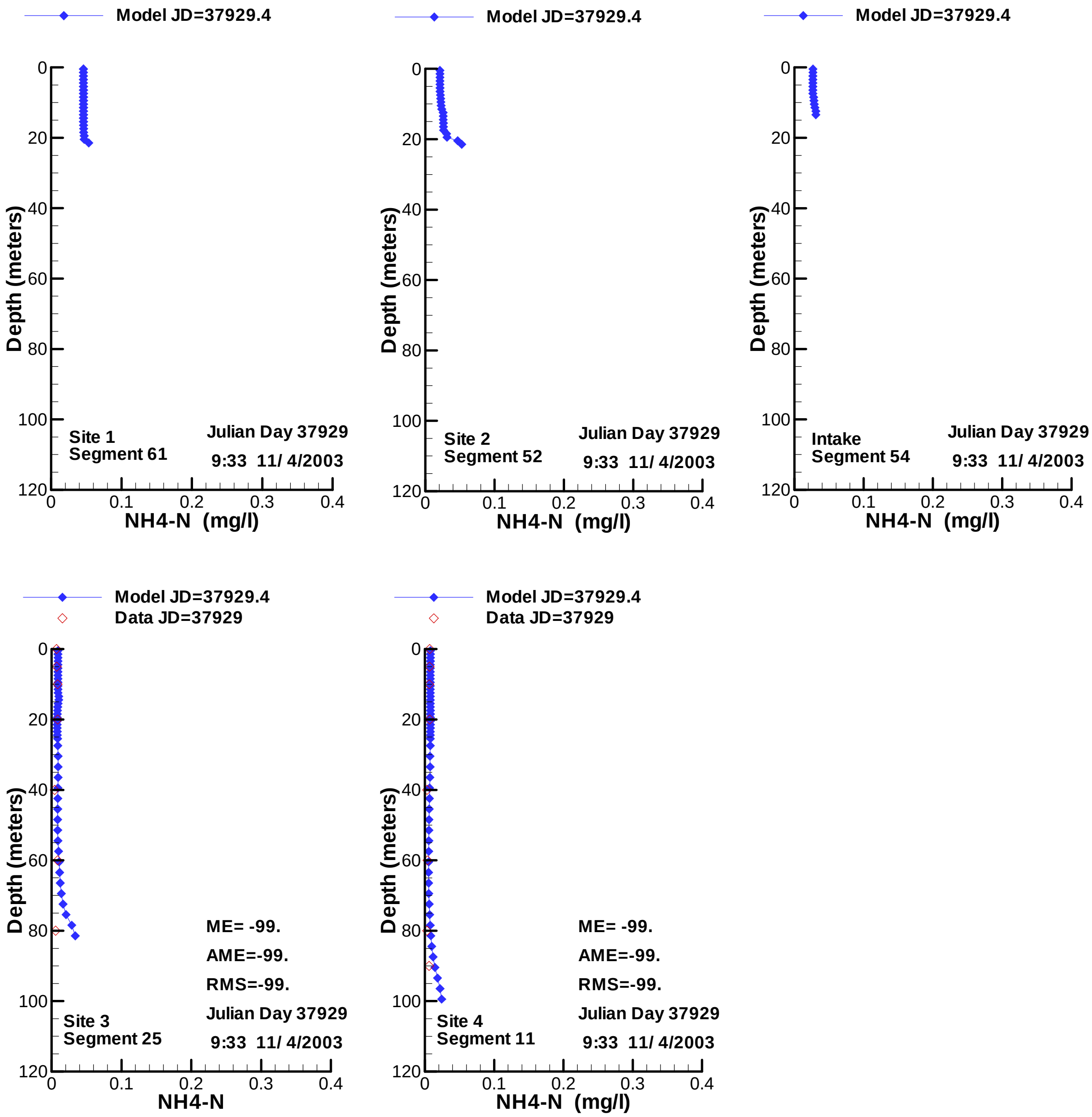

Figure 108. Vertical profiles of AMMONIA NITROGEN compared with data for 11/ 4/2003.

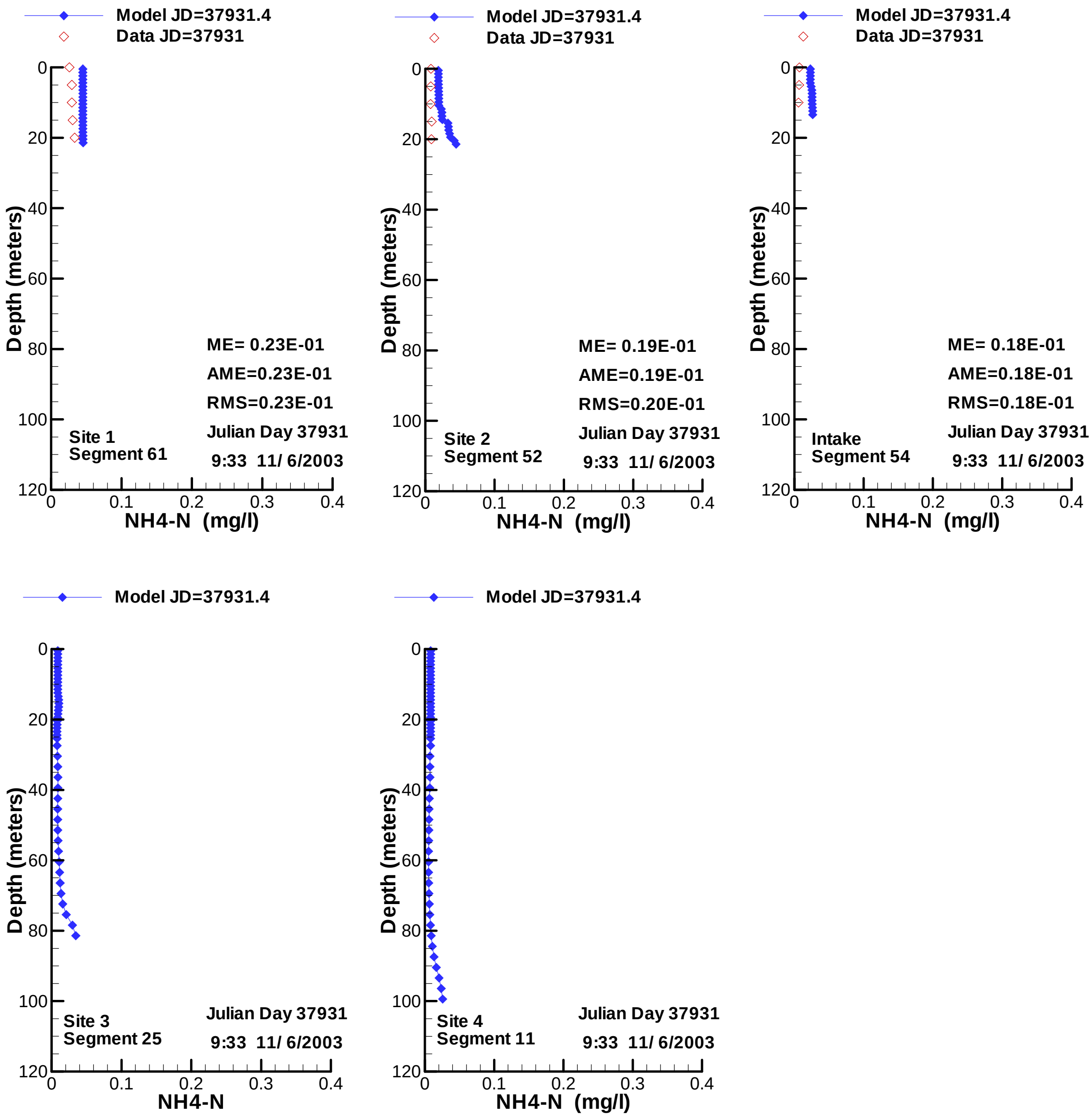

Figure 109. Vertical profiles of AMMONIA NITROGEN compared with data for 11/ 6/2003.

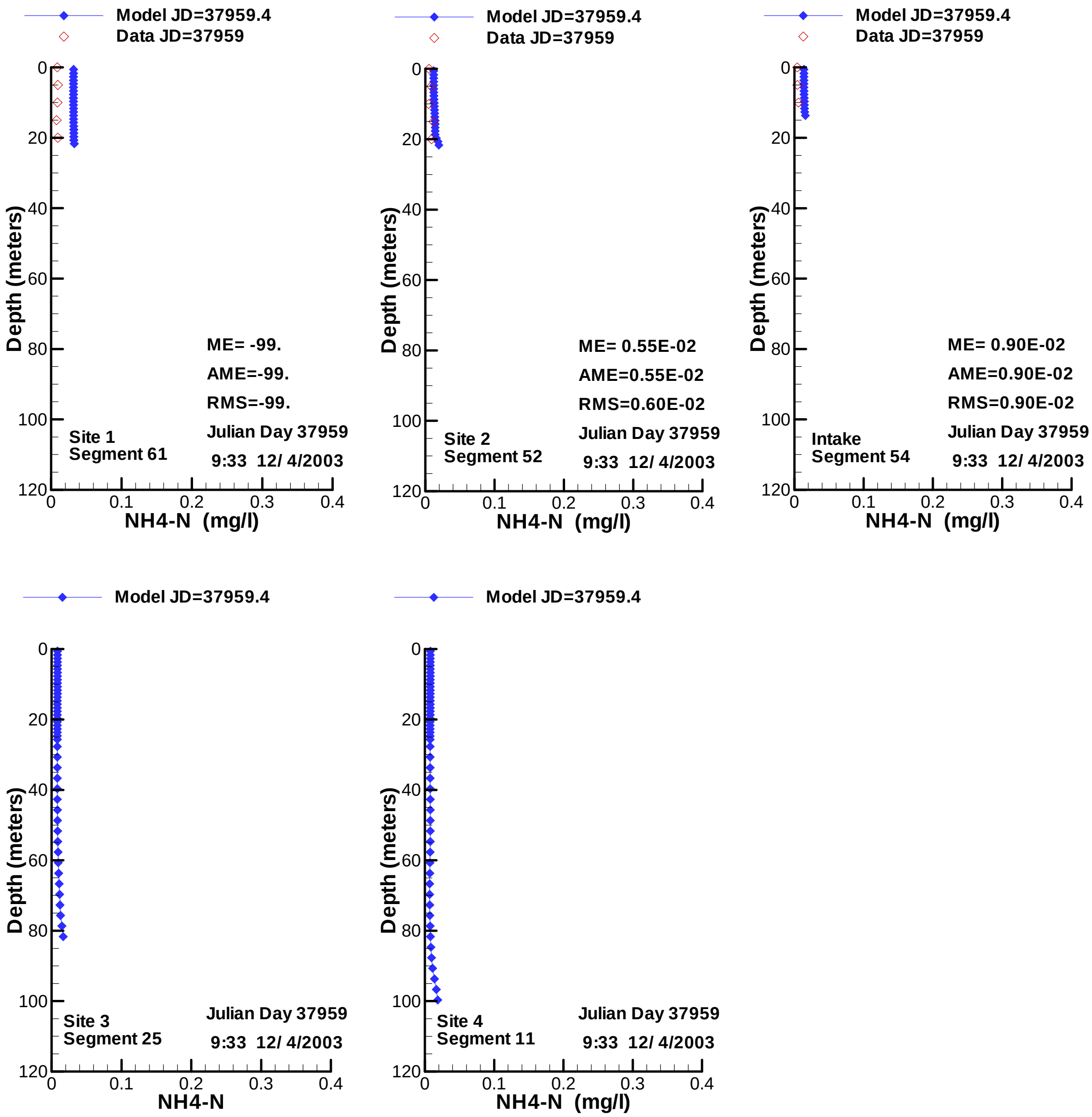

Figure 110. Vertical profiles of AMMONIA NITROGEN compared with data for 12/ 4/2003.

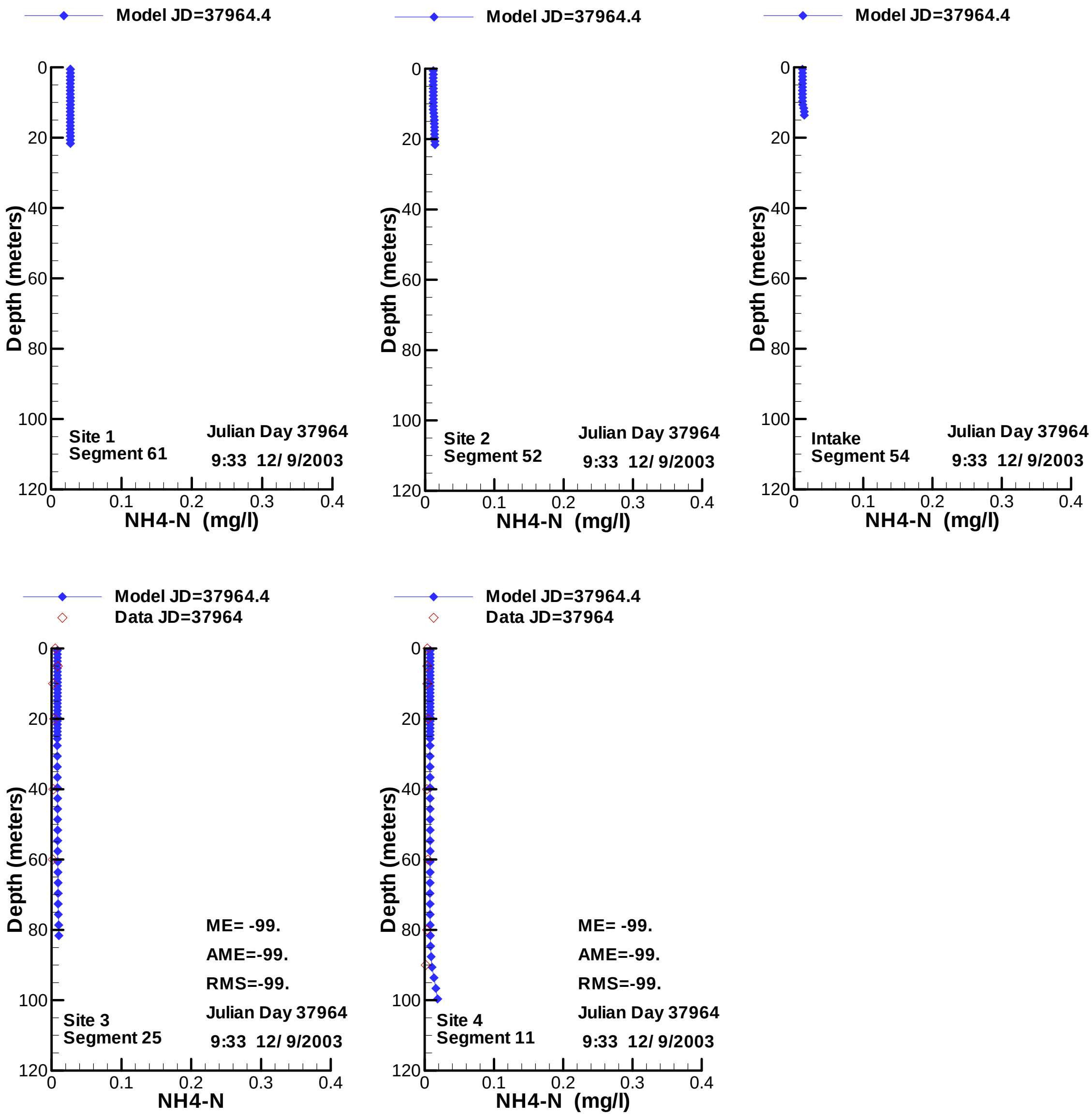

Figure 111. Vertical profiles of AMMONIA NITROGEN compared with data for 12/ 9/2003.

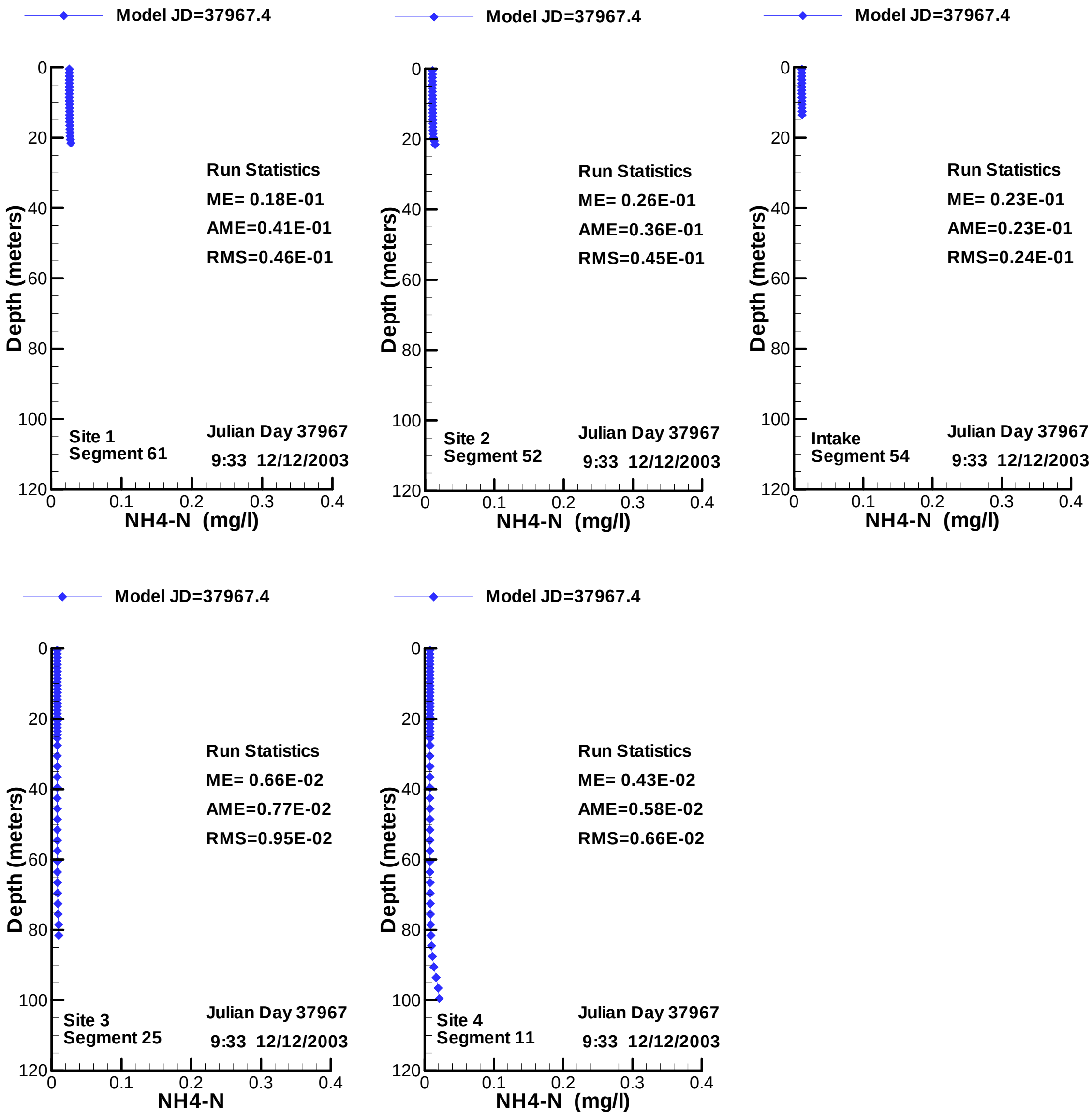

Figure 112. Vertical profiles of AMMONIA NITROGEN compared with data for 12/12/2003.

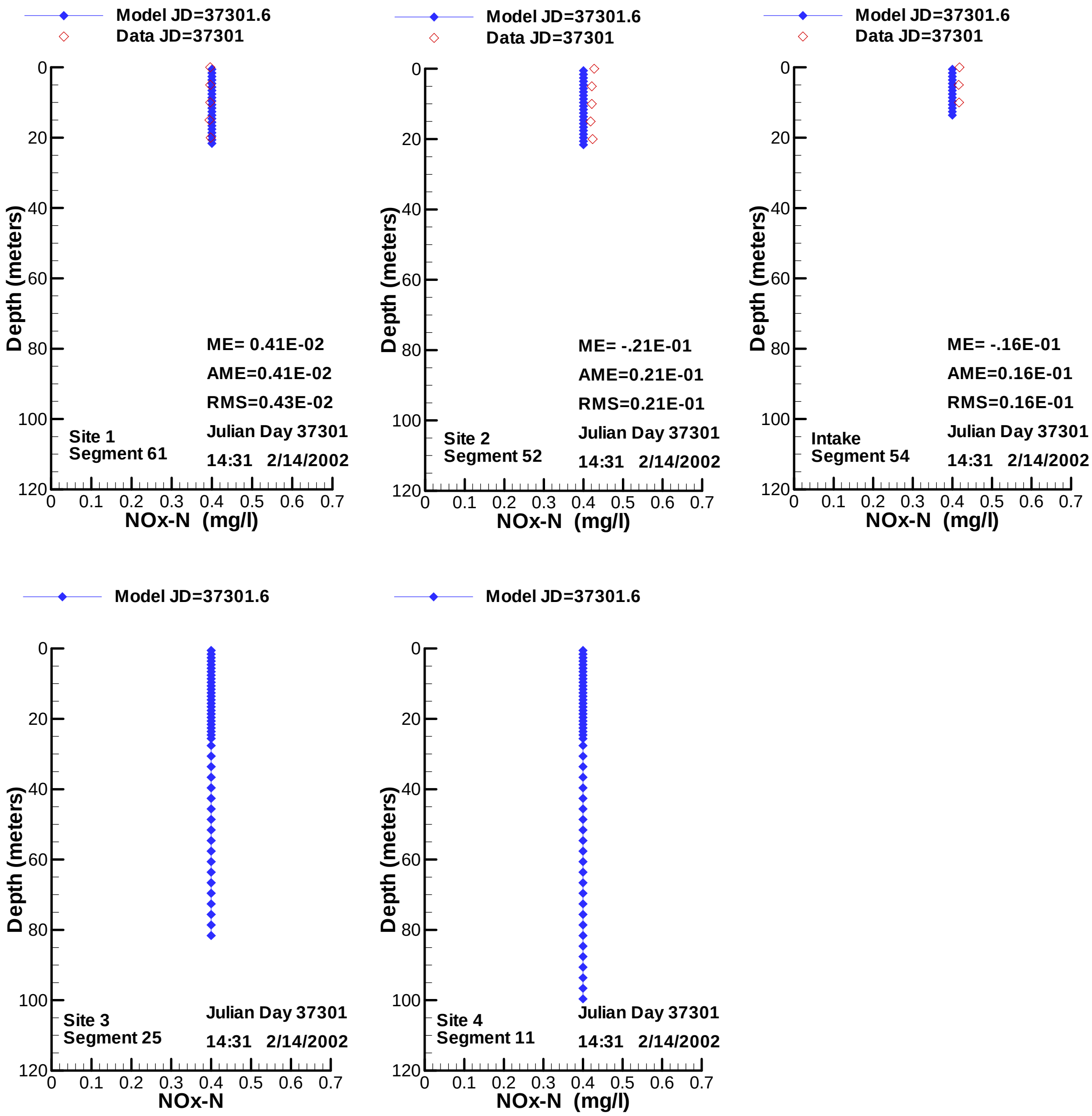

Figure 113. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 2/14/2002.

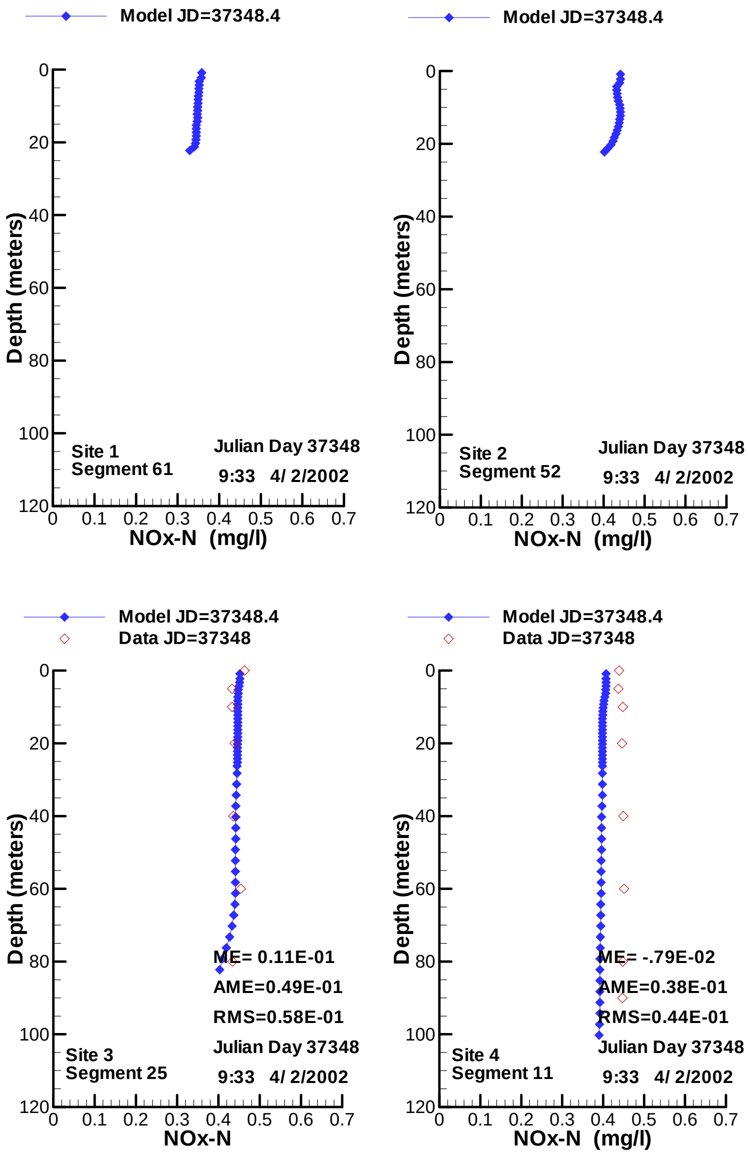

Figure 114. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 4/ 2/2002.

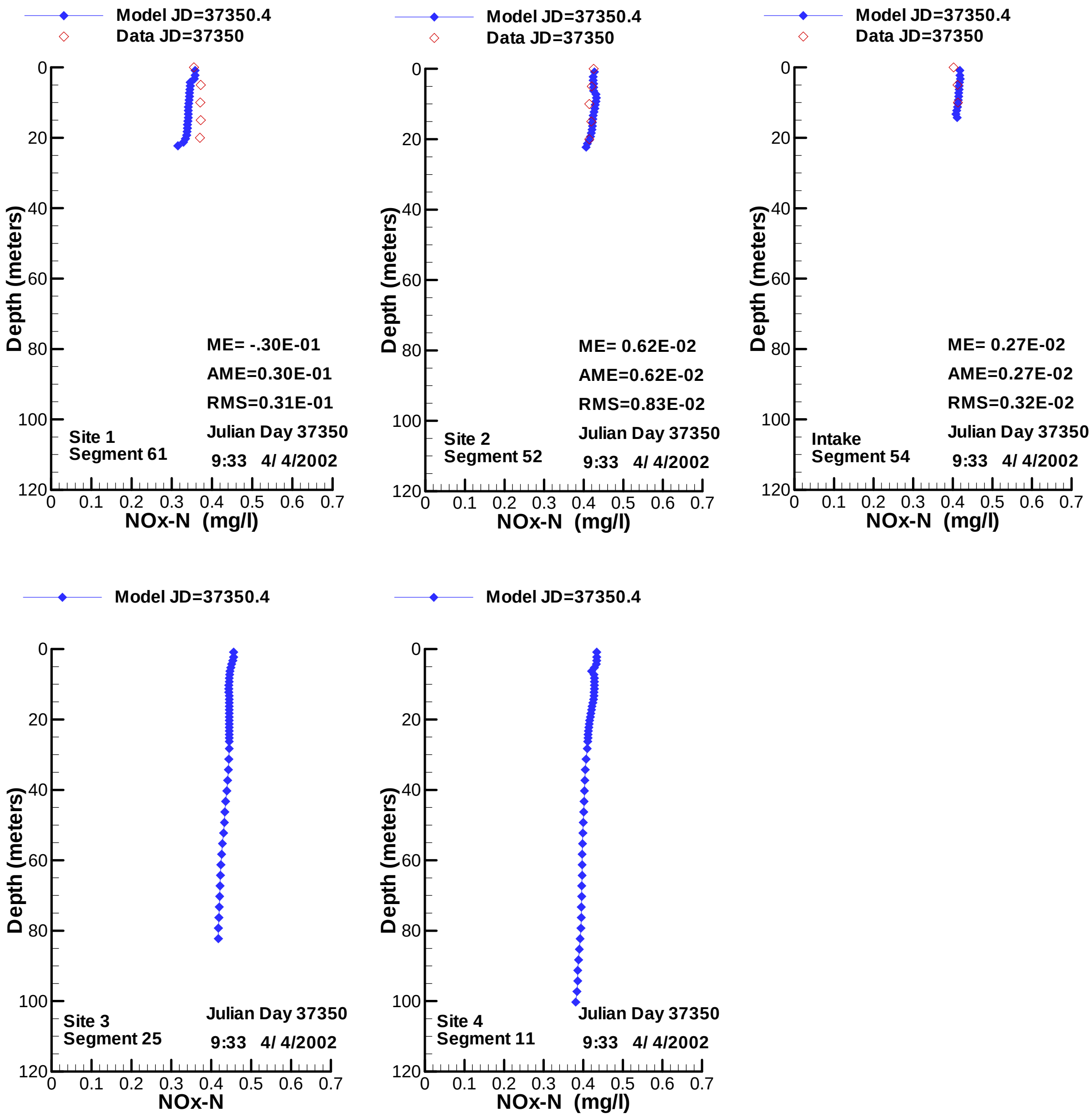

Figure 115. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 4/ 4/2002.

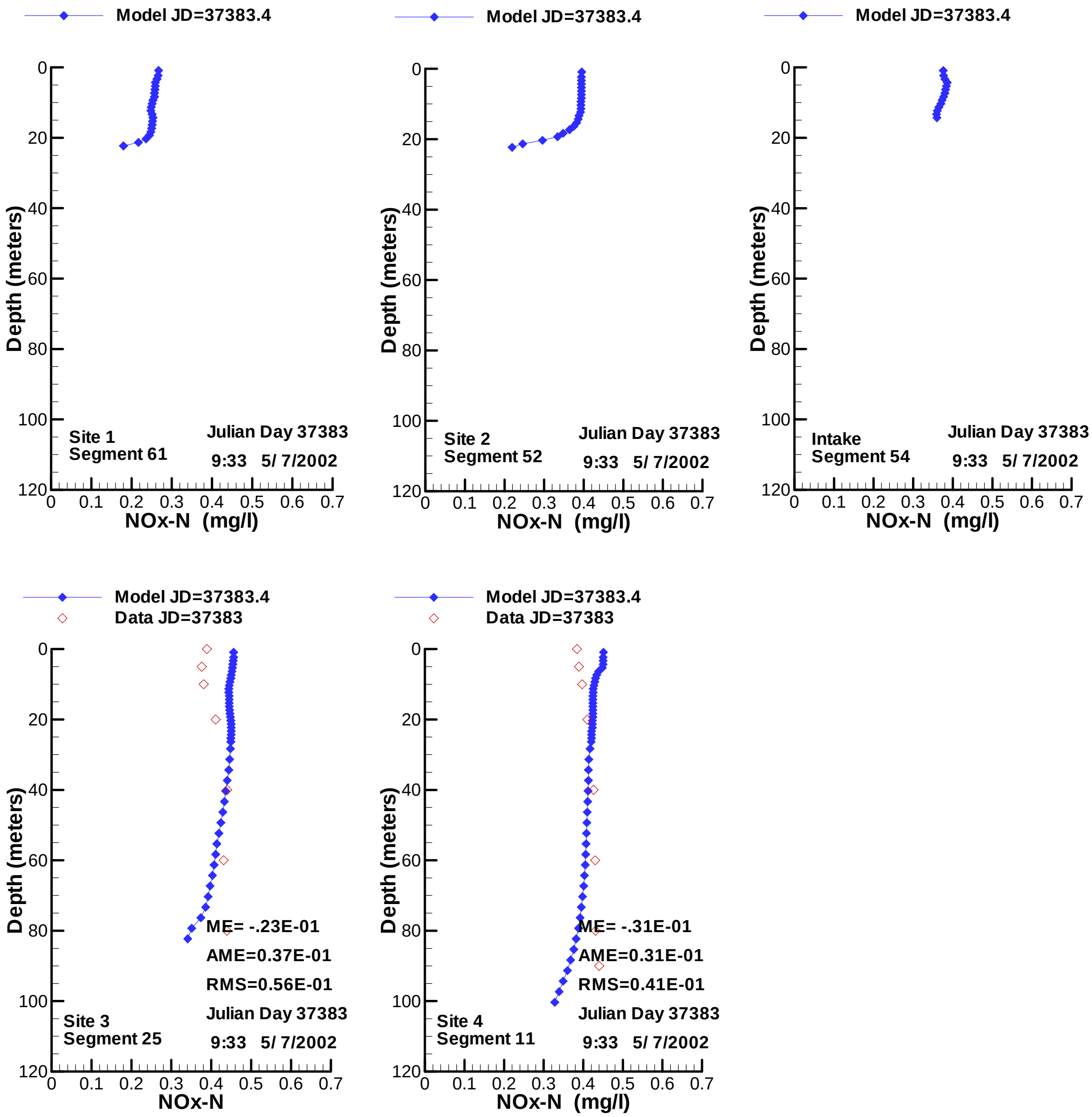

Figure 116. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 5/ 7/2002.

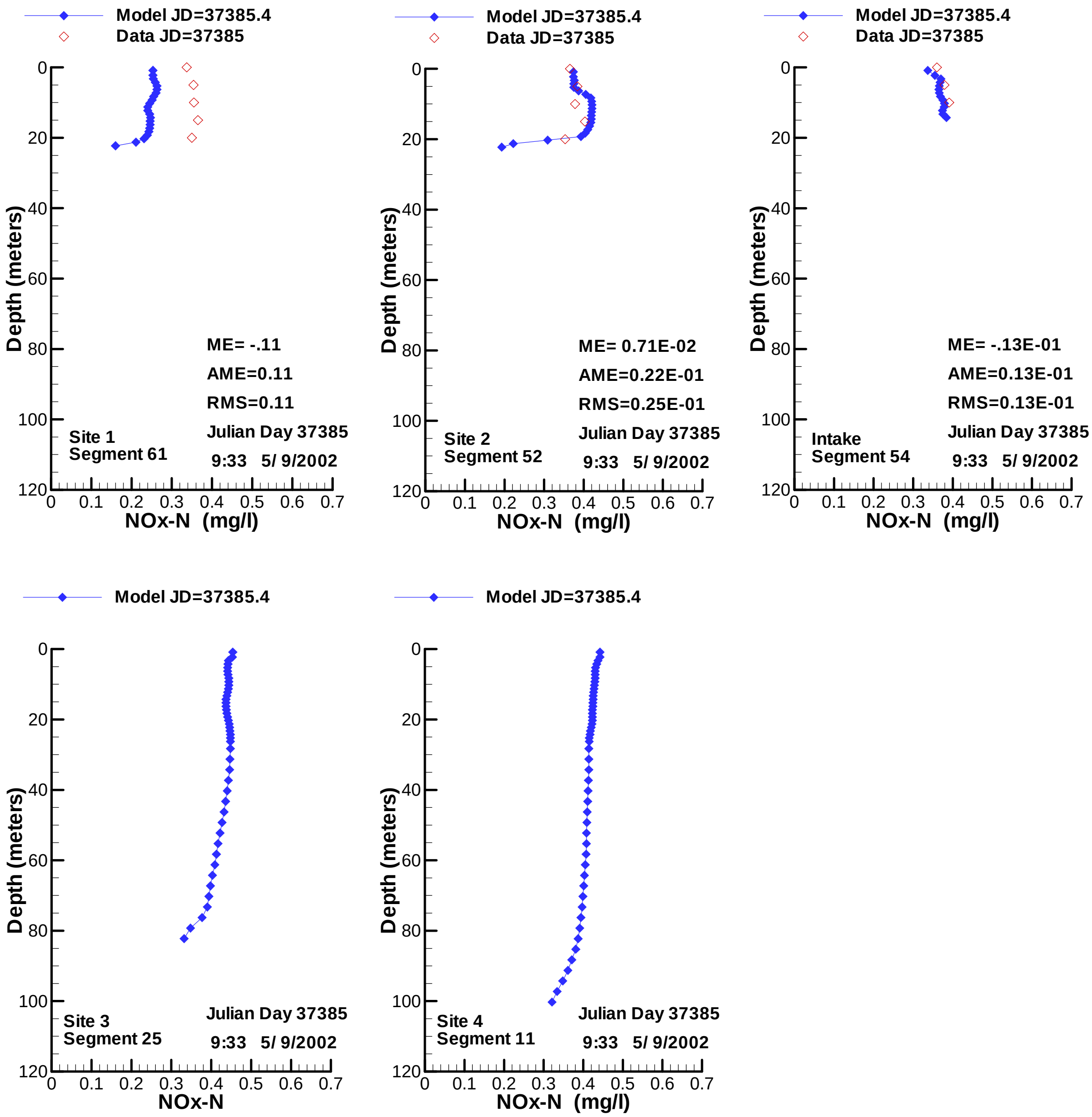

Figure 117. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 5/ 9/2002.

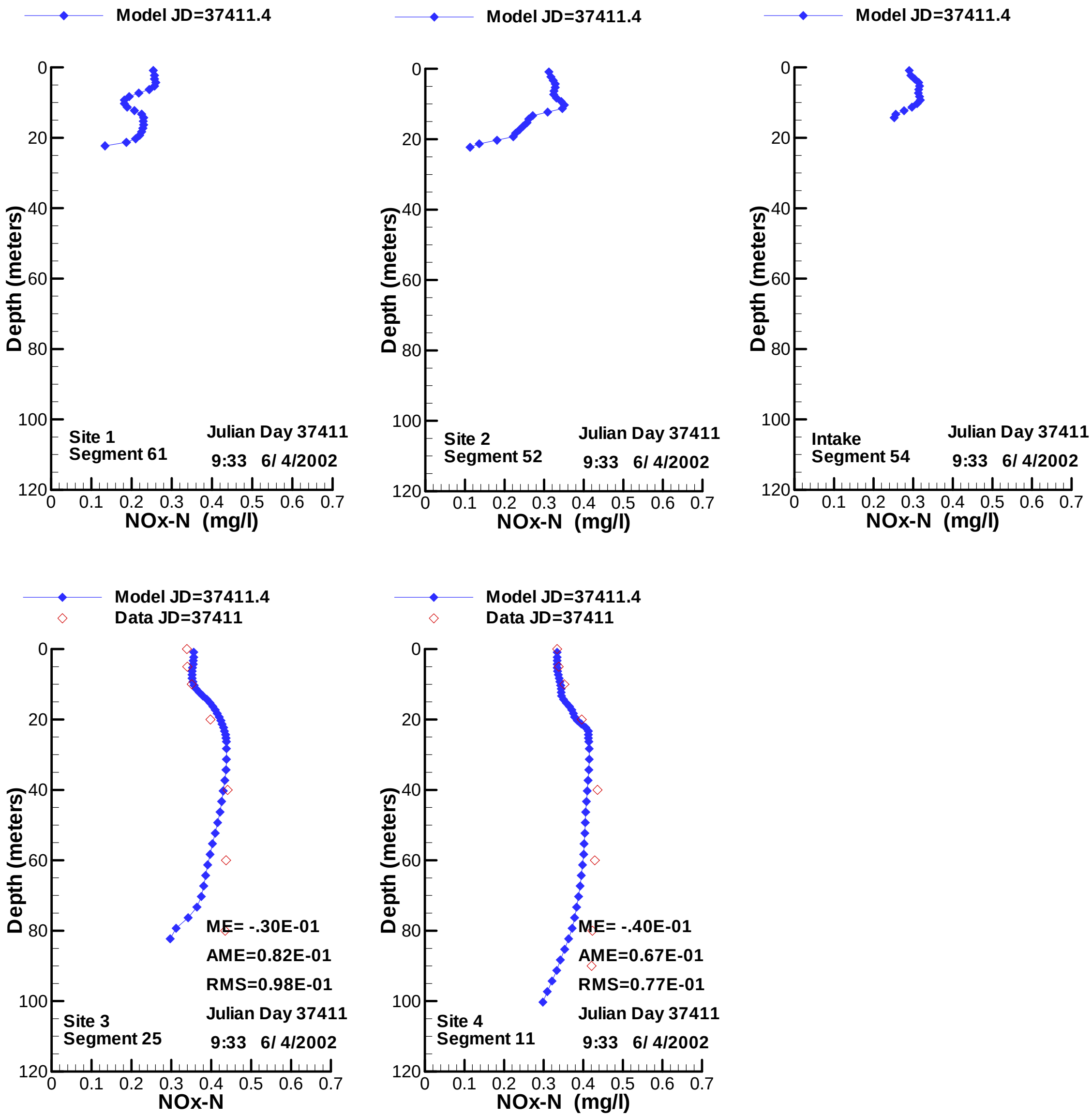

Figure 118. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 6/ 4/2002.

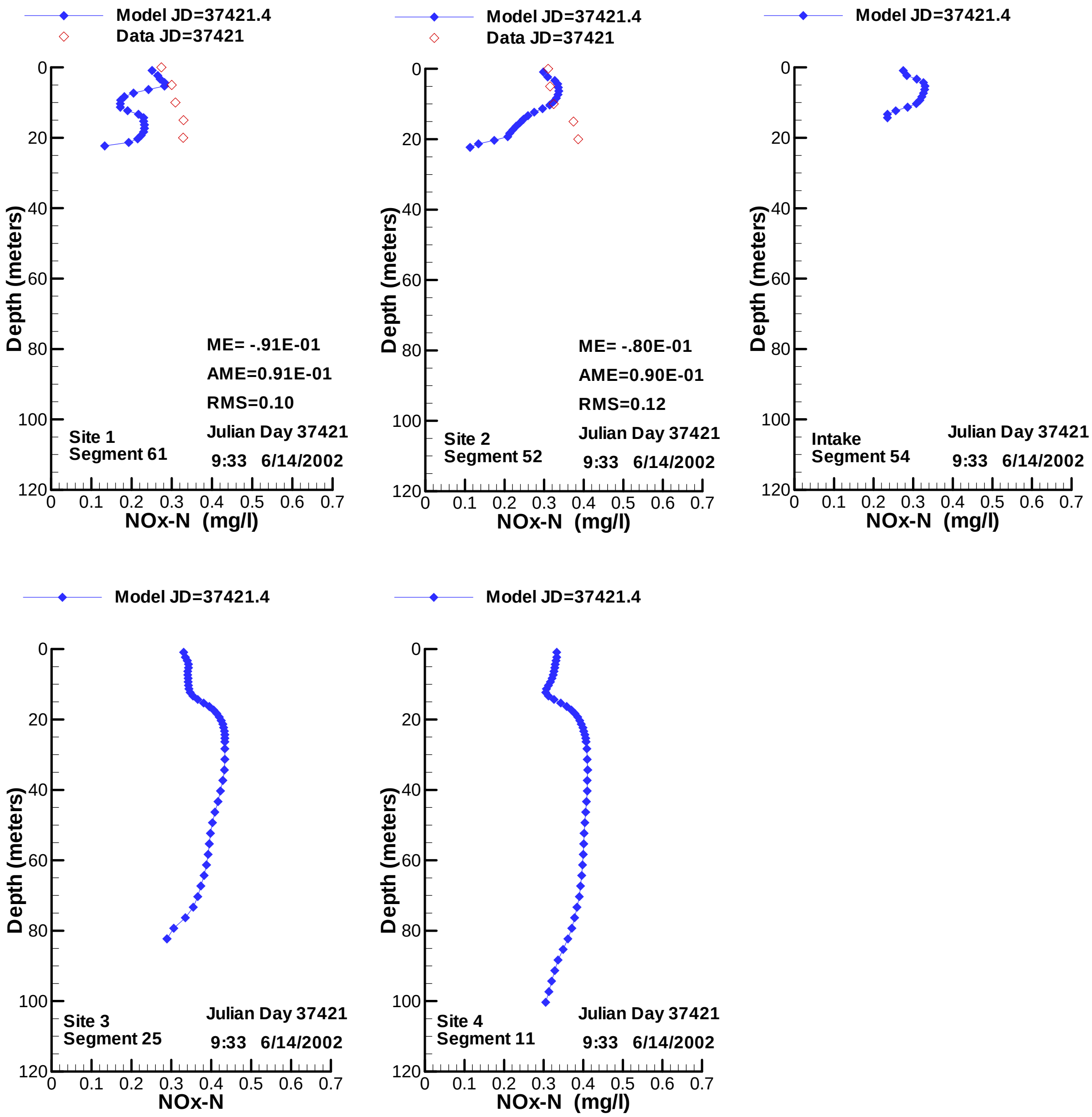

Figure 119. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 6/14/2002.

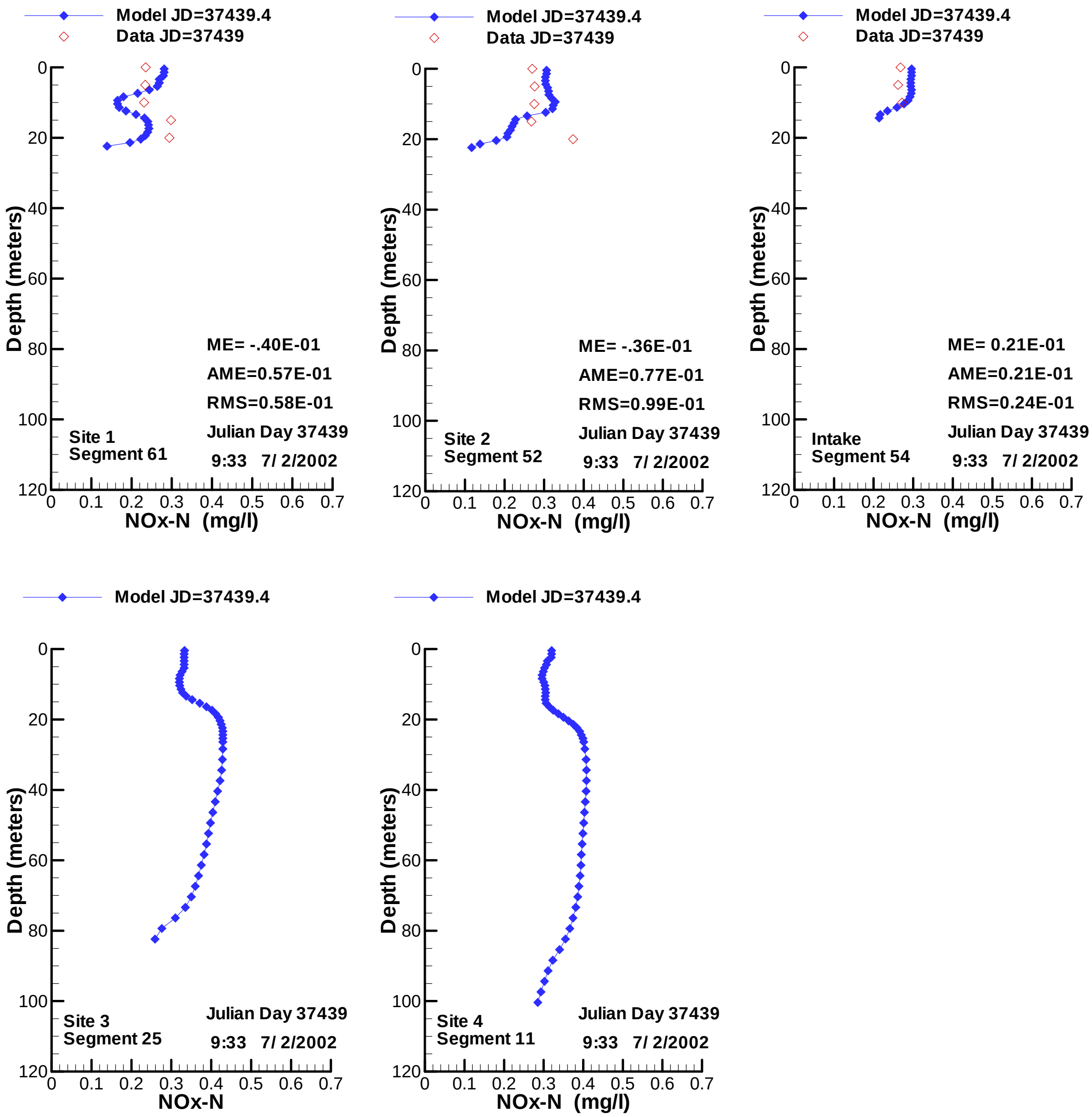

Figure 120. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/ 2/2002.

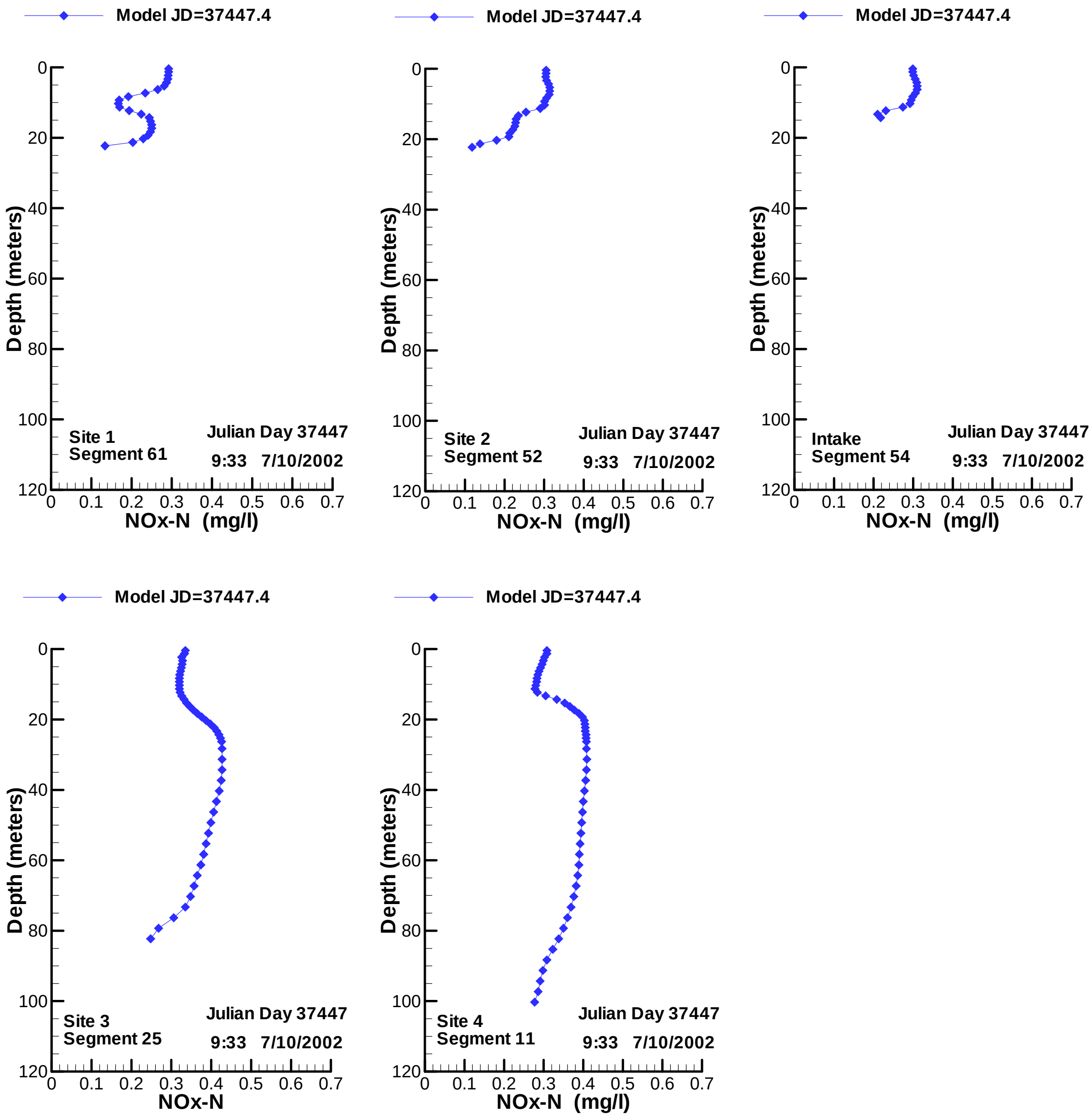

Figure 121. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/10/2002.

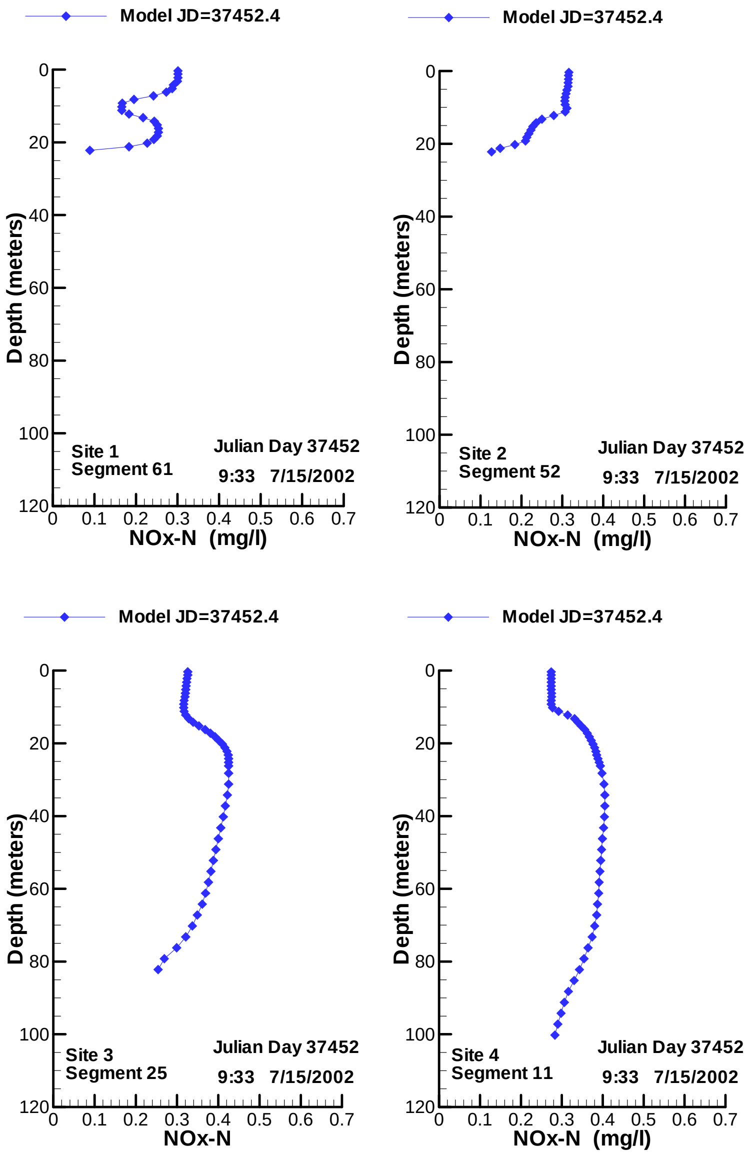

Figure 122. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/15/2002.

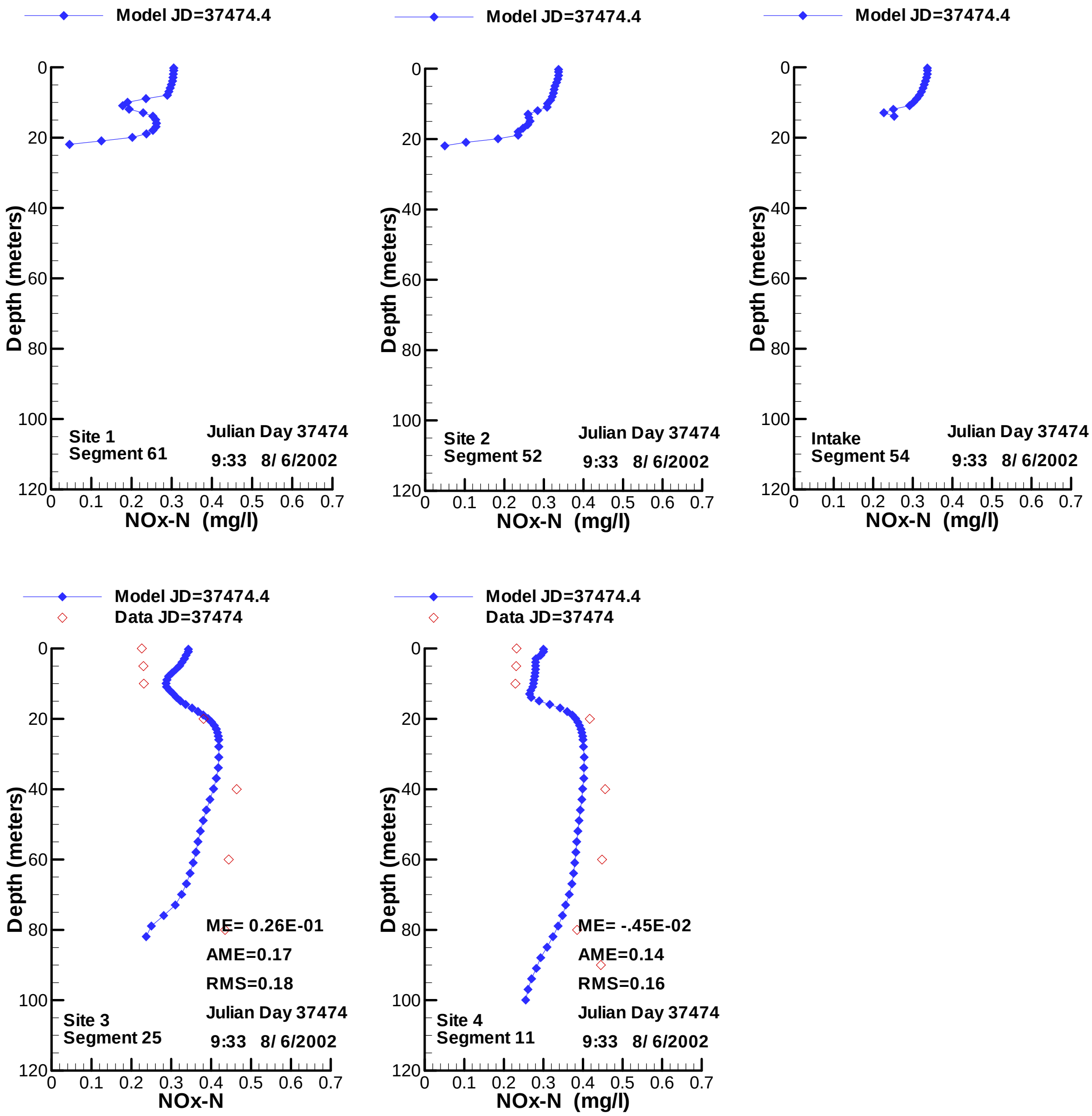

Figure 123. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/ 6/2002.

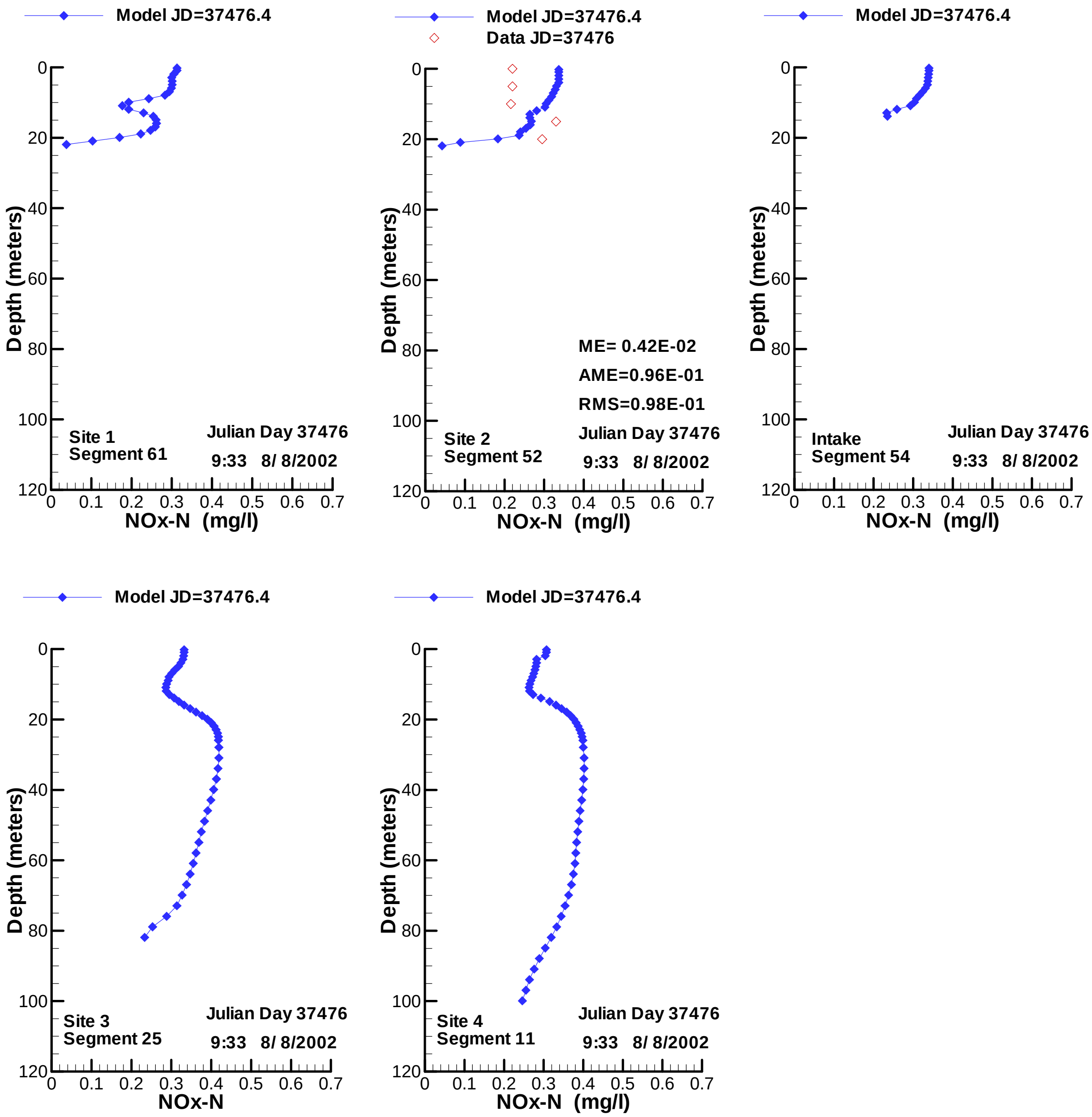

Figure 124. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/ 8/2002.

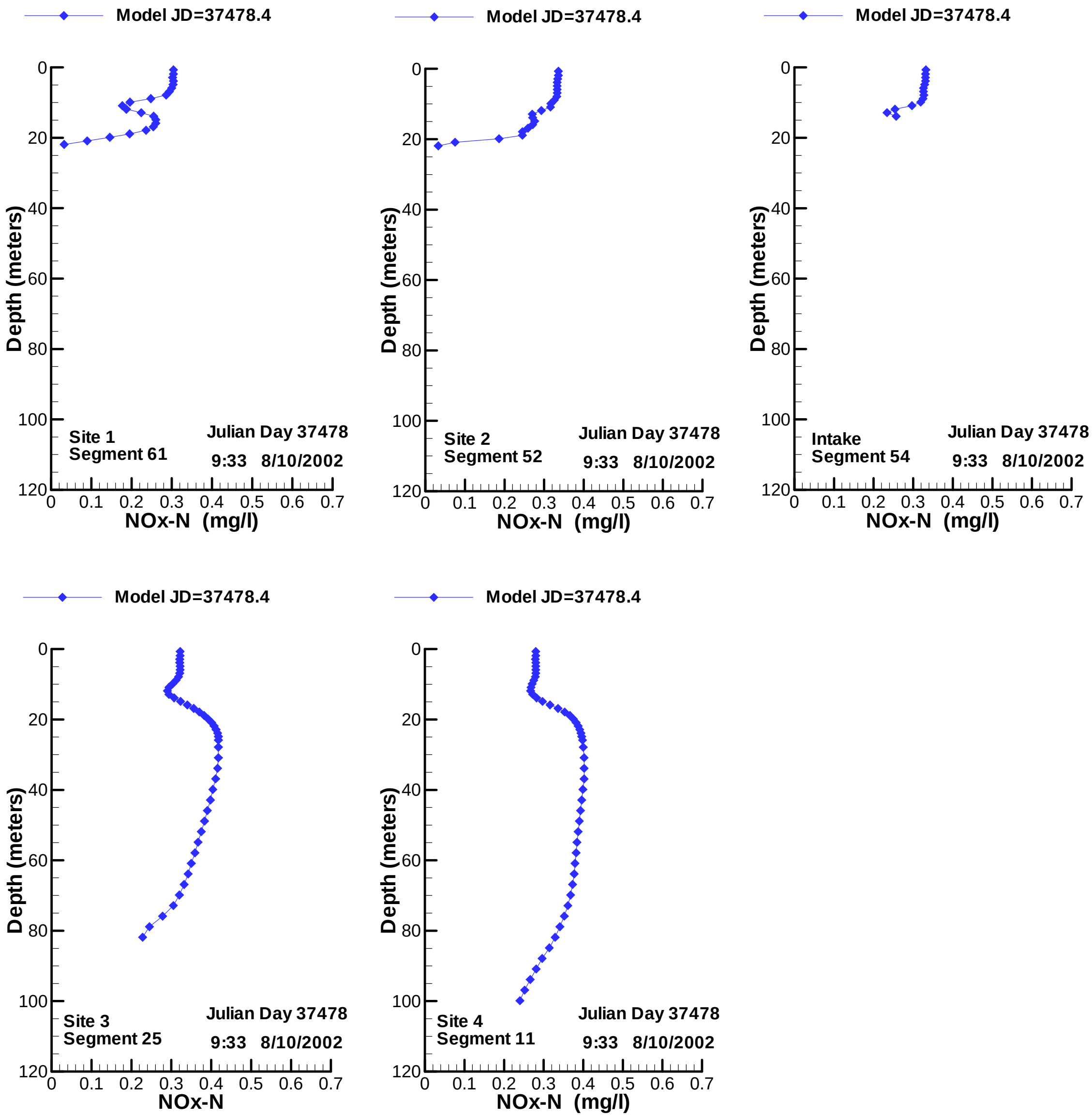

Figure 125. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/10/2002.

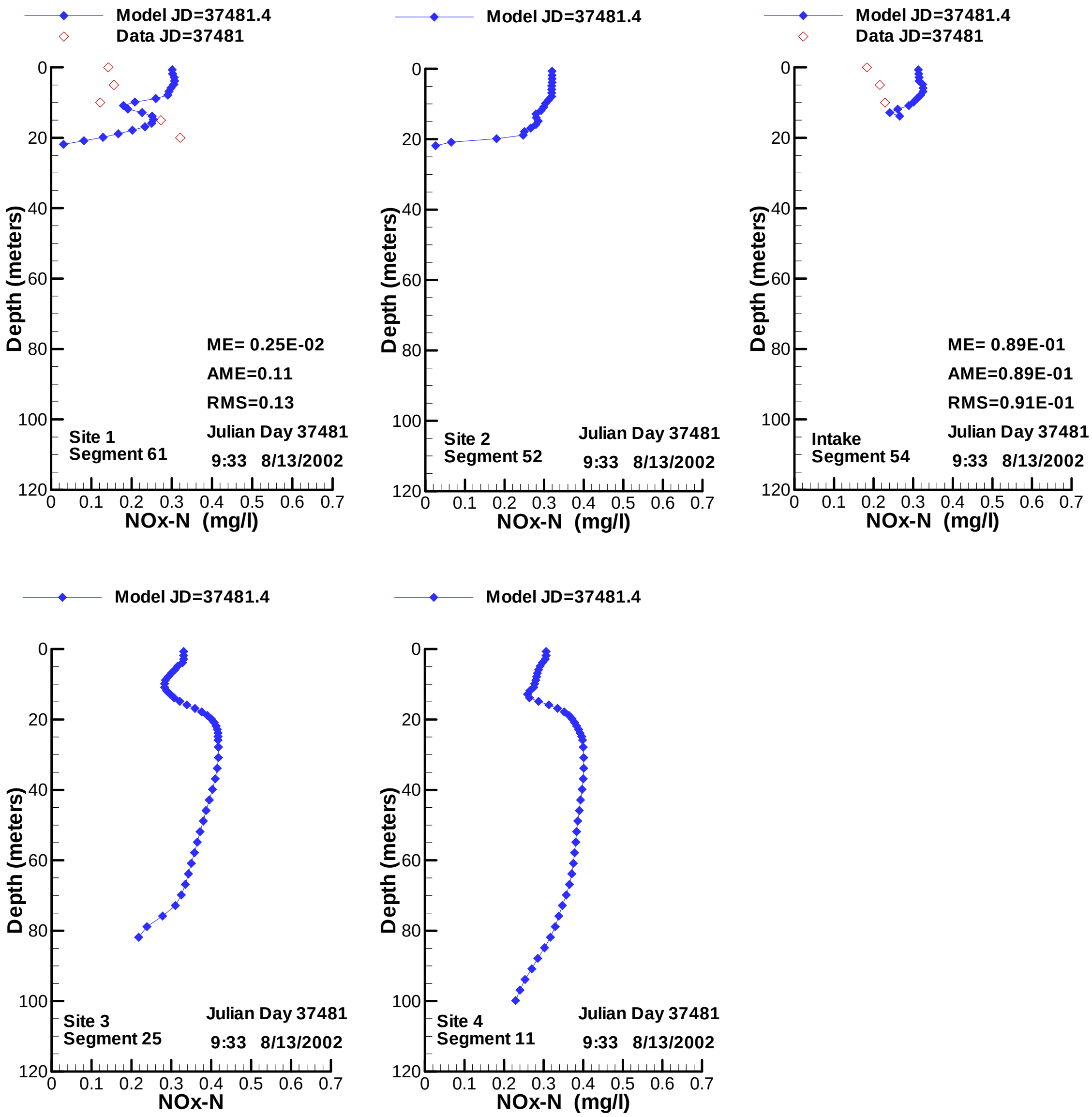

Figure 126. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/13/2002.

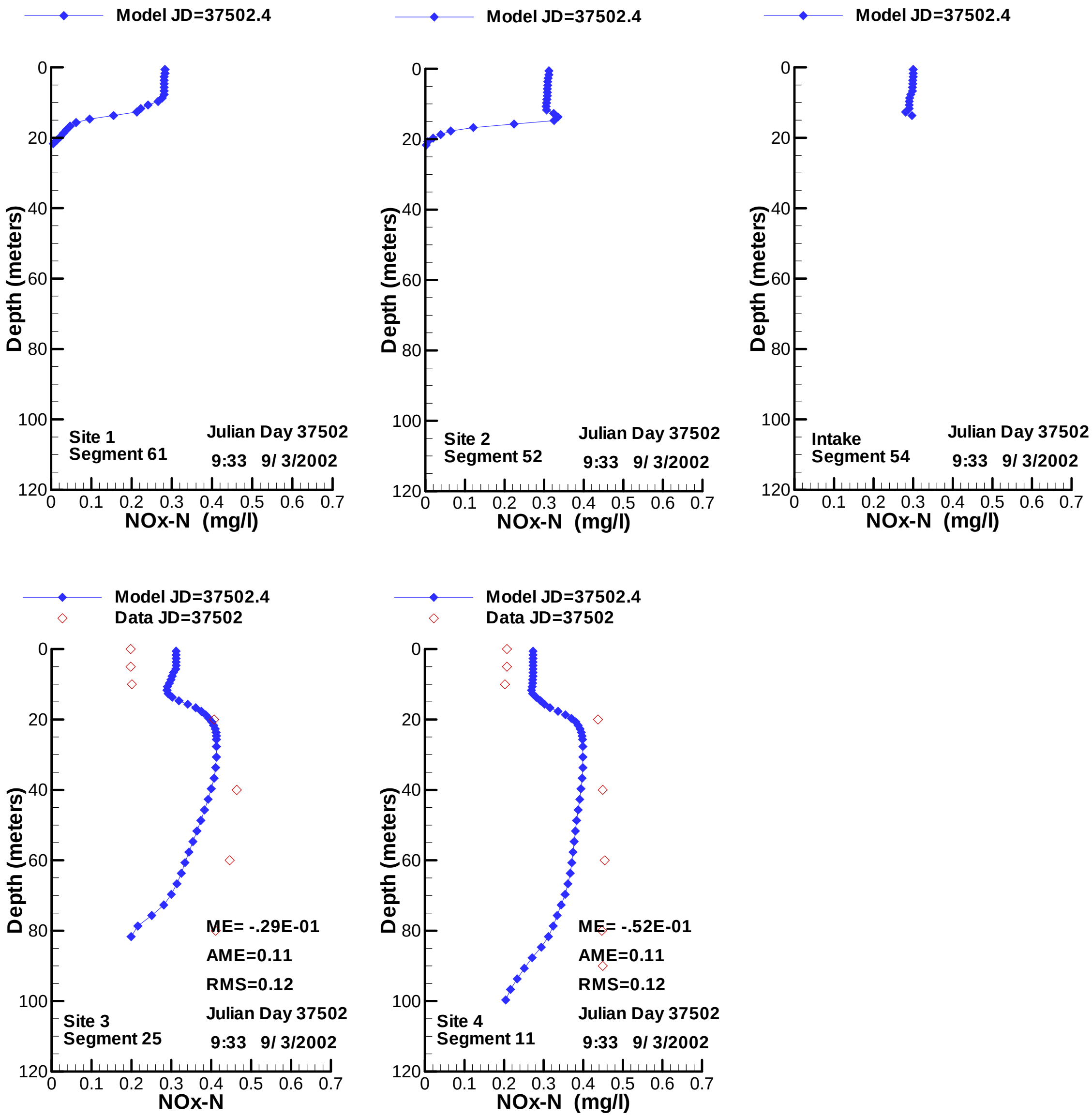

Figure 127. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/ 3/2002.

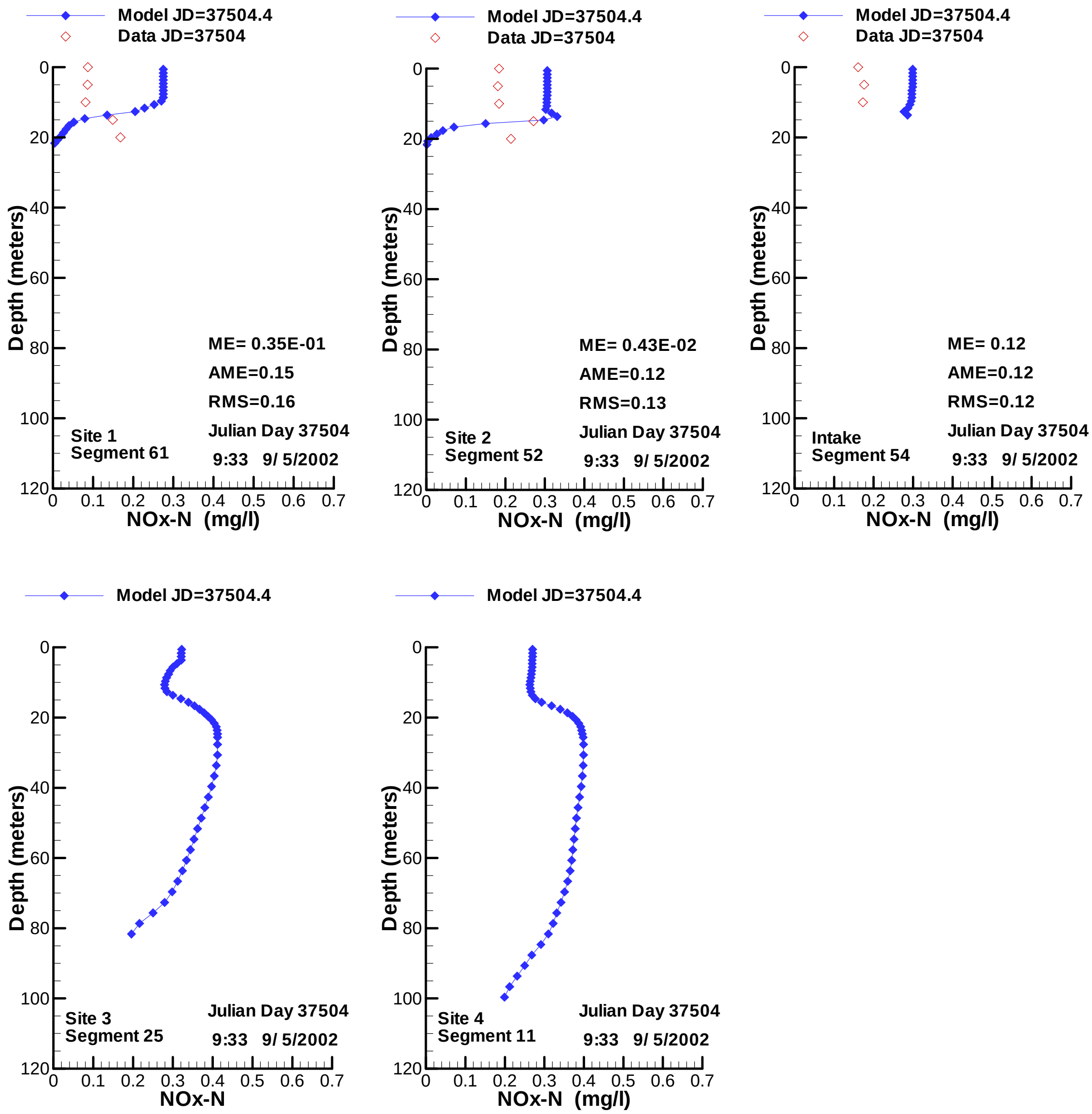

Figure 128. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/ 5/2002.

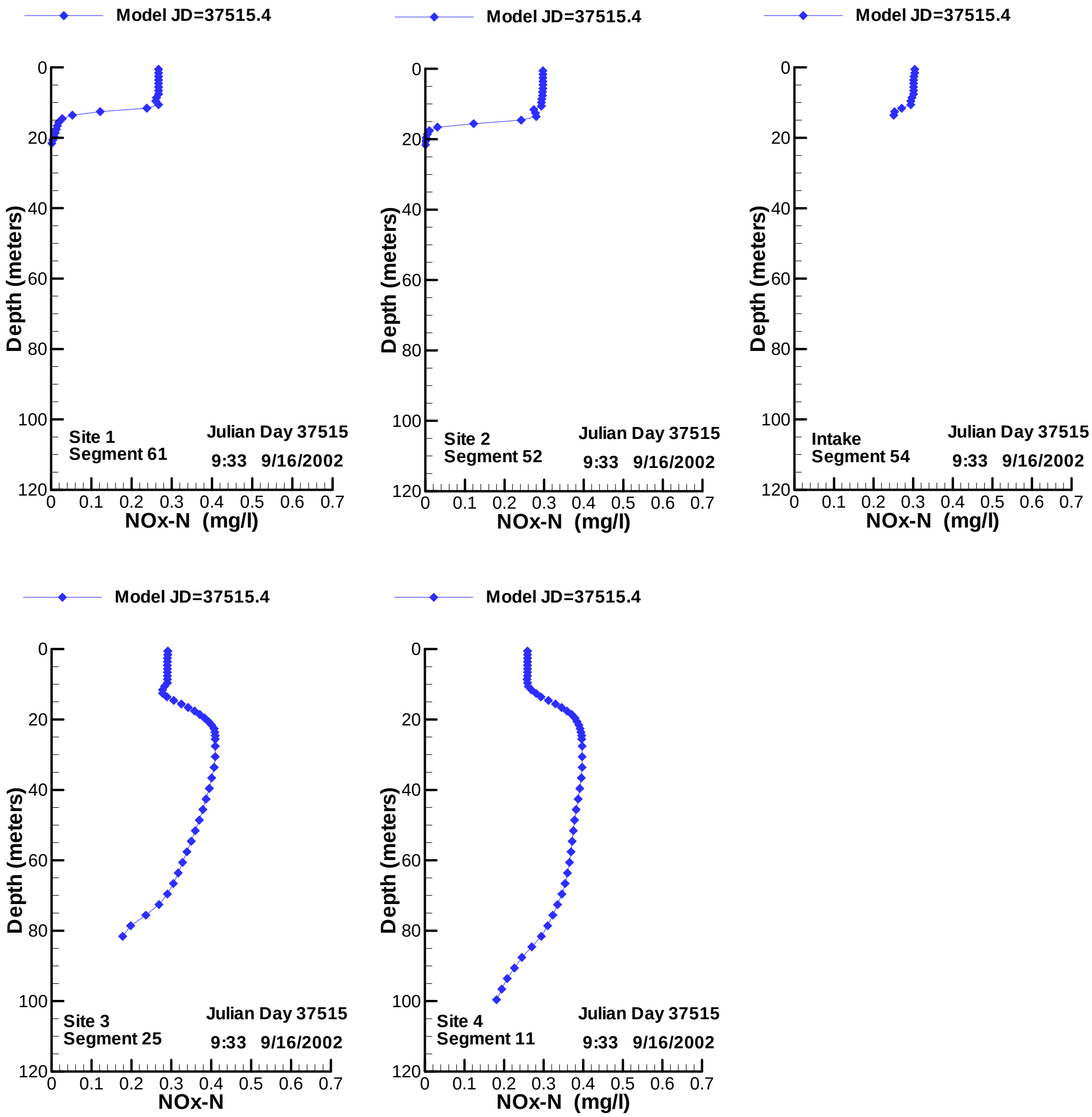

Figure 129. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/16/2002.

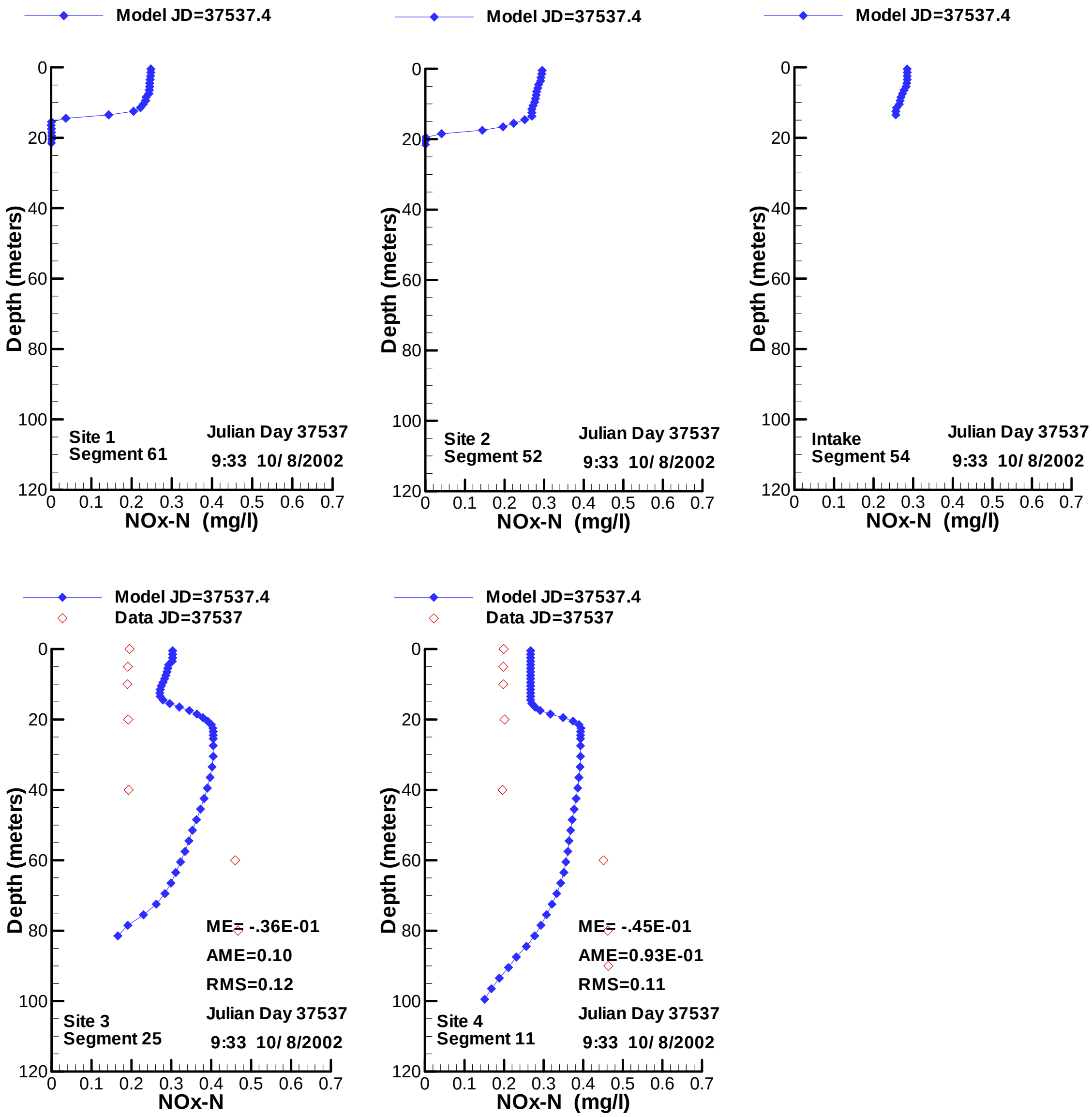

Figure 130. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 10/ 8/2002.

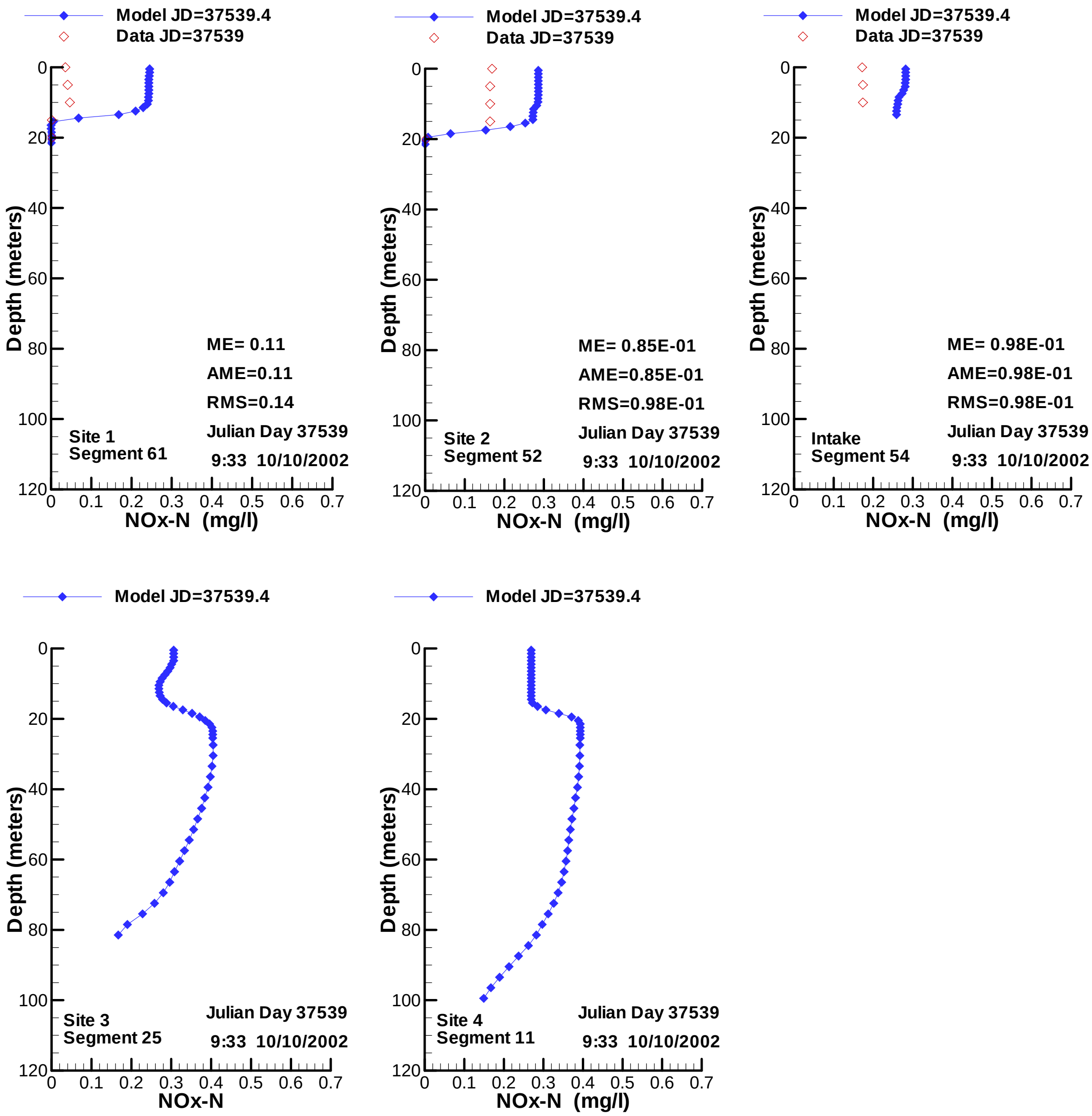

Figure 131. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 10/10/2002.

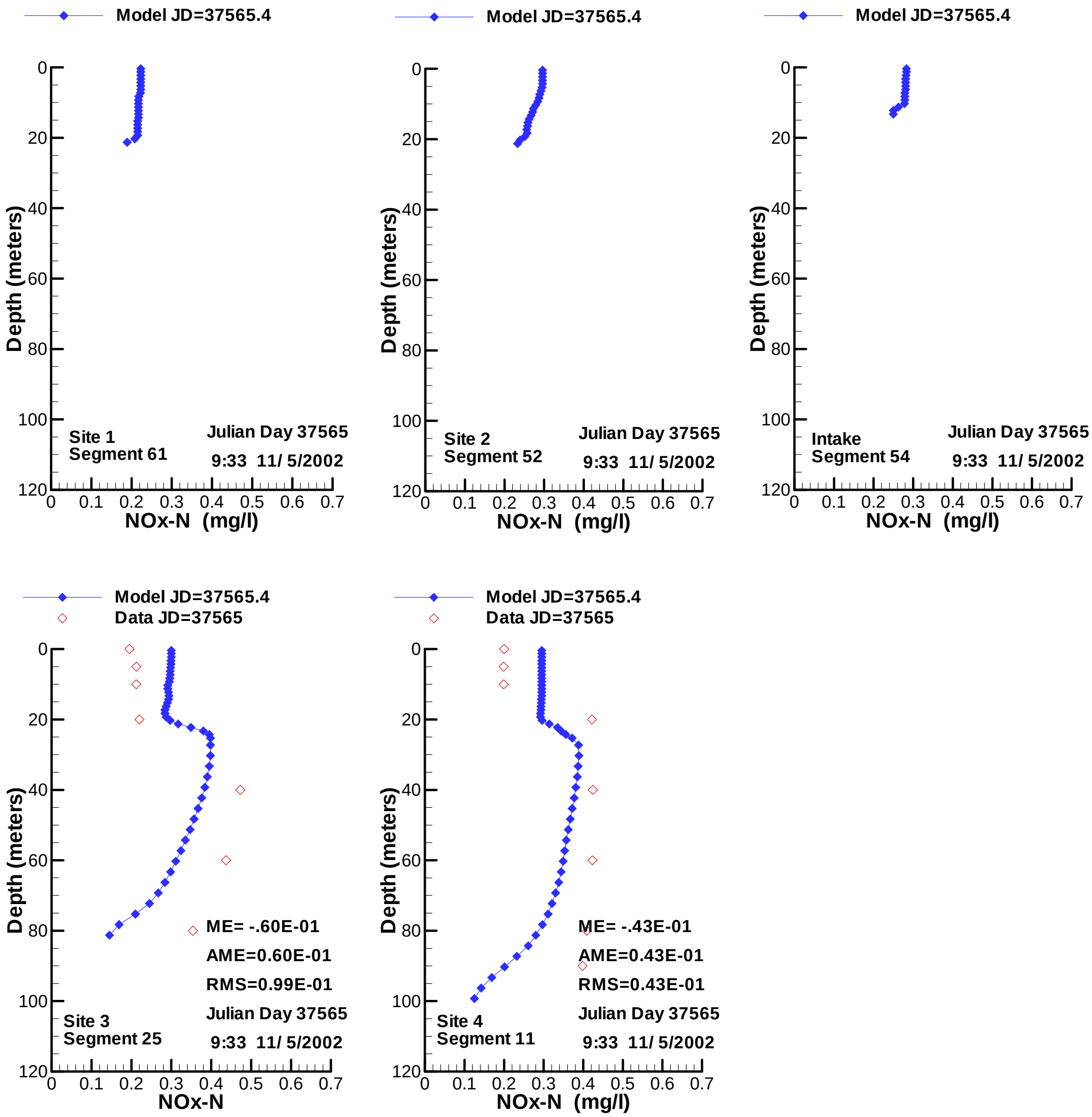

Figure 132. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 11/ 5/2002.

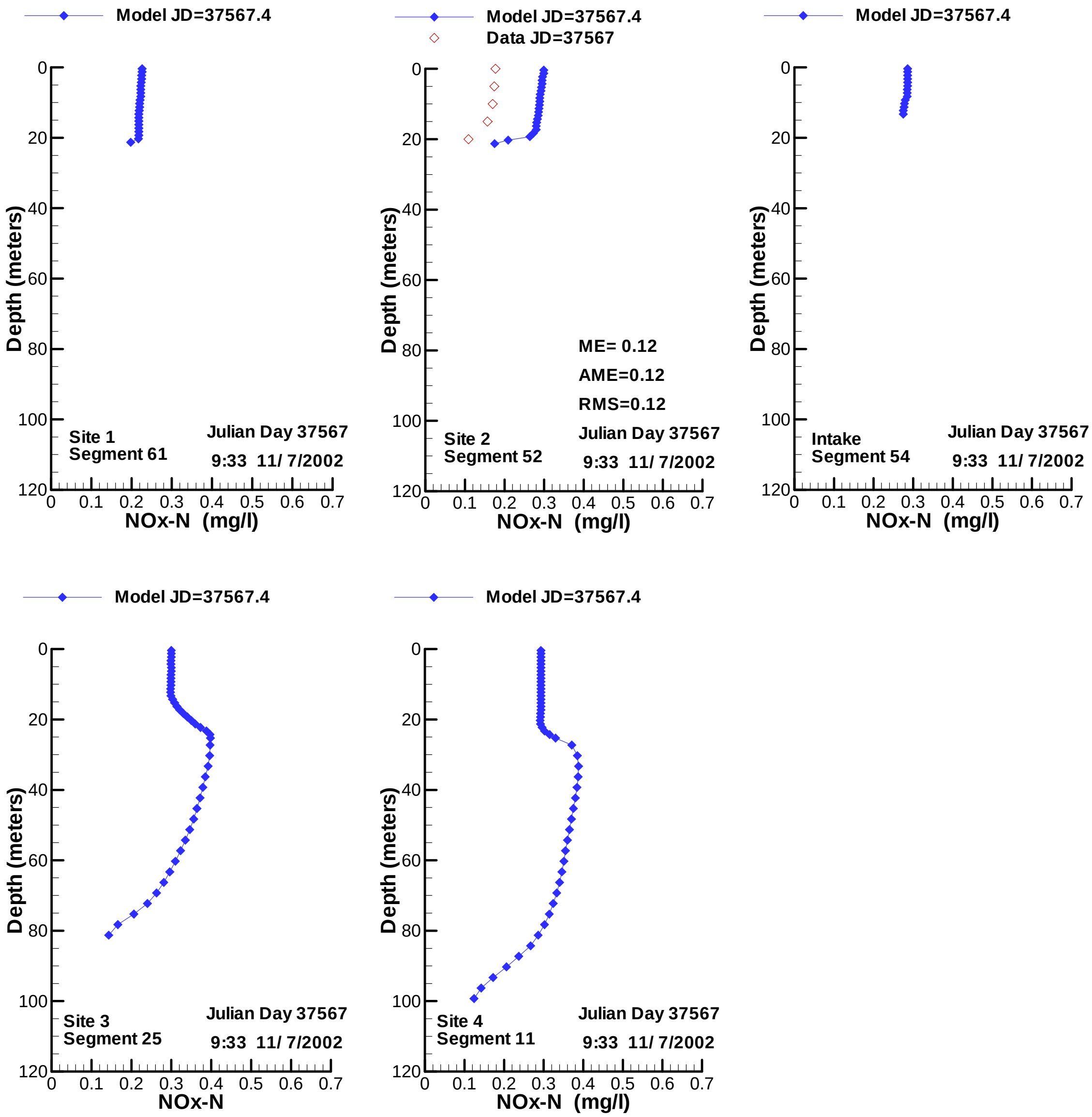

Figure 133. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 11/ 7/2002.

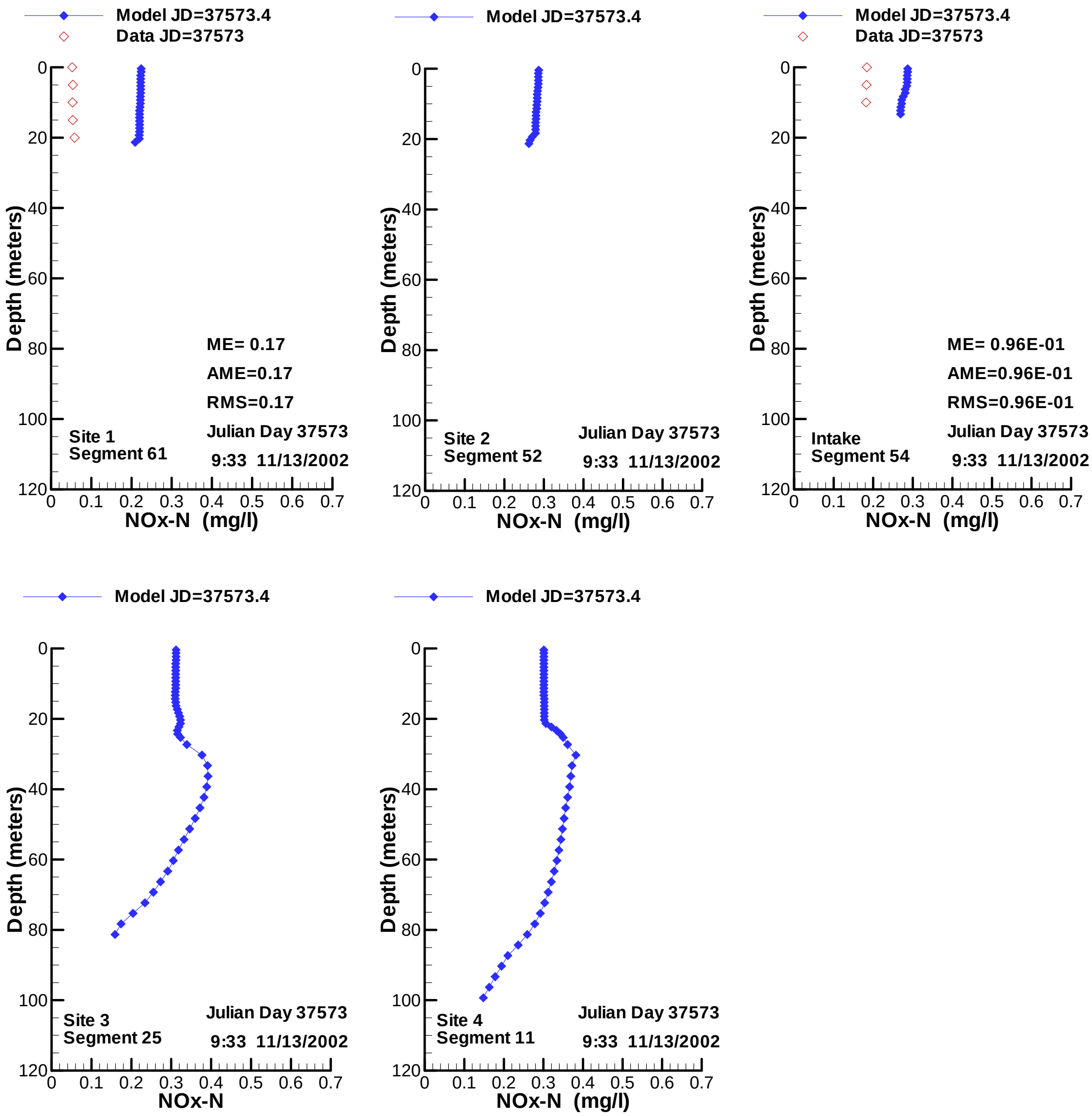

Figure 134. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 11/13/2002.

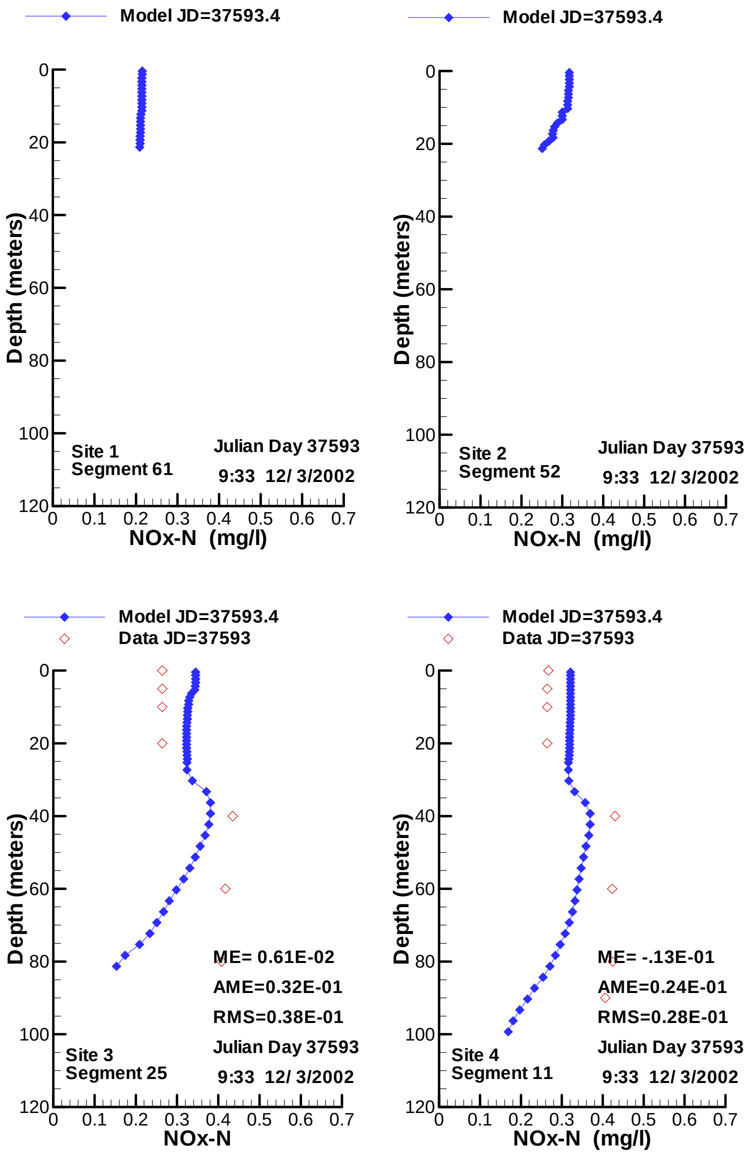

Figure 135. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 12/ 3/2002.

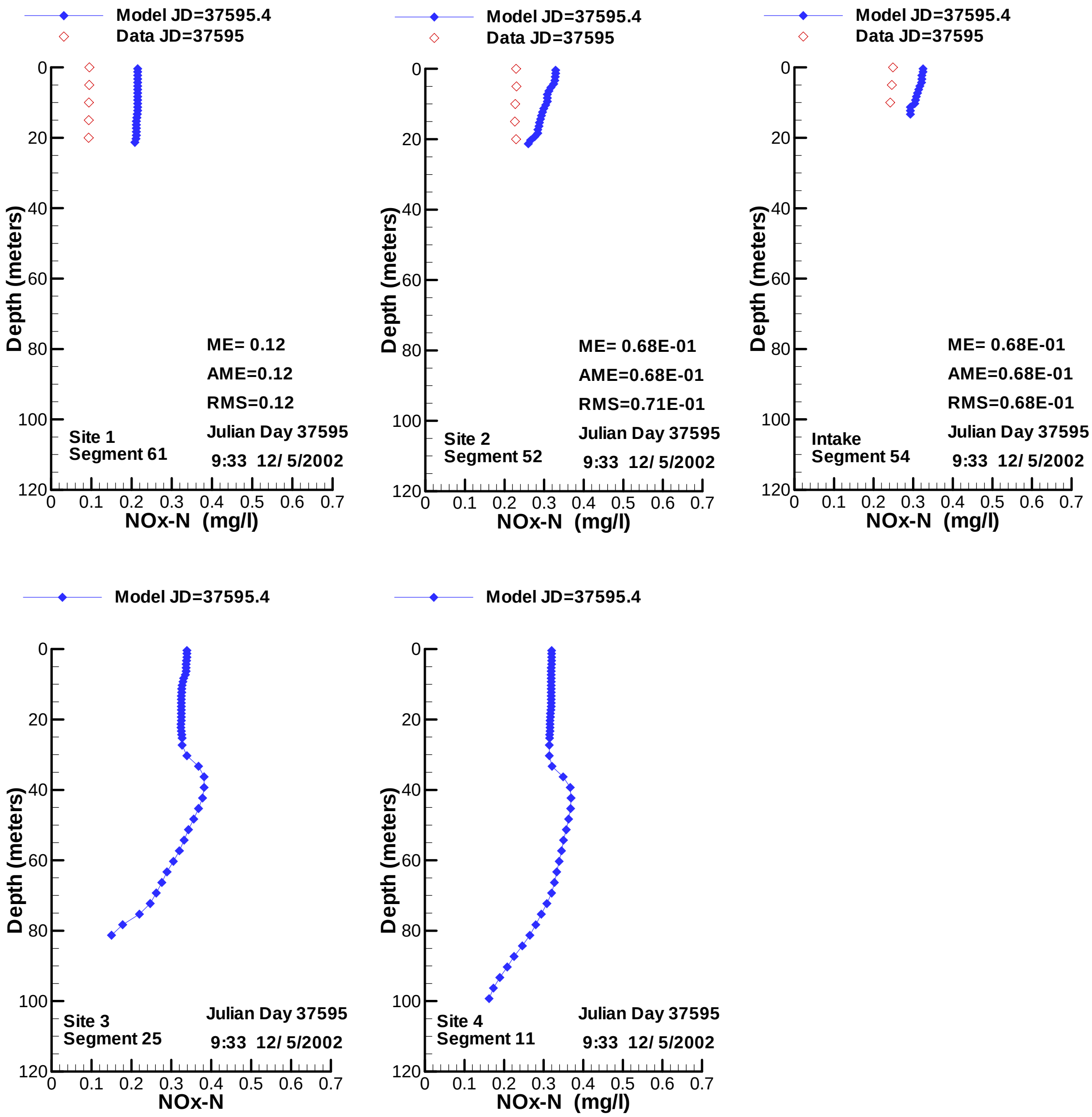

Figure 136. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 12/ 5/2002.

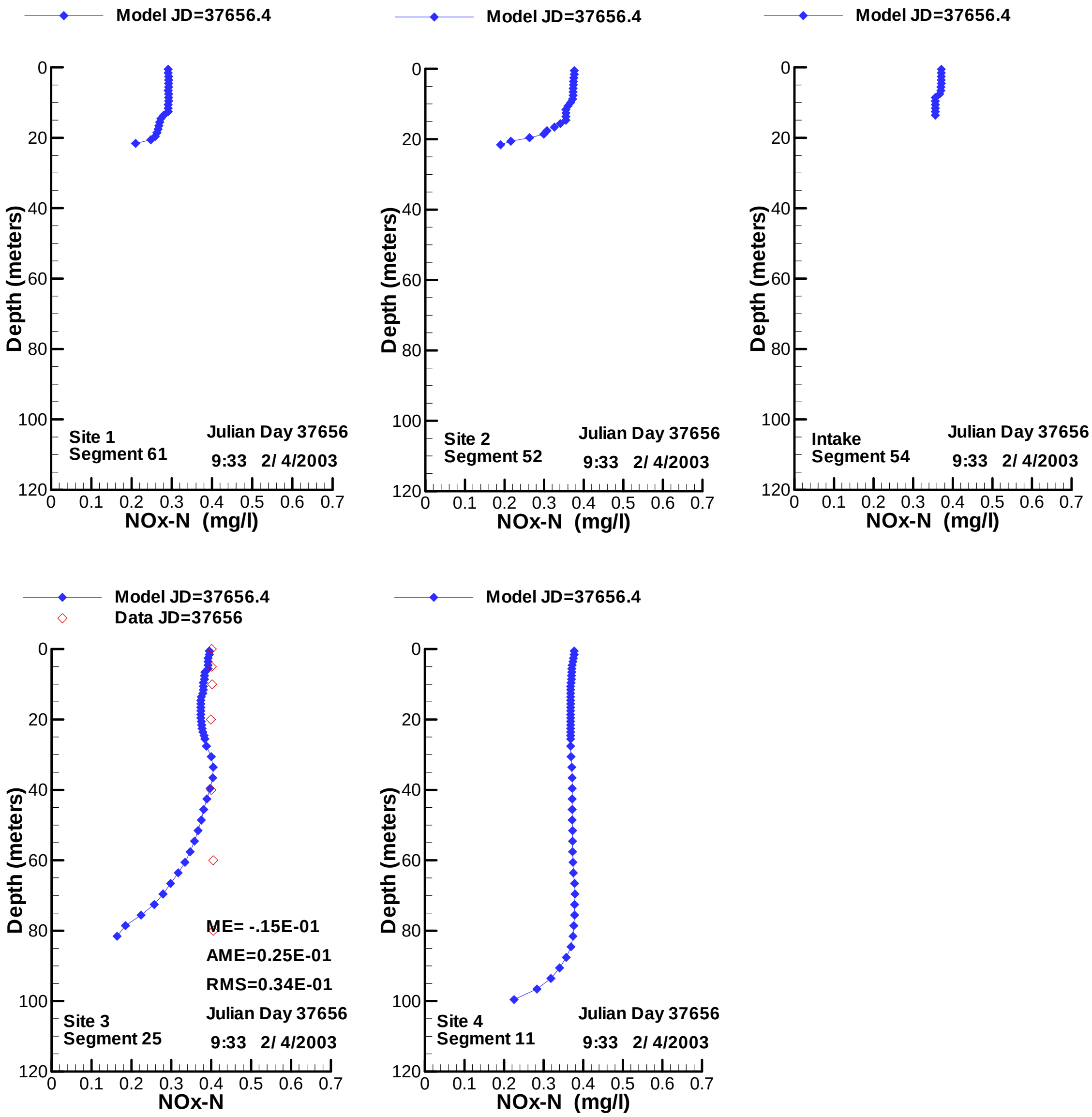

Figure 137. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 2/ 4/2003.

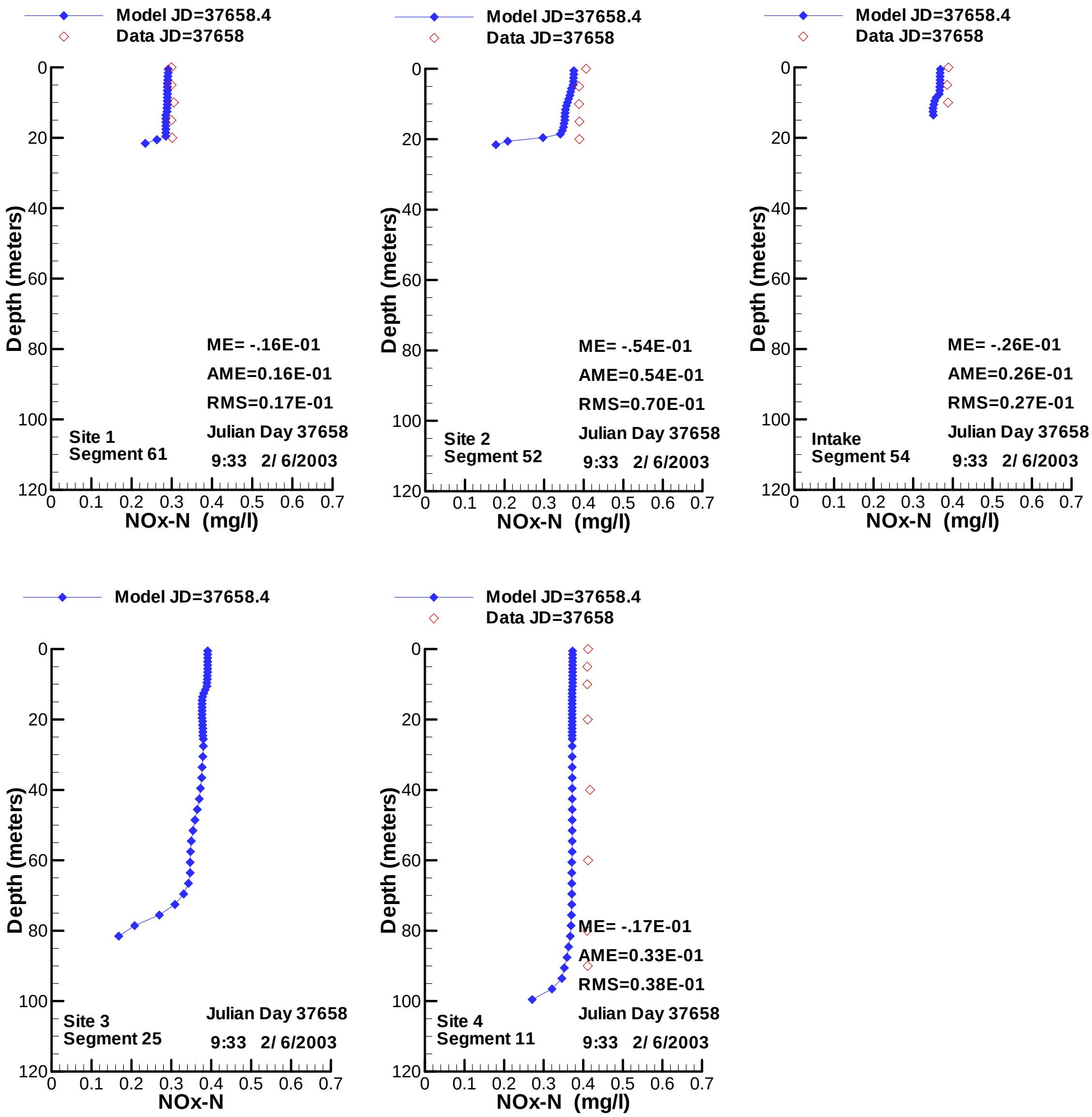

Figure 138. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 2/ 6/2003.

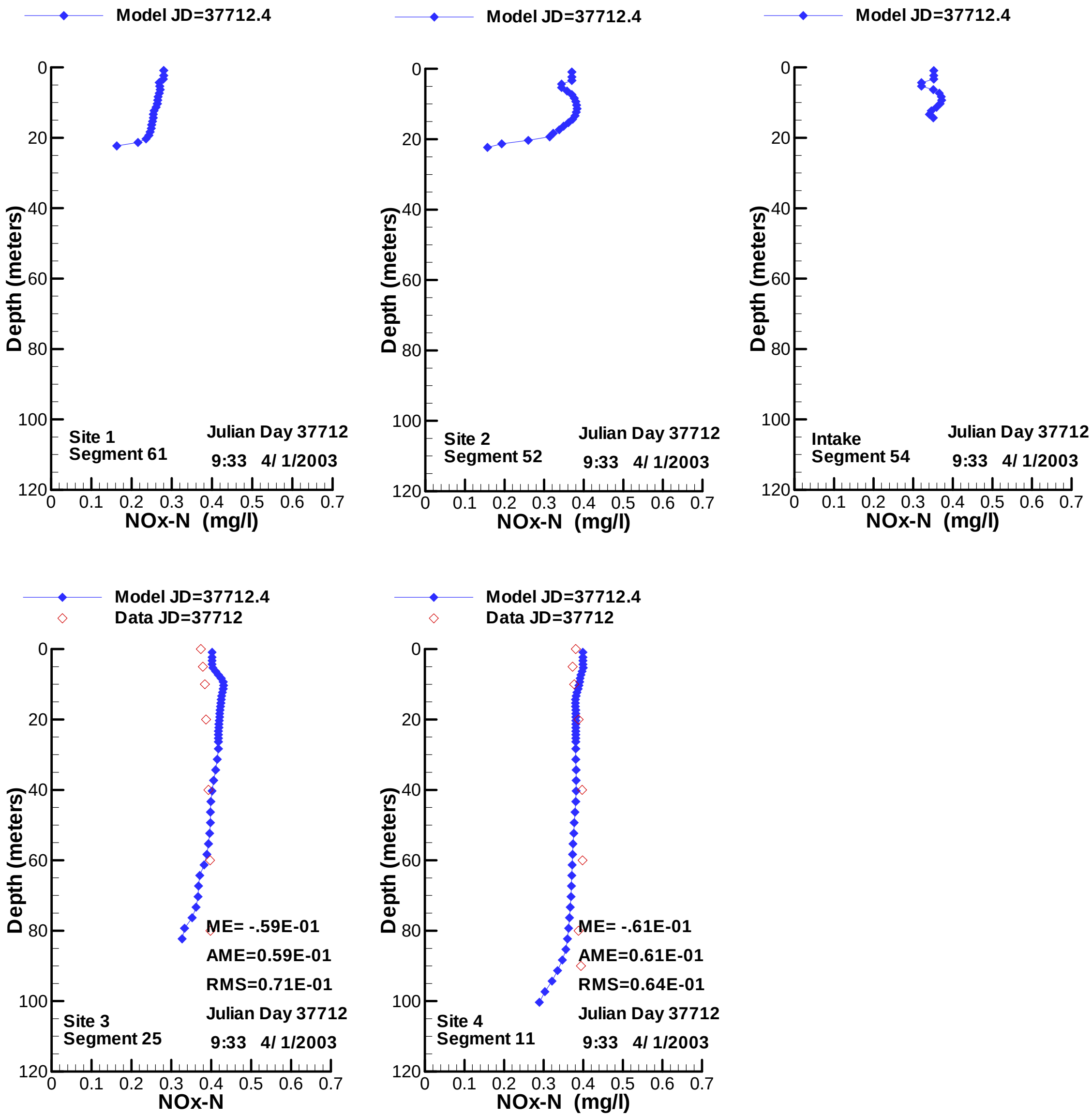

Figure 139. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 4/ 1/2003.

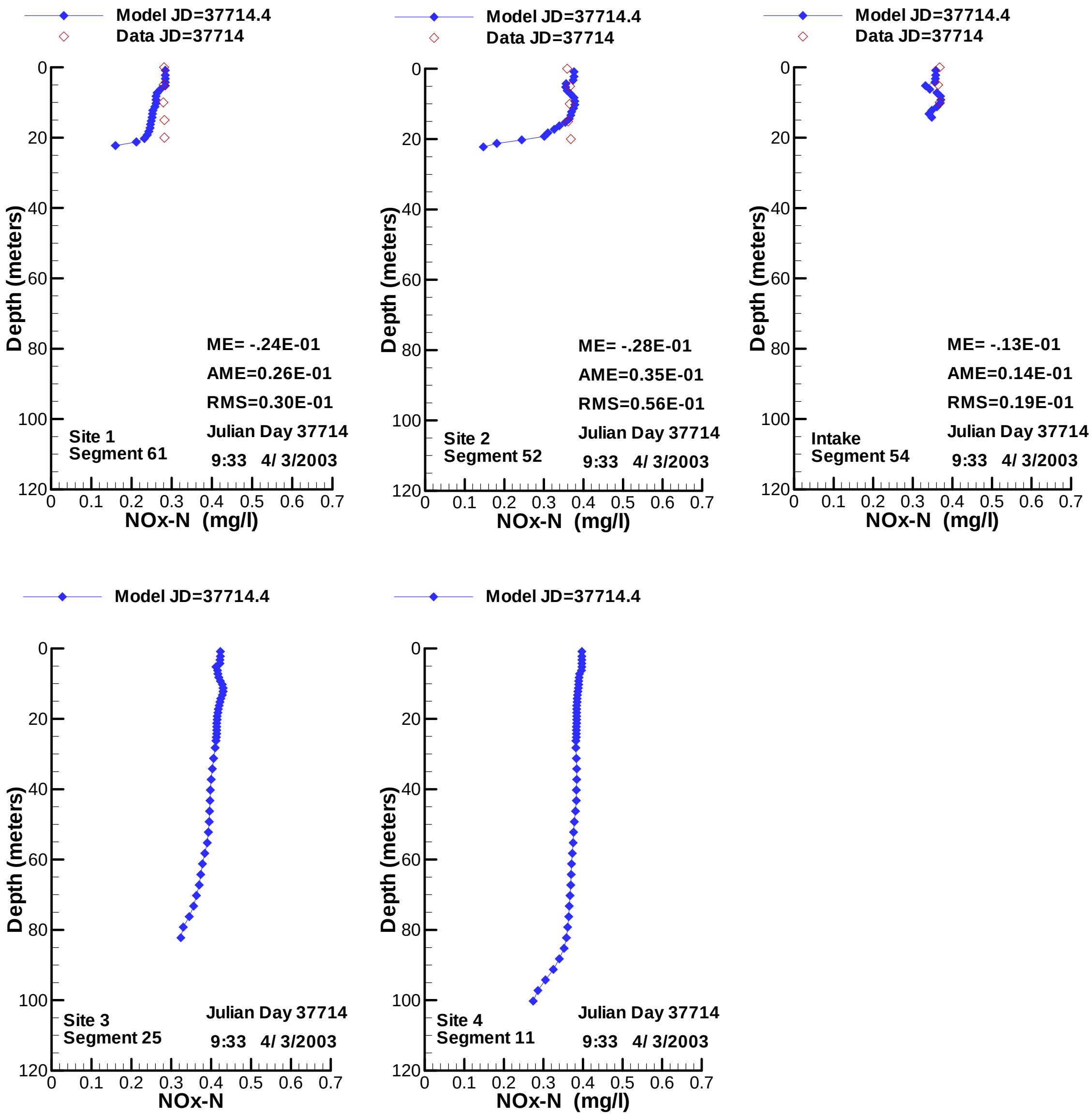

Figure 140. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 4/ 3/2003.

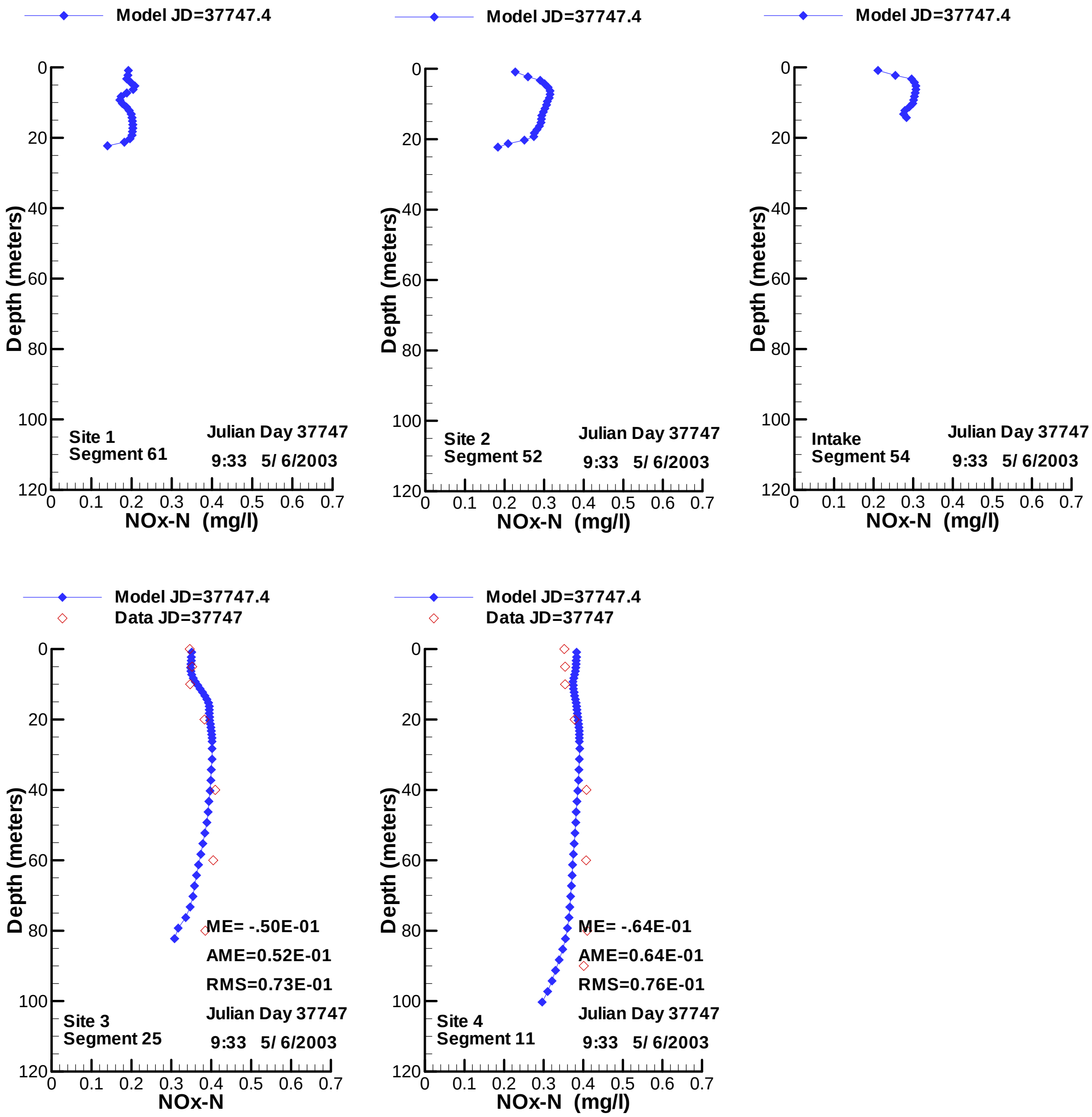

Figure 141. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 5/ 6/2003.

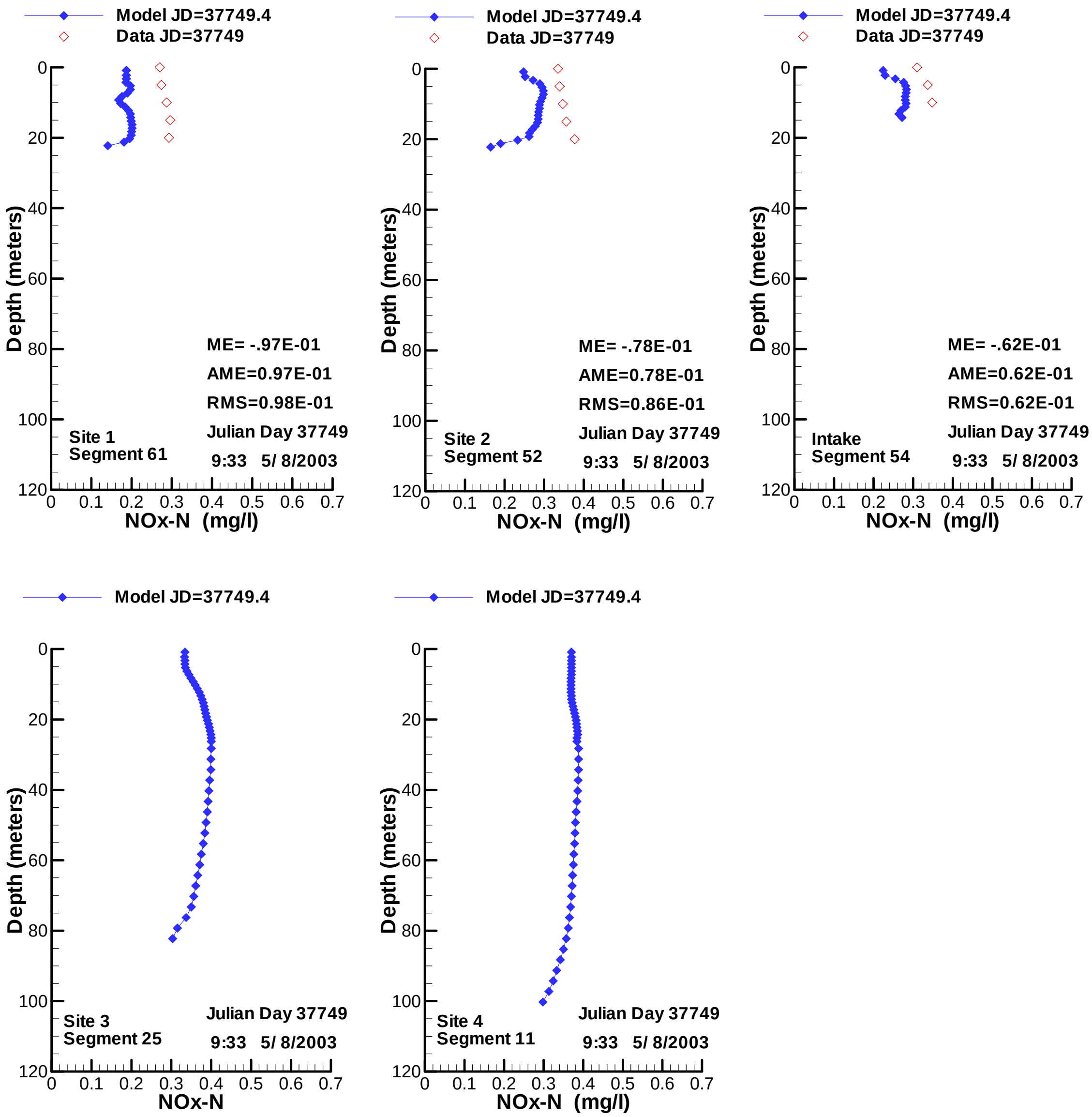

Figure 142. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 5/ 8/2003.

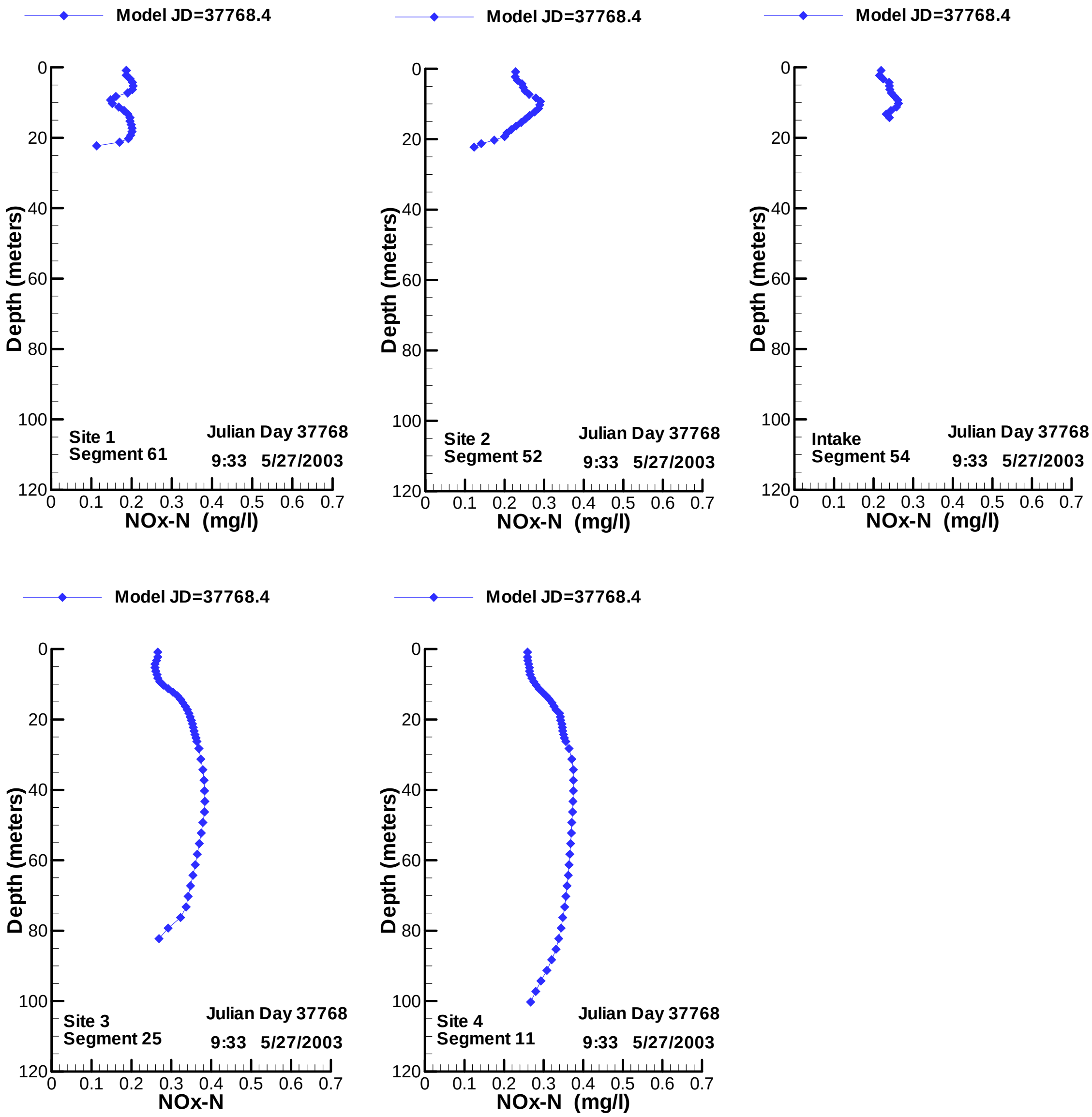

Figure 143. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 5/27/2003.

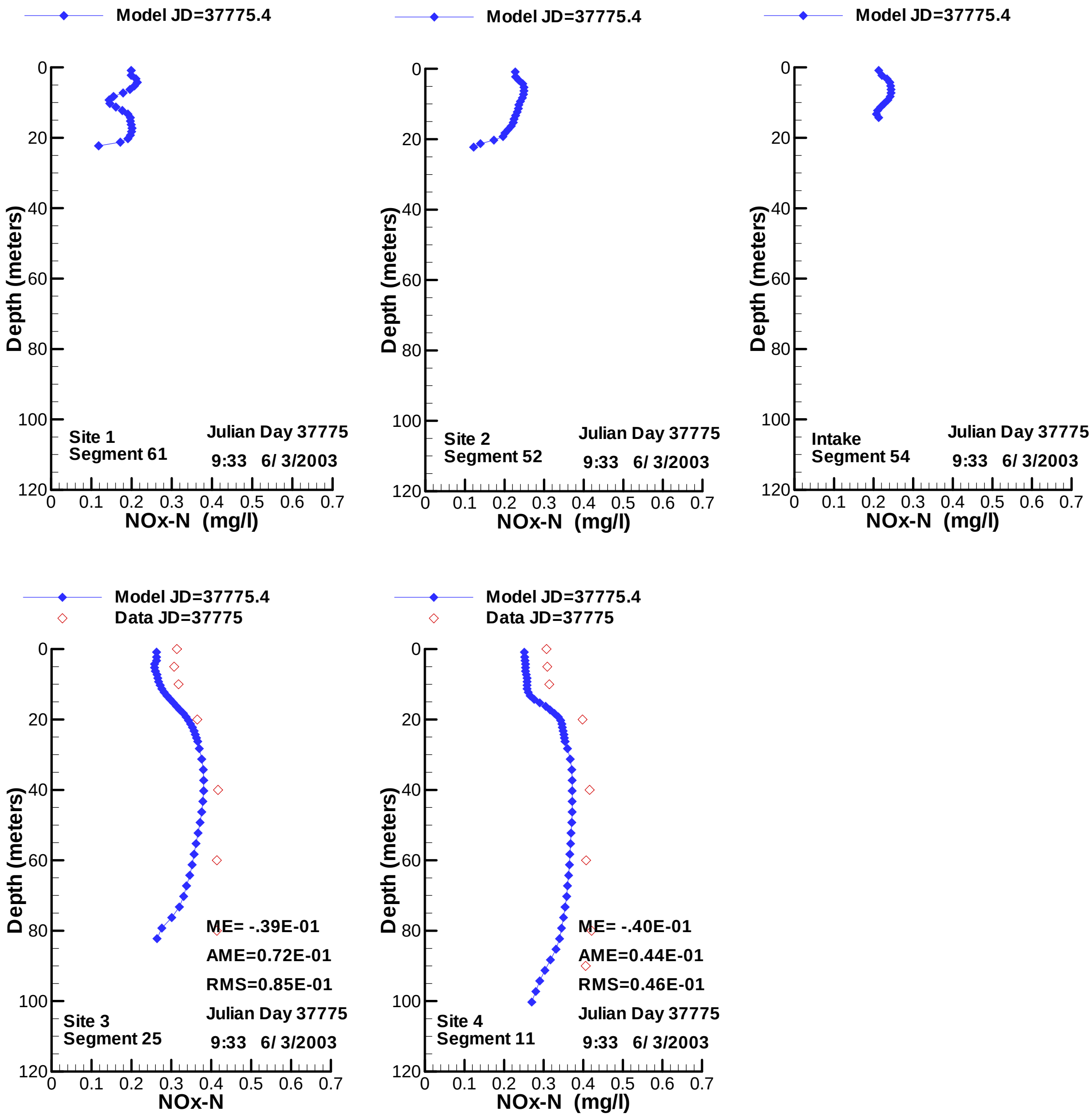

Figure 144. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 6/ 3/2003.

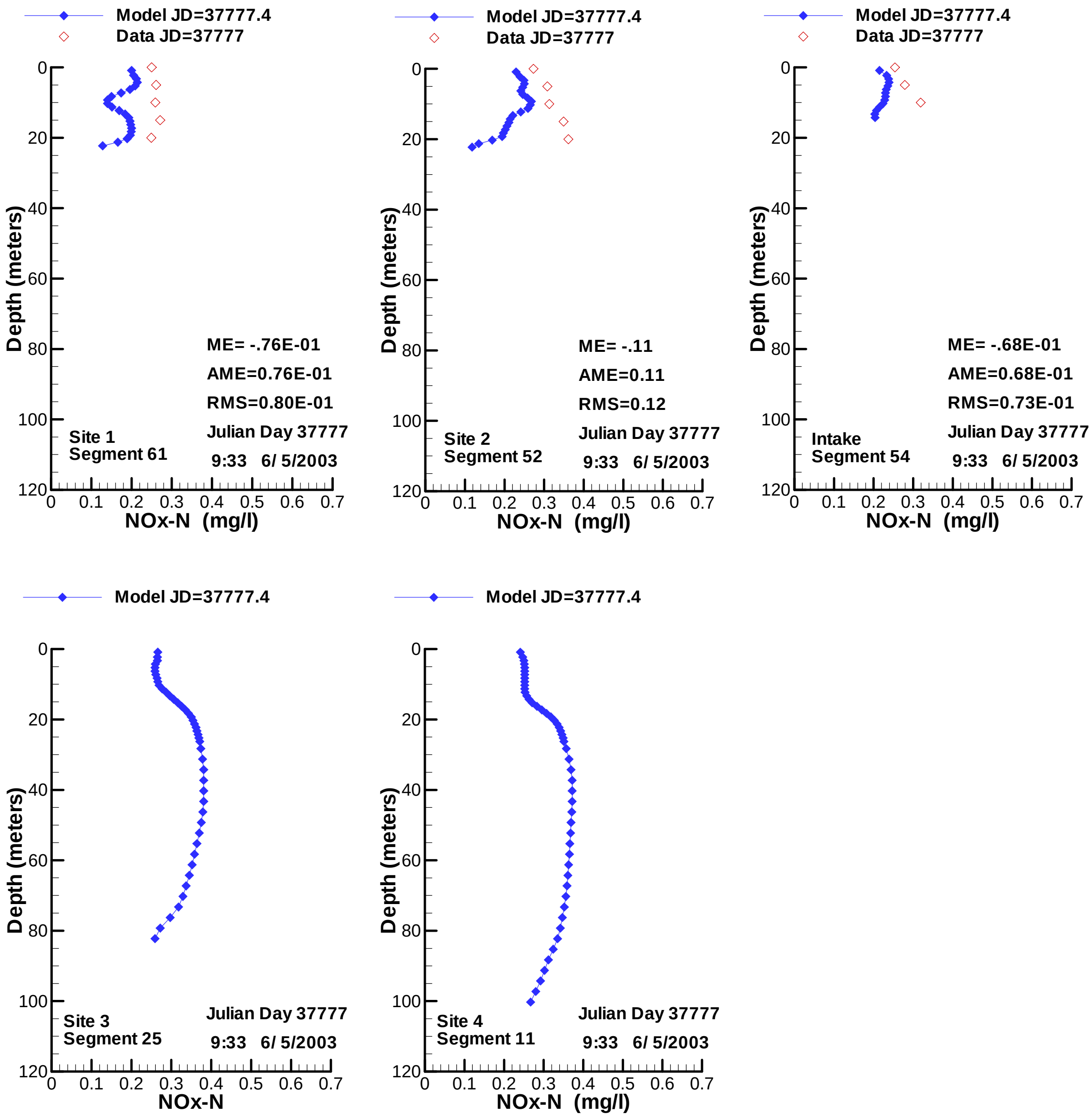

Figure 145. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 6/ 5/2003.

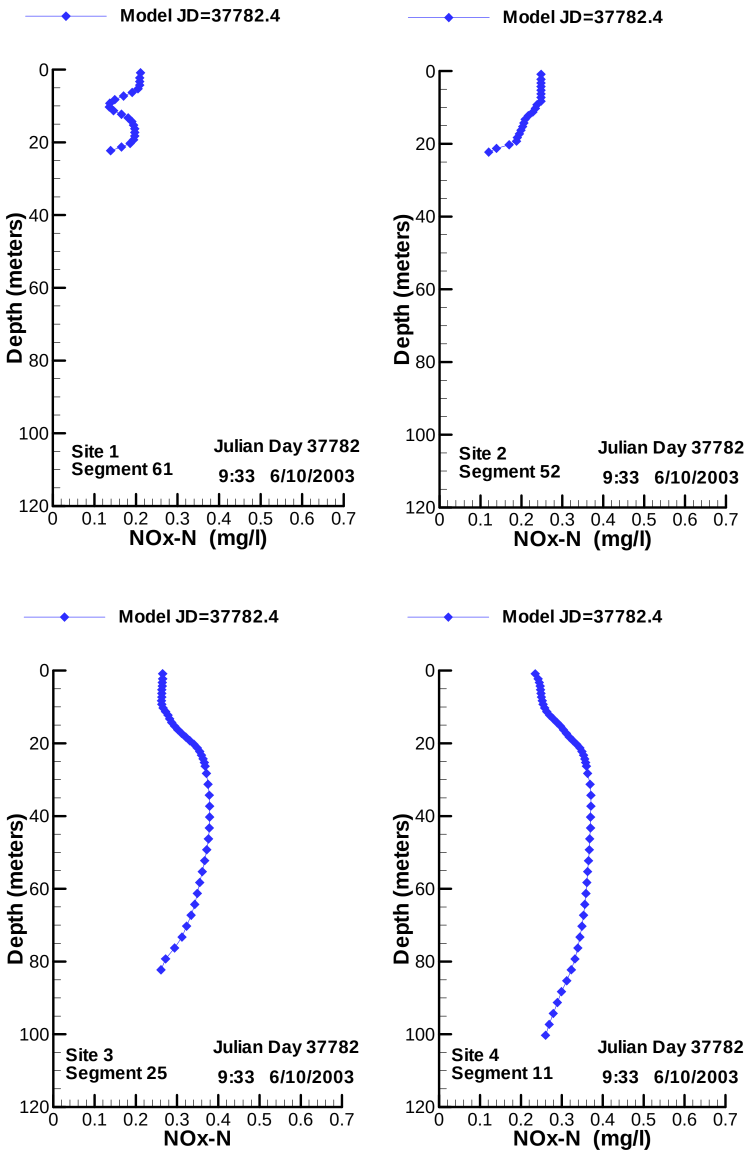

Figure 146. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 6/10/2003.

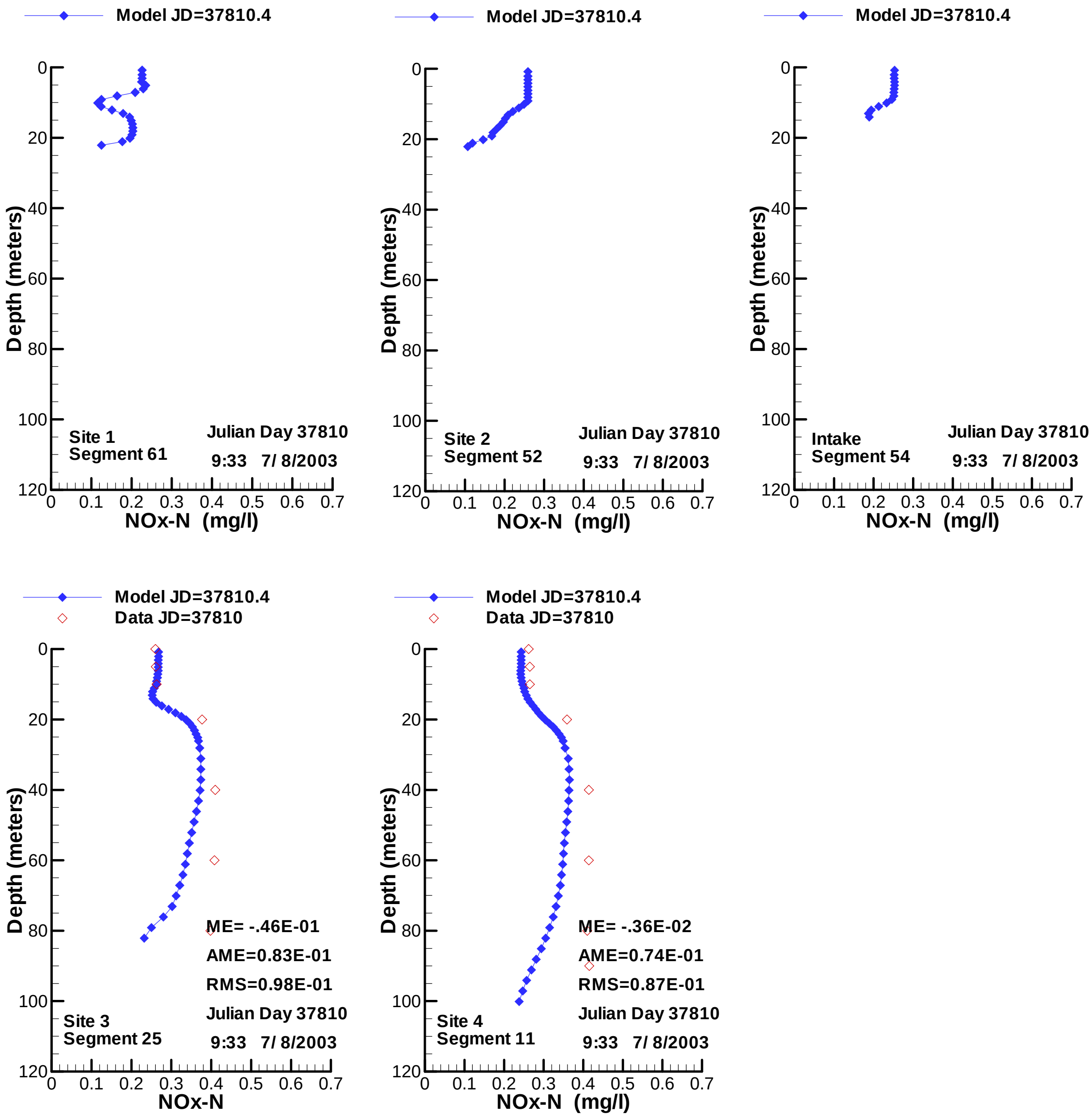

Figure 147. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/ 8/2003.

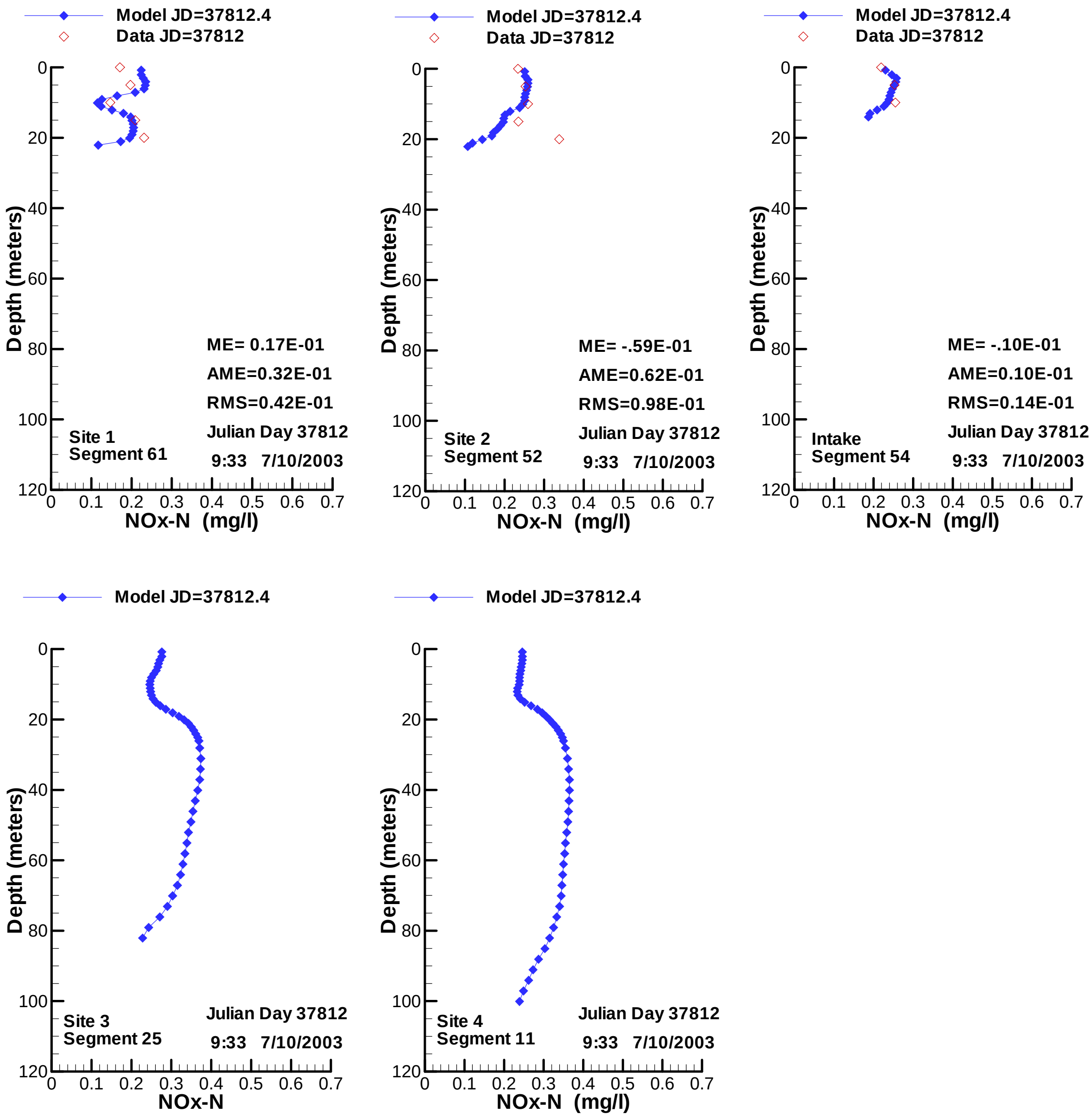

Figure 148. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/10/2003.

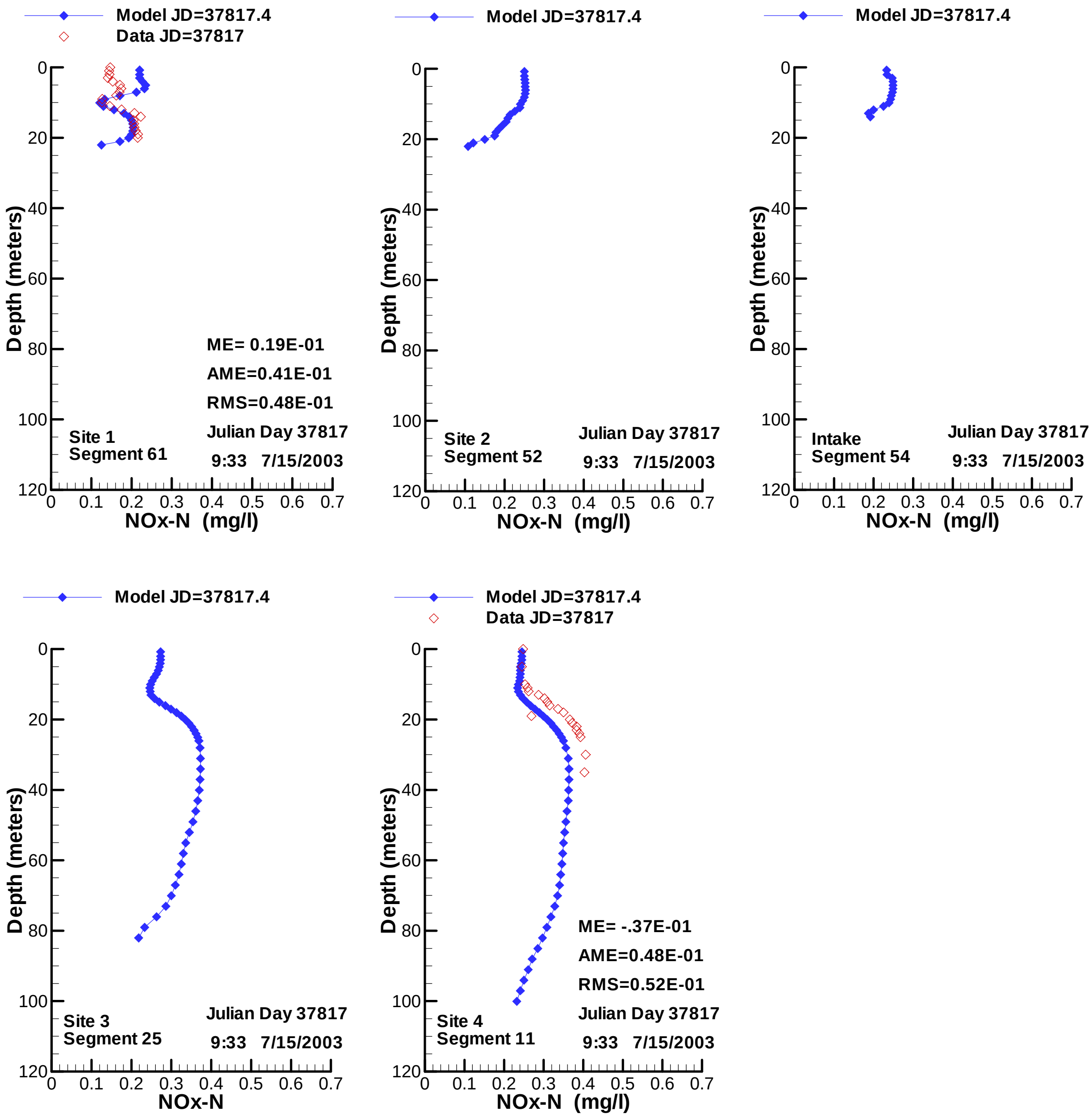

Figure 149. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/15/2003.

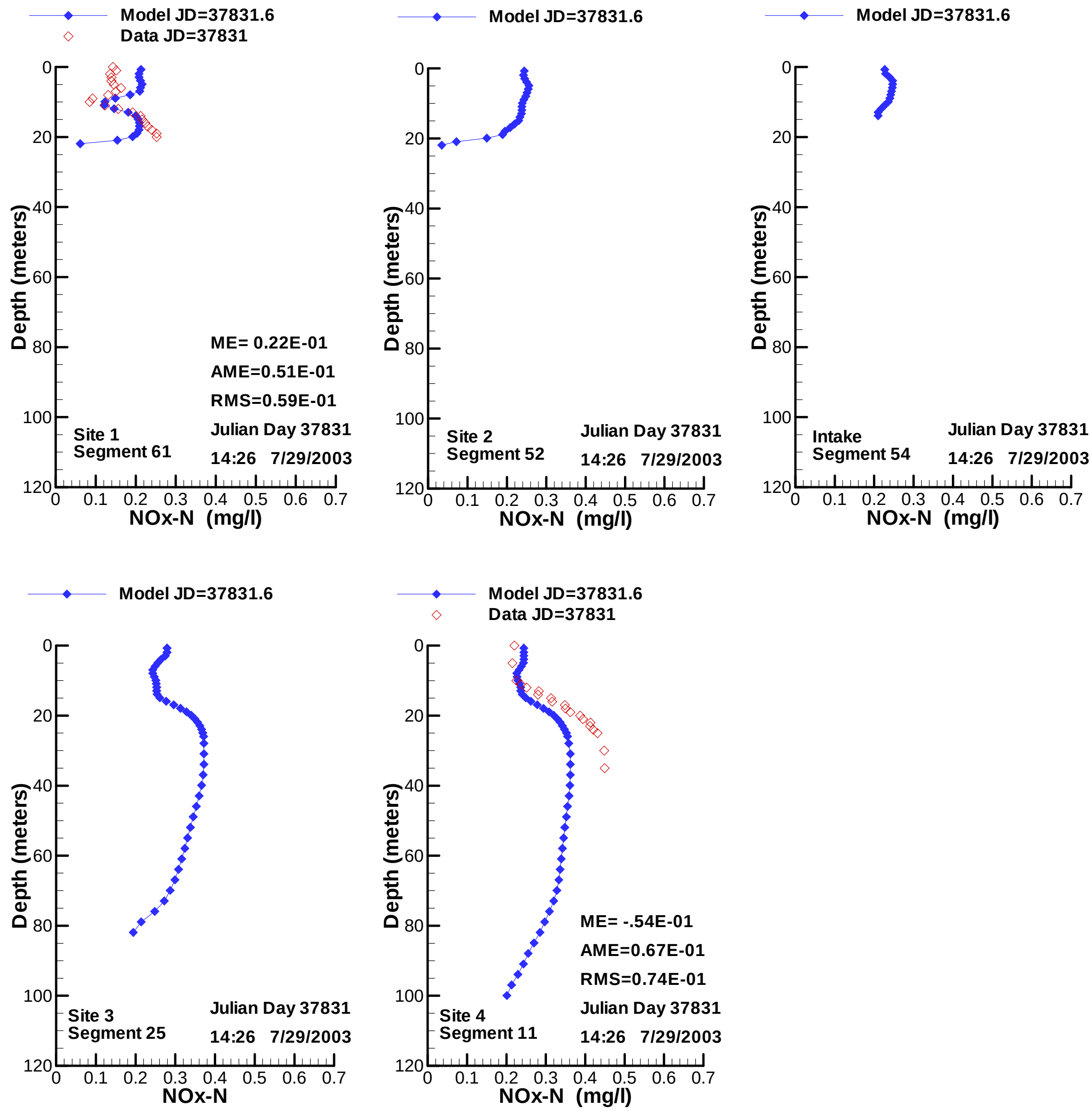

Figure 150. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 7/29/2003.

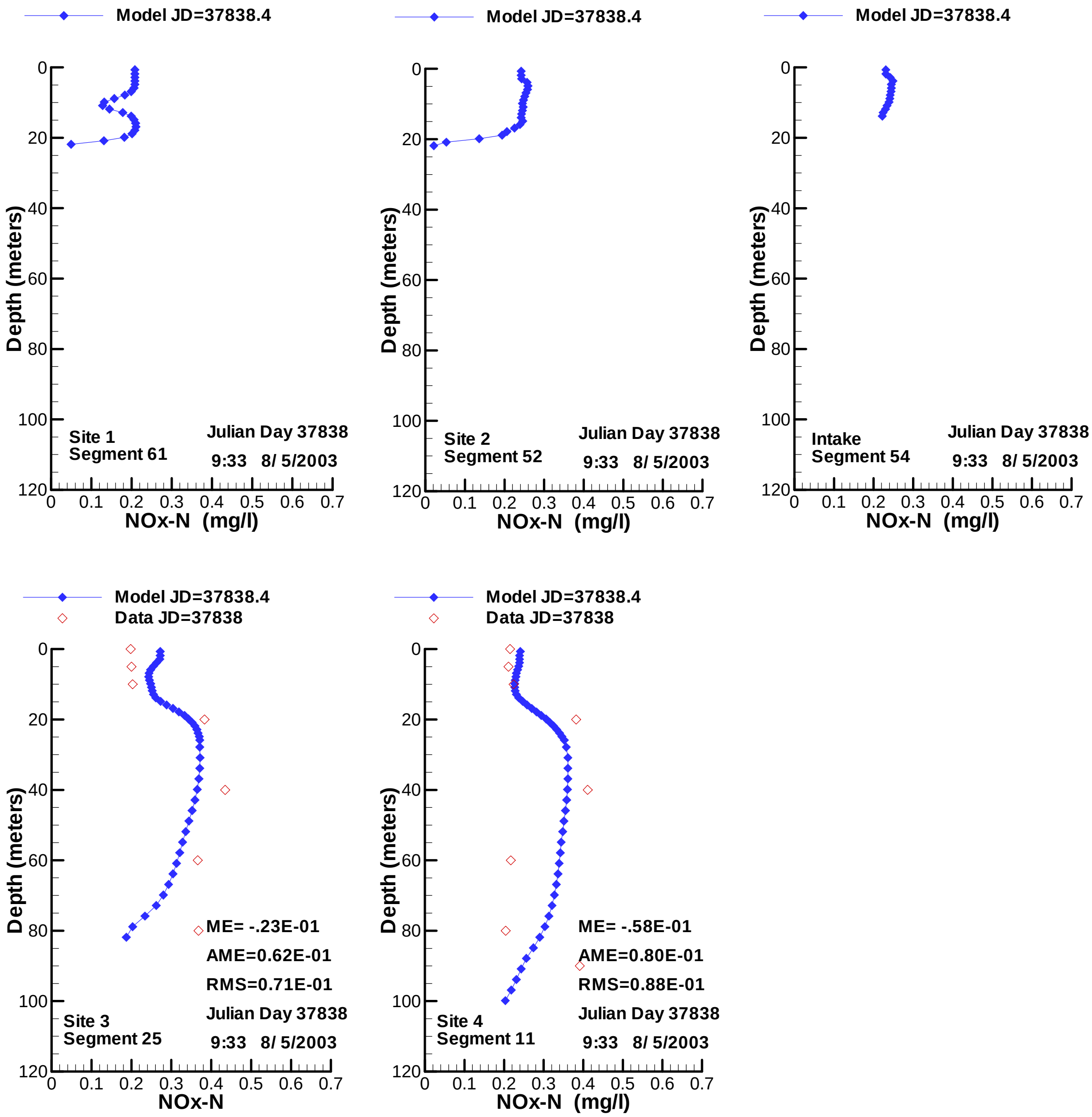

Figure 151. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/ 5/2003.

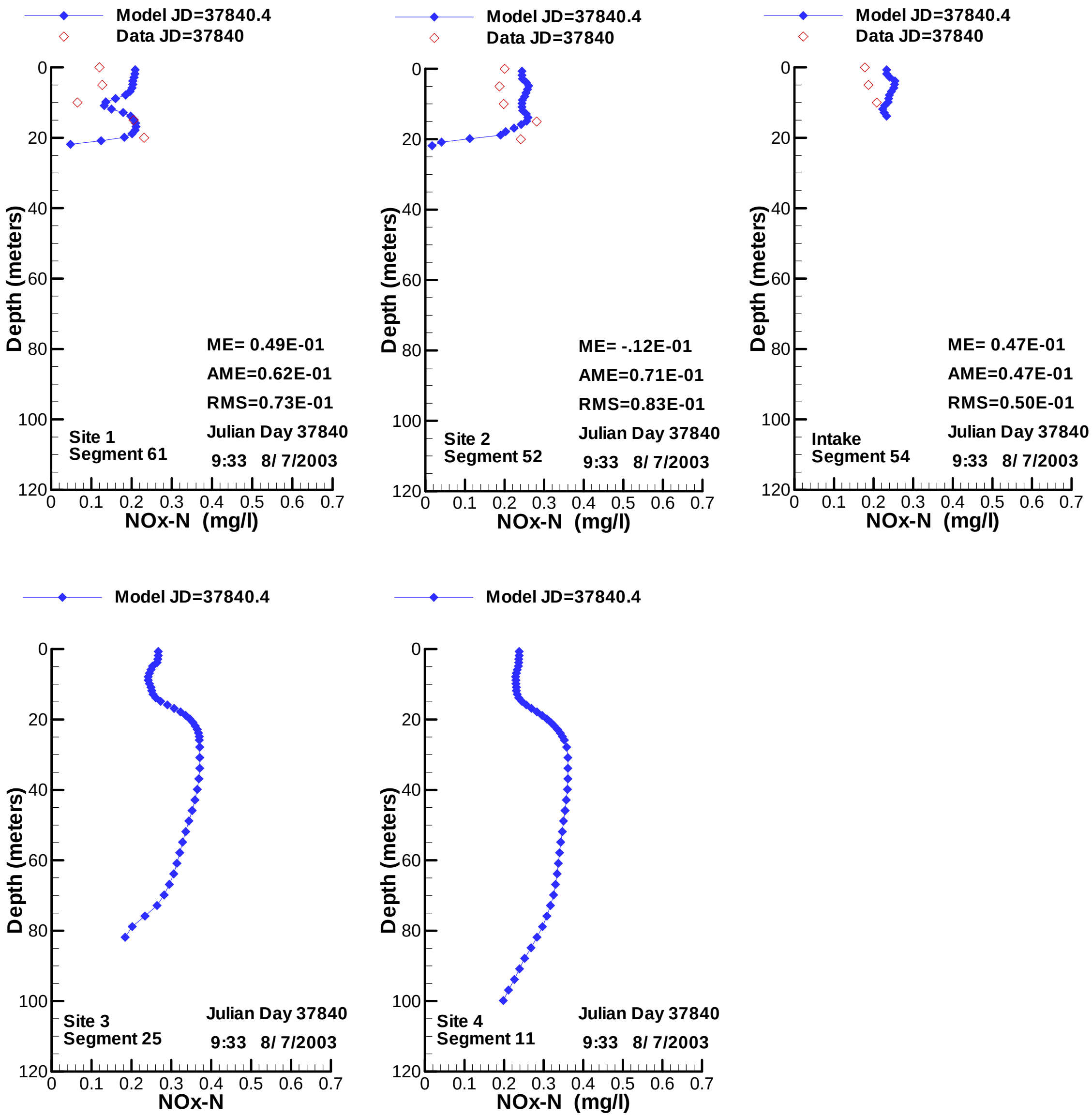

Figure 152. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/ 7/2003.

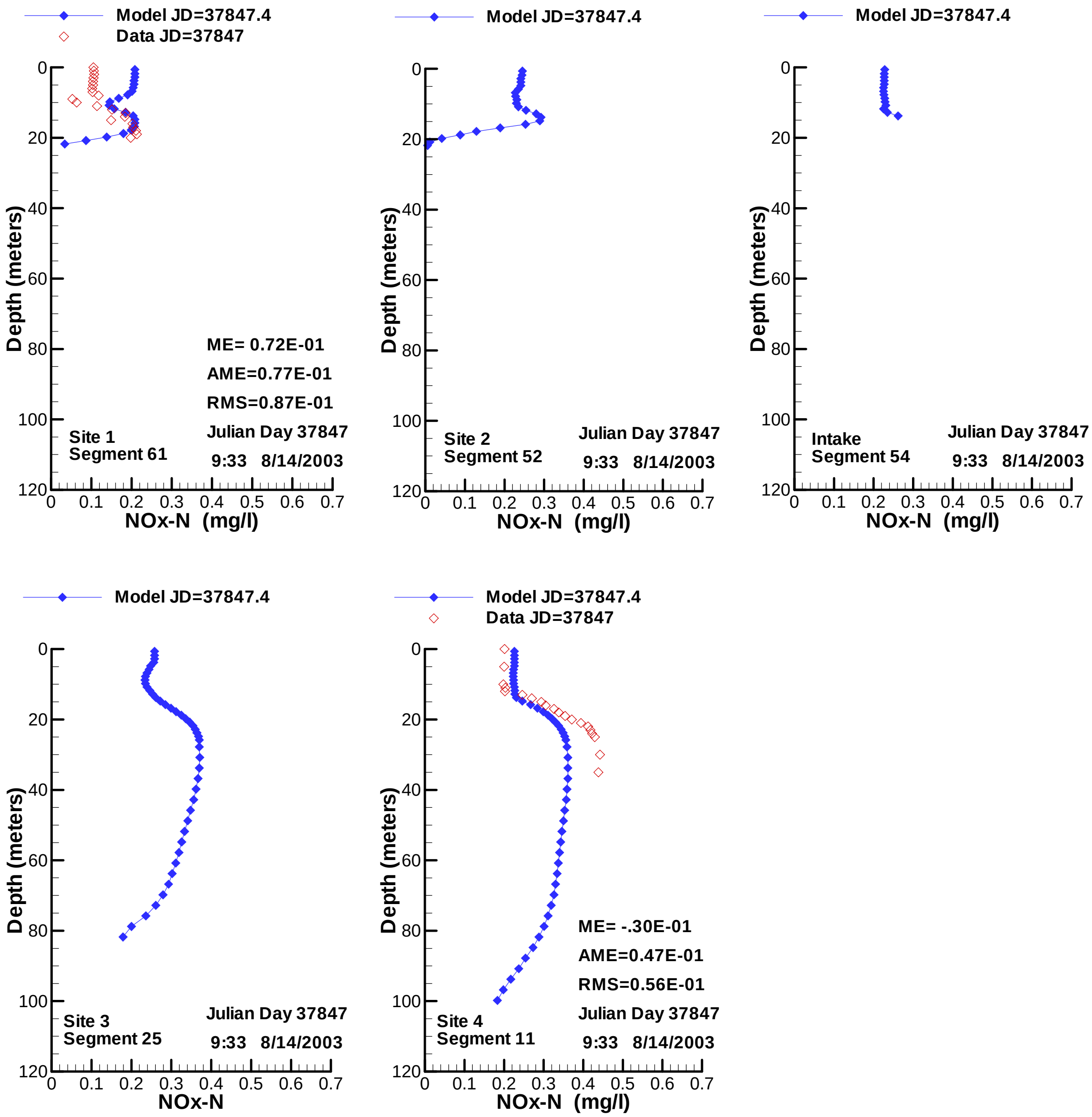

Figure 153. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/14/2003.

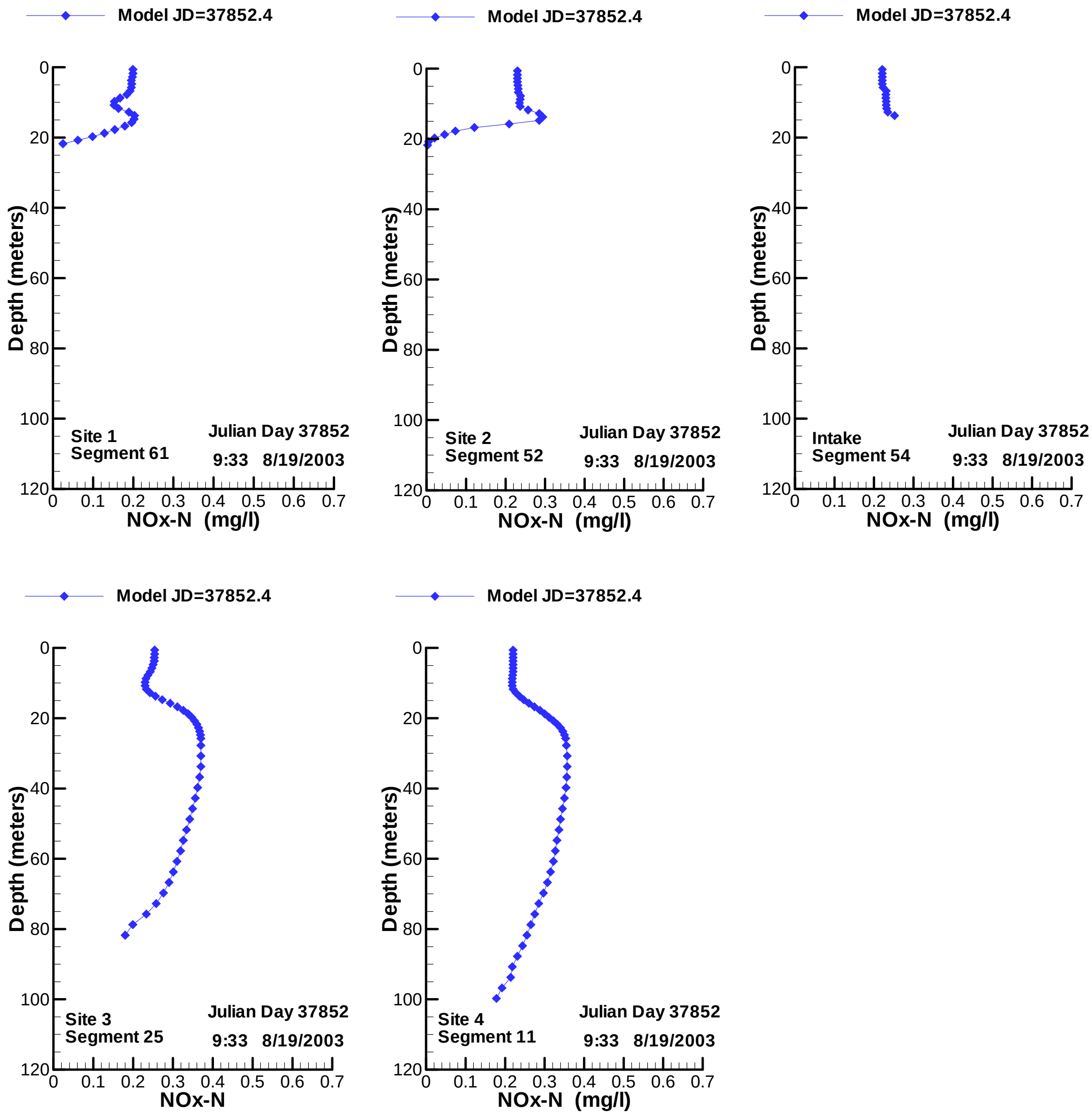

Figure 154. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/19/2003.

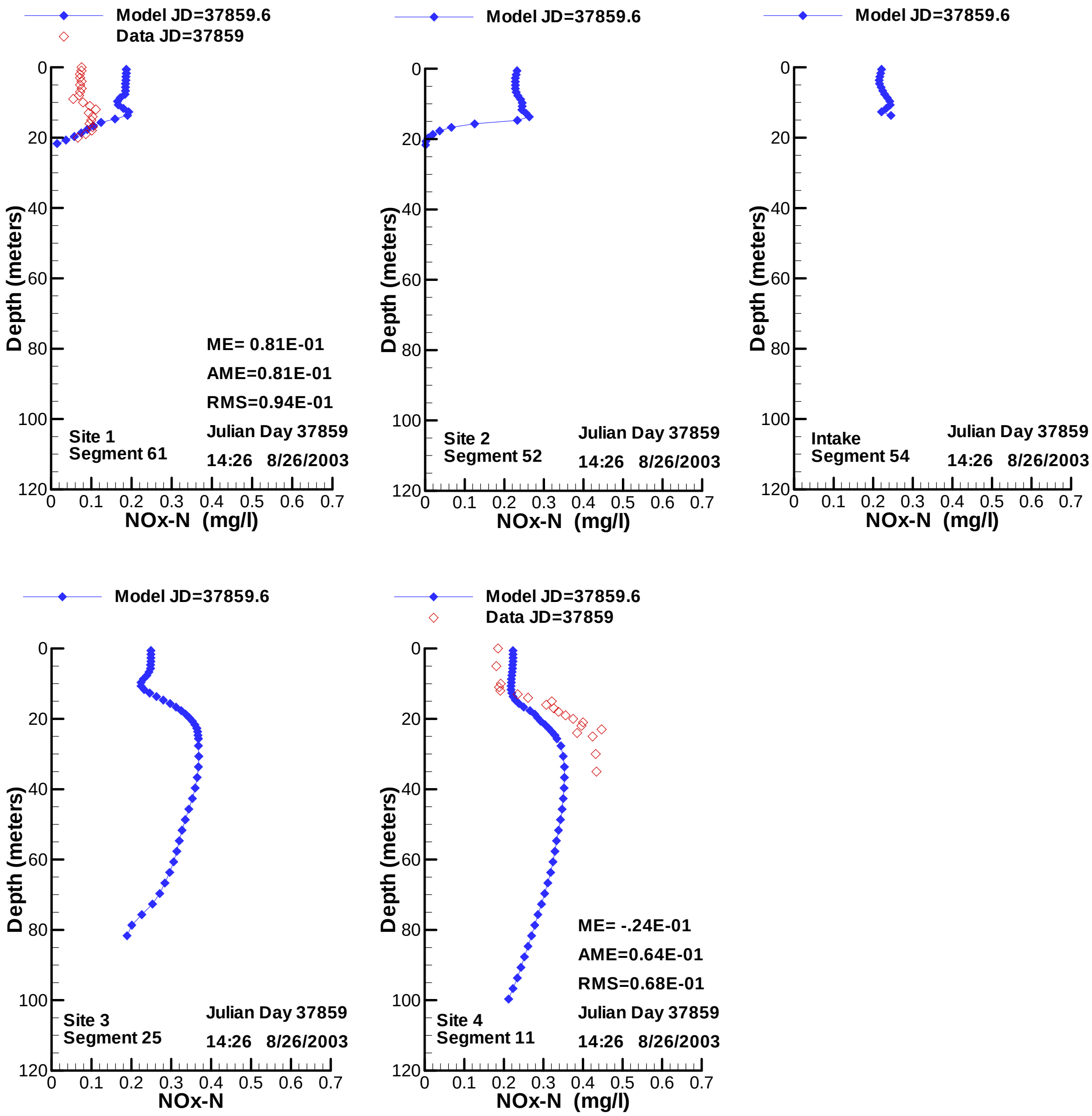

Figure 155. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 8/26/2003.

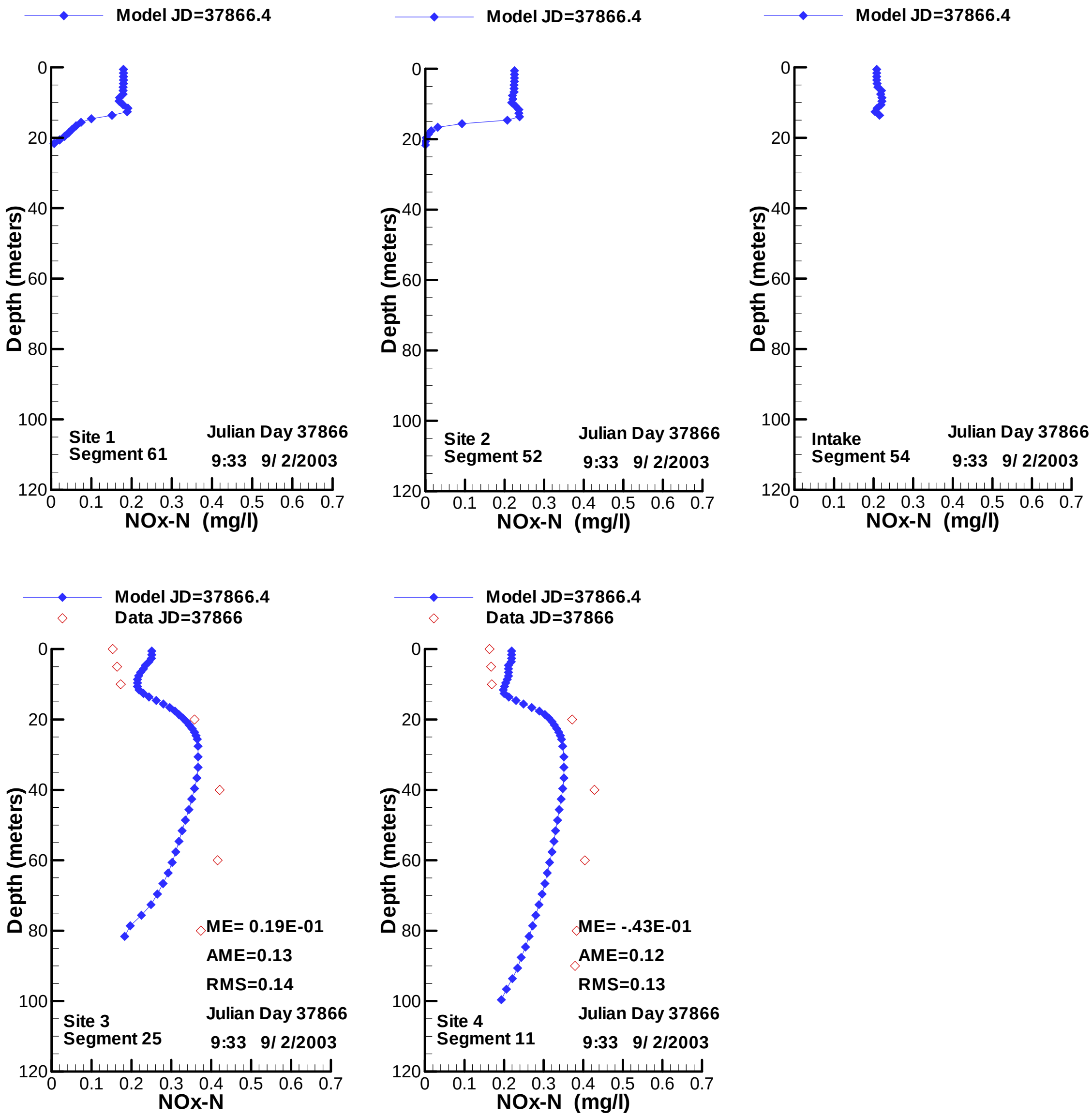

Figure 156. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/ 2/2003.

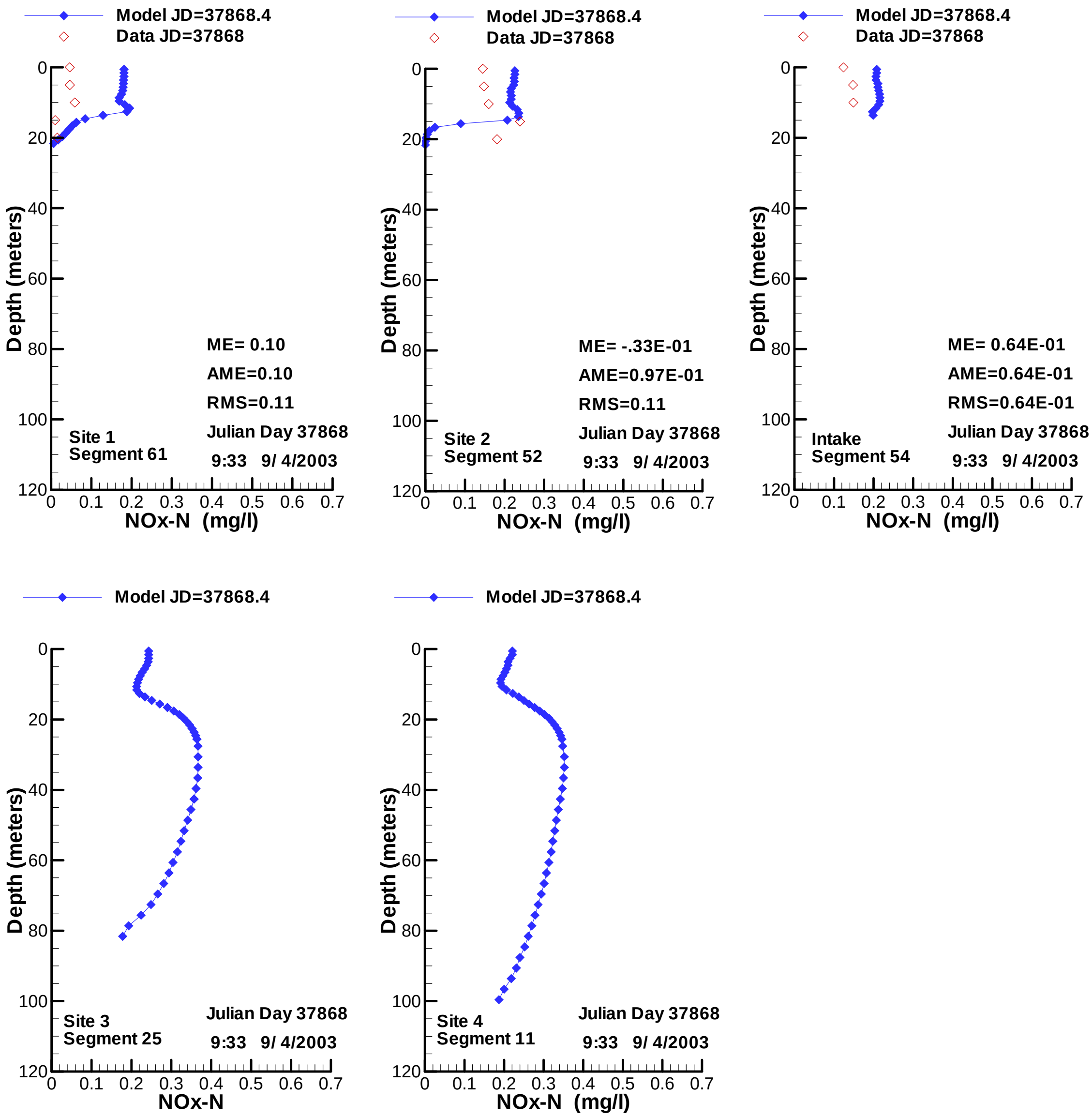

Figure 157. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/ 4/2003.

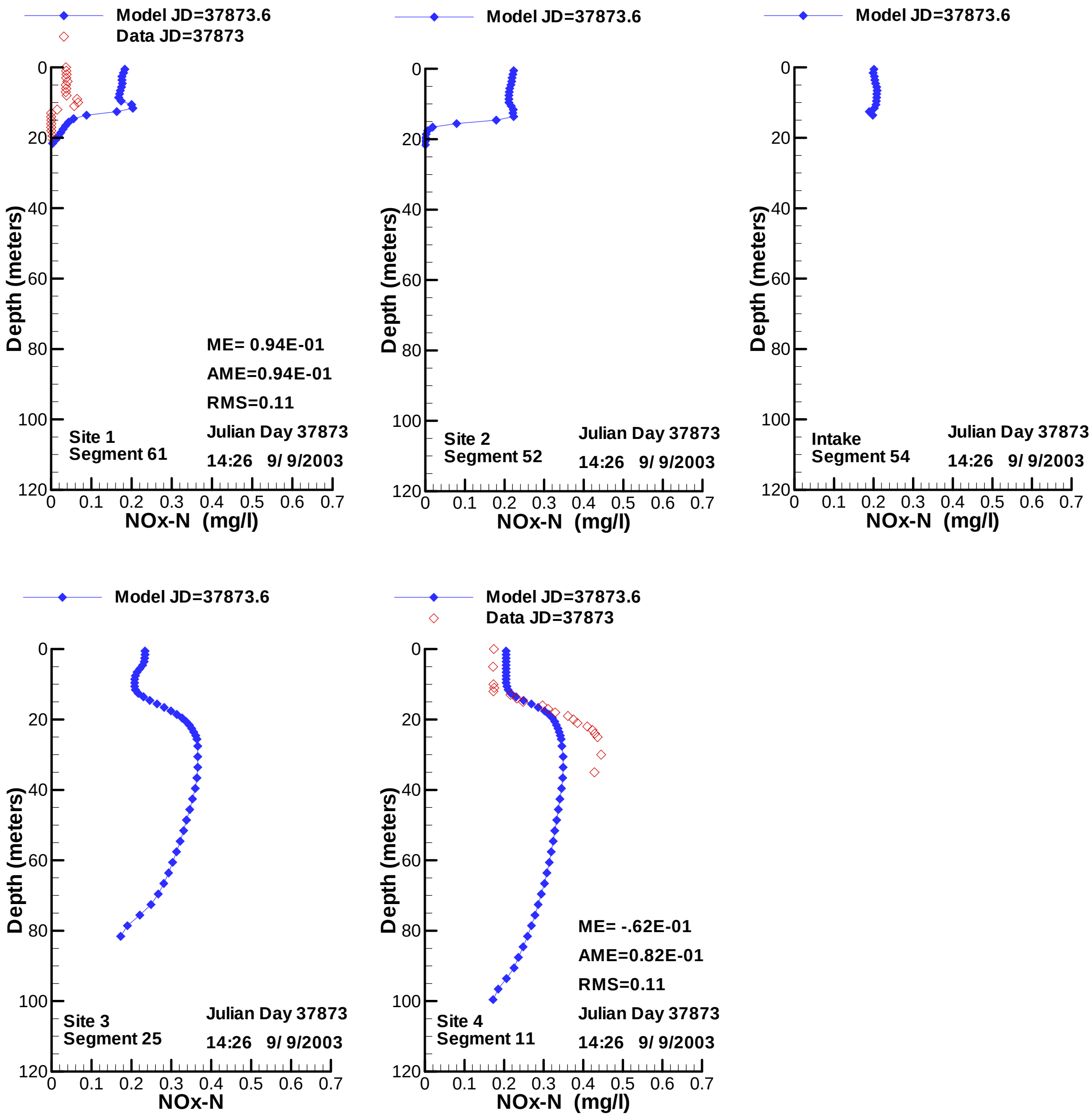

Figure 158. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/ 9/2003.

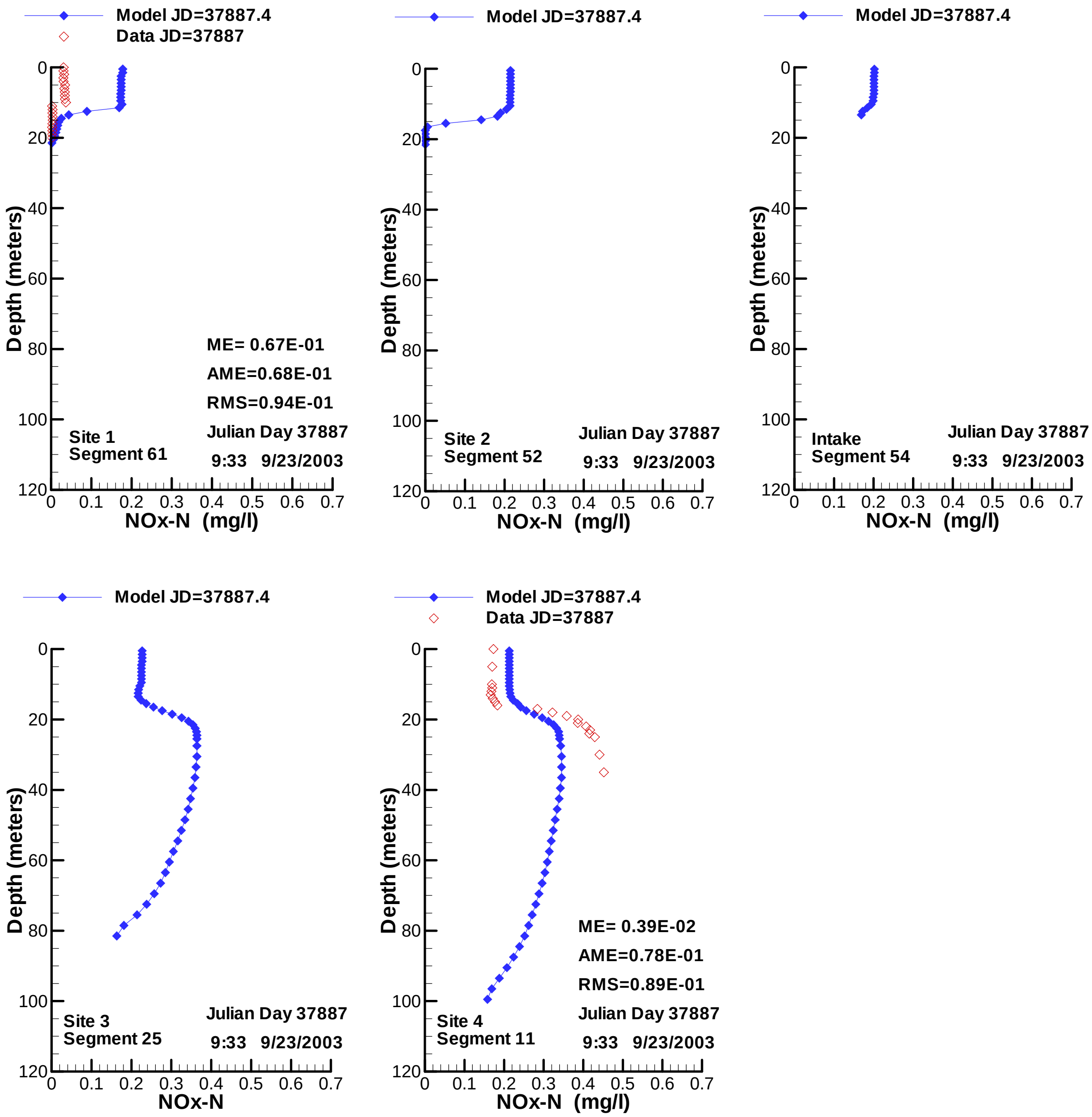

Figure 159. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 9/23/2003.

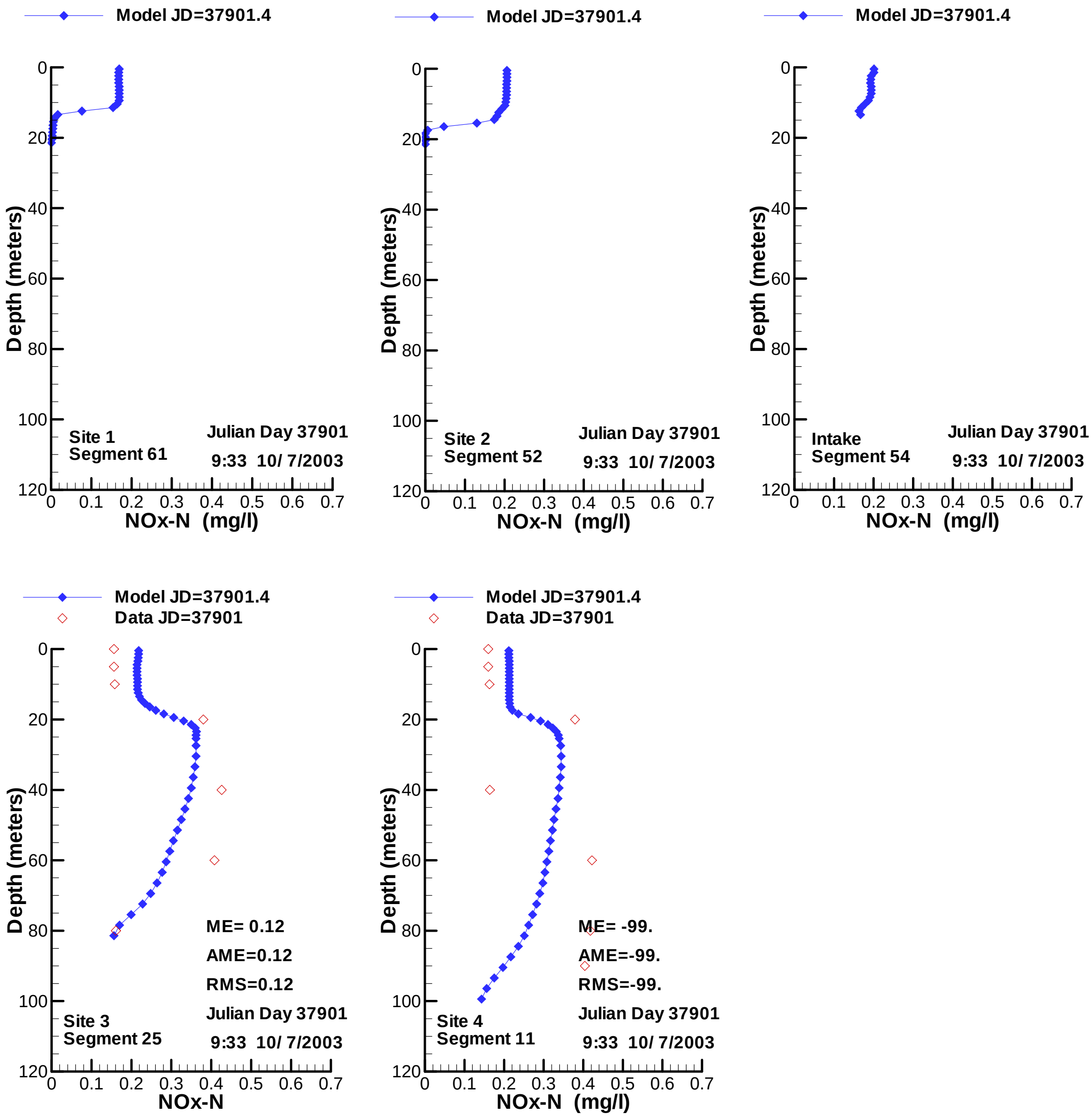

Figure 160. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 10/ 7/2003.

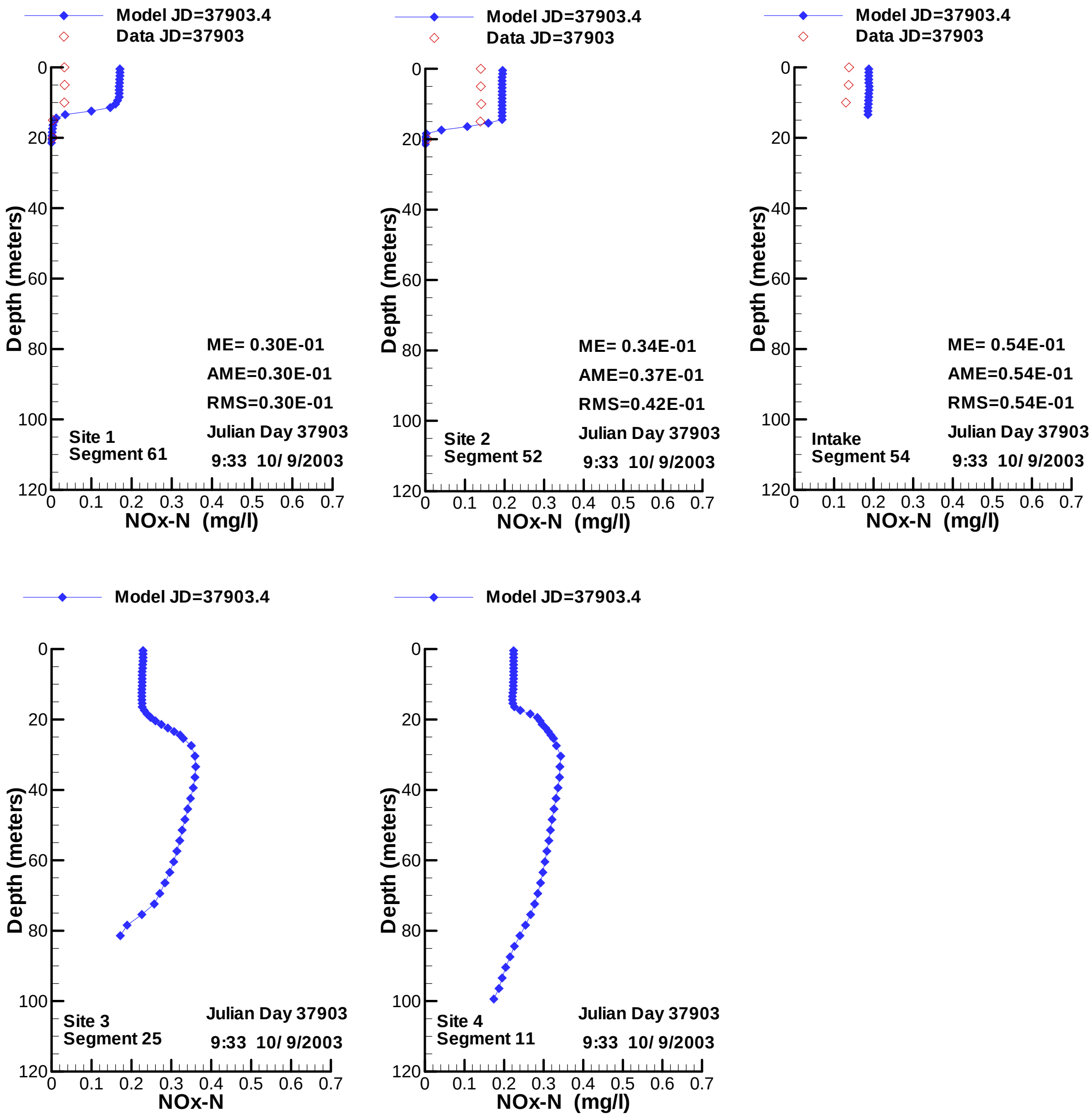

Figure 161. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 10/ 9/2003.

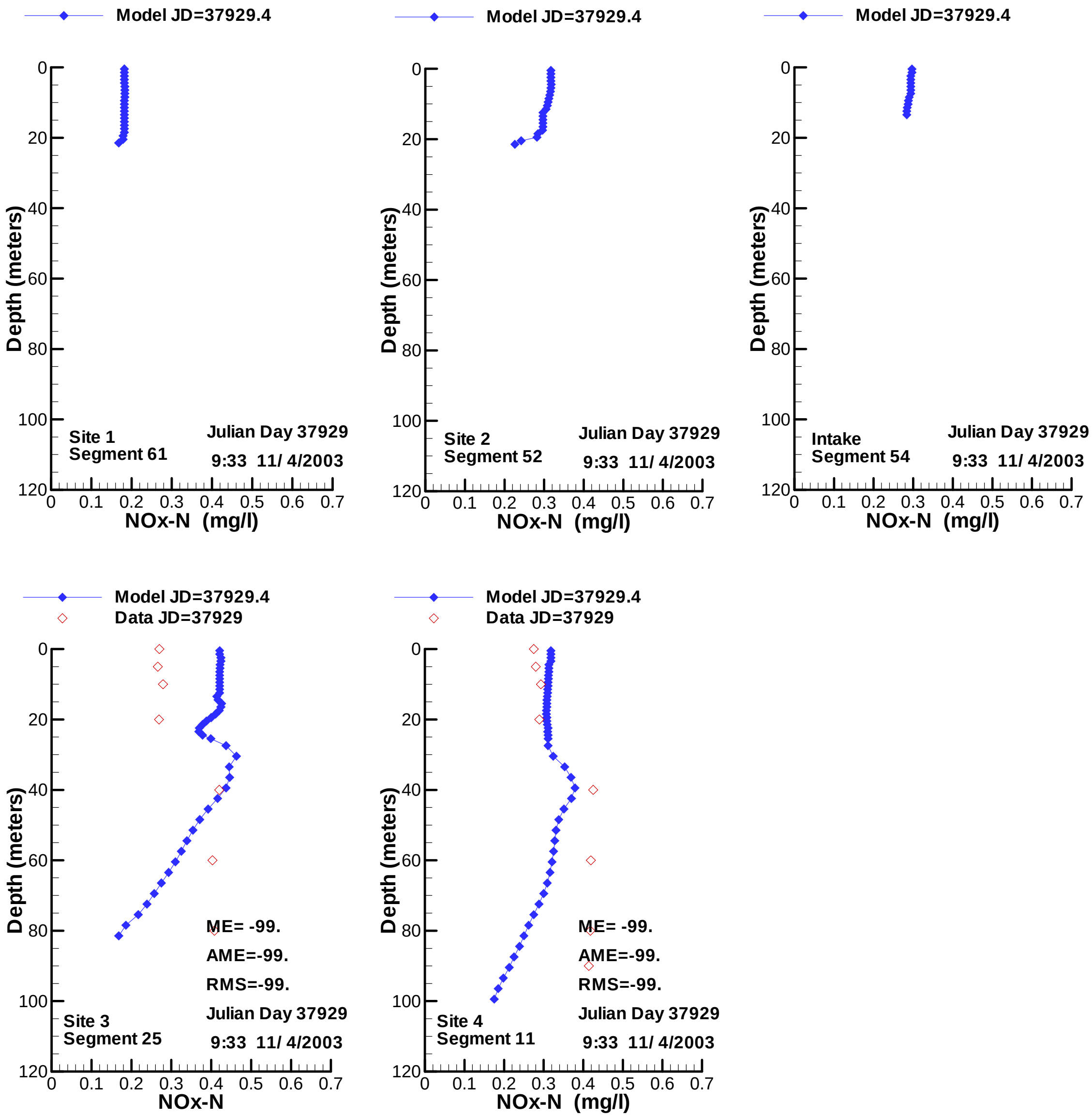

Figure 162. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 11/ 4/2003.

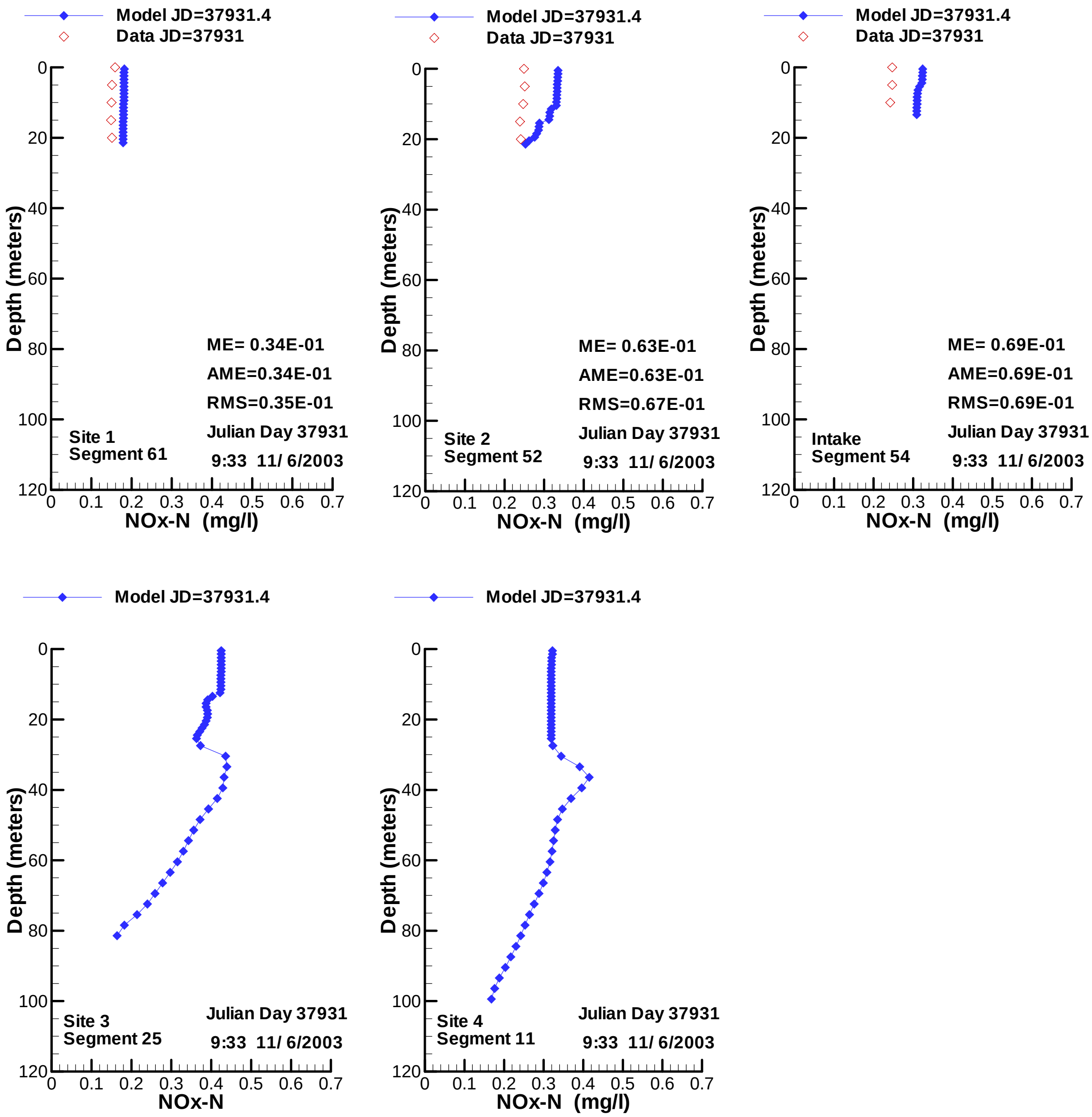

Figure 163. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 11/ 6/2003.

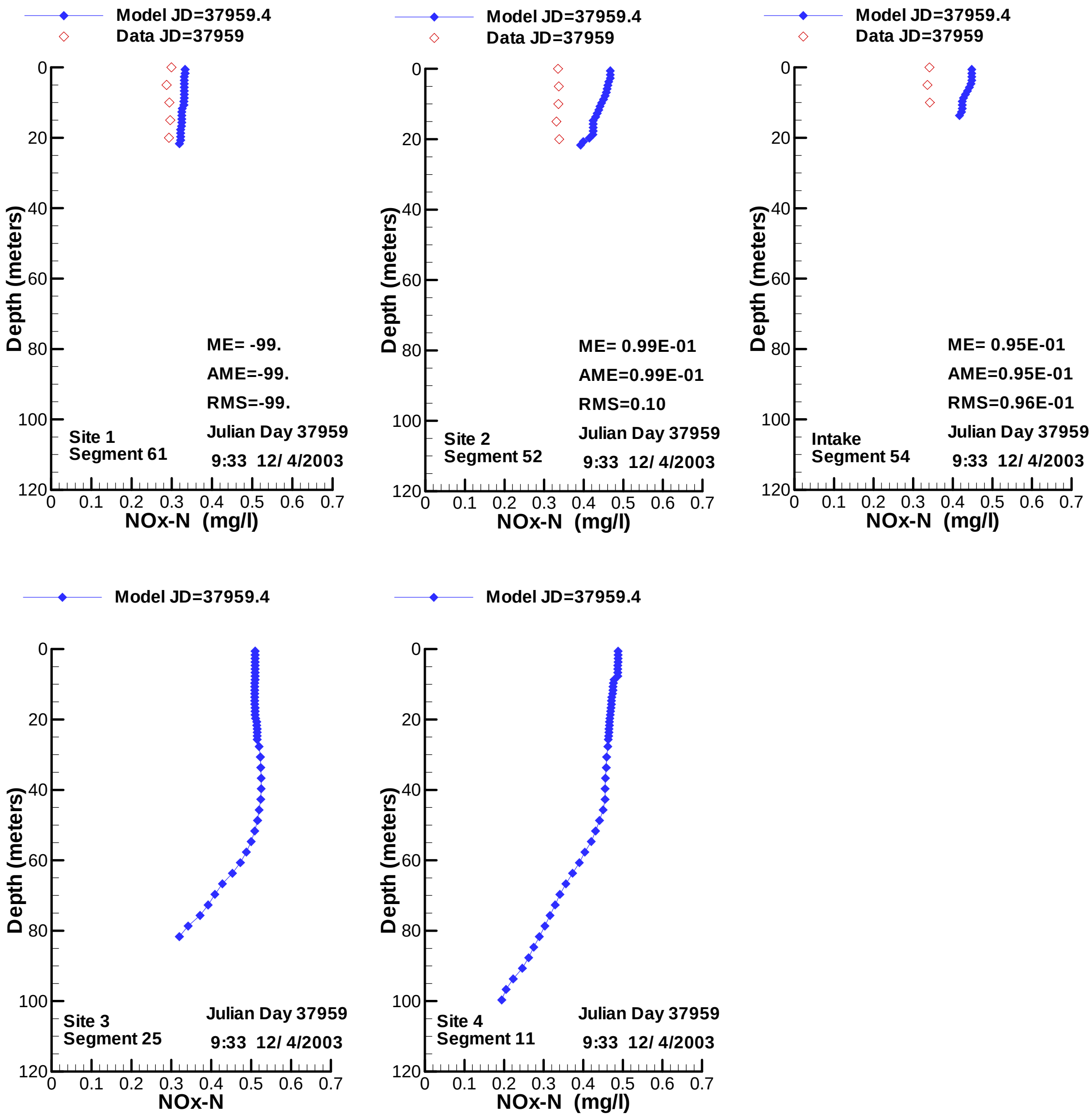

Figure 164. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 12/ 4/2003.

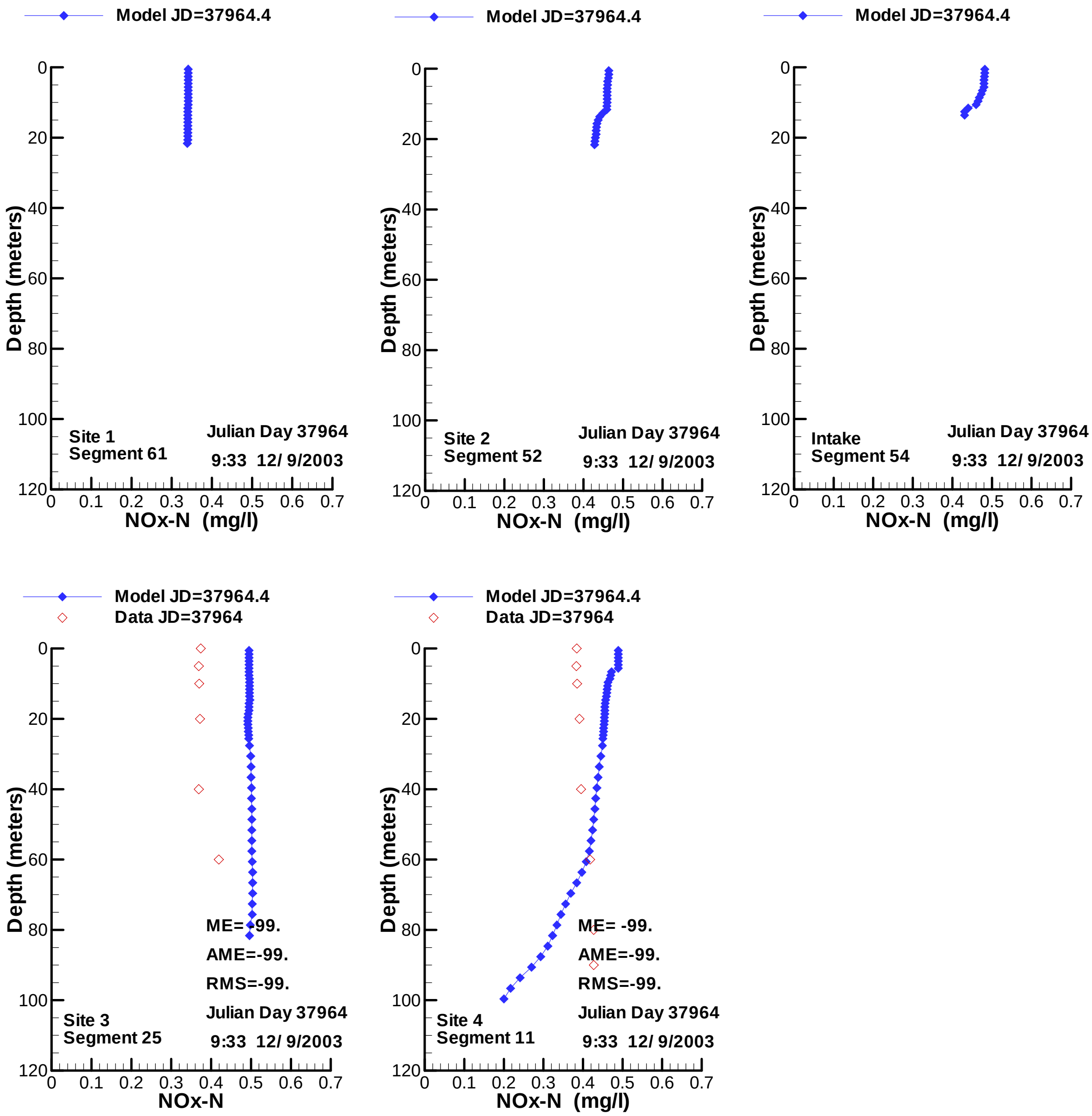

Figure 165. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 12/ 9/2003.

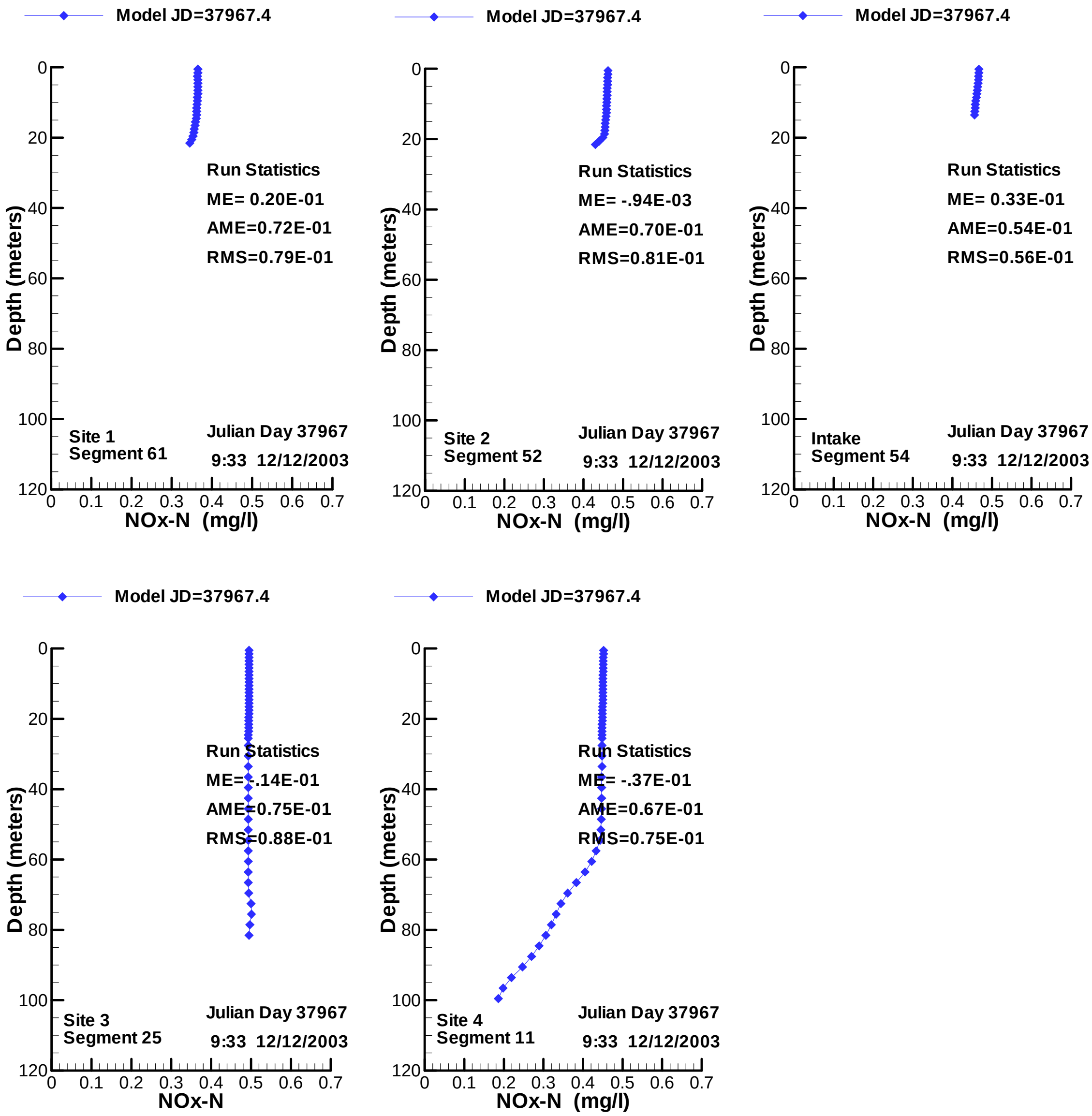

Figure 166. Vertical profiles of Nitrite-nitrate nitrogen compared with data for 12/12/2003.

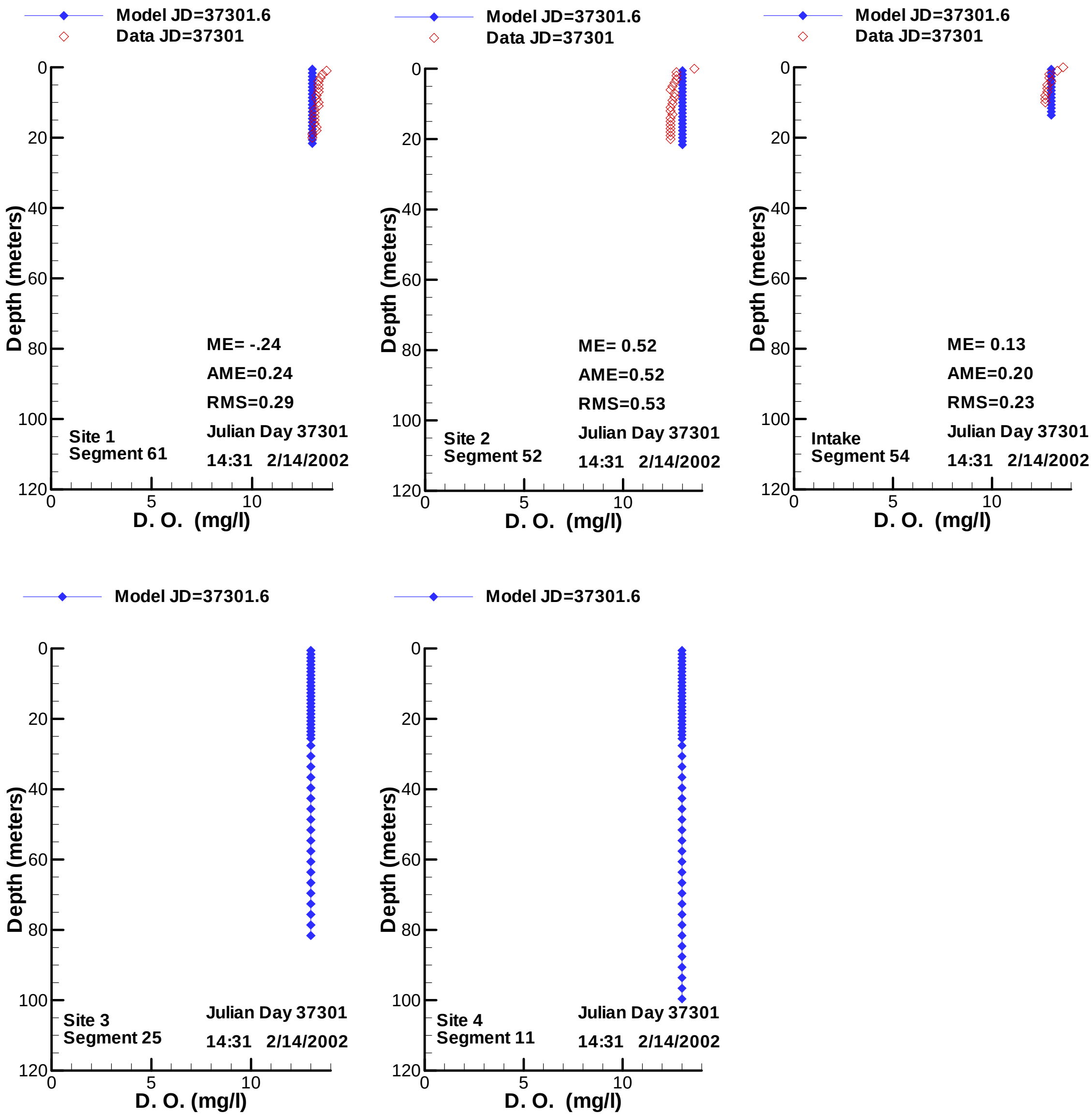

Figure 167. Vertical profiles of DISSOLVED OXYGEN compared with data for 2/14/2002.

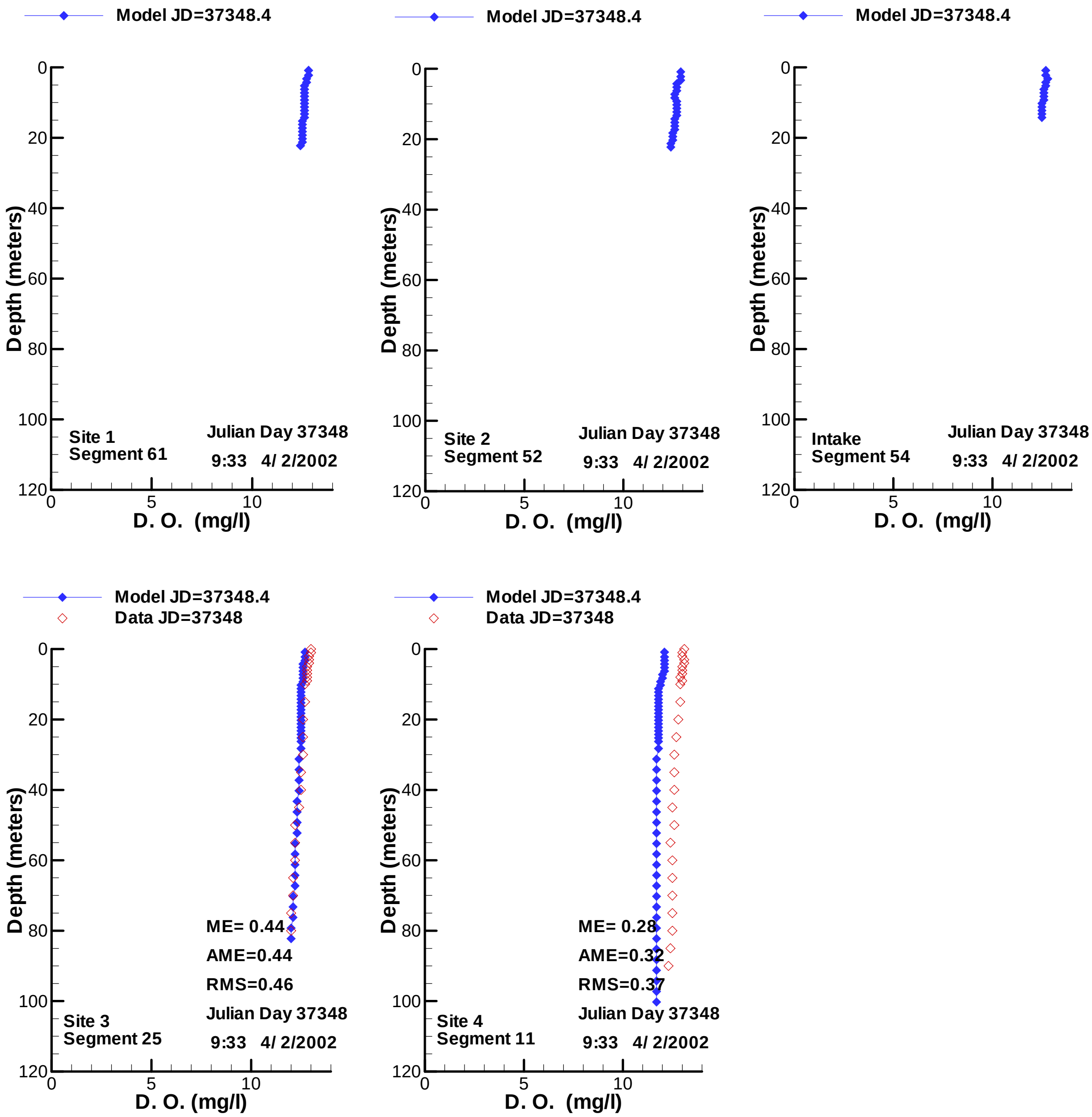

Figure 168. Vertical profiles of DISSOLVED OXYGEN compared with data for 4/ 2/2002.

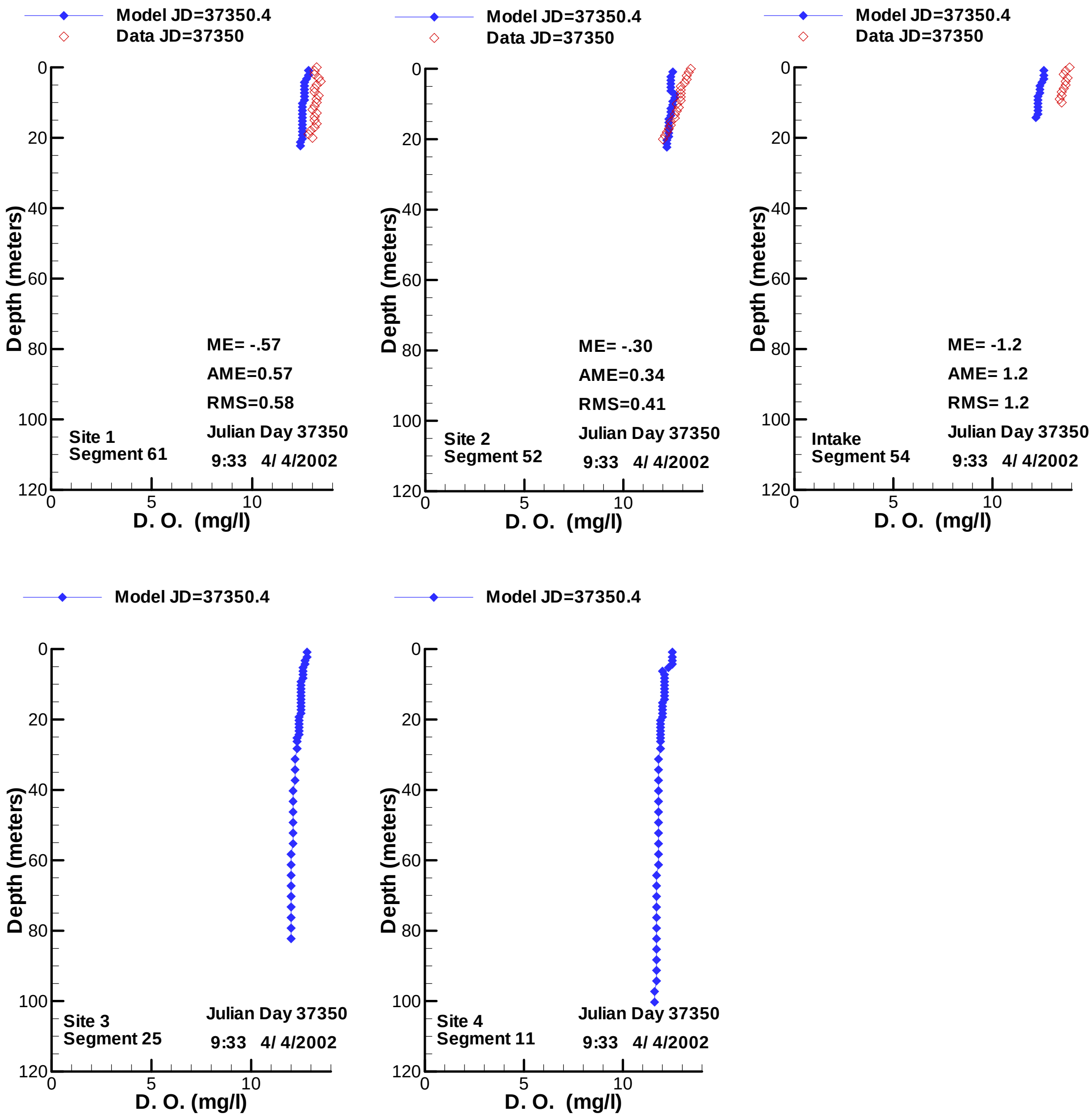

Figure 169. Vertical profiles of DISSOLVED OXYGEN compared with data for 4/ 4/2002.

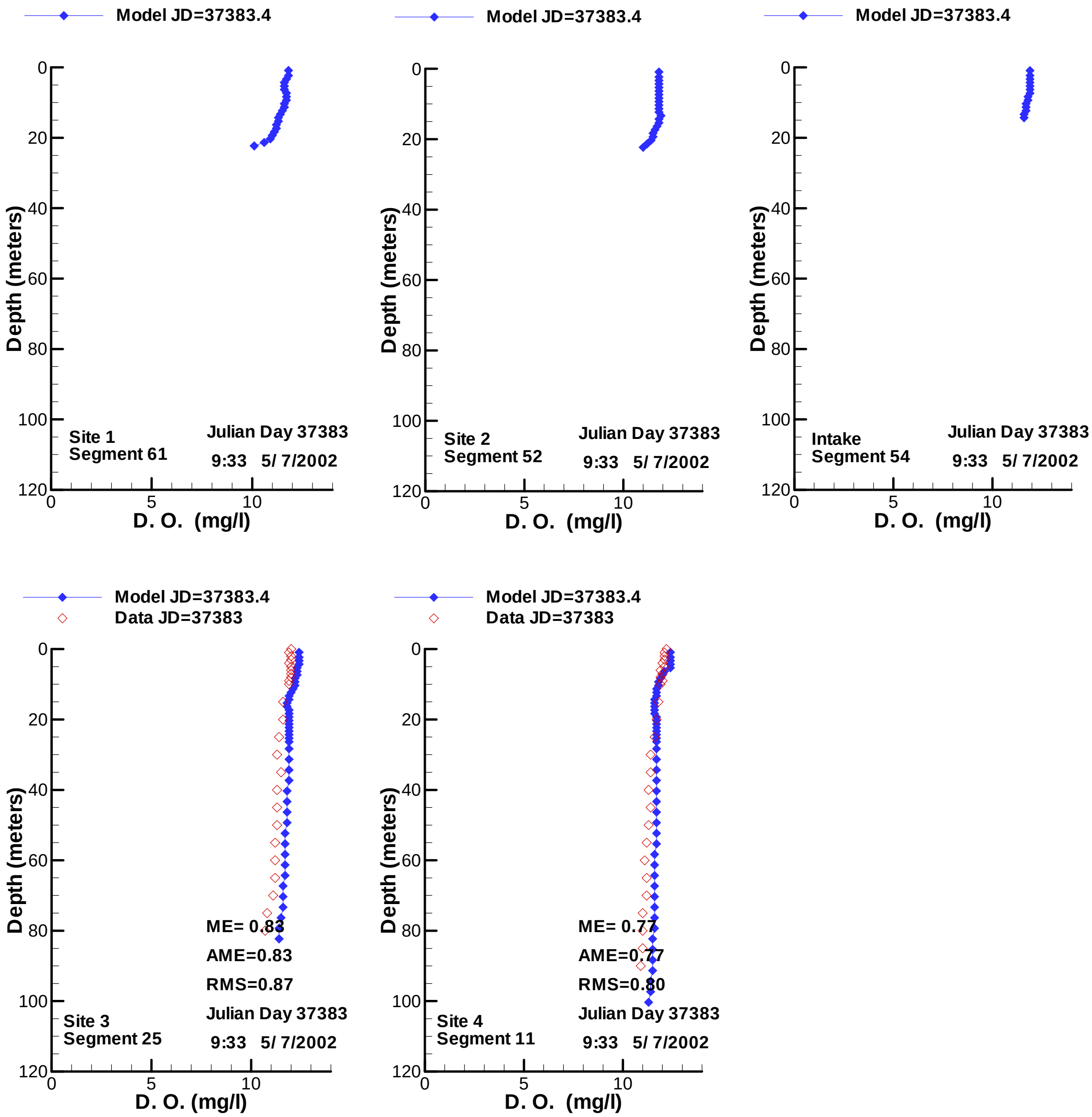

Figure 170. Vertical profiles of DISSOLVED OXYGEN compared with data for 5/ 7/2002.

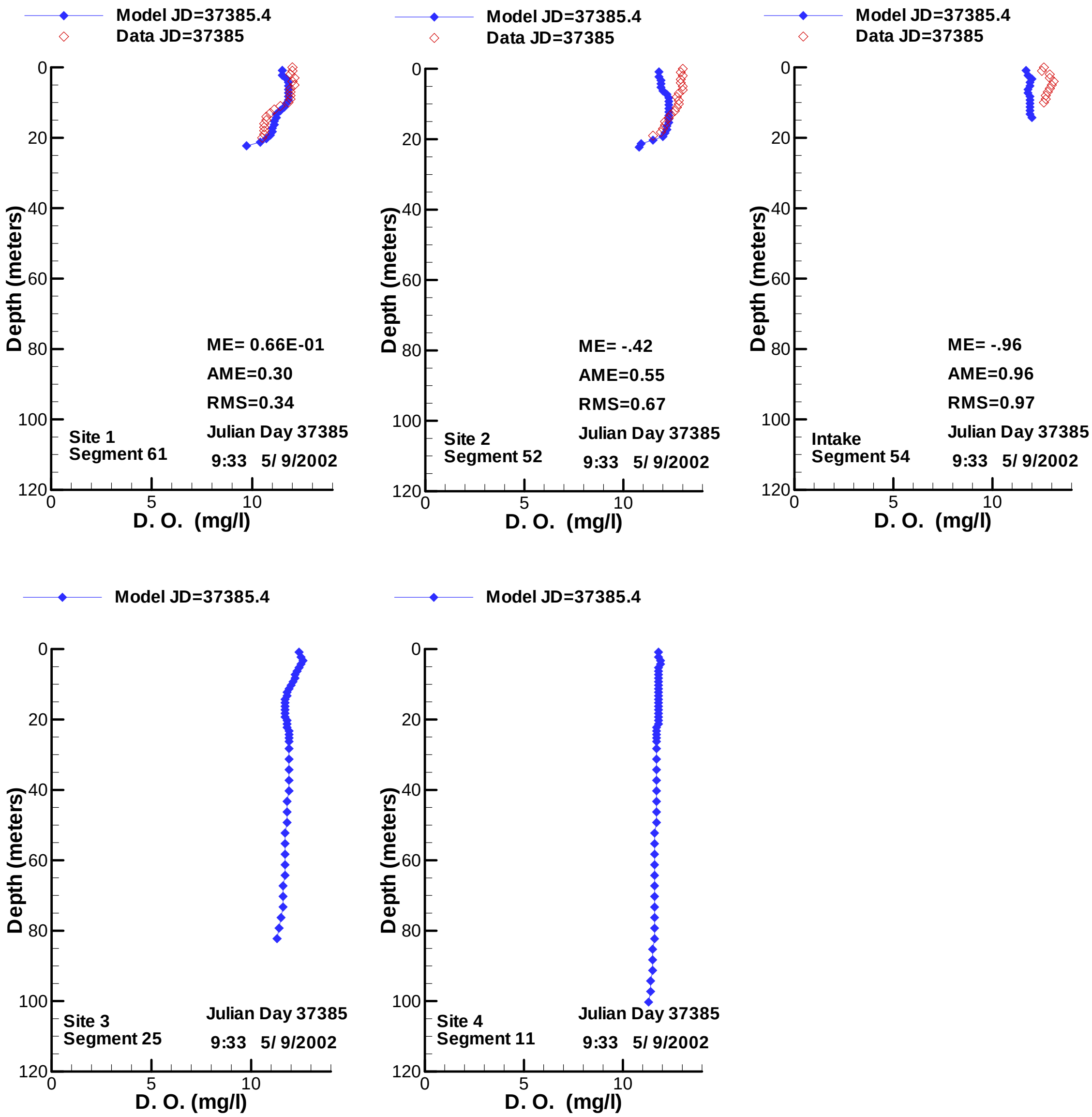

Figure 171. Vertical profiles of DISSOLVED OXYGEN compared with data for 5/ 9/2002.

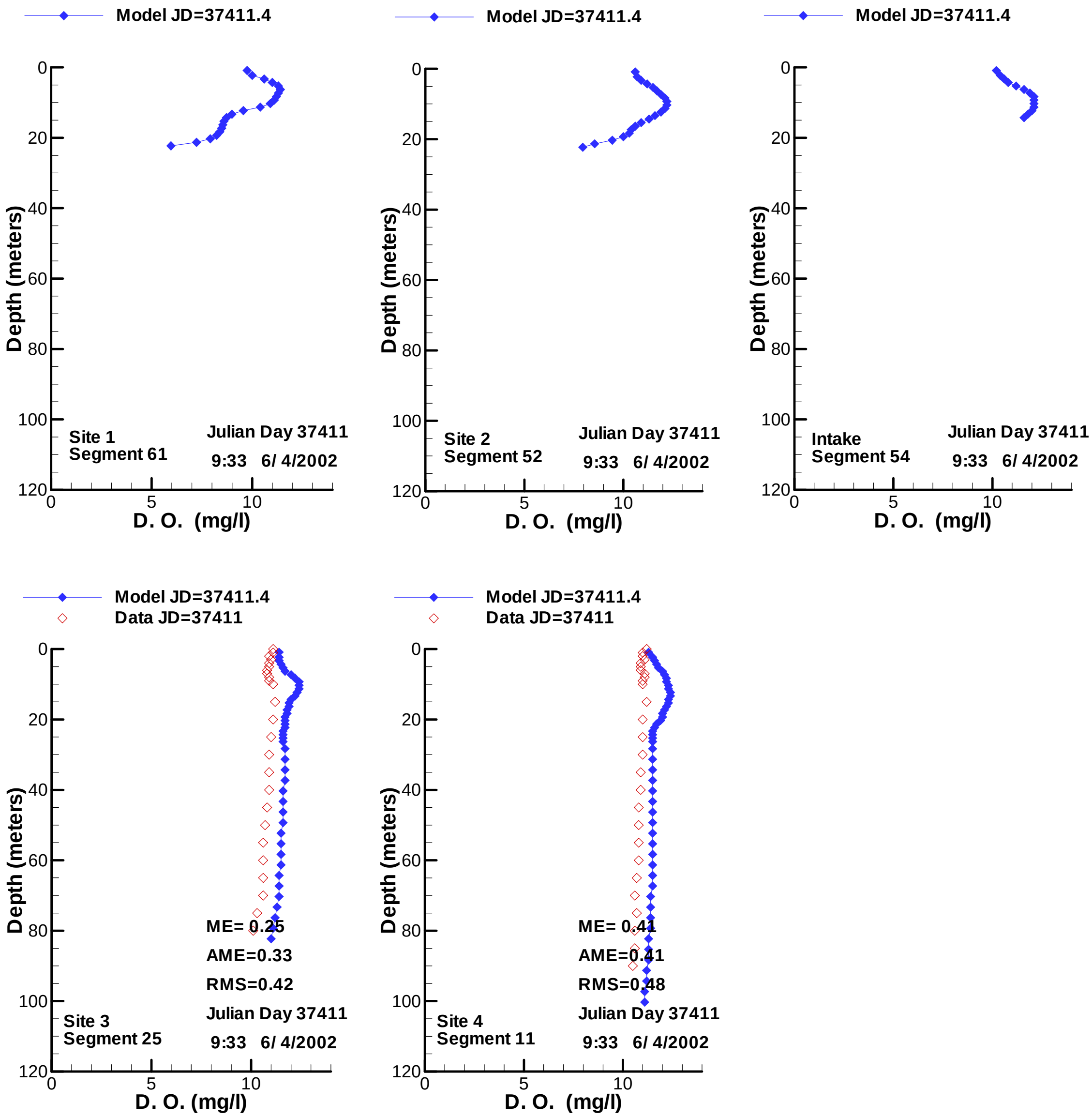

Figure 172. Vertical profiles of DISSOLVED OXYGEN compared with data for 6/ 4/2002.

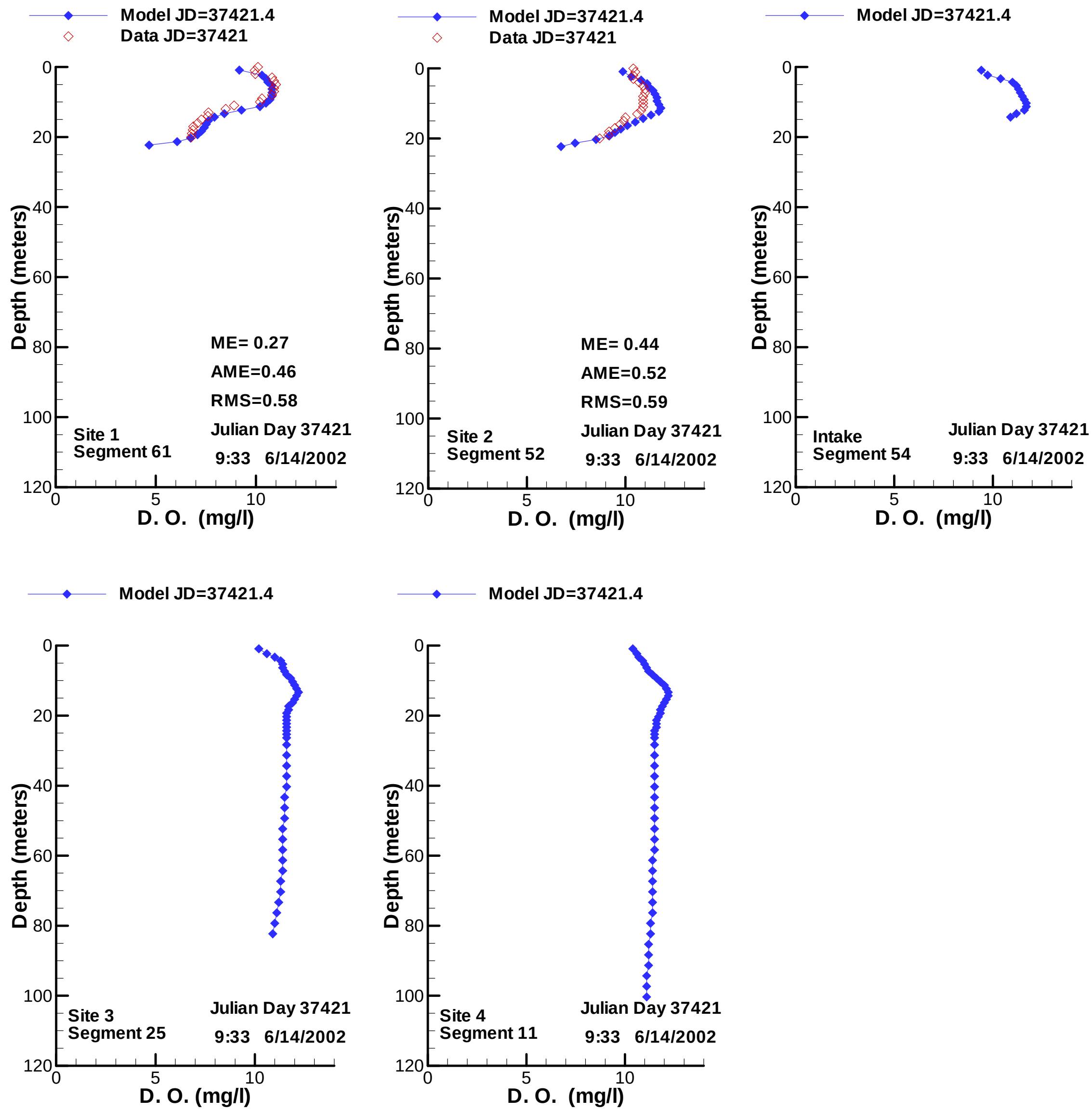

Figure 173. Vertical profiles of DISSOLVED OXYGEN compared with data for 6/14/2002.

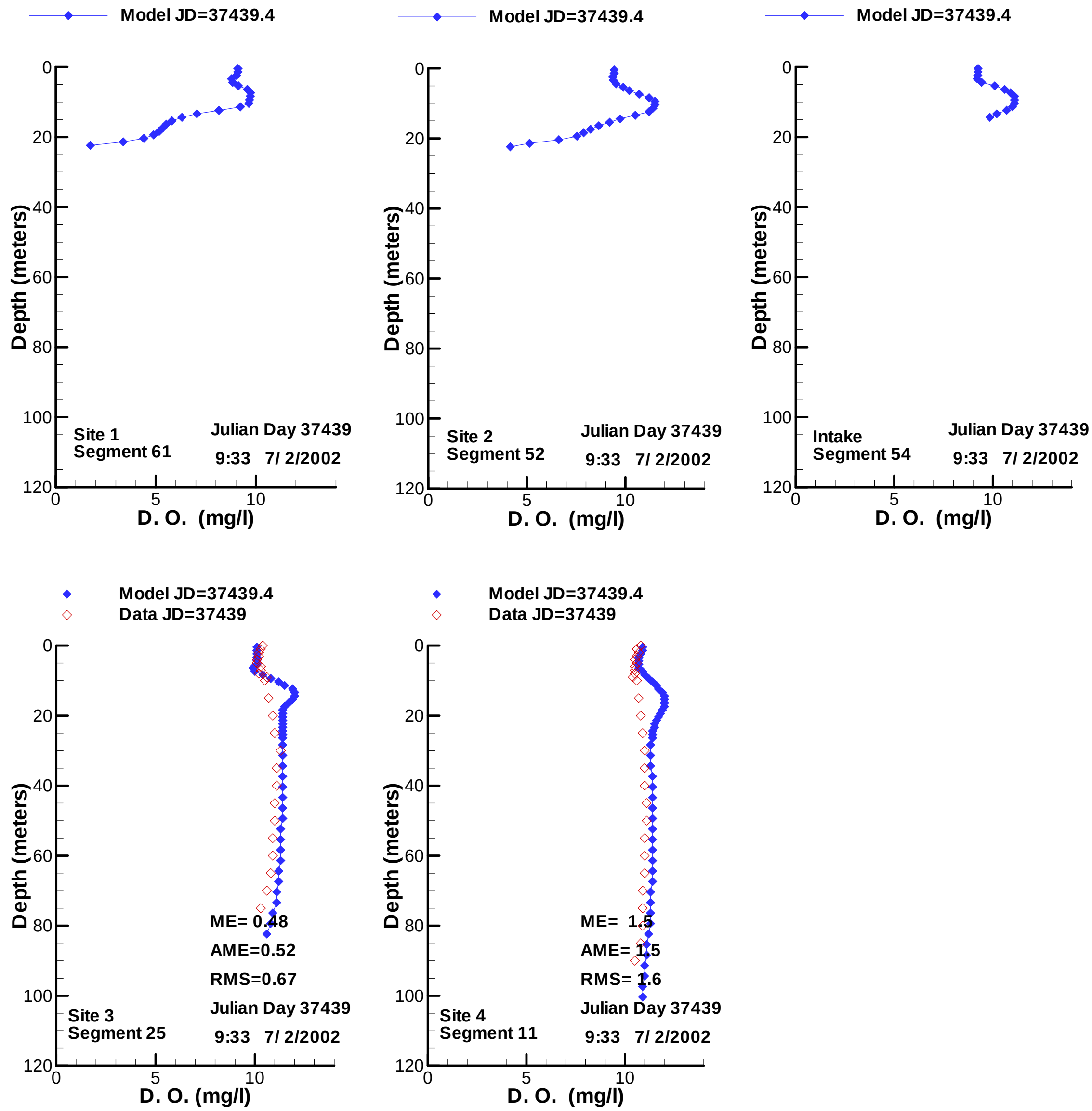

Figure 174. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/ 2/2002.

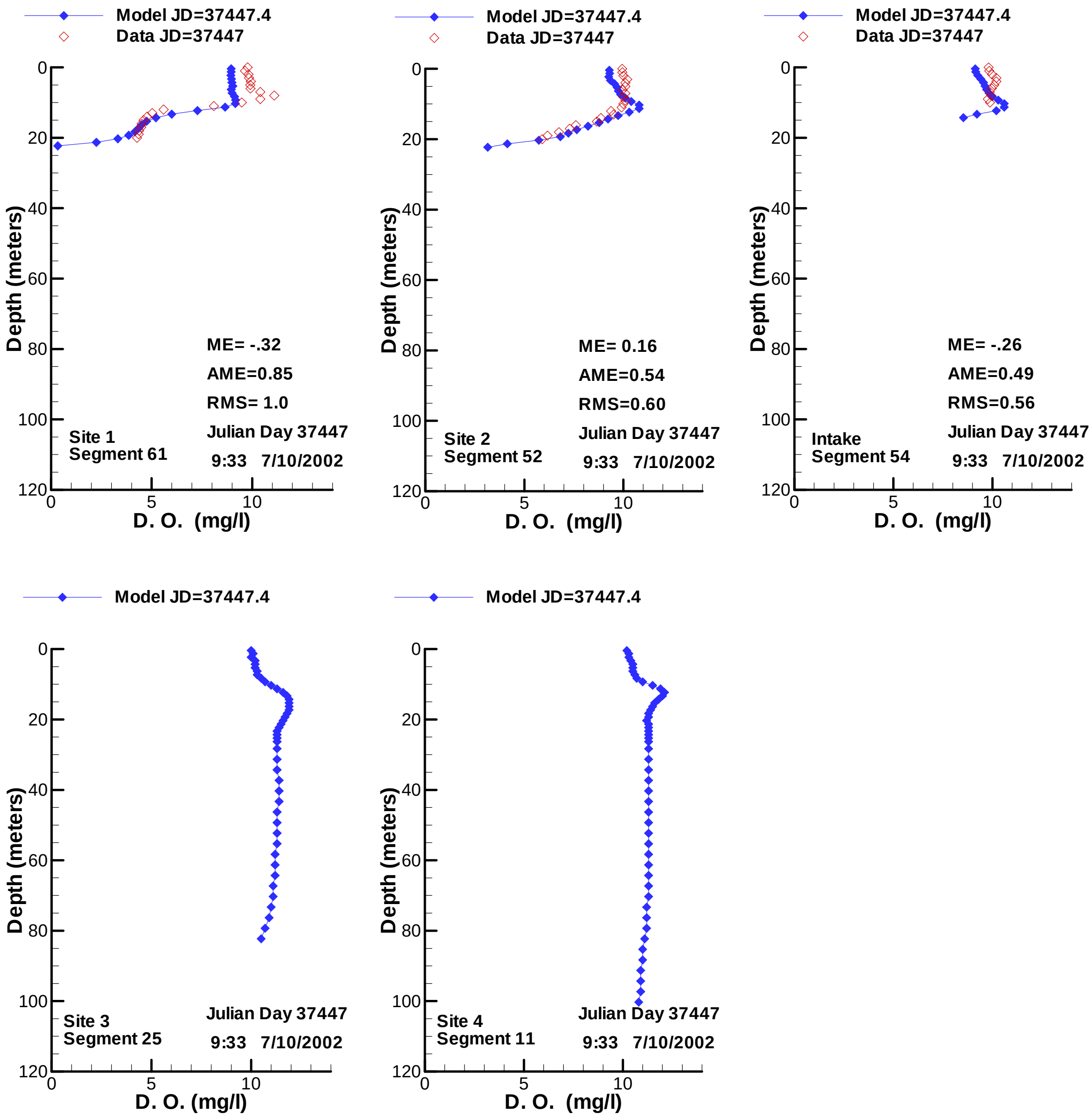

Figure 175. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/10/2002.

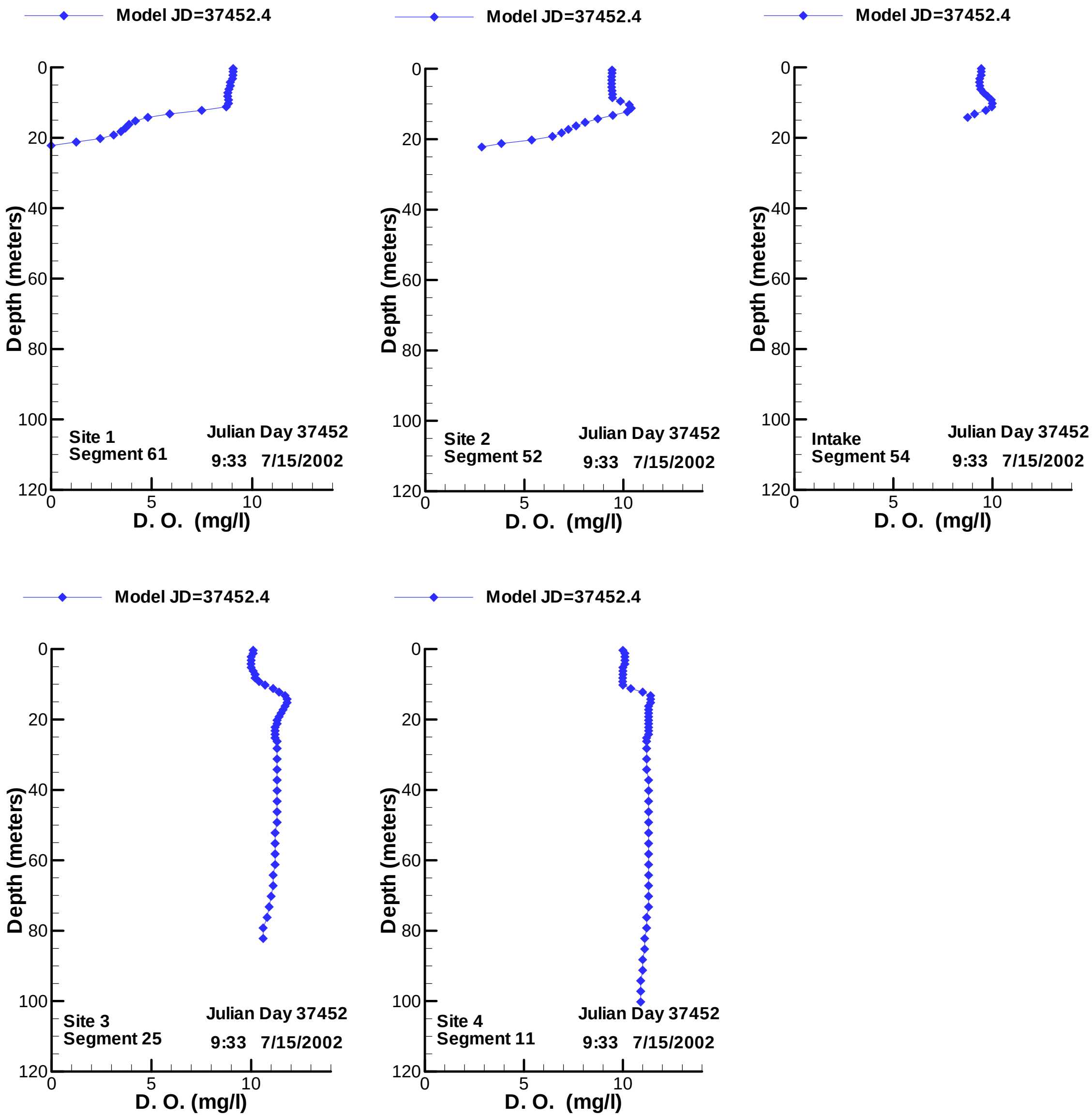

Figure 176. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/15/2002.

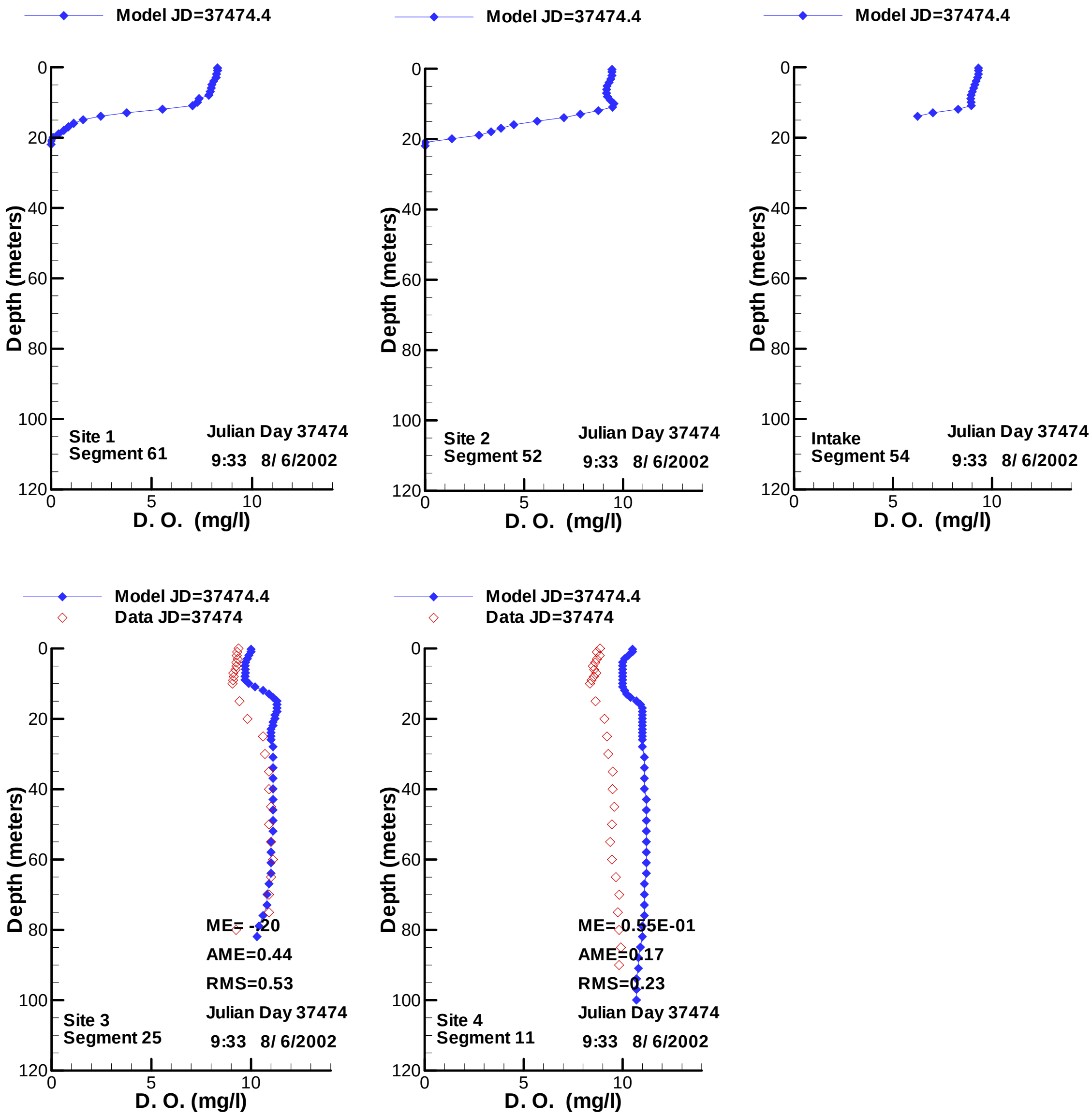

Figure 177. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/ 6/2002.

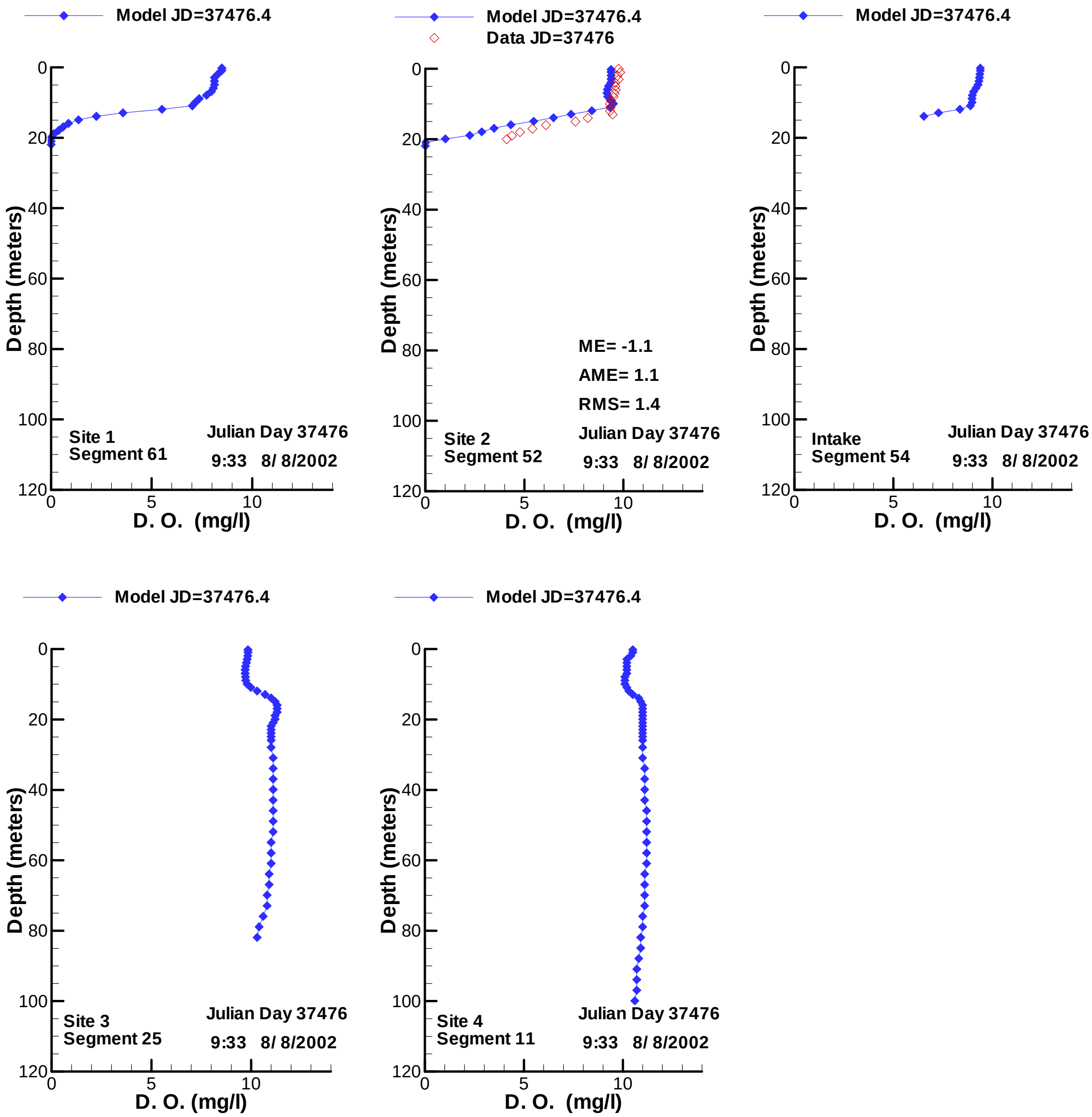

Figure 178. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/ 8/2002.

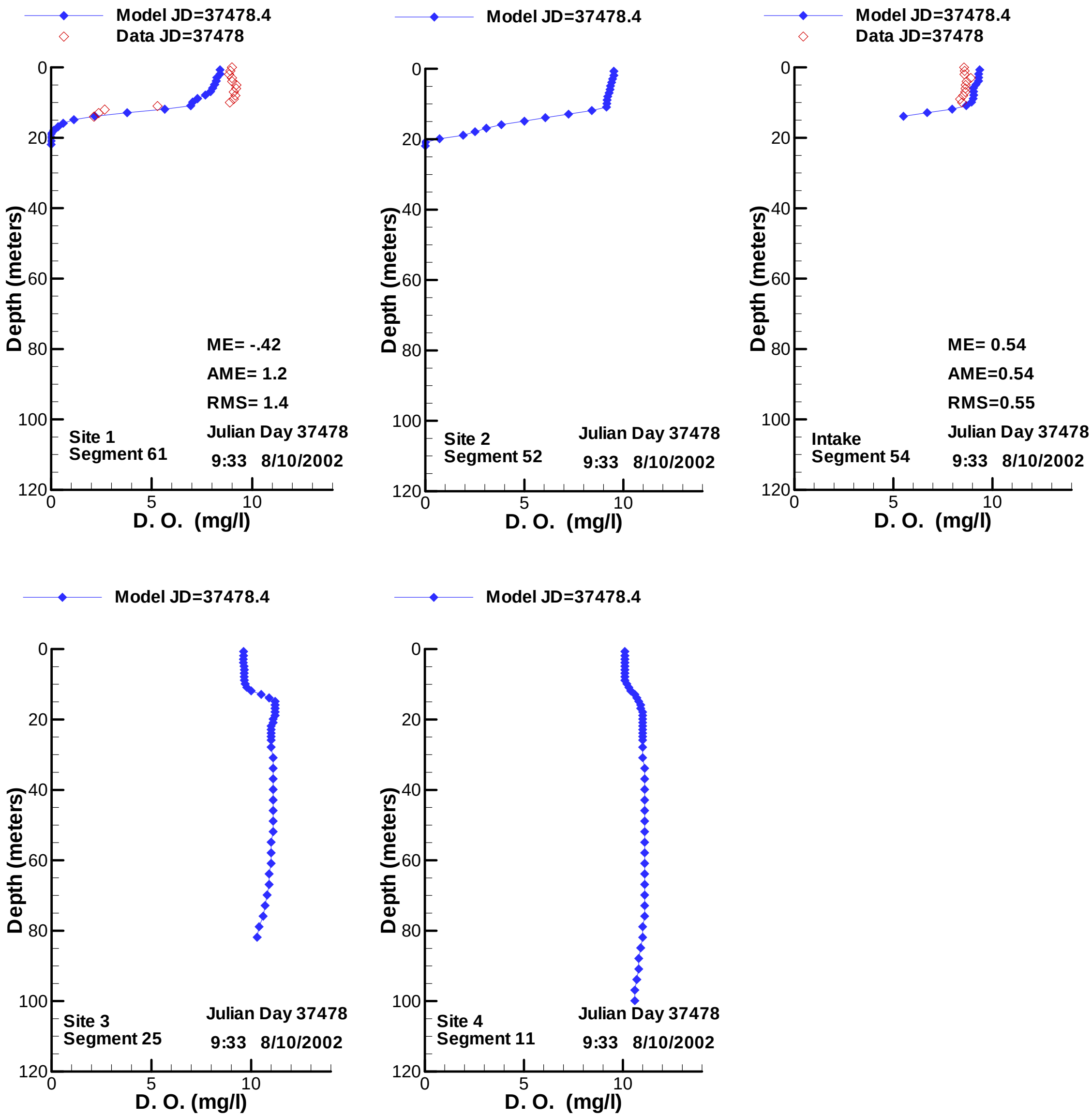

Figure 179. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/10/2002.

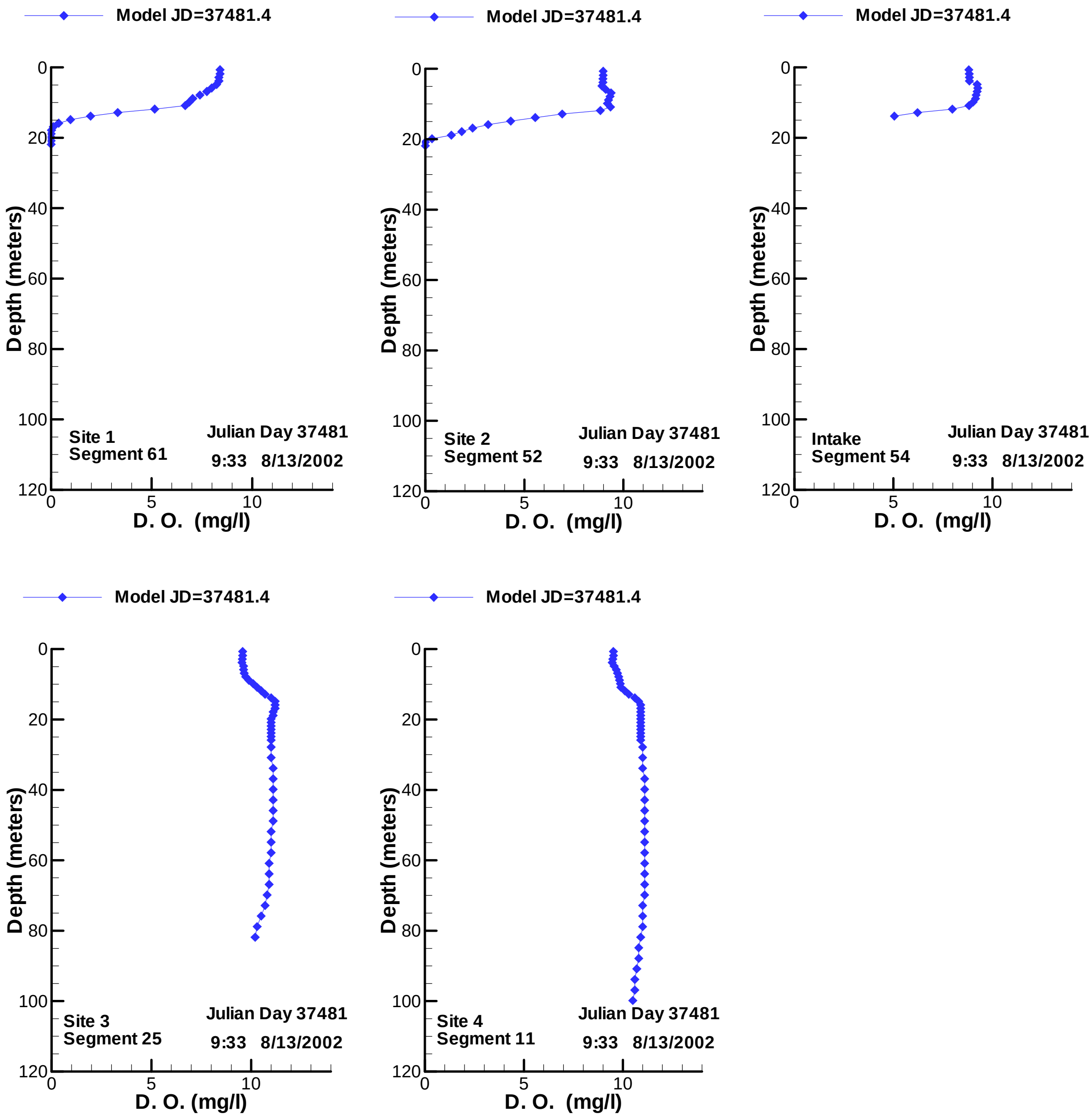

Figure 180. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/13/2002.

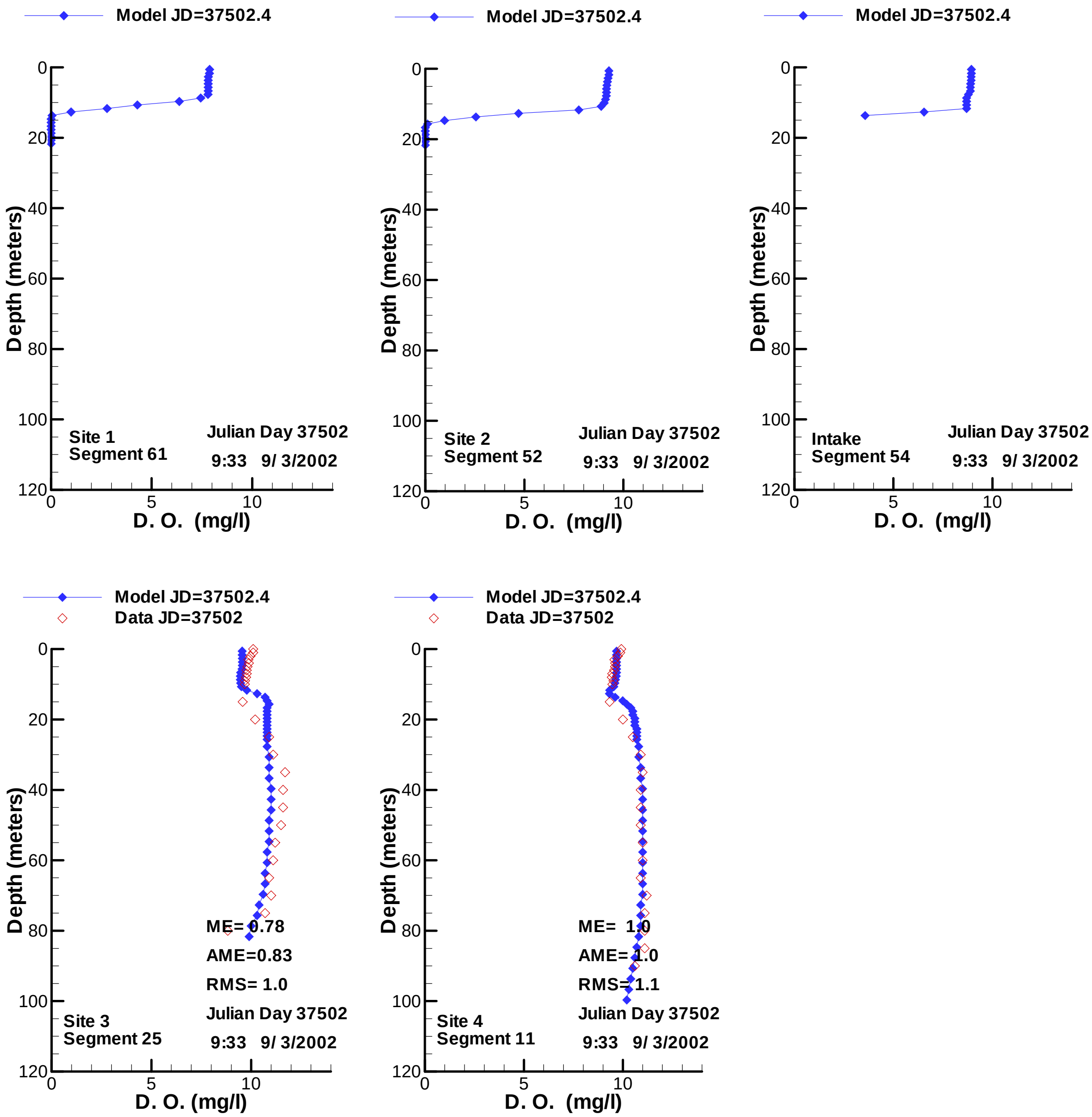

Figure 181. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/ 3/2002.

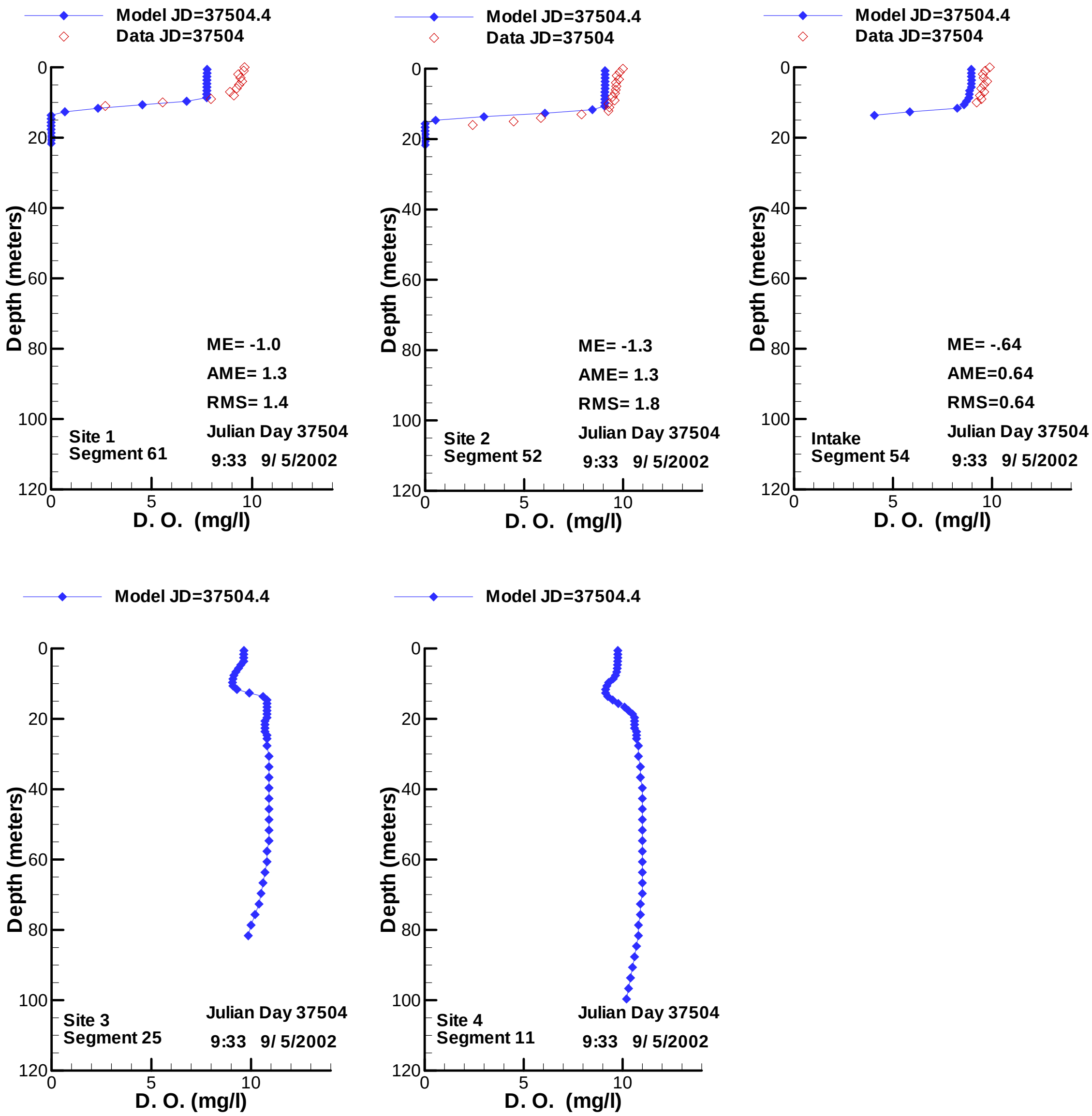

Figure 182. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/ 5/2002.

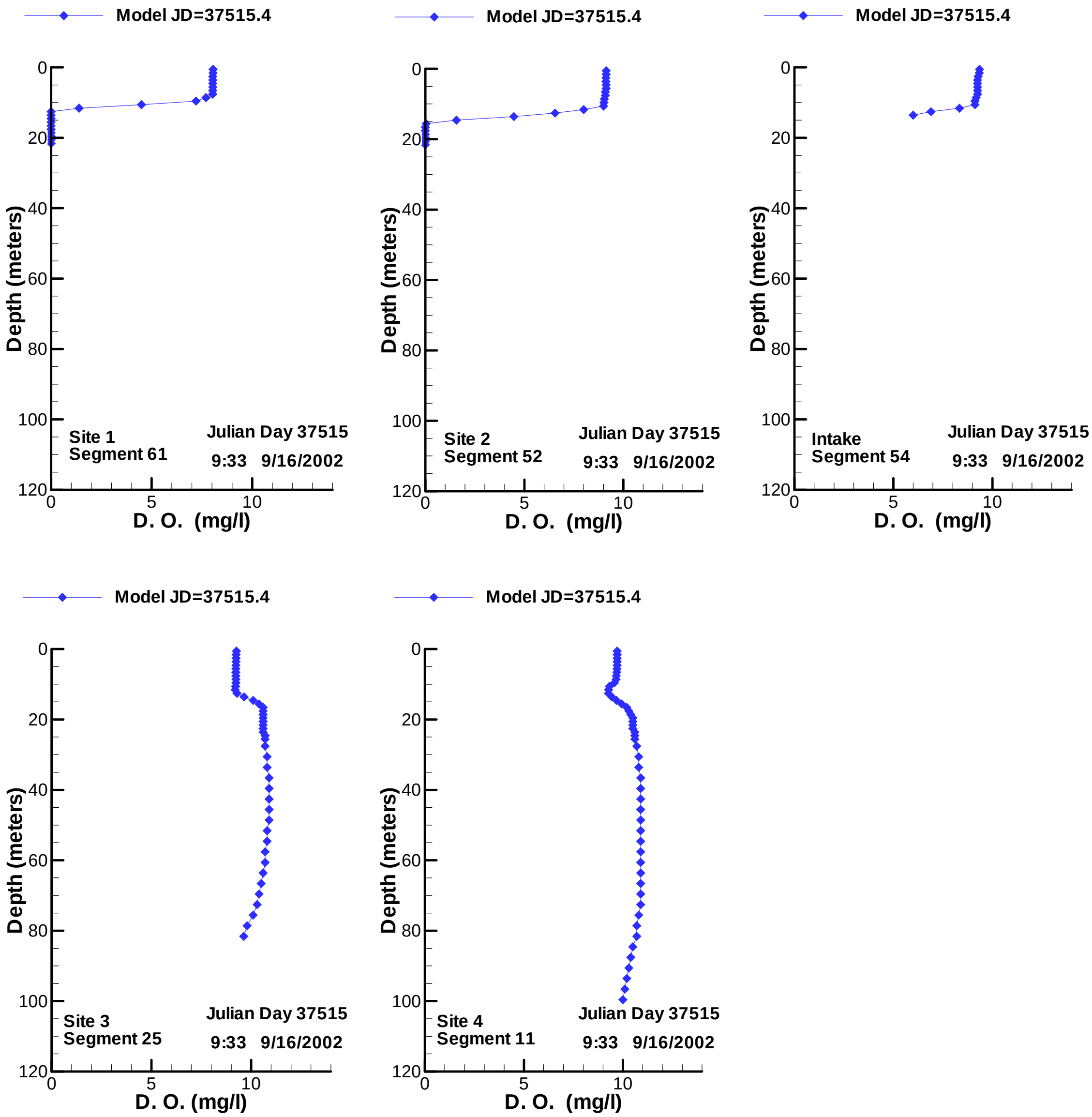

Figure 183. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/16/2002.

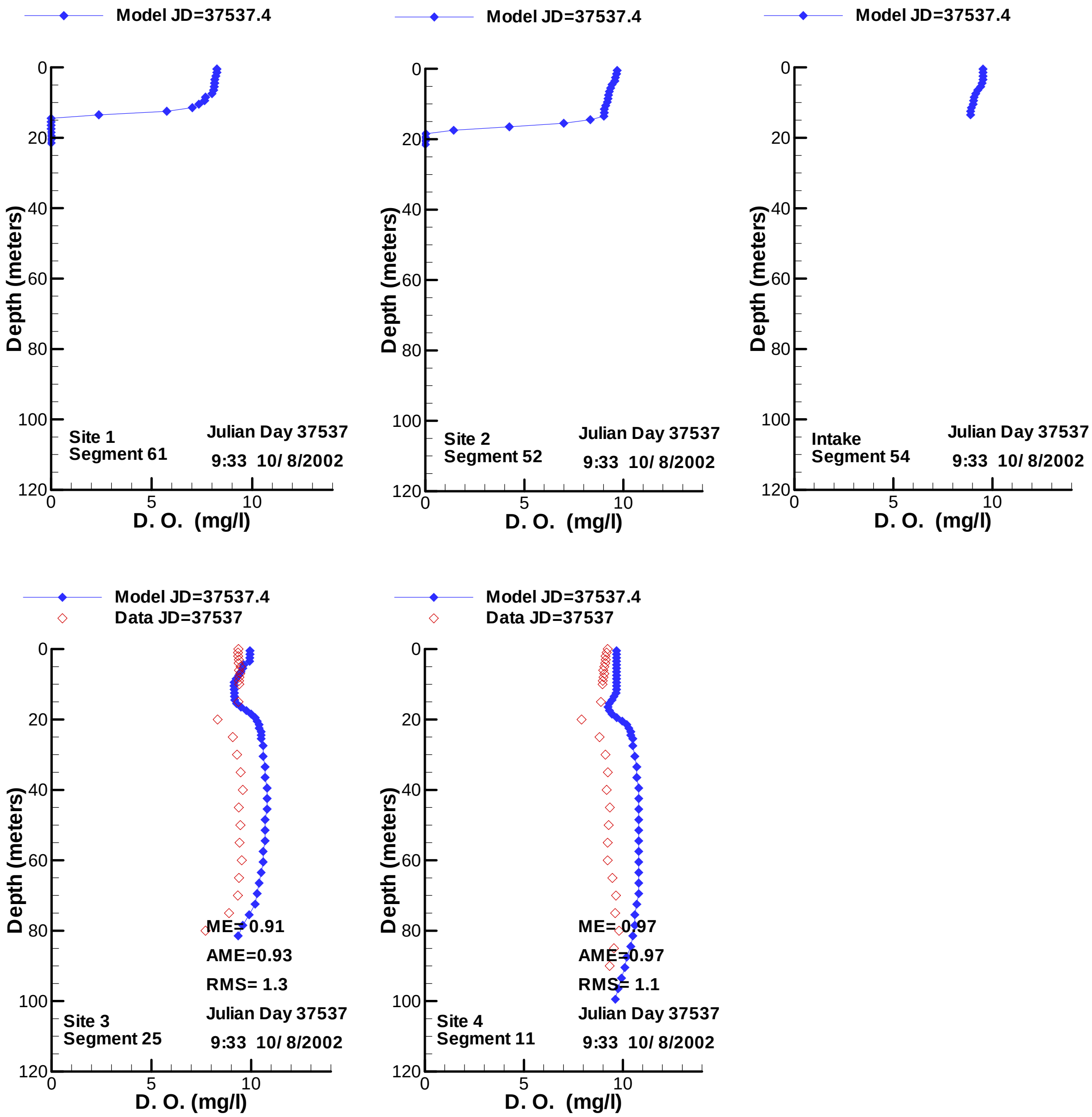

Figure 184. Vertical profiles of DISSOLVED OXYGEN compared with data for 10/ 8/2002.

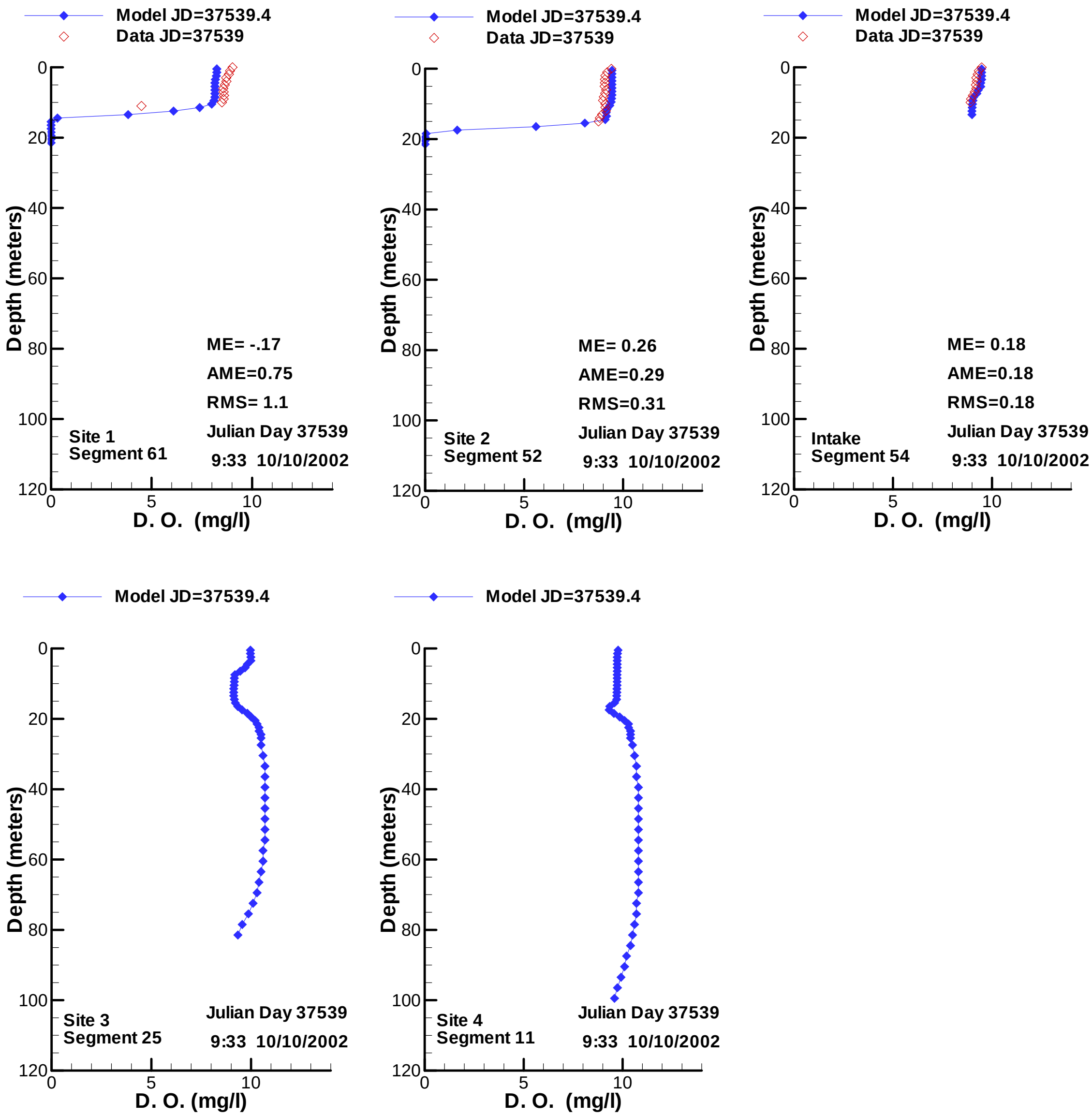

Figure 185. Vertical profiles of DISSOLVED OXYGEN compared with data for 10/10/2002.

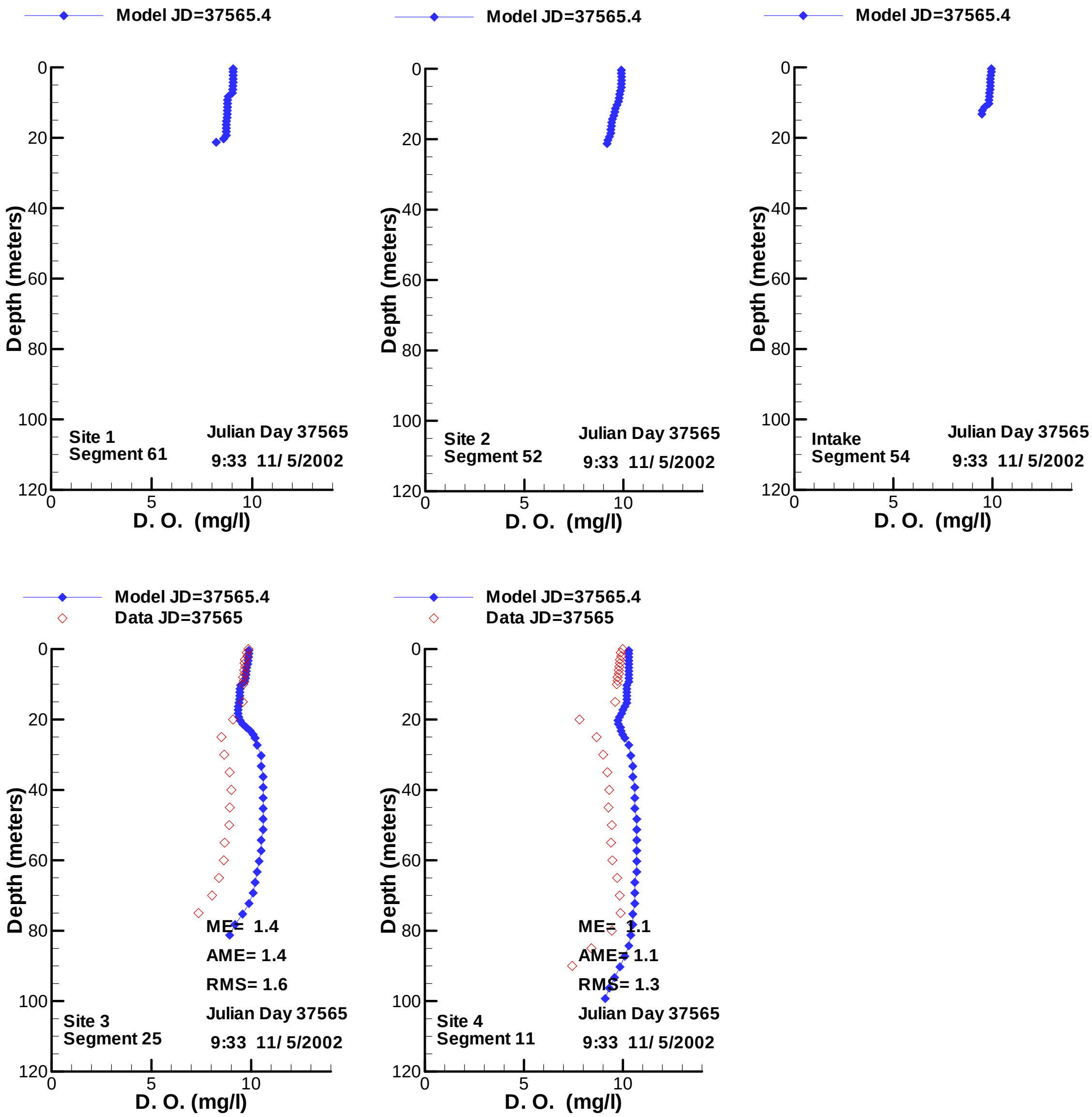

Figure 186. Vertical profiles of DISSOLVED OXYGEN compared with data for 11/ 5/2002.

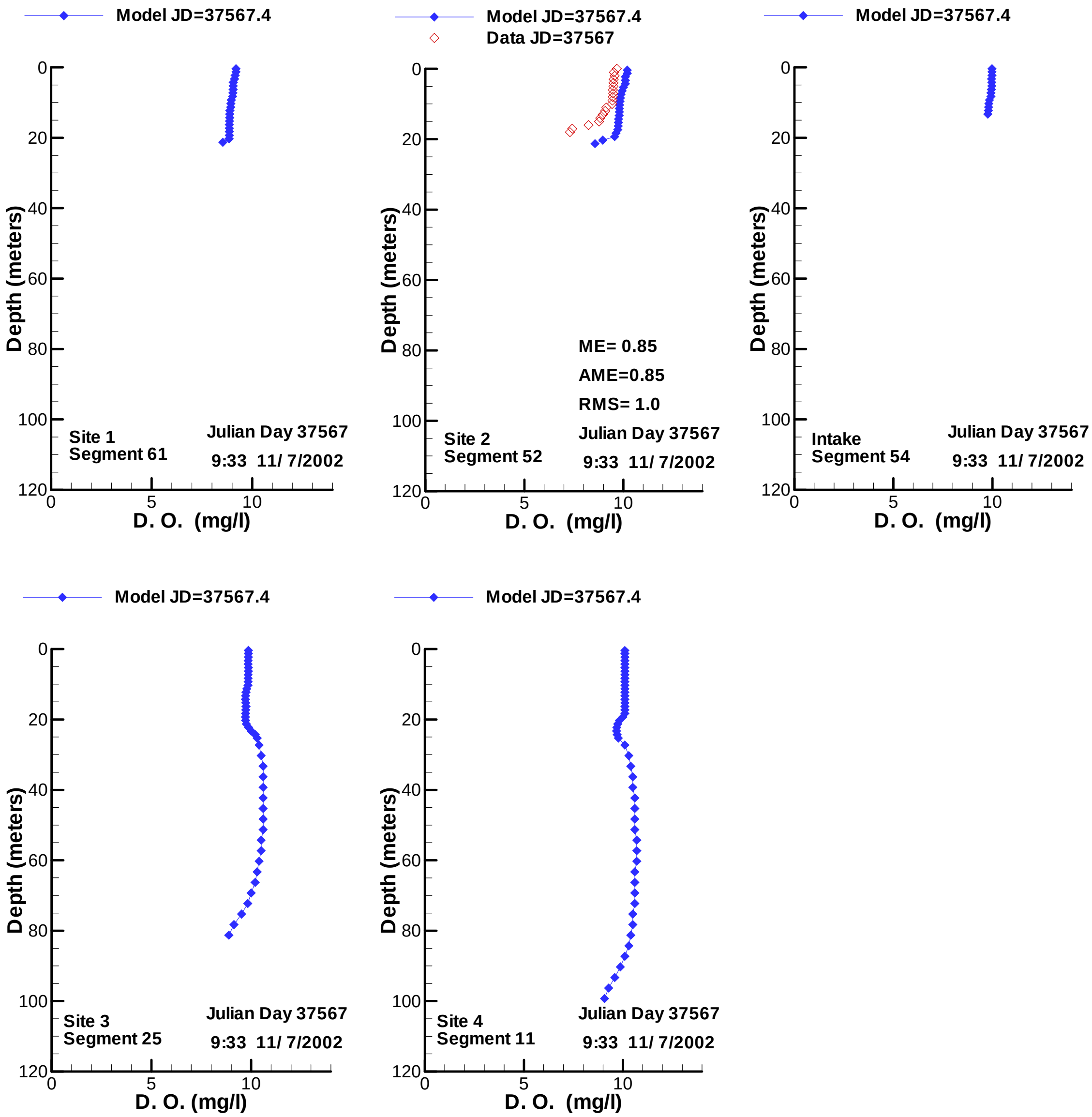

Figure 187. Vertical profiles of DISSOLVED OXYGEN compared with data for 11/ 7/2002.

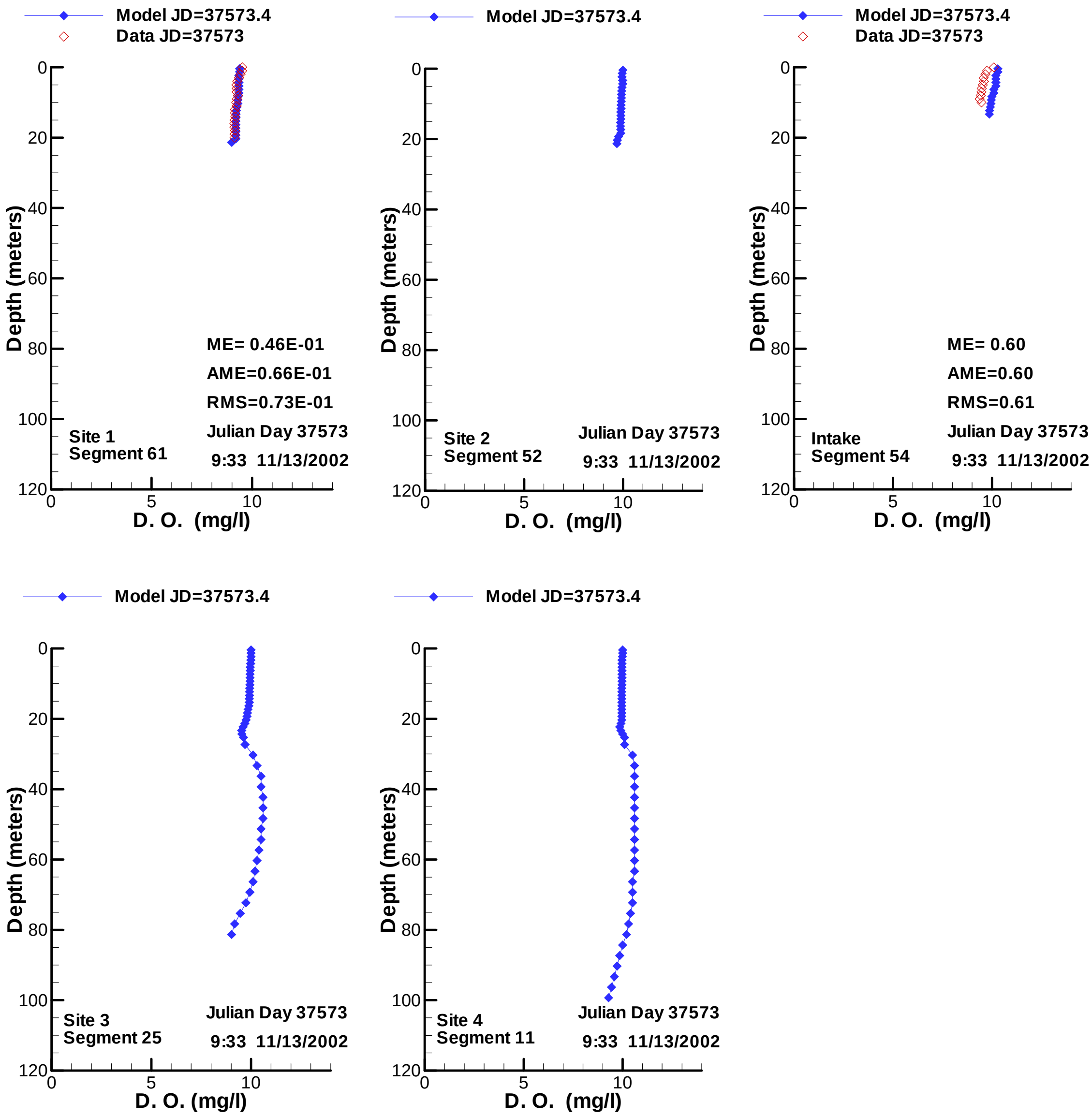

Figure 188. Vertical profiles of DISSOLVED OXYGEN compared with data for 11/13/2002.

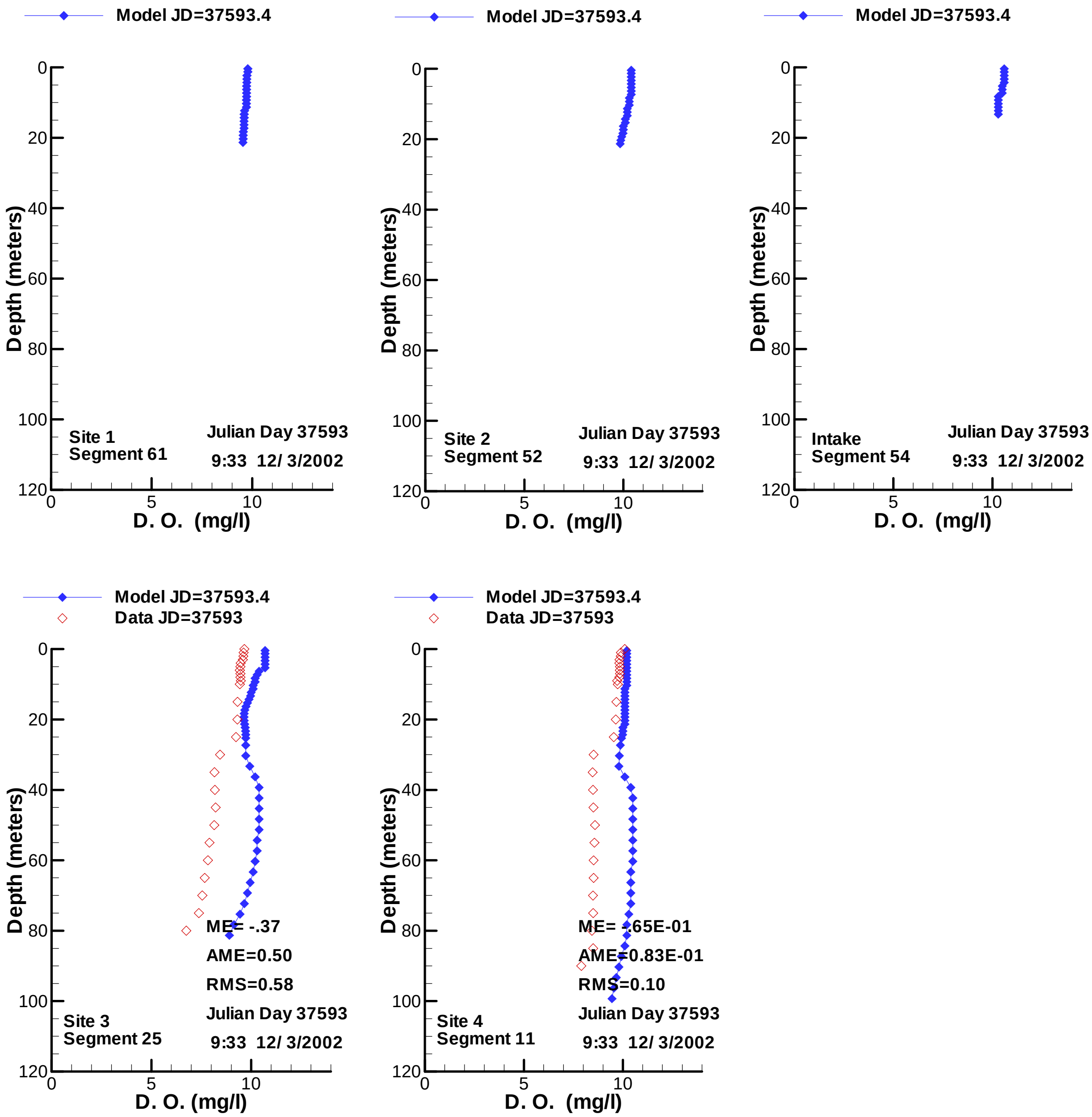

Figure 189. Vertical profiles of DISSOLVED OXYGEN compared with data for 12/ 3/2002.

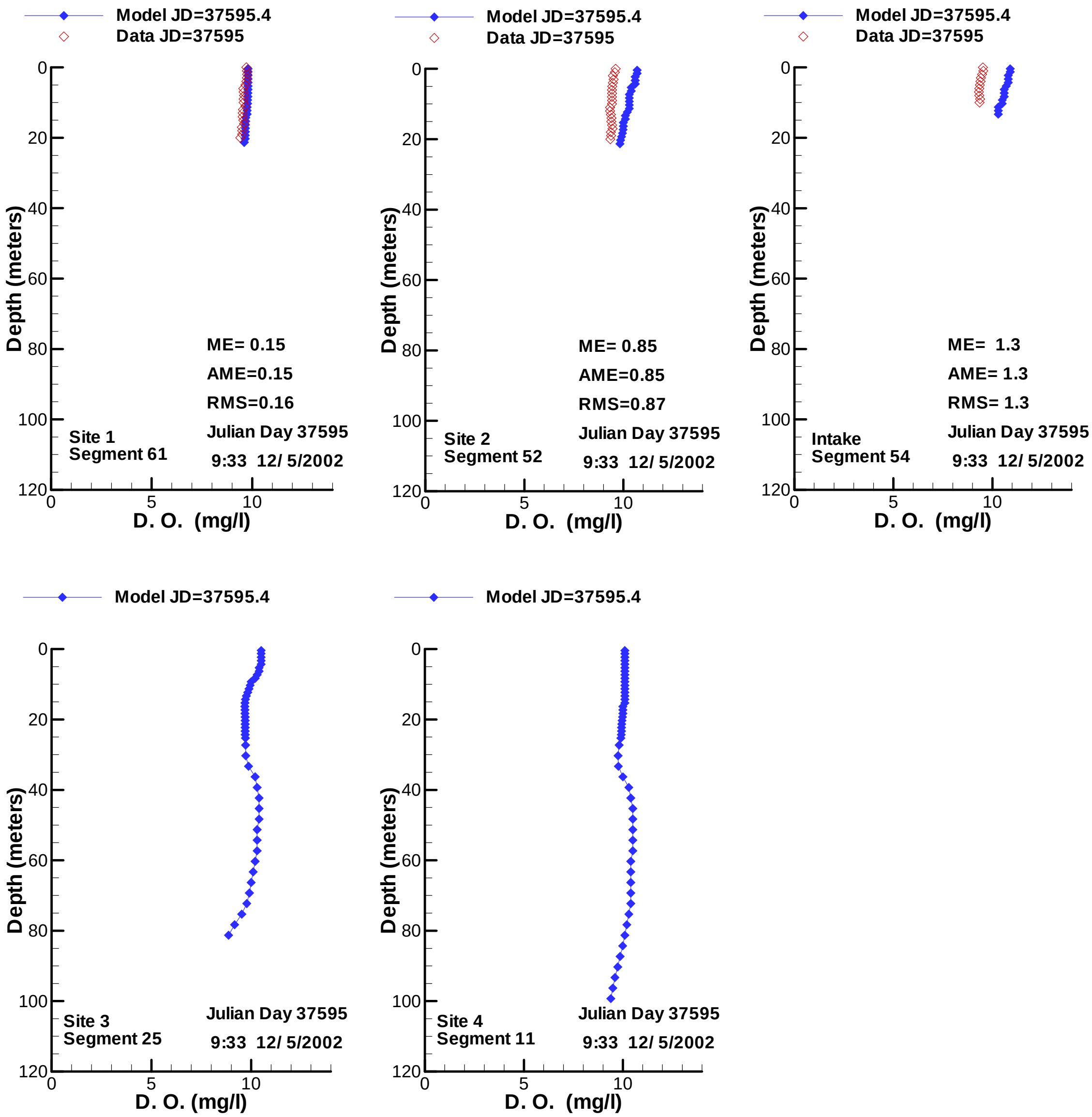

Figure 190. Vertical profiles of DISSOLVED OXYGEN compared with data for 12/ 5/2002.

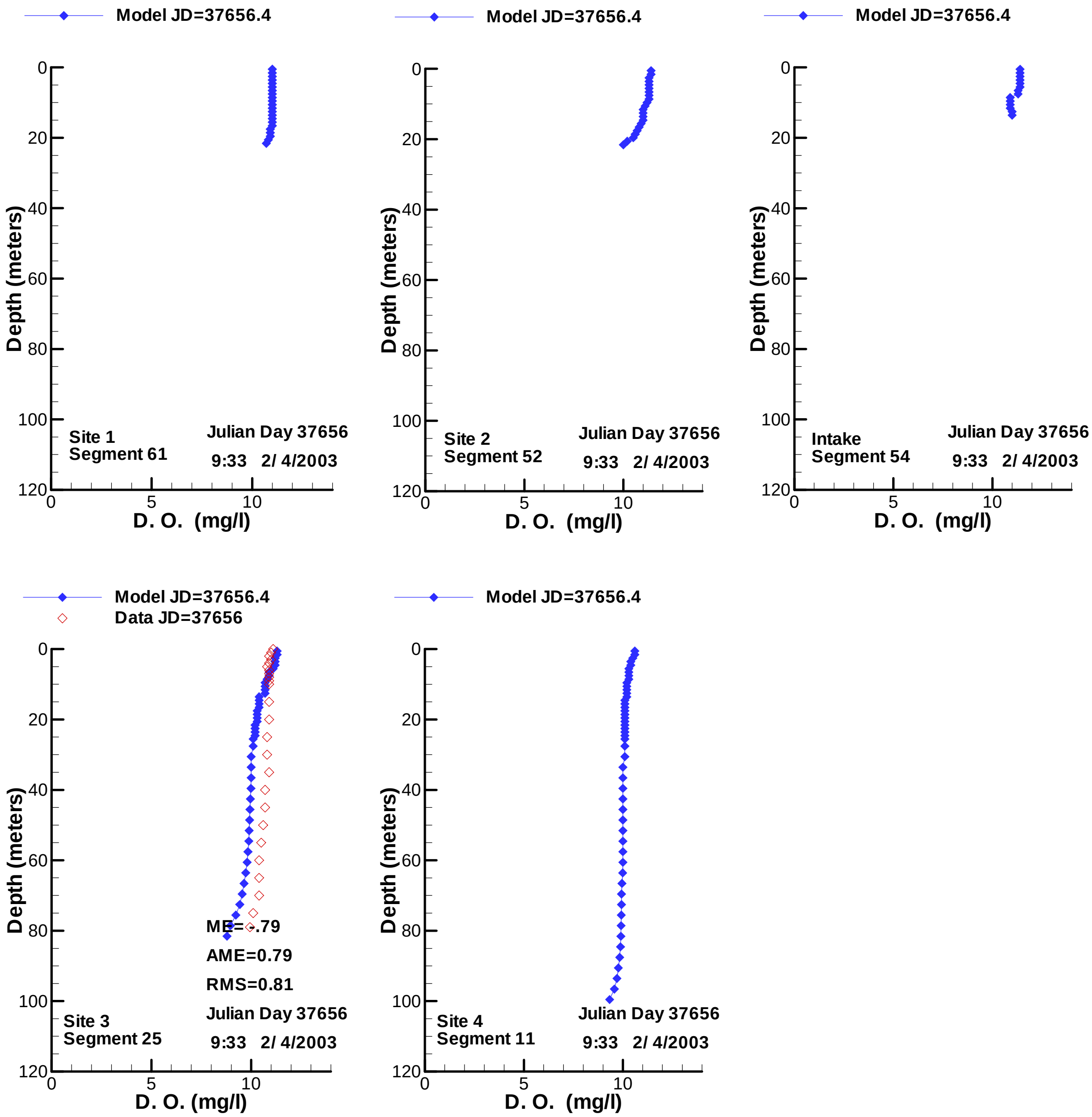

Figure 191. Vertical profiles of DISSOLVED OXYGEN compared with data for 2/ 4/2003.

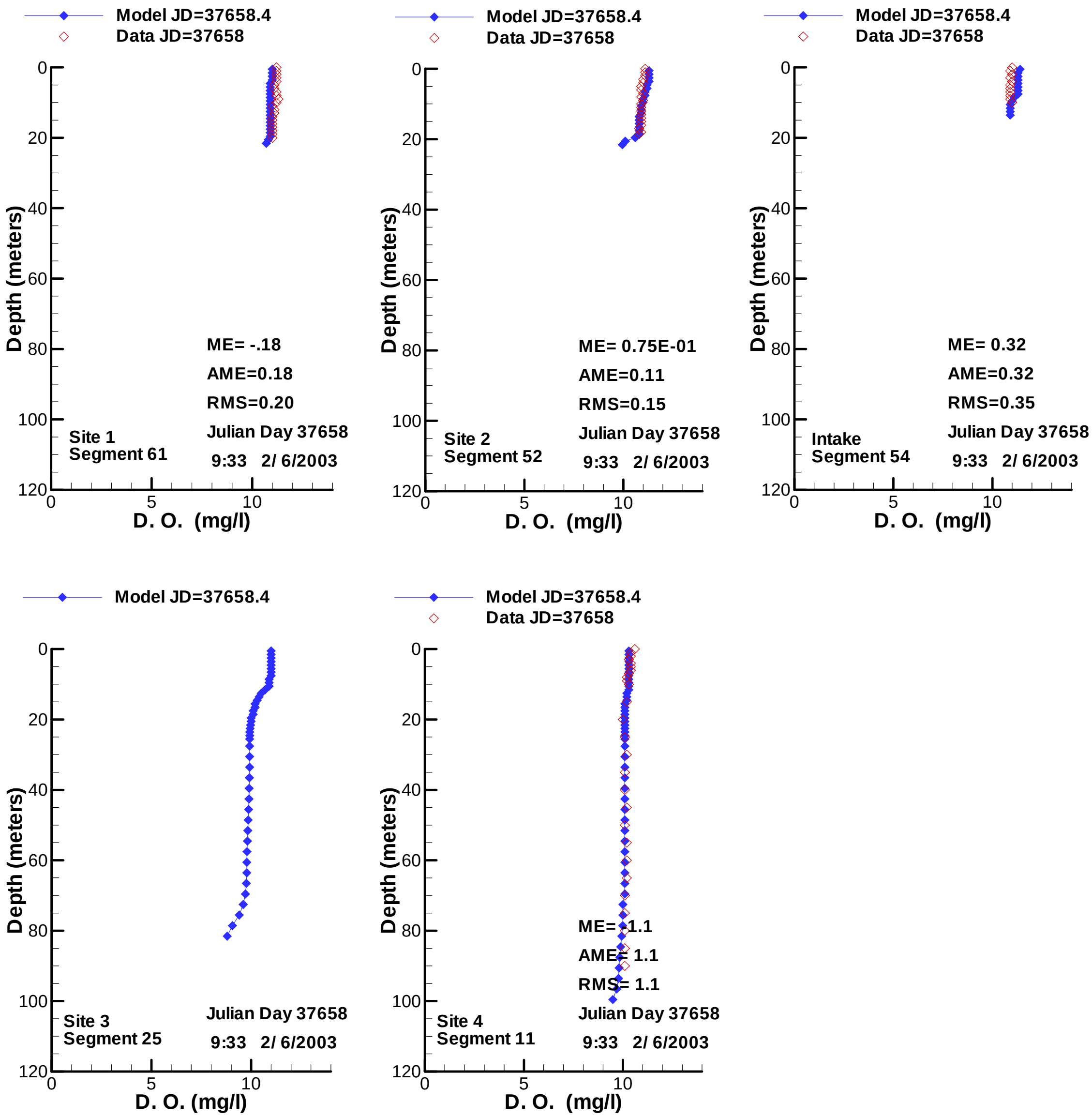

Figure 192. Vertical profiles of DISSOLVED OXYGEN compared with data for 2/ 6/2003.

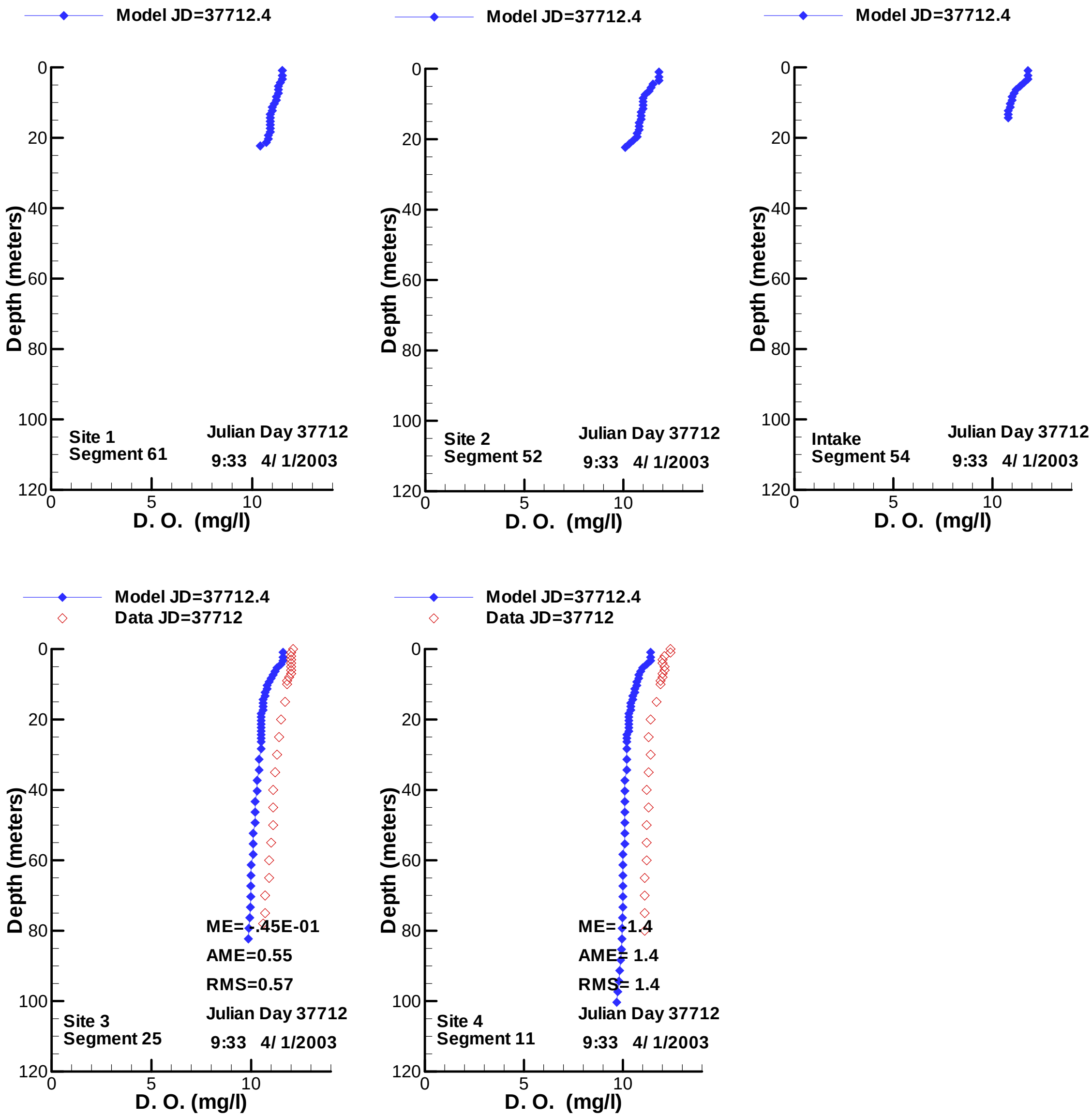

Figure 193. Vertical profiles of DISSOLVED OXYGEN compared with data for 4/ 1/2003.

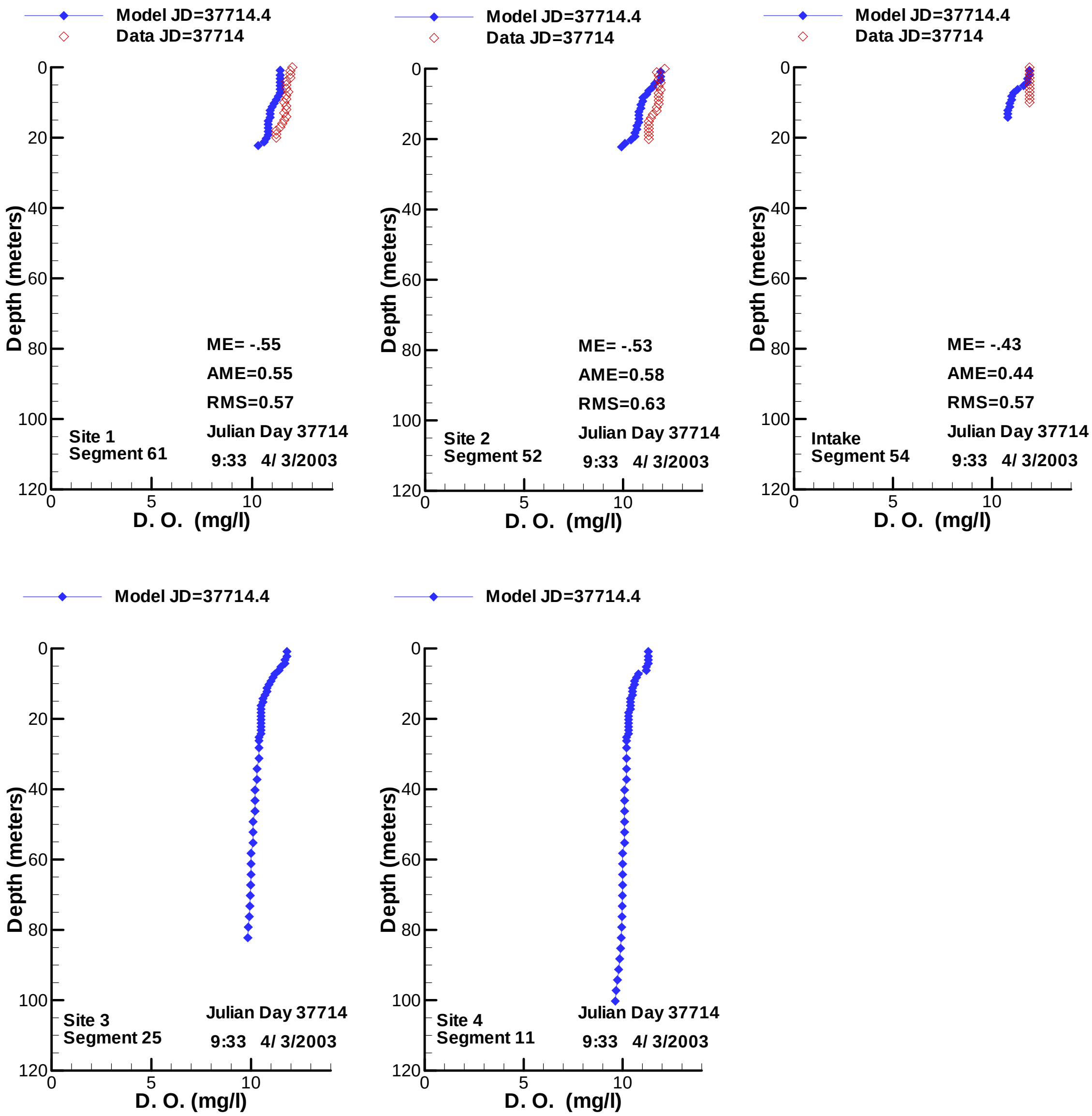

Figure 194. Vertical profiles of DISSOLVED OXYGEN compared with data for 4/ 3/2003.

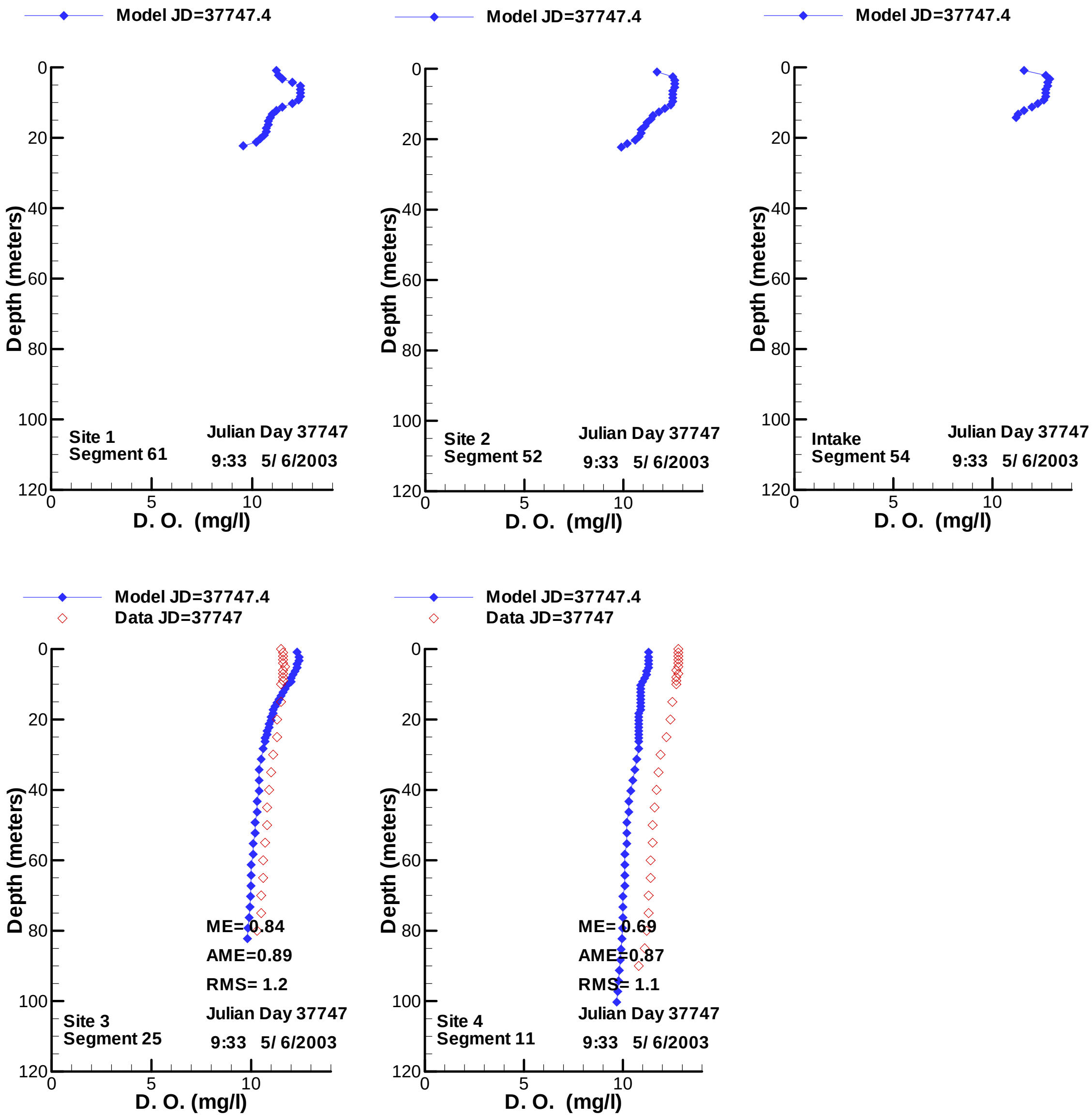

Figure 195. Vertical profiles of DISSOLVED OXYGEN compared with data for 5/ 6/2003.

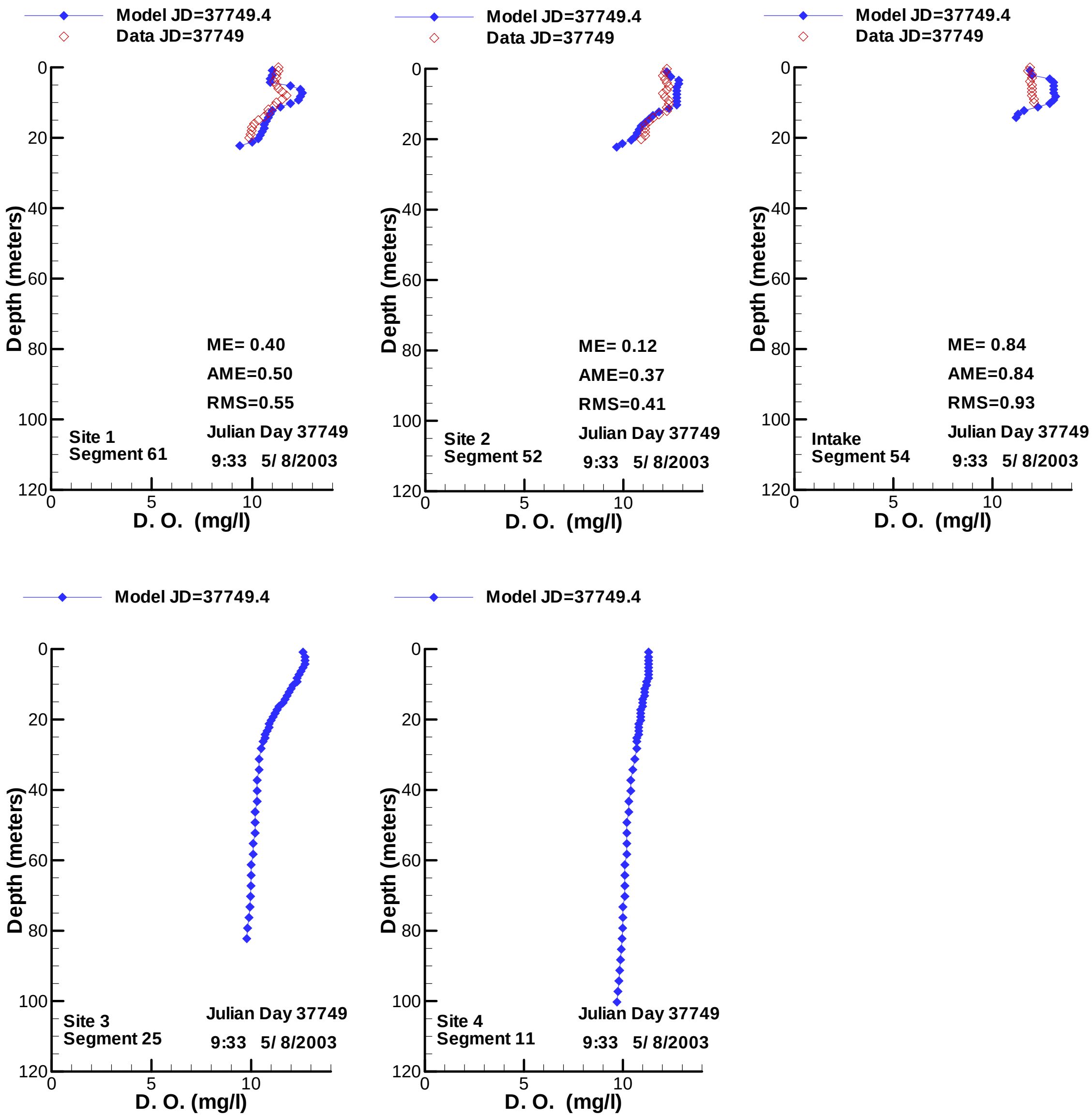

Figure 196. Vertical profiles of DISSOLVED OXYGEN compared with data for 5/ 8/2003.

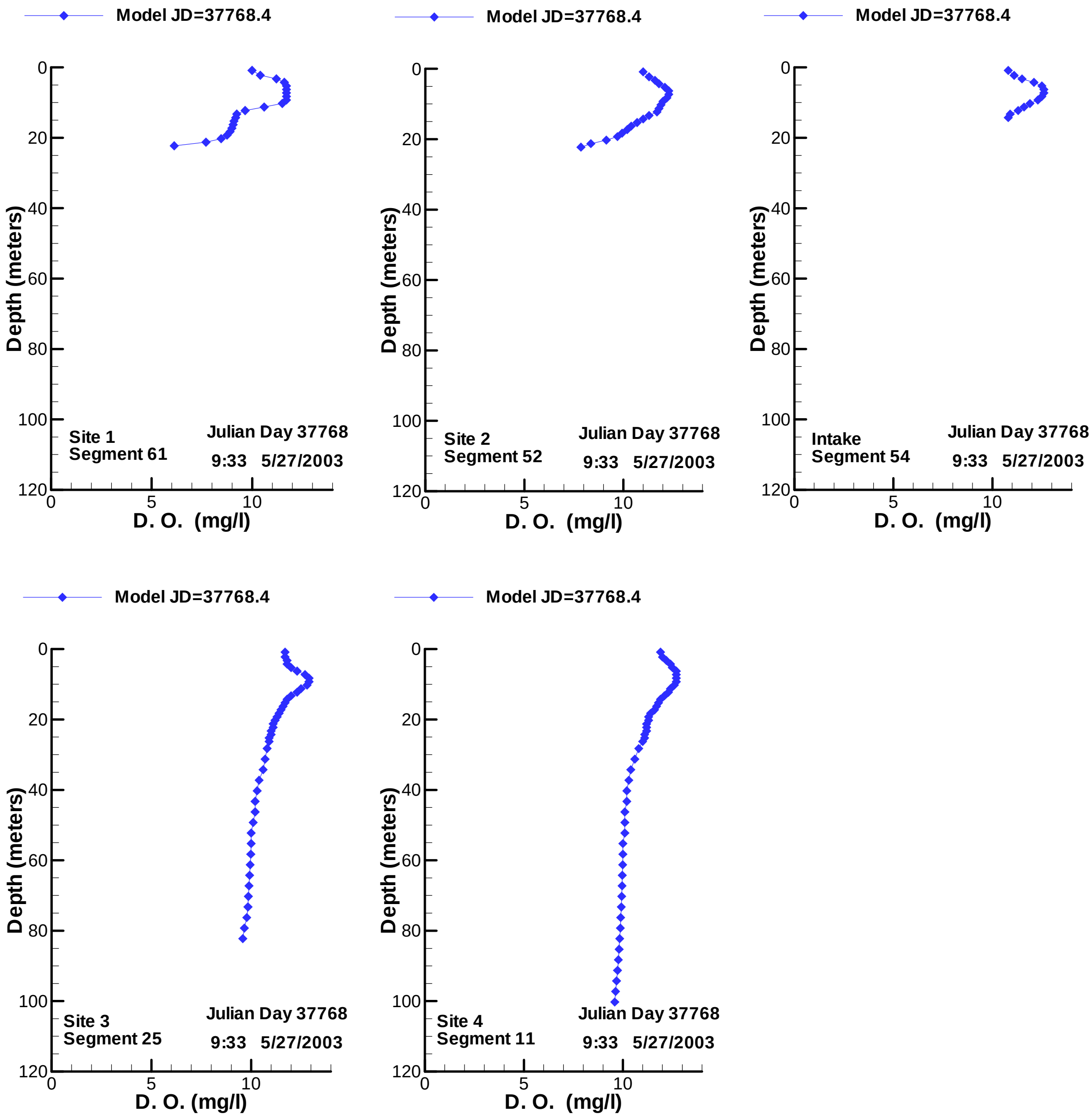

Figure 197. Vertical profiles of DISSOLVED OXYGEN compared with data for 5/27/2003.

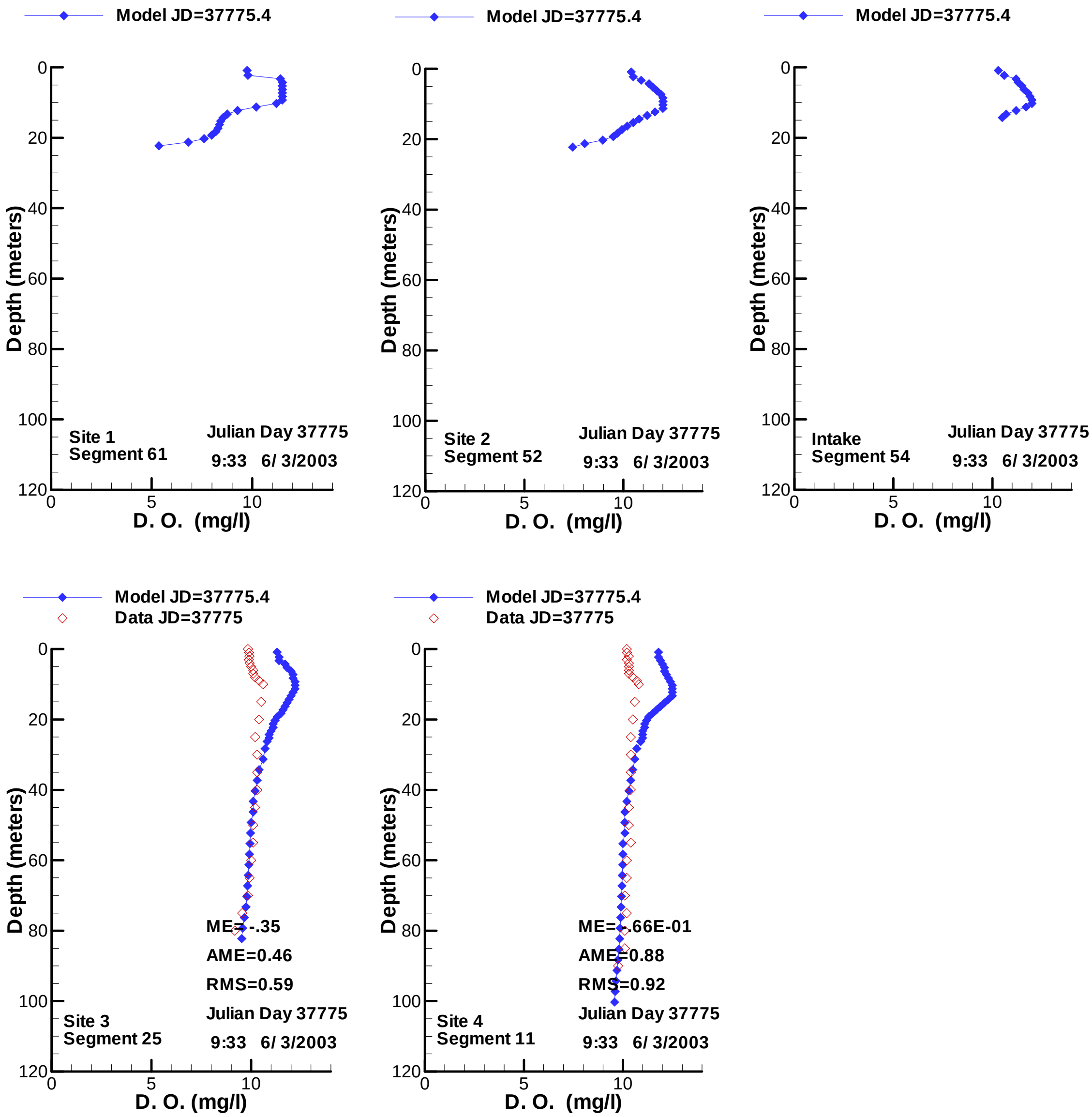

Figure 198. Vertical profiles of DISSOLVED OXYGEN compared with data for 6/ 3/2003.

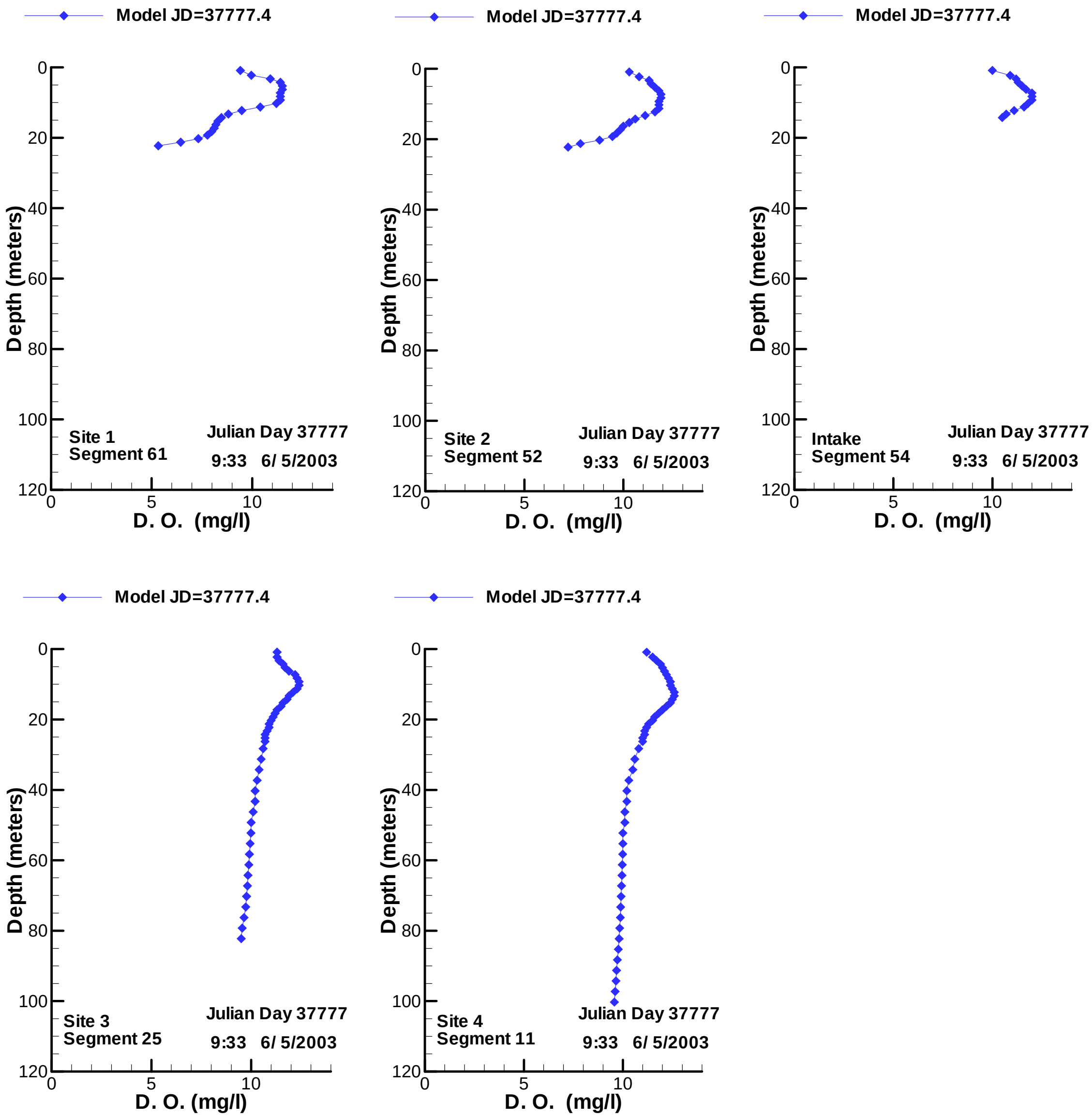

Figure 199. Vertical profiles of DISSOLVED OXYGEN compared with data for 6/ 5/2003.

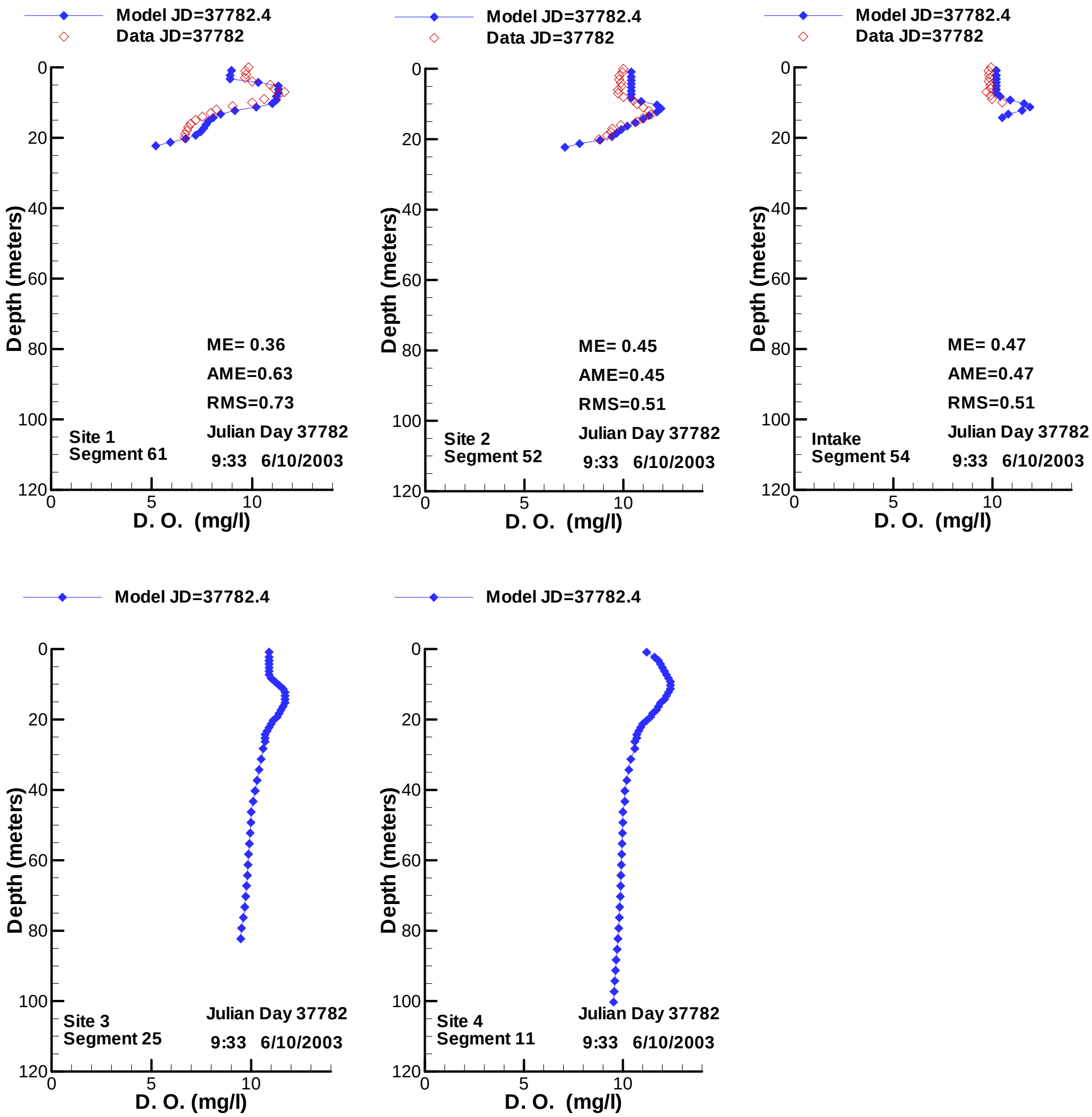

Figure 200. Vertical profiles of DISSOLVED OXYGEN compared with data for 6/10/2003.

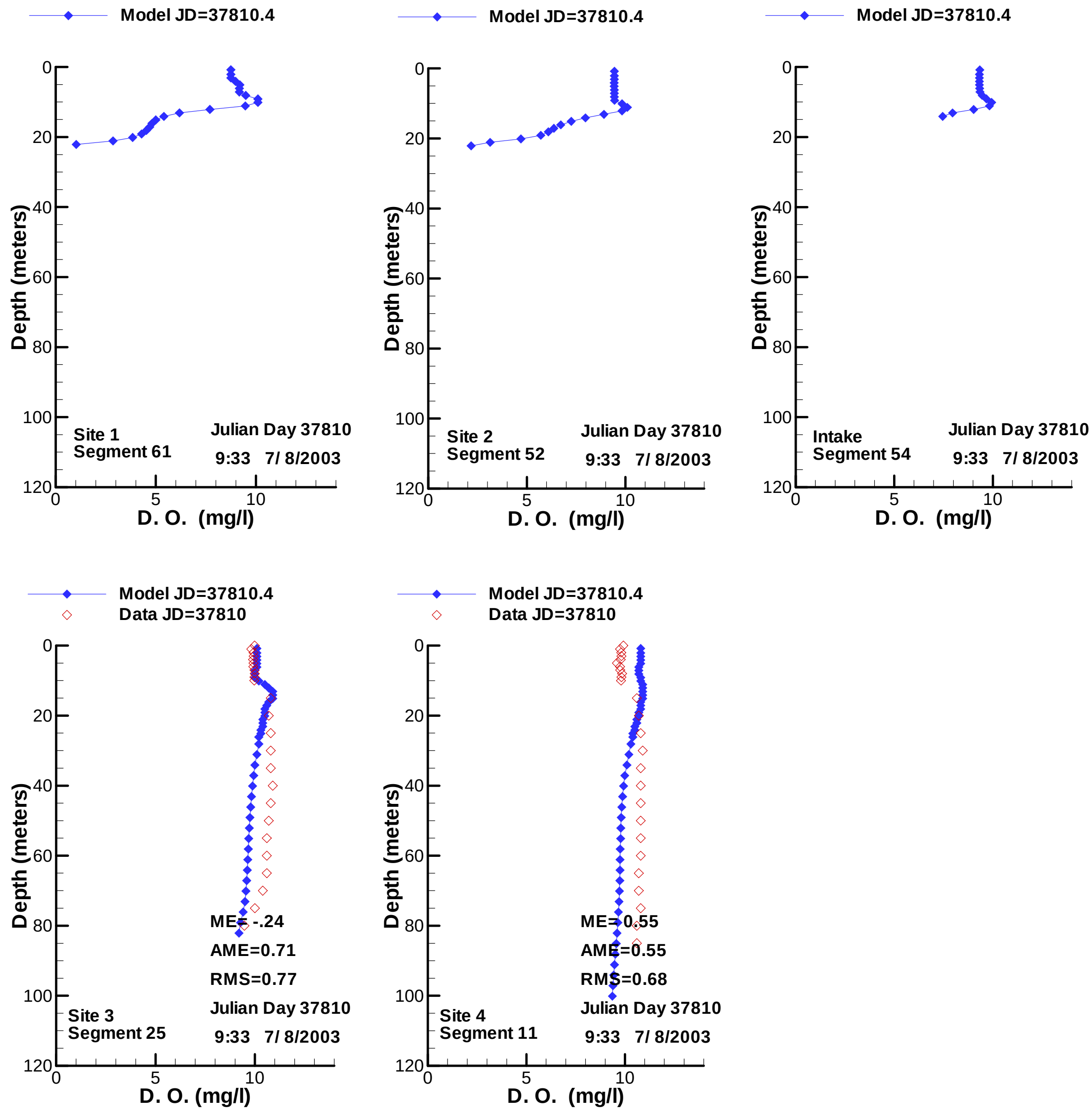

Figure 201. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/ 8/2003.

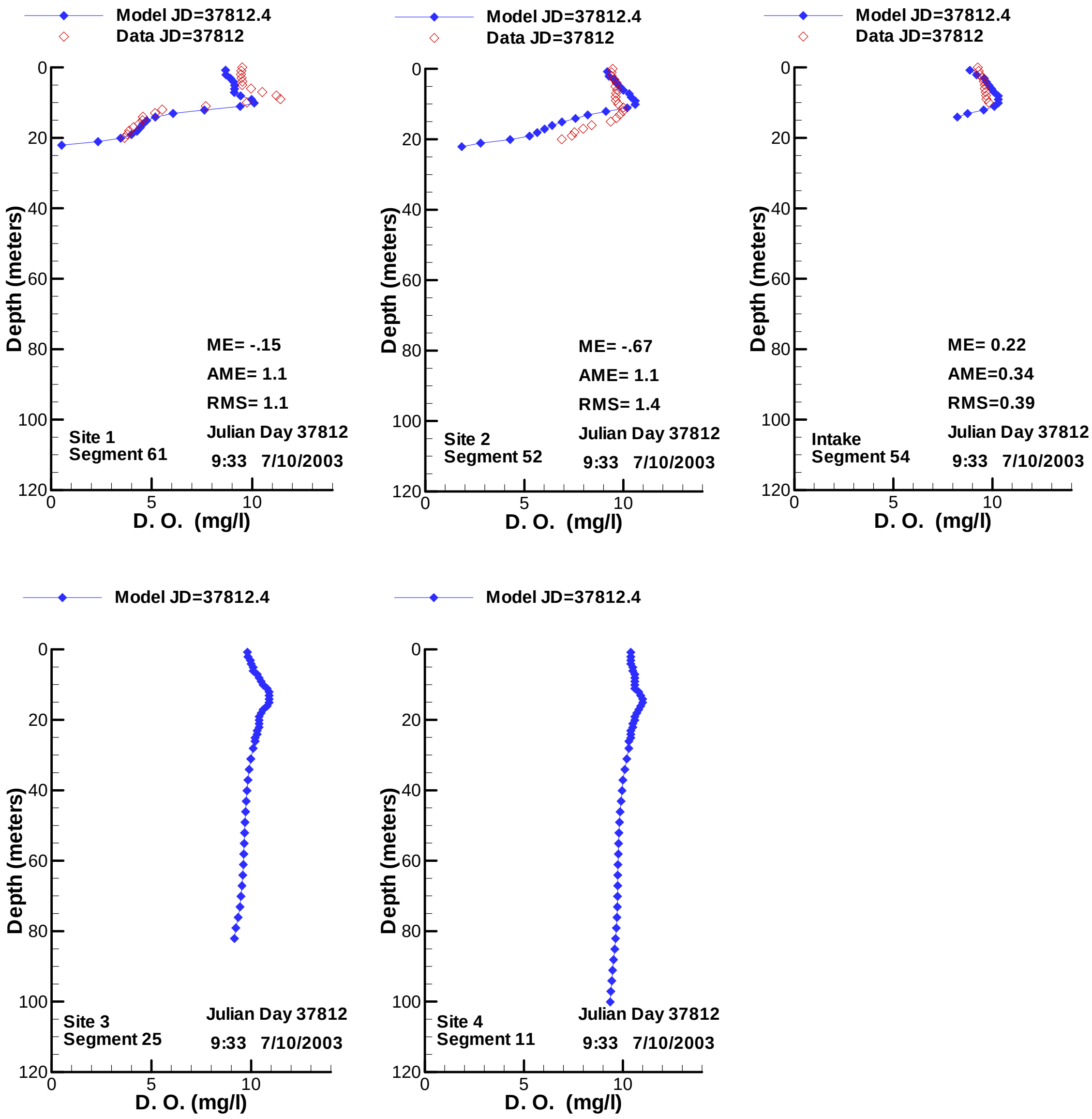

Figure 202. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/10/2003.

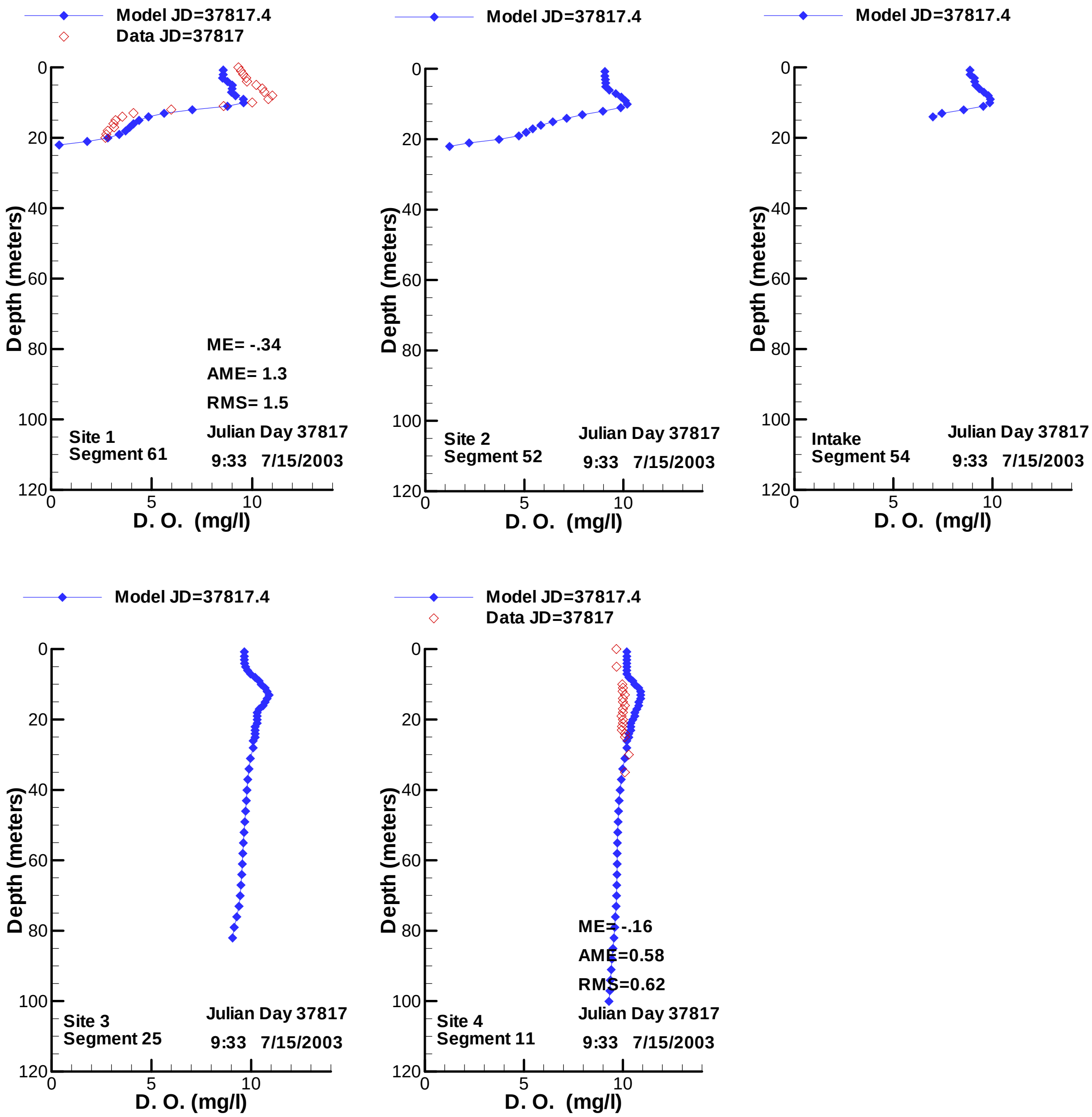

Figure 203. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/15/2003.

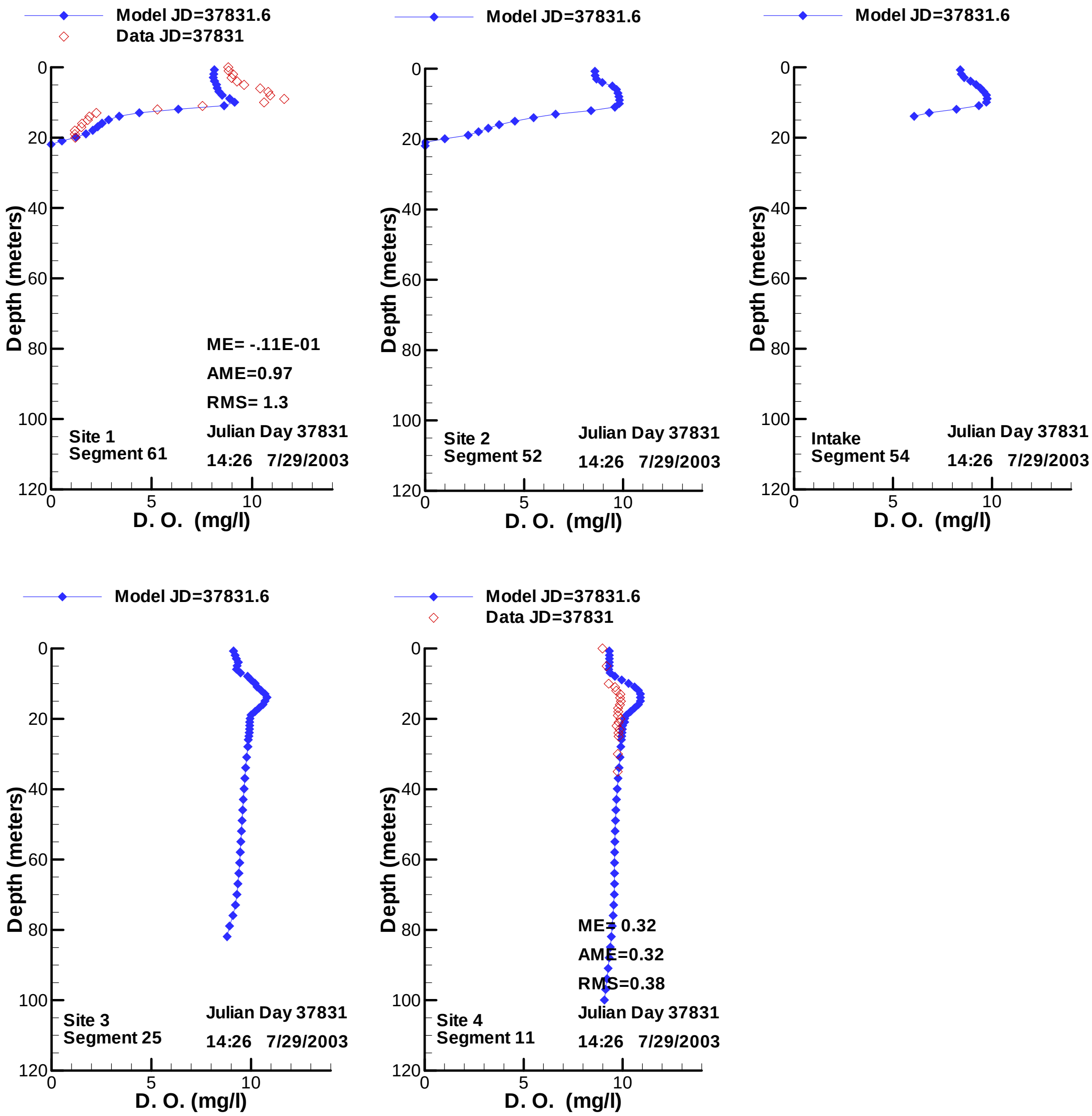

Figure 204. Vertical profiles of DISSOLVED OXYGEN compared with data for 7/29/2003.

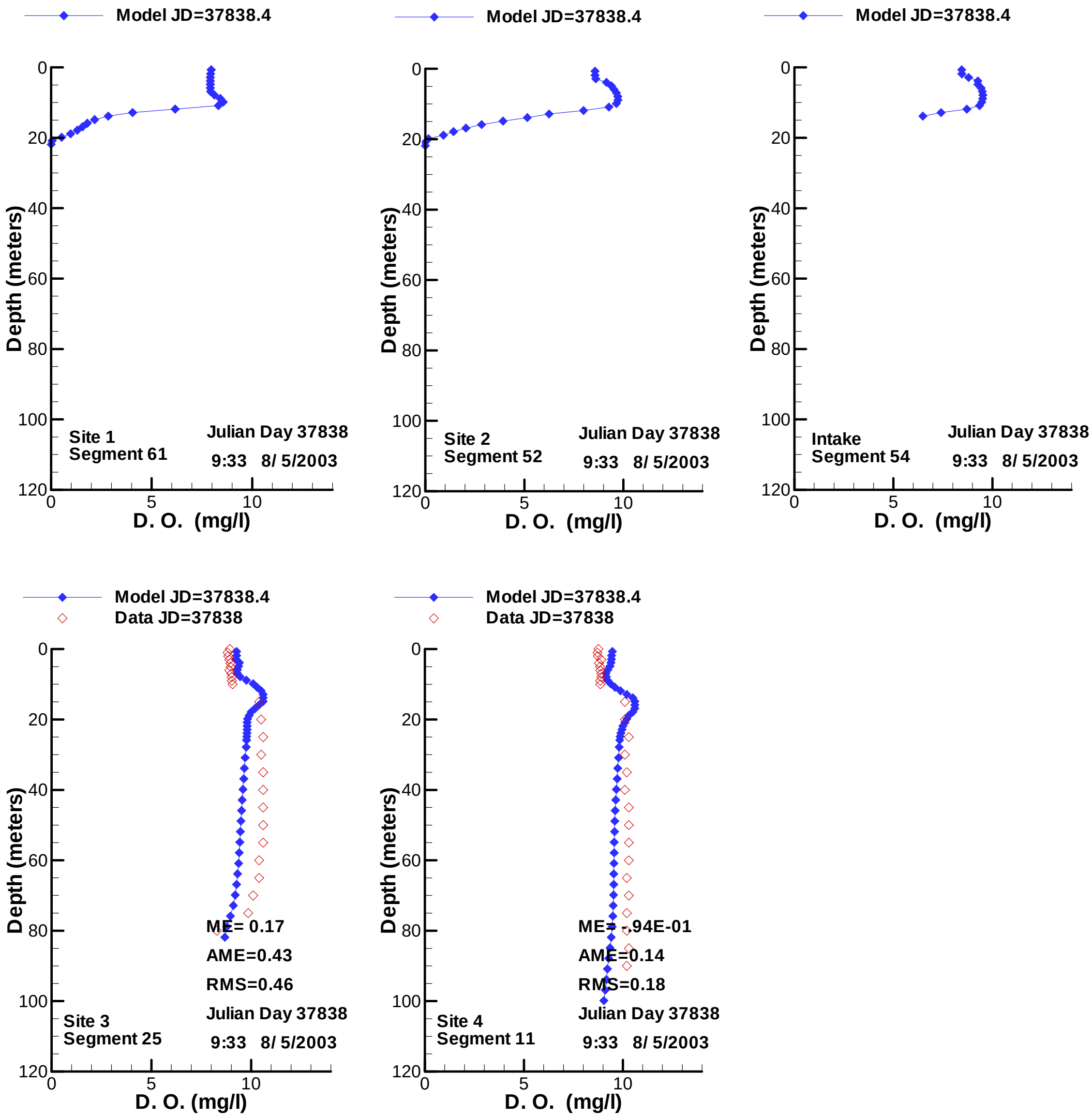

Figure 205. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/ 5/2003.

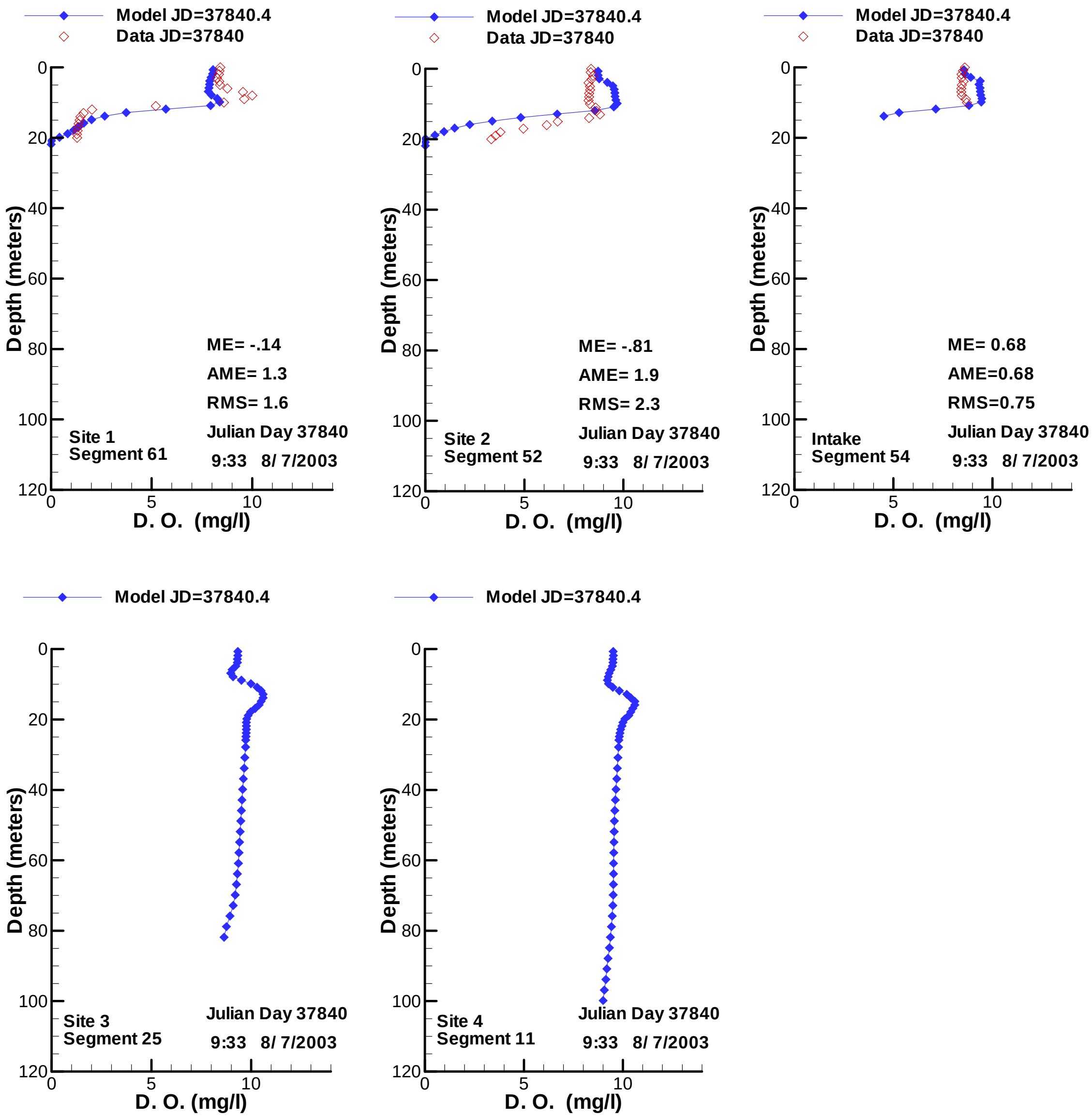

Figure 206. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/ 7/2003.

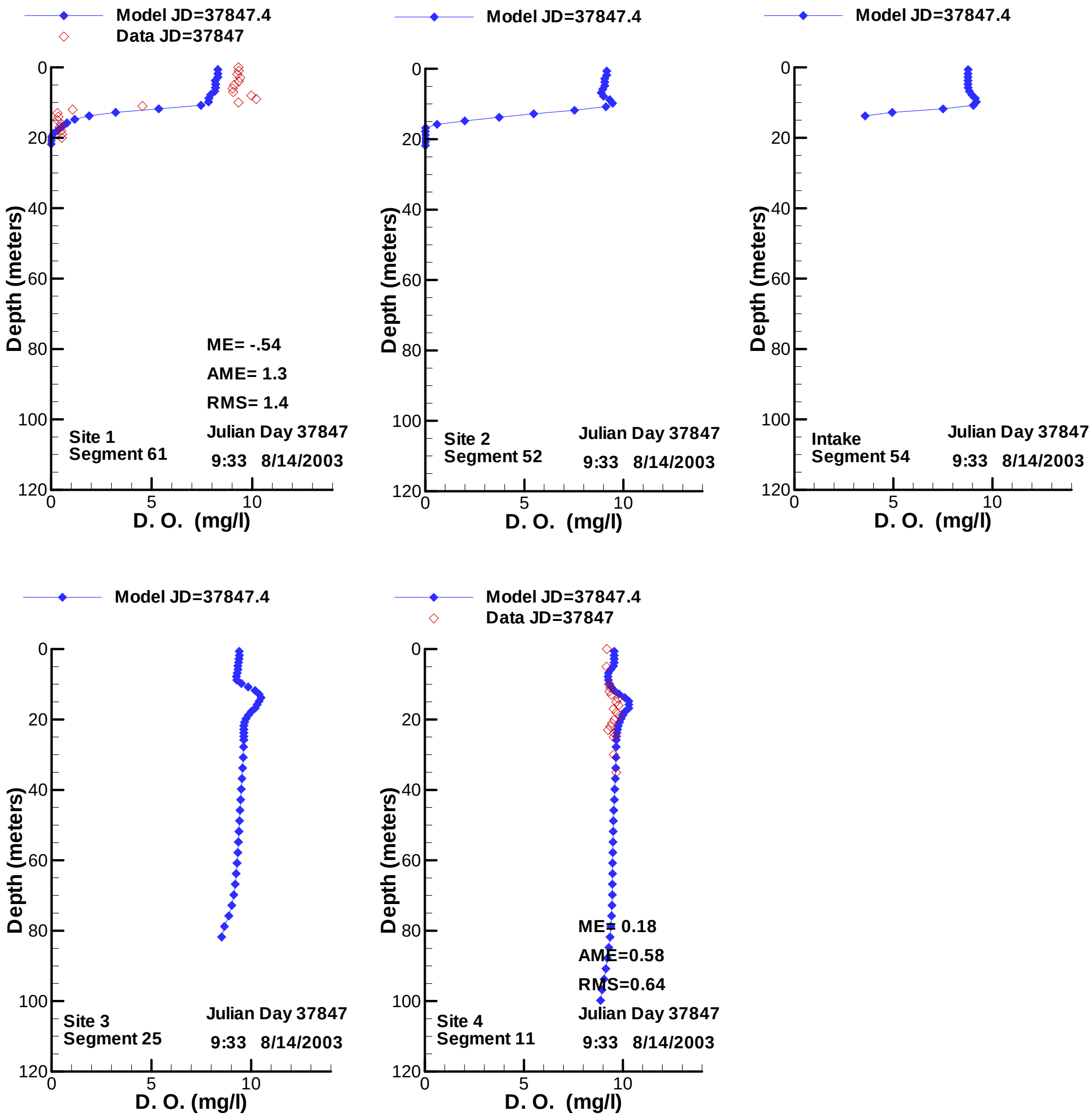

Figure 207. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/14/2003.

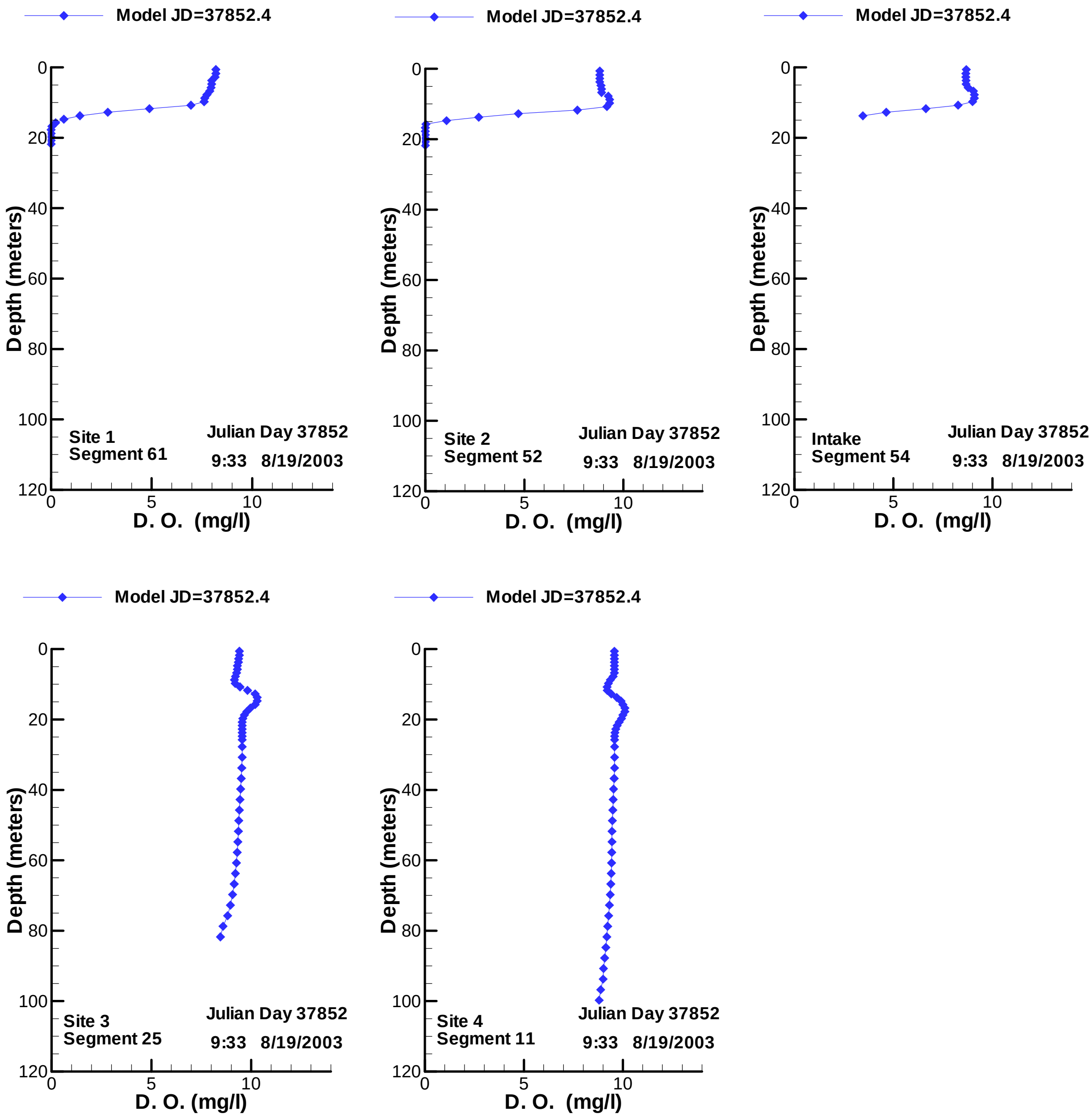

Figure 208. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/19/2003.

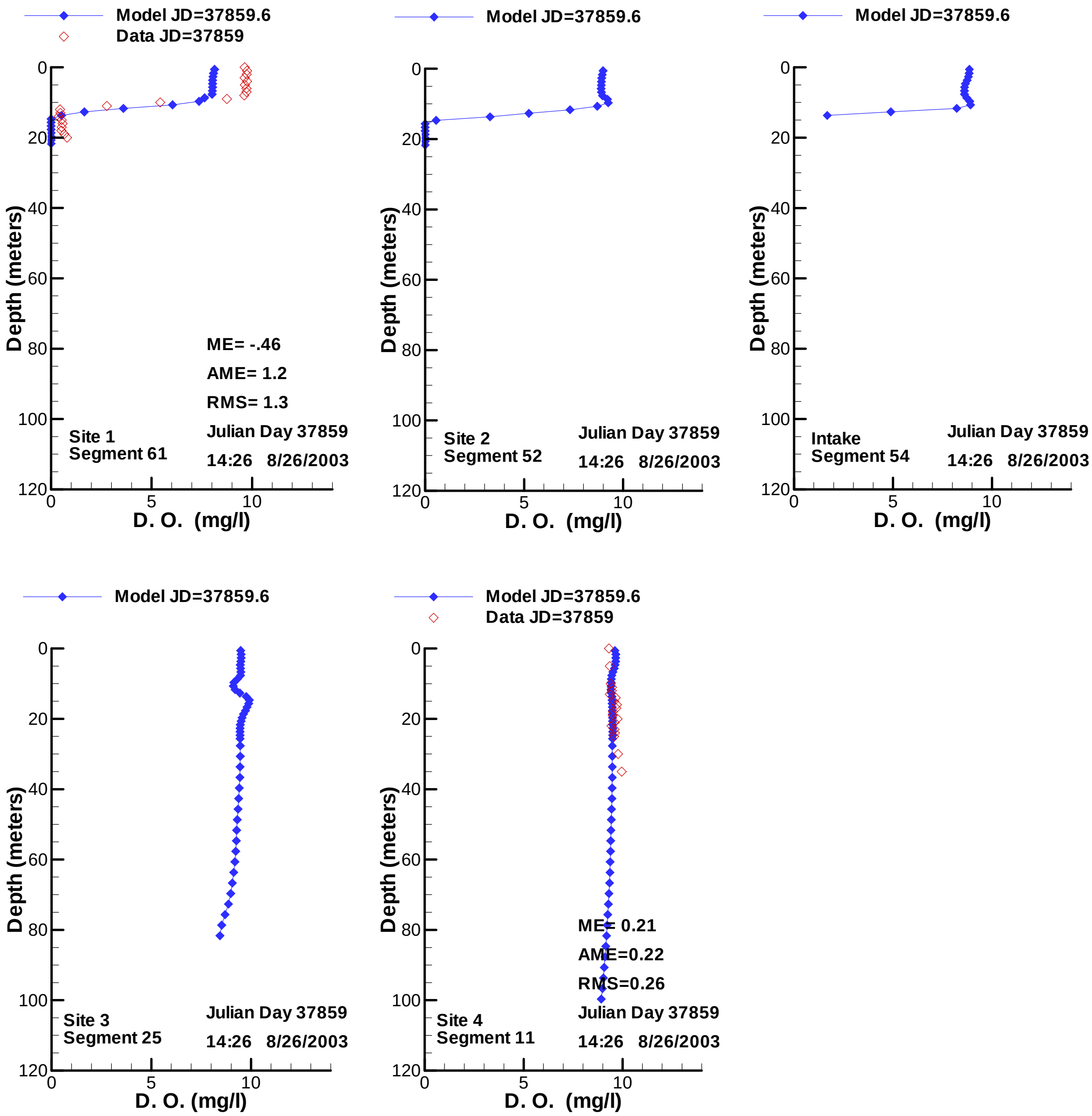

Figure 209. Vertical profiles of DISSOLVED OXYGEN compared with data for 8/26/2003.

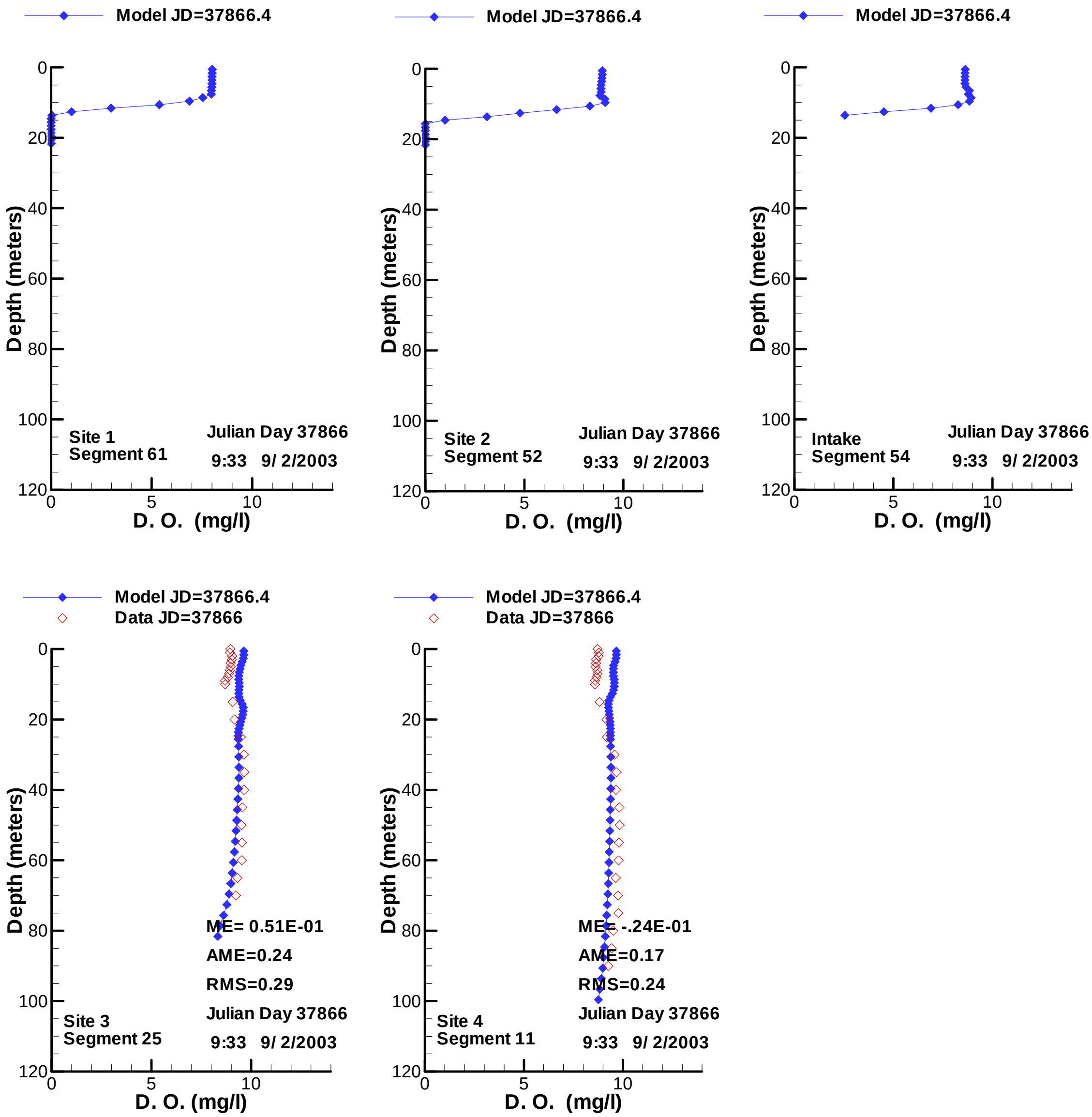

Figure 210. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/ 2/2003.

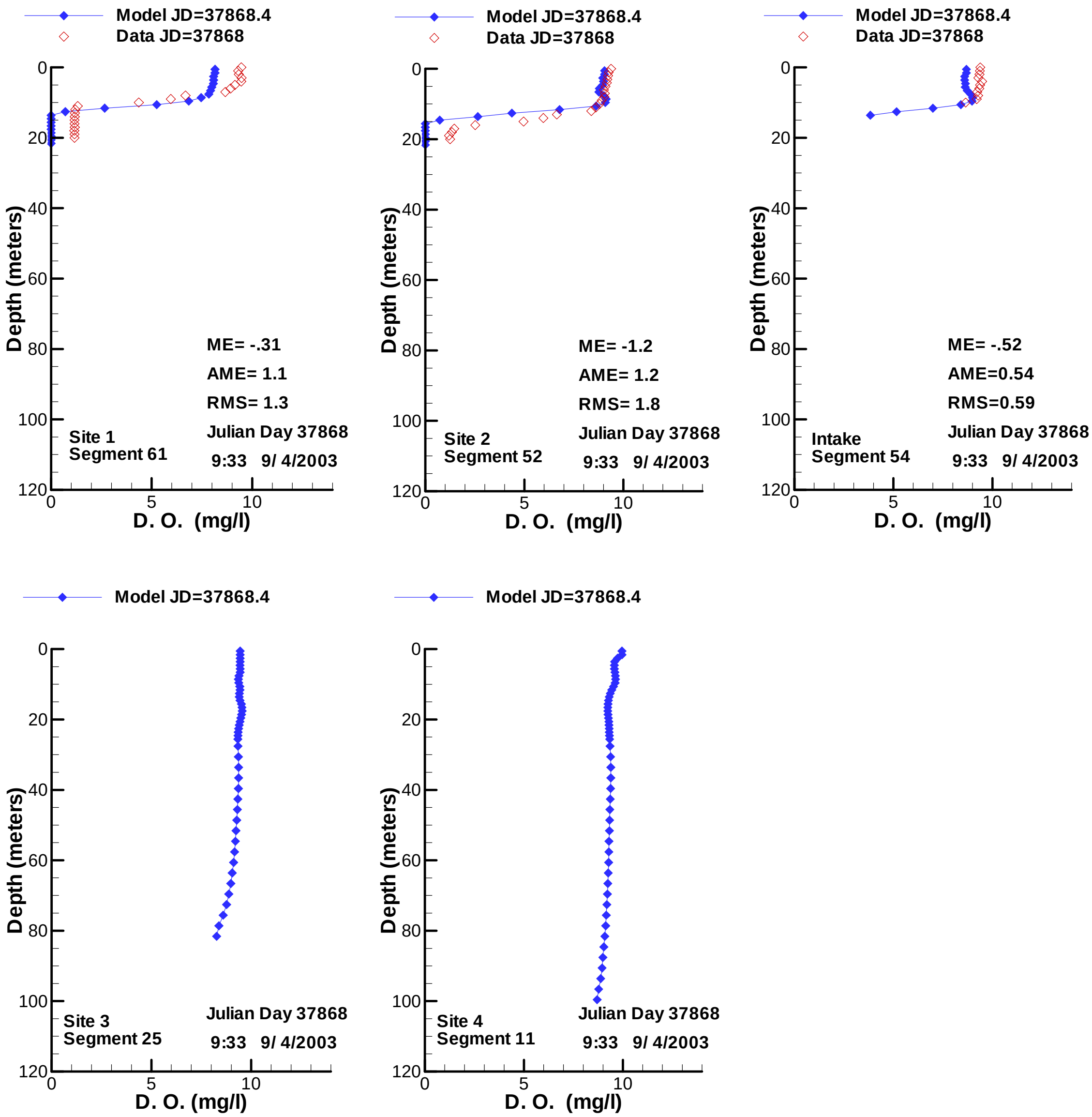

Figure 211. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/ 4/2003.

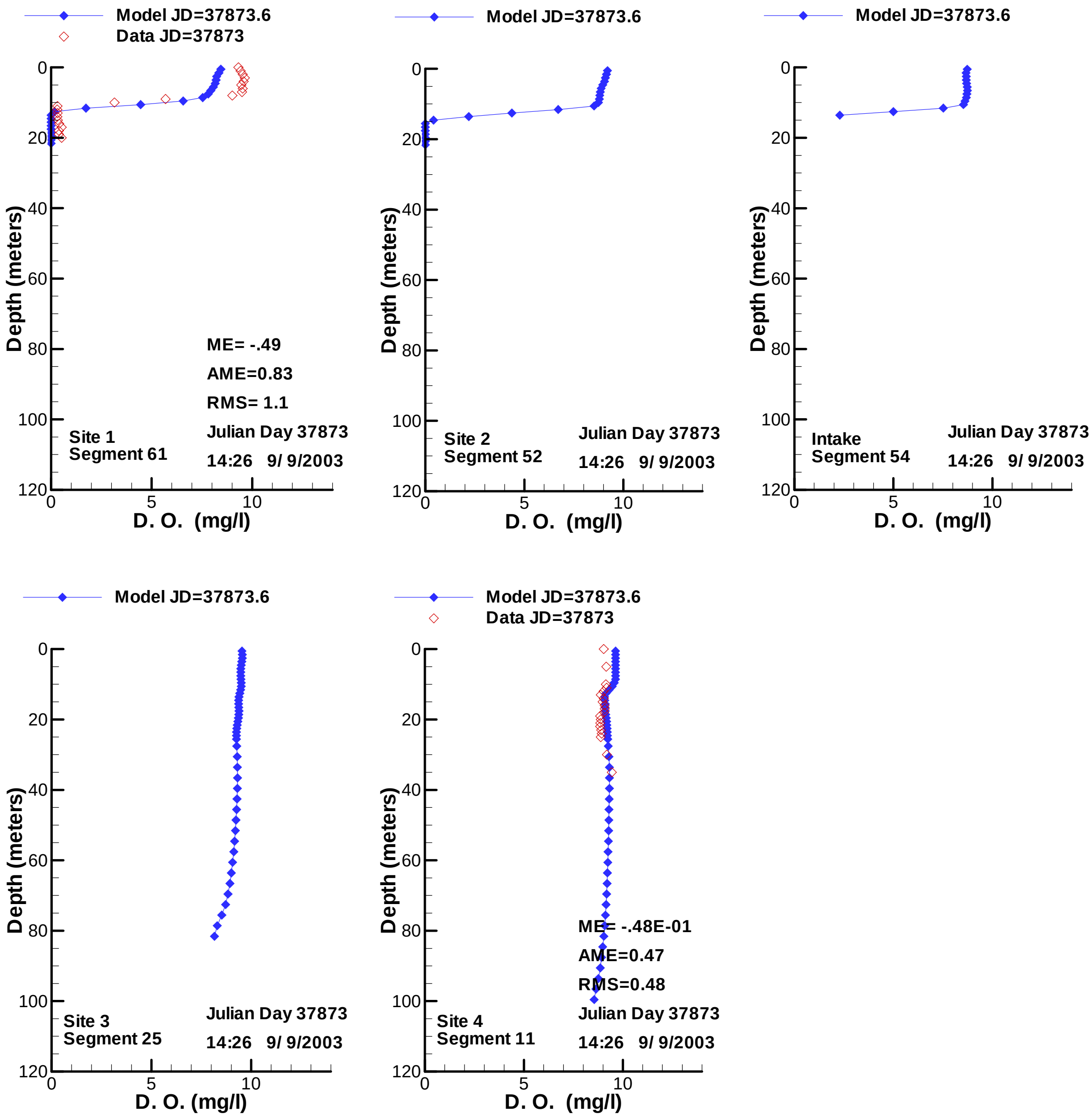

Figure 212. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/ 9/2003.

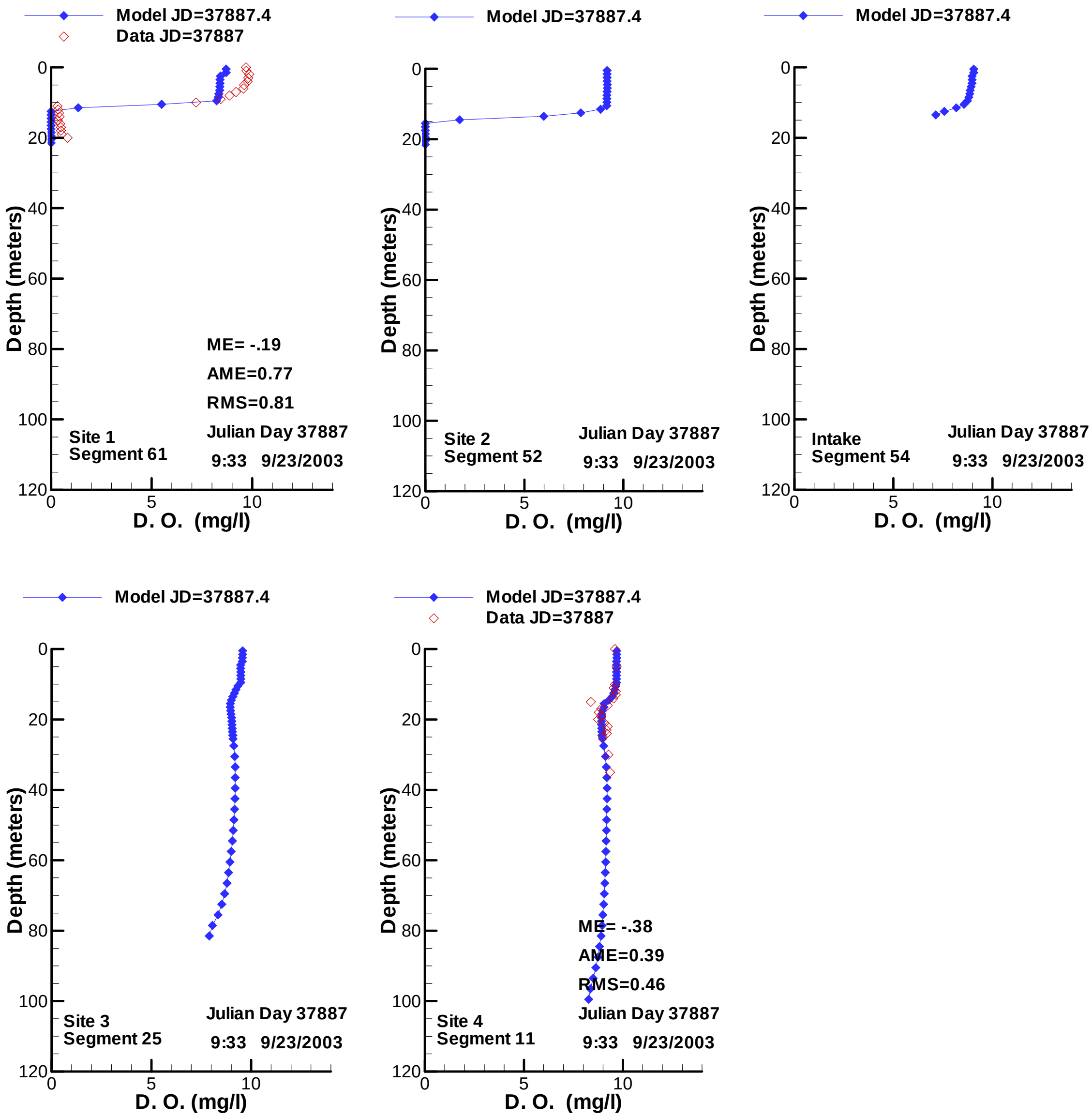

Figure 213. Vertical profiles of DISSOLVED OXYGEN compared with data for 9/23/2003.

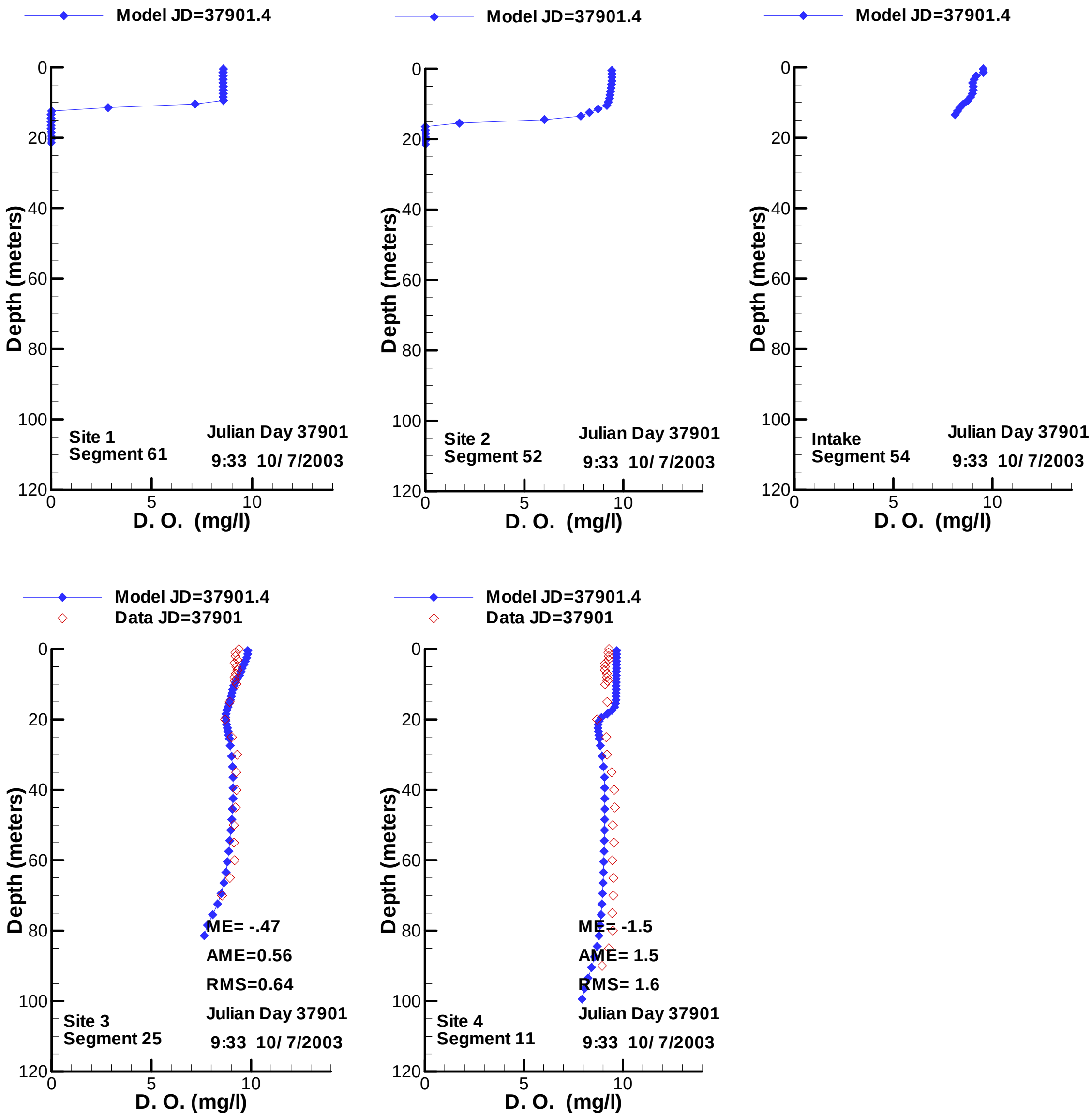

Figure 214. Vertical profiles of DISSOLVED OXYGEN compared with data for 10/ 7/2003.

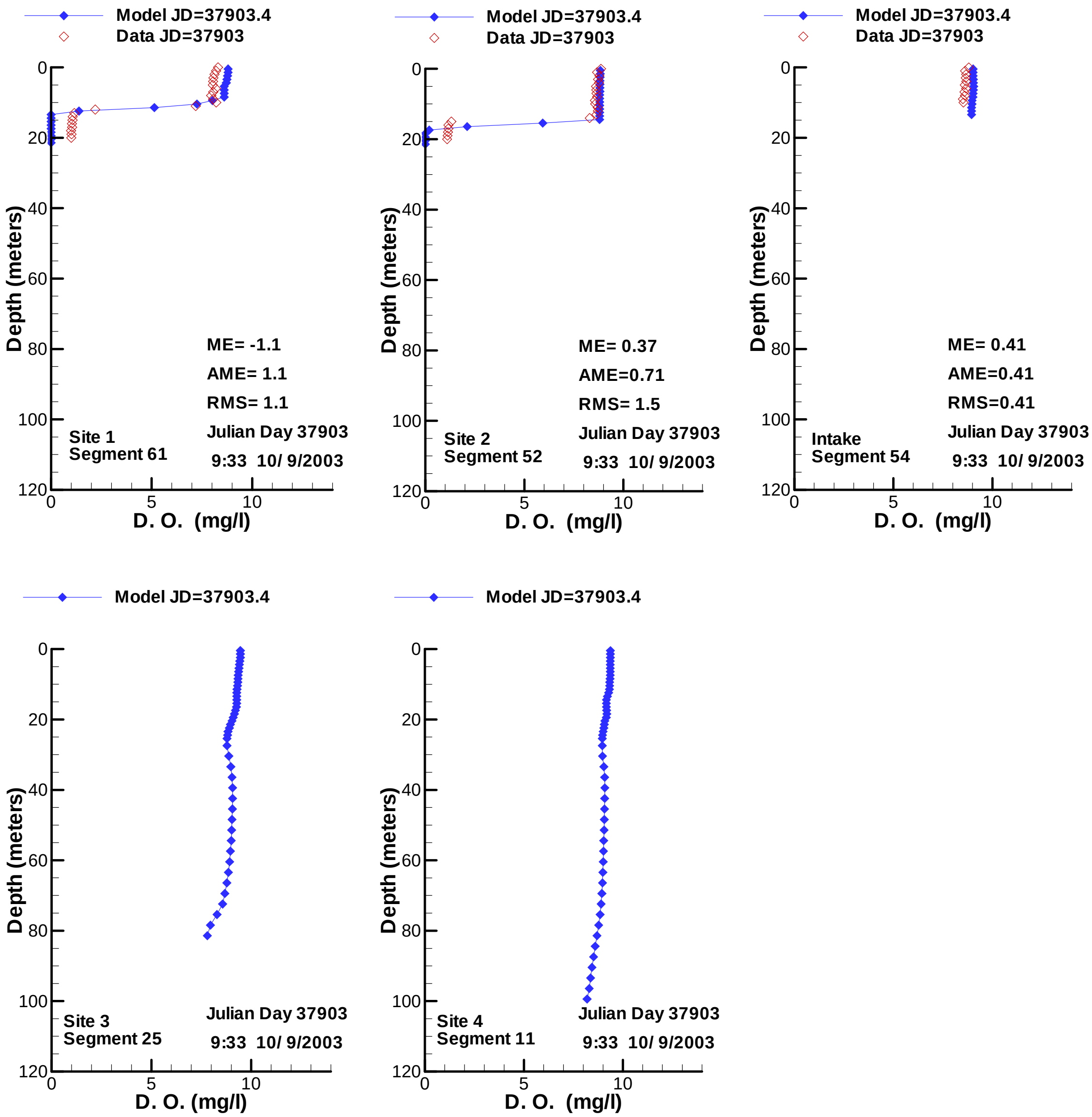

Figure 215. Vertical profiles of DISSOLVED OXYGEN compared with data for 10/ 9/2003.

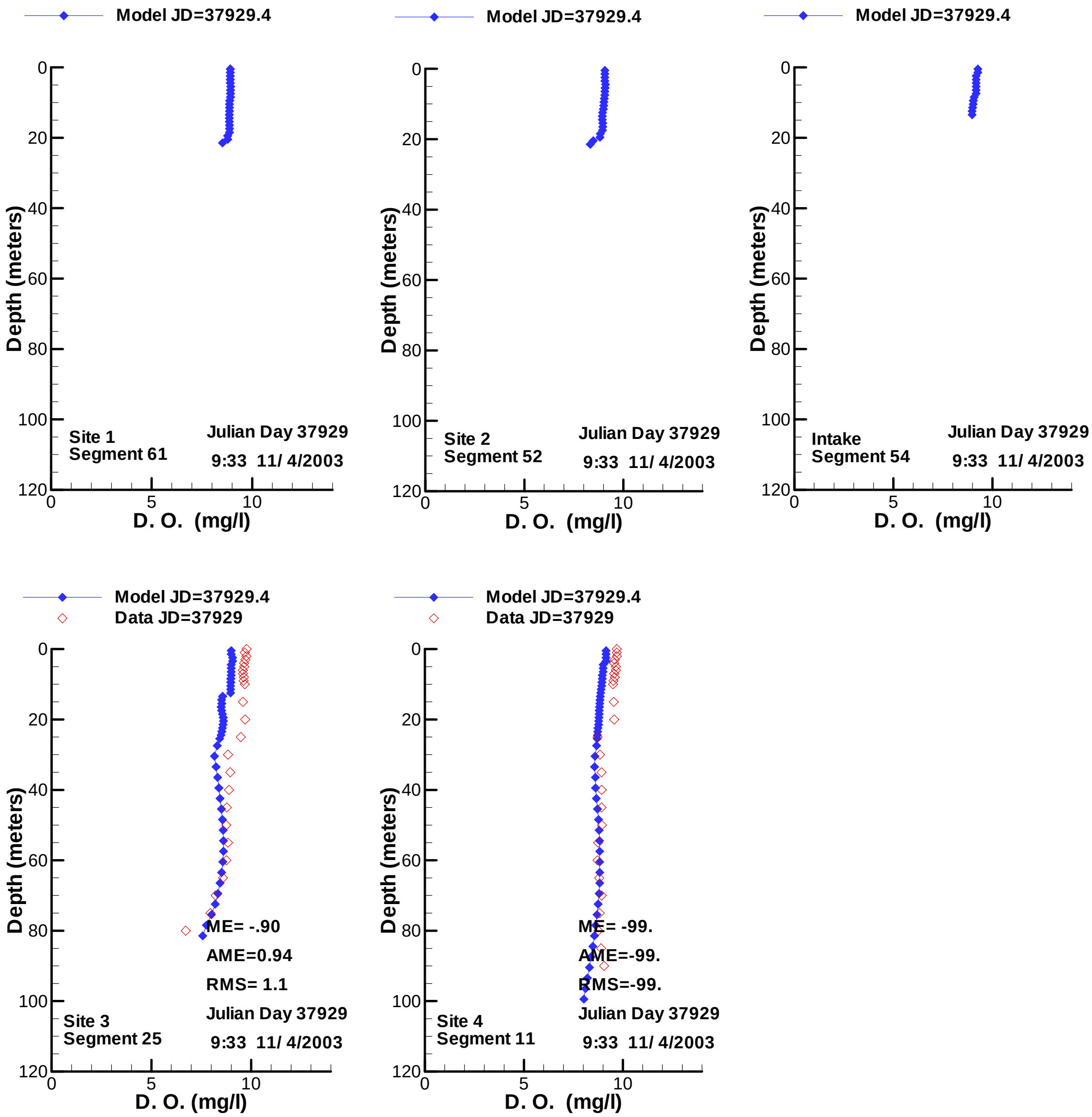

Figure 216. Vertical profiles of DISSOLVED OXYGEN compared with data for 11/ 4/2003.

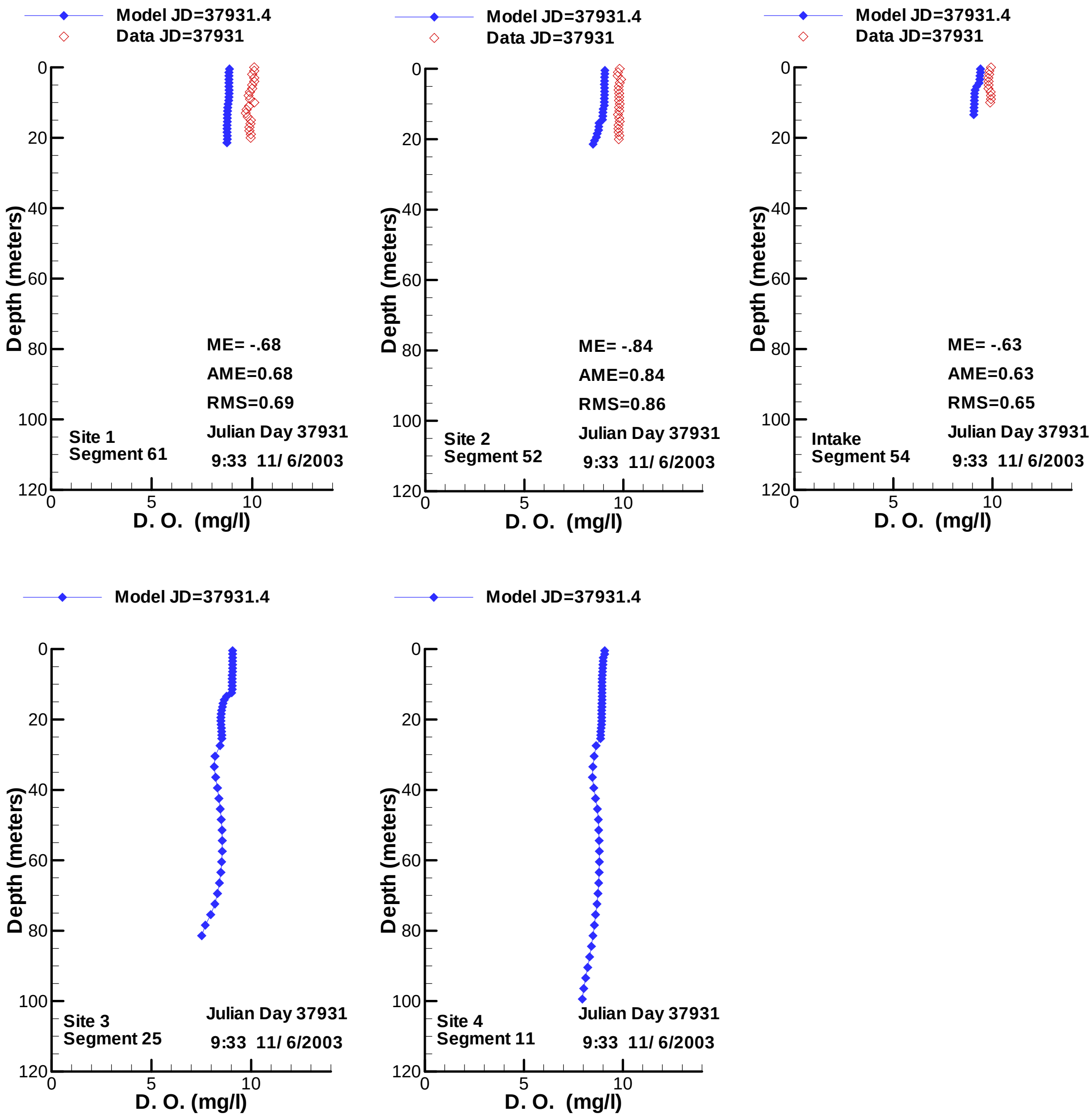

Figure 217. Vertical profiles of DISSOLVED OXYGEN compared with data for 11/ 6/2003.

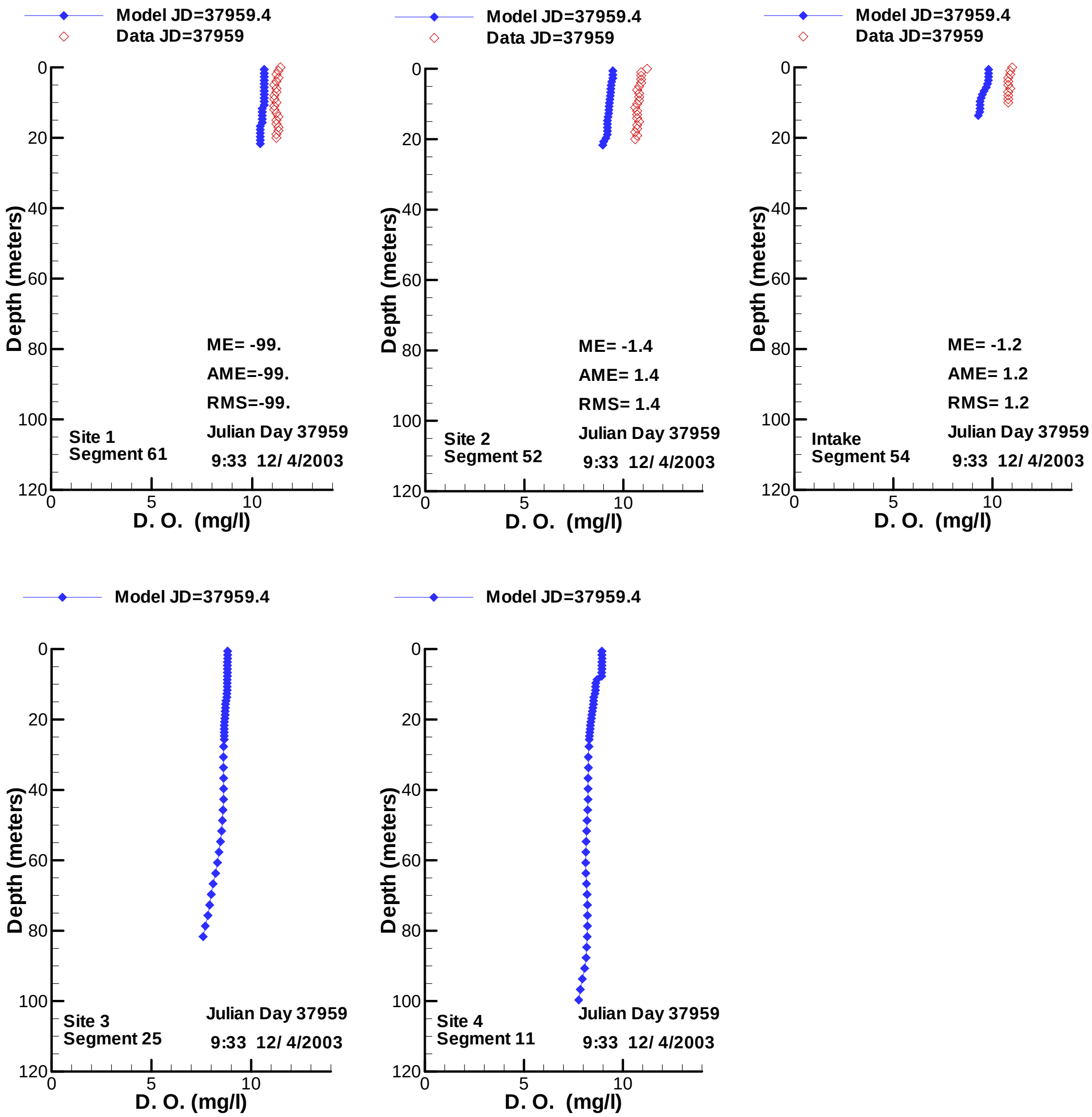

Figure 218. Vertical profiles of DISSOLVED OXYGEN compared with data for 12/ 4/2003.

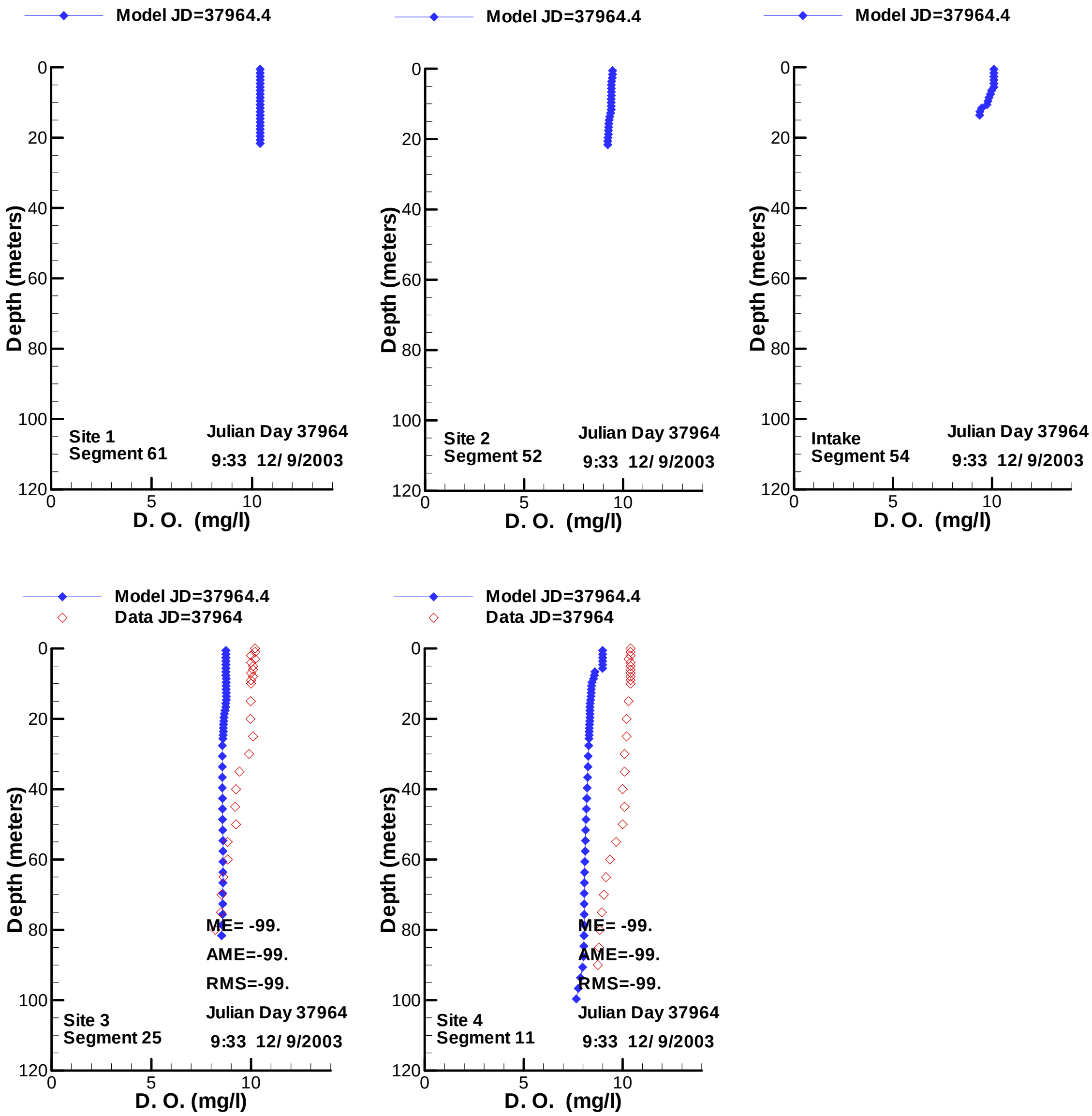

Figure 219. Vertical profiles of DISSOLVED OXYGEN compared with data for 12/ 9/2003.

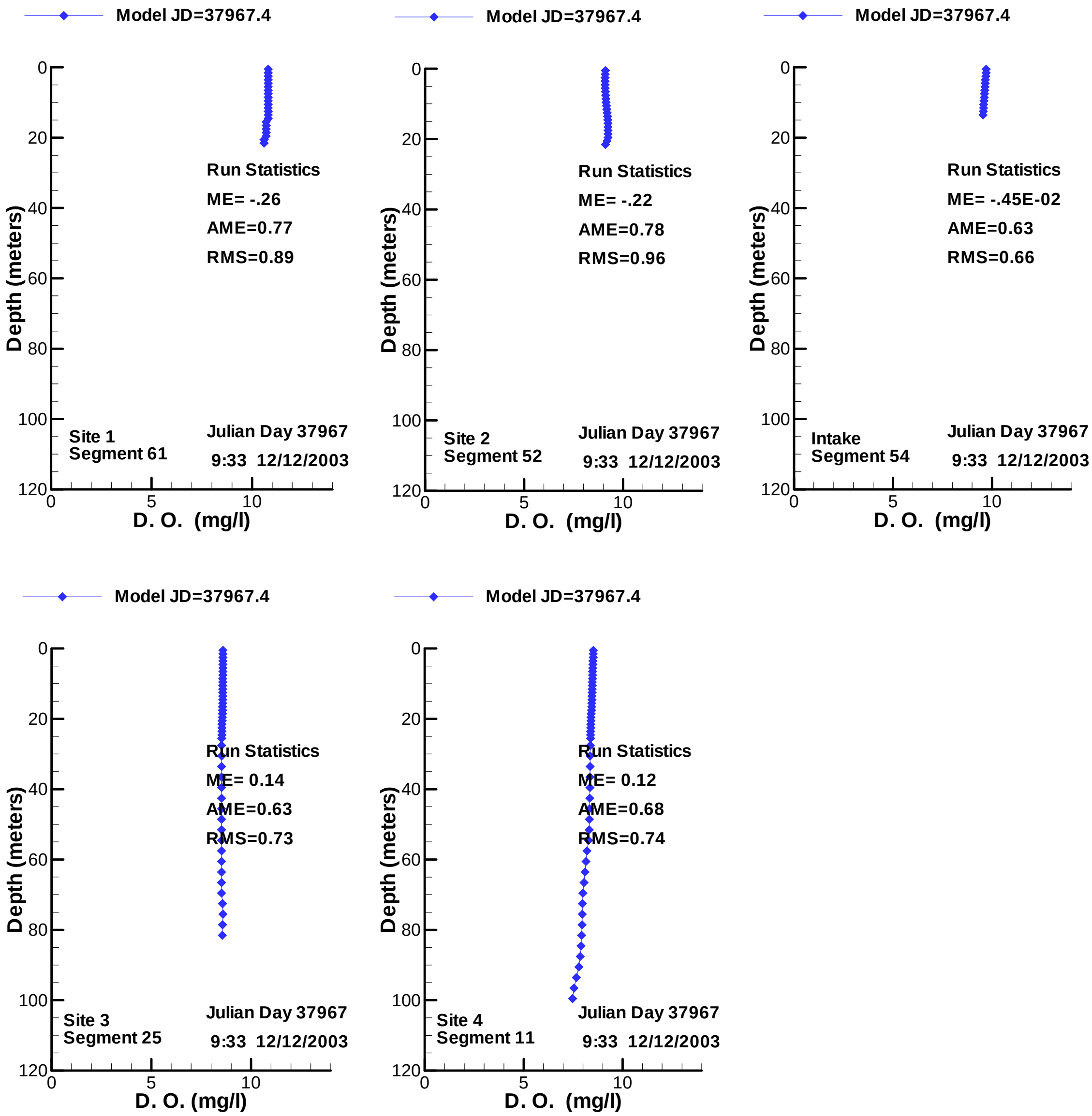

Figure 220. Vertical profiles of DISSOLVED OXYGEN compared with data for 12/12/2003.

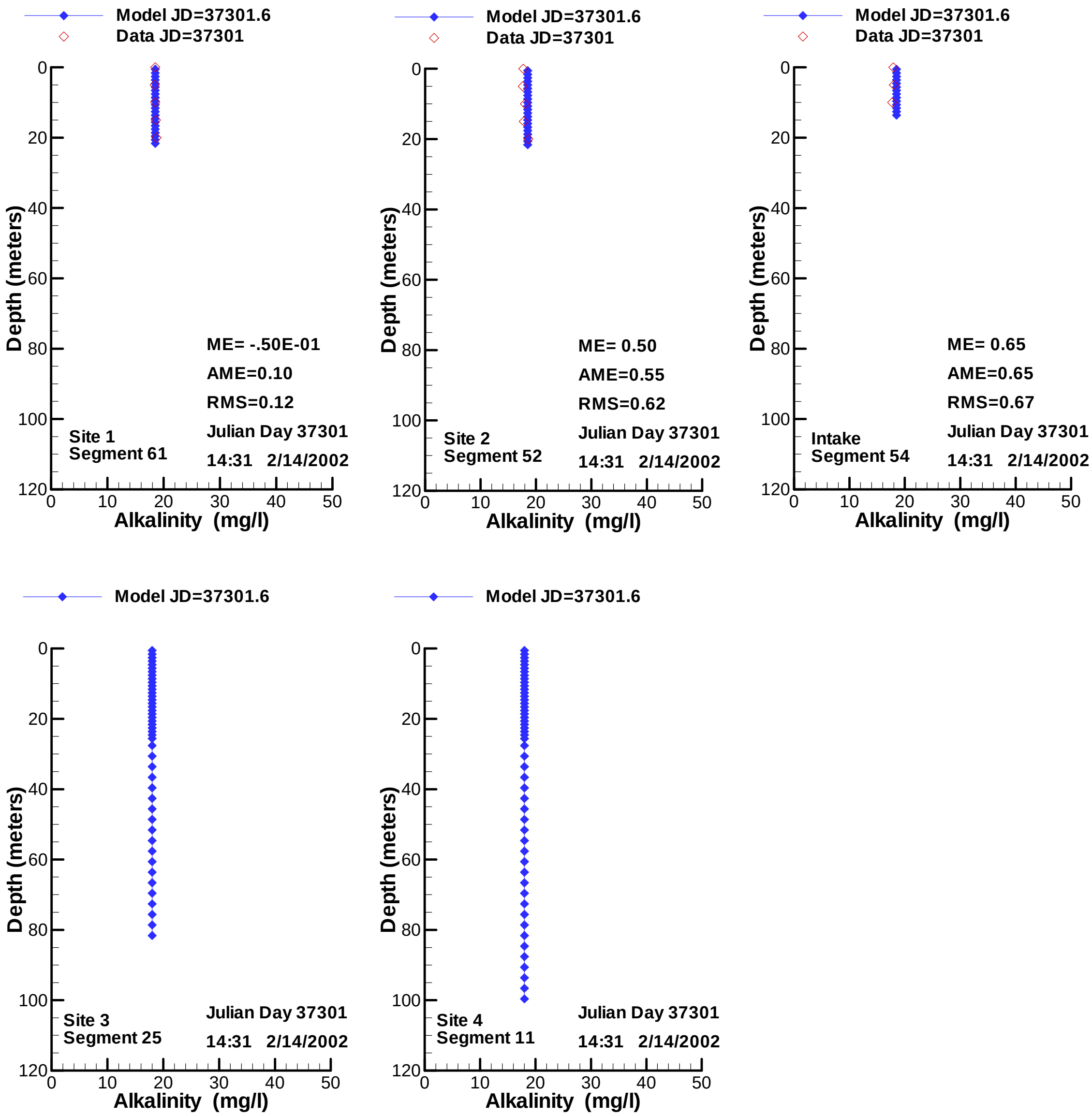

Figure 221. Vertical profiles of Alkalinity compared with data for 2/14/2002.

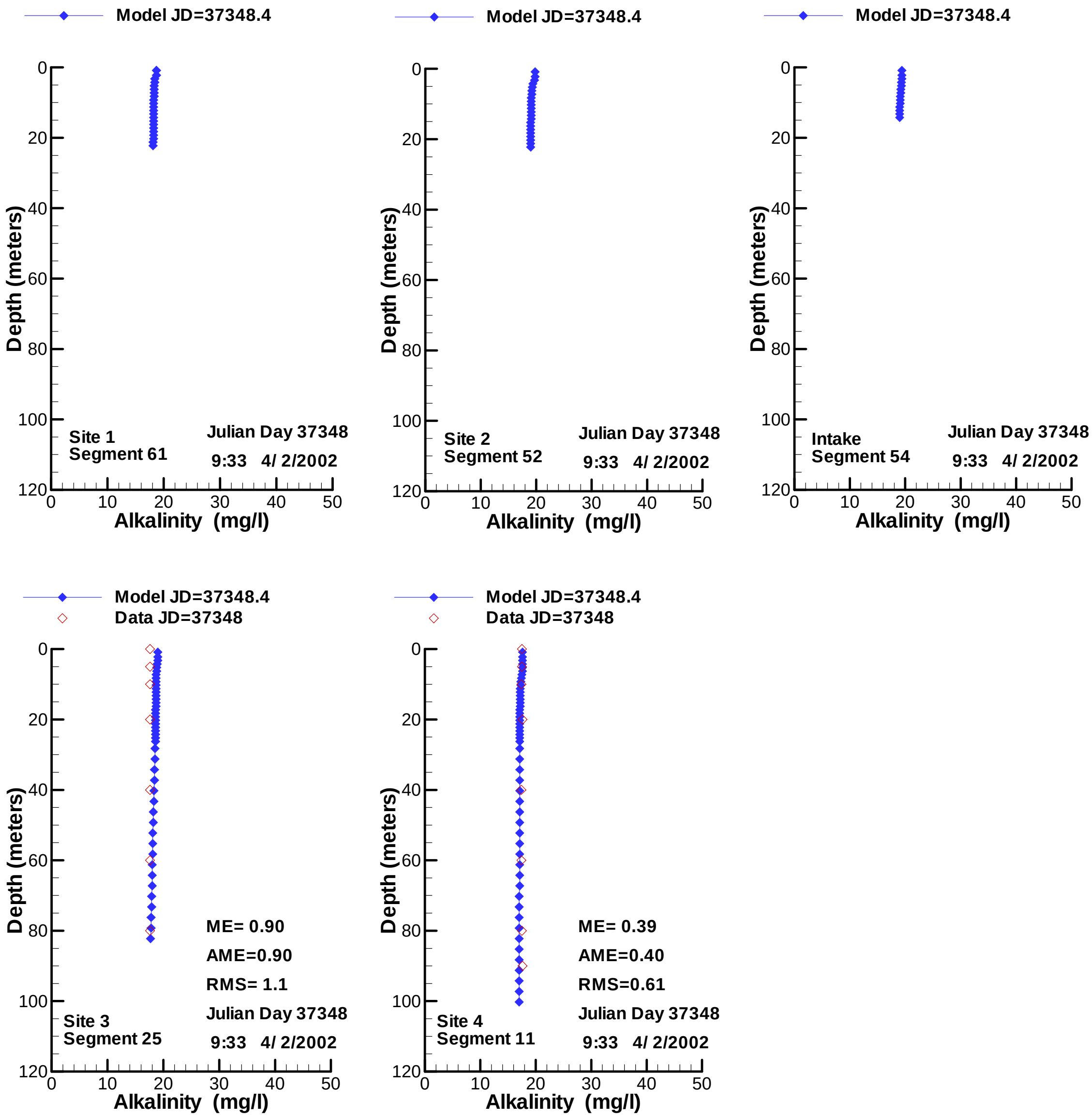

Figure 222. Vertical profiles of Alkalinity compared with data for 4/ 2/2002.

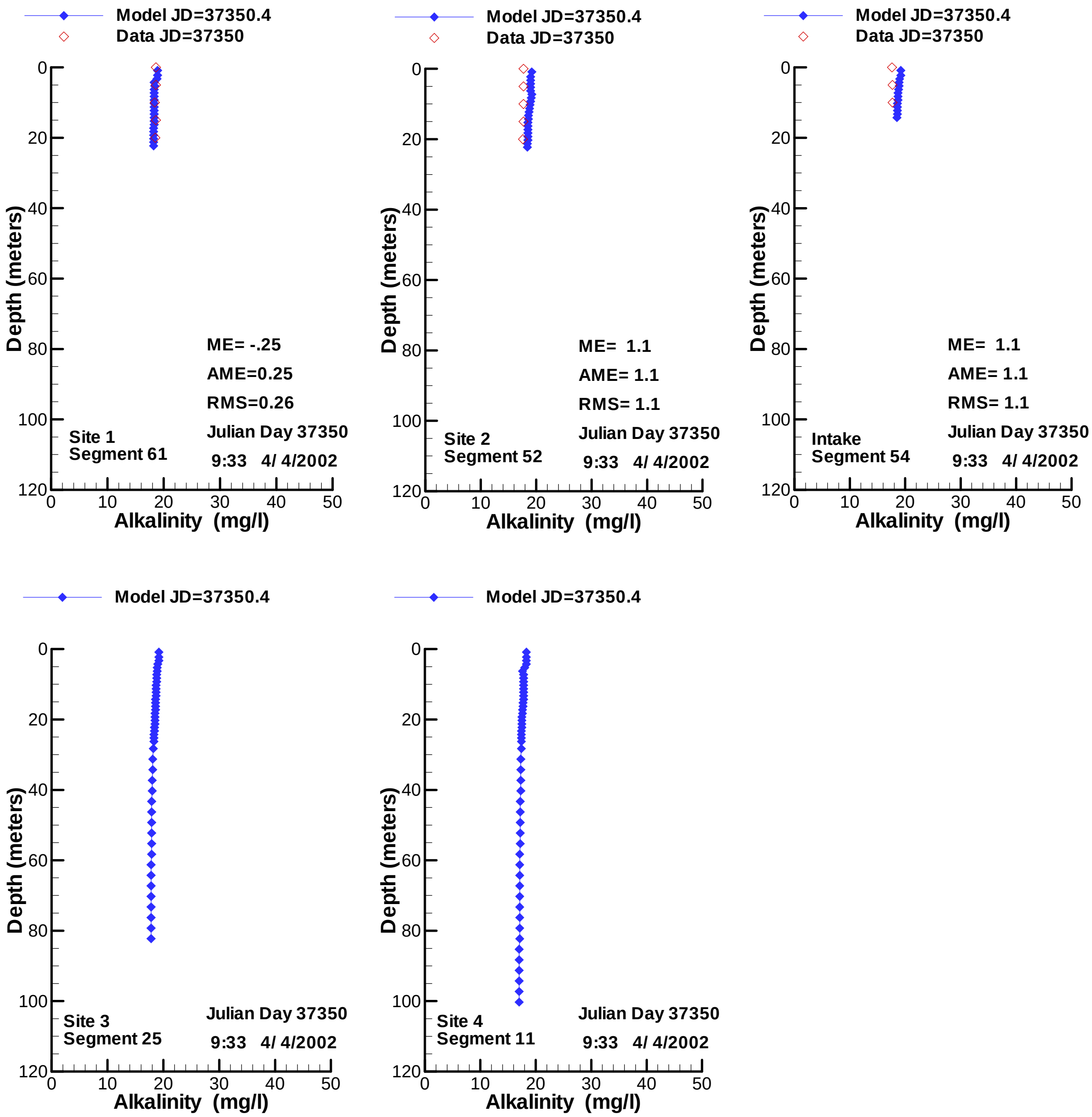

Figure 223. Vertical profiles of Alkalinity compared with data for 4/ 4/2002.

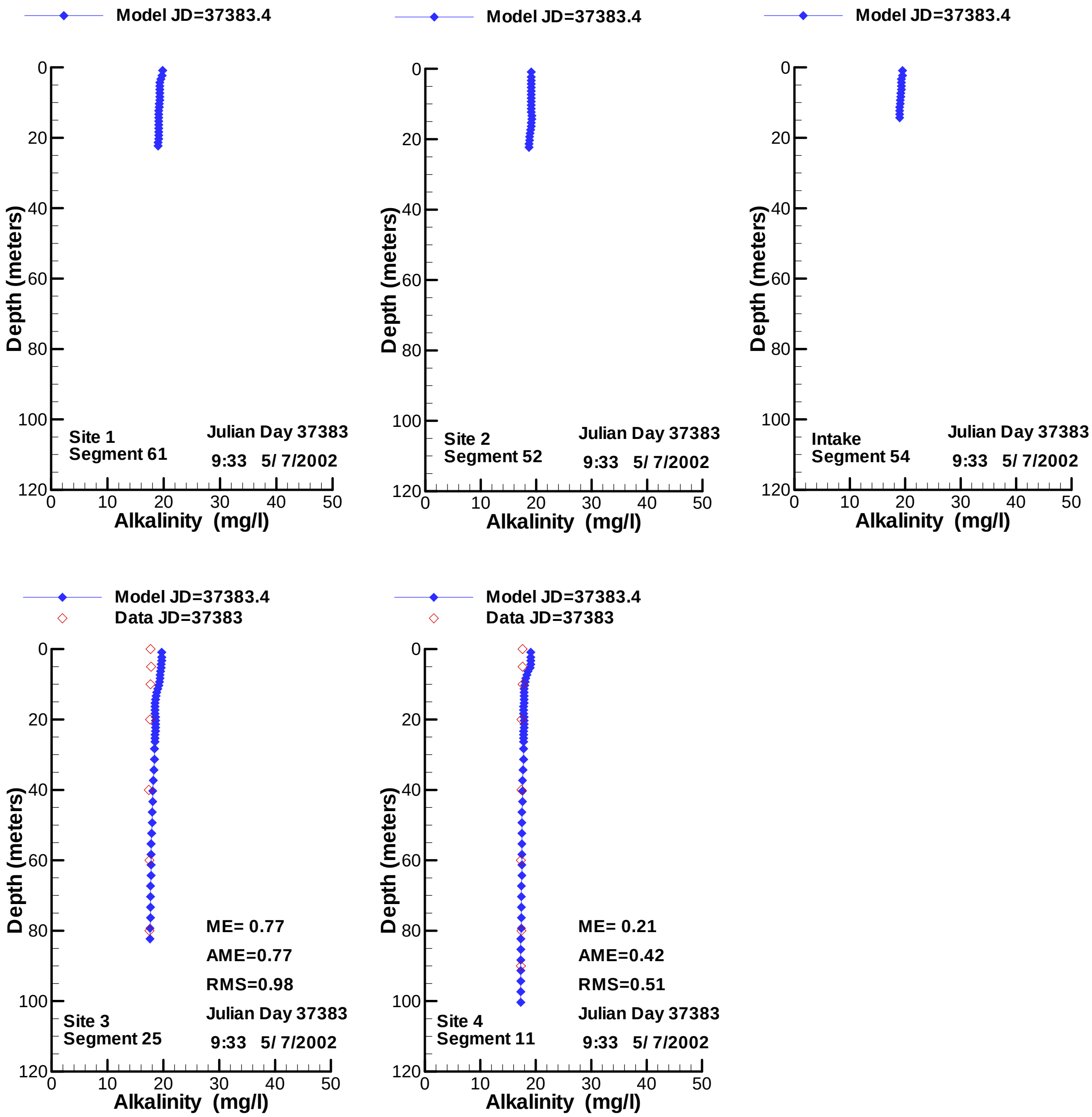

Figure 224. Vertical profiles of Alkalinity compared with data for 5/ 7/2002.

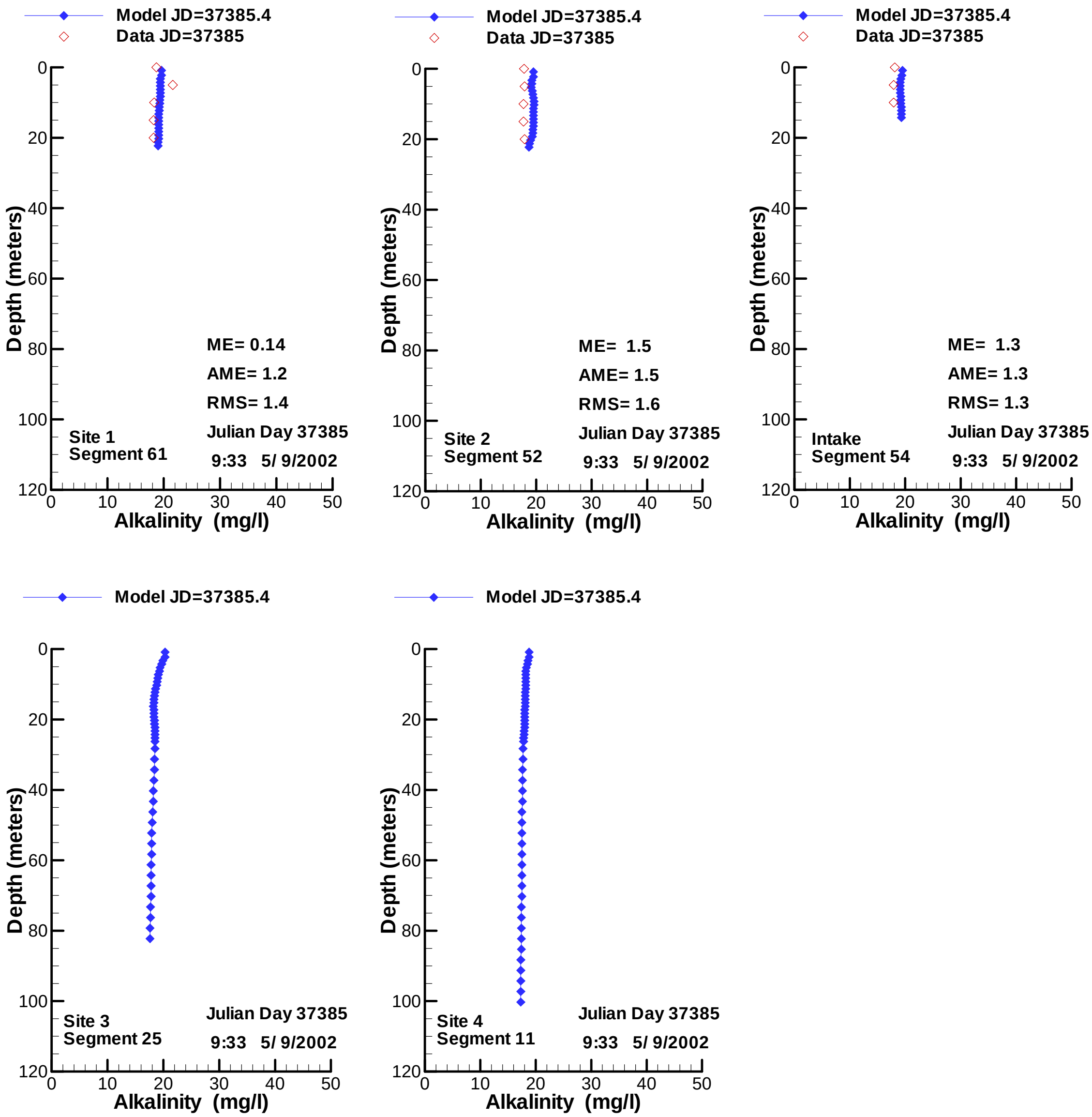

Figure 225. Vertical profiles of Alkalinity compared with data for 5/ 9/2002.

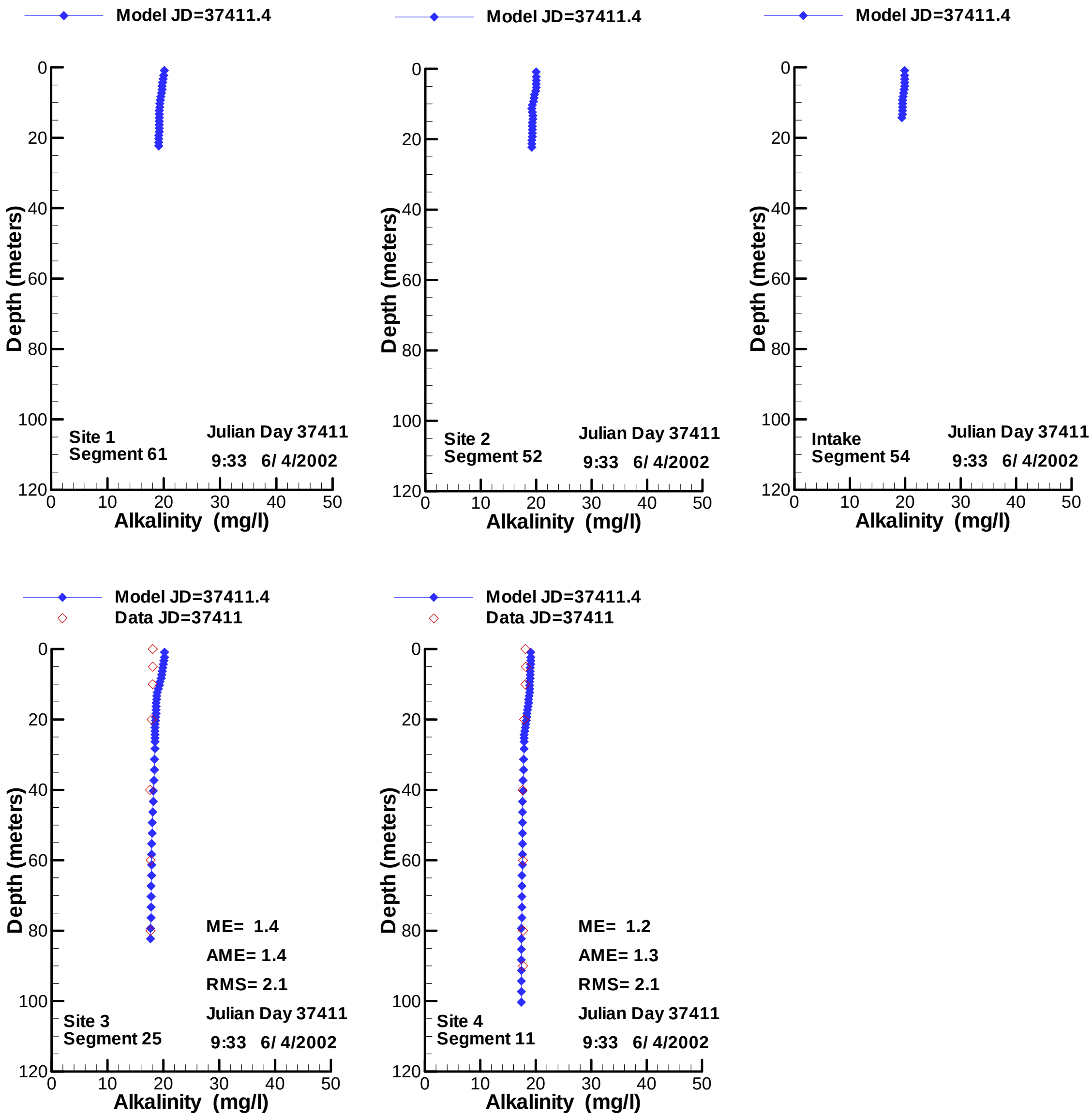

Figure 226. Vertical profiles of Alkalinity compared with data for 6/ 4/2002.

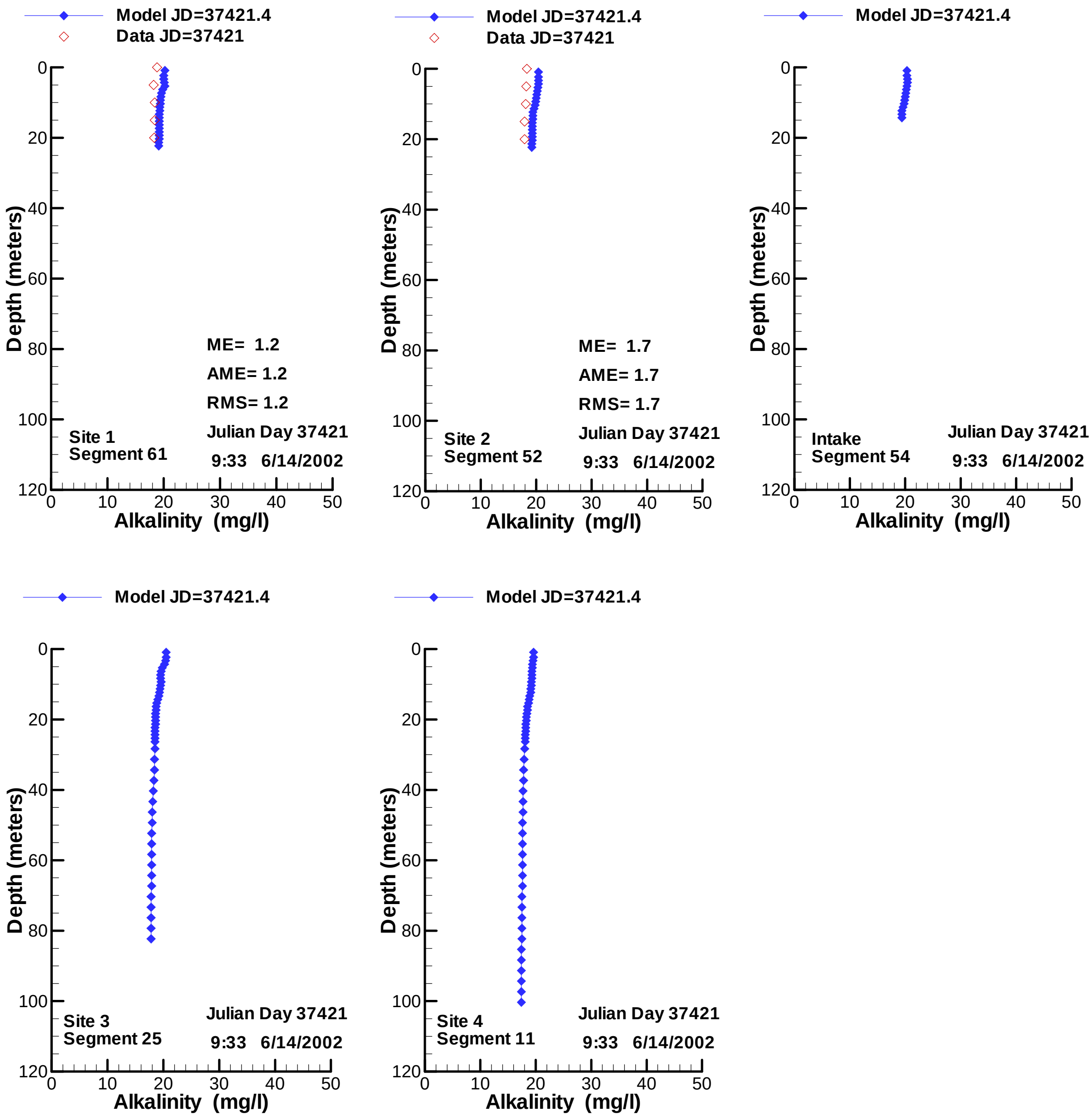

Figure 227. Vertical profiles of Alkalinity compared with data for 6/14/2002.

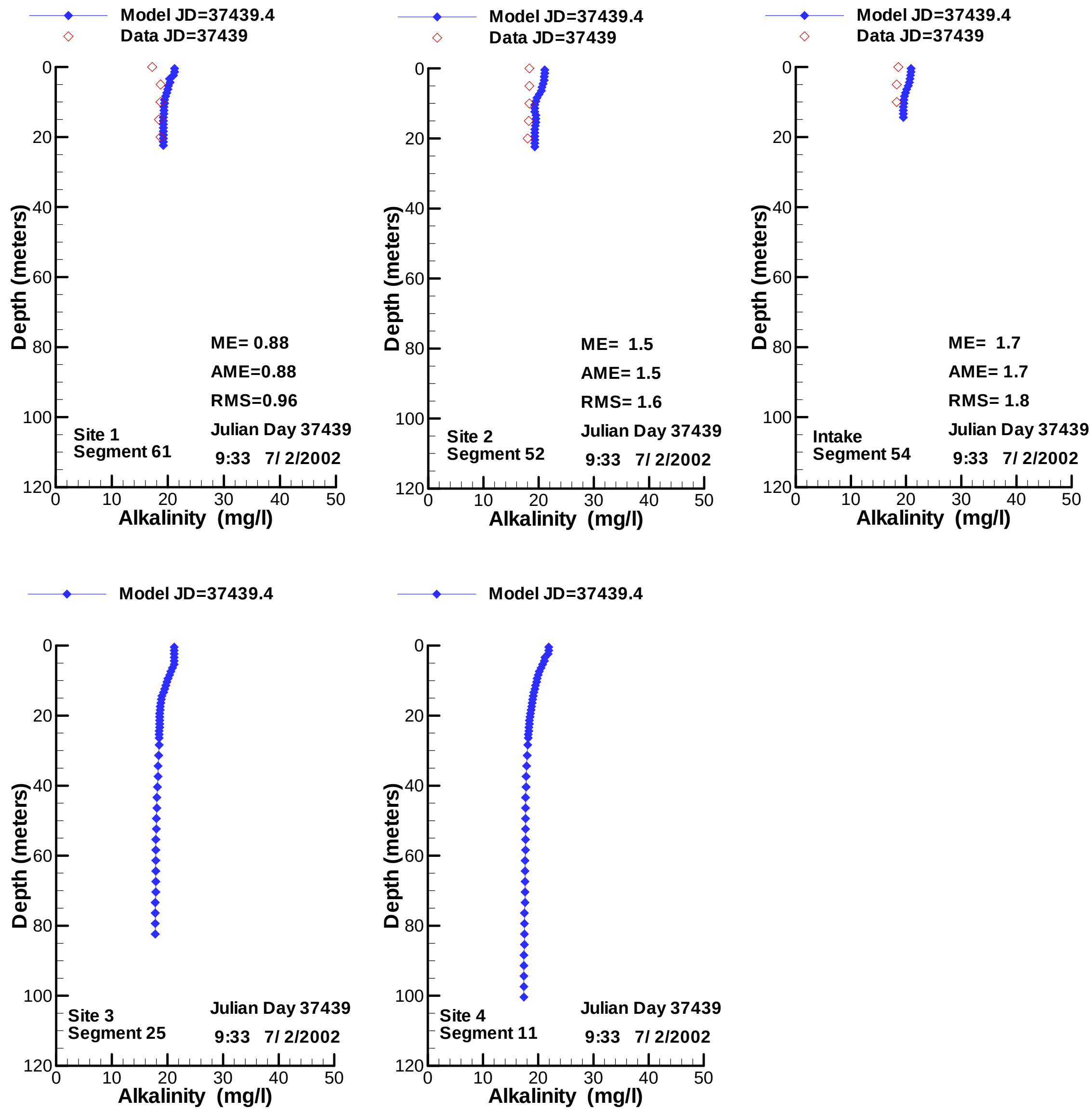

Figure 228. Vertical profiles of Alkalinity compared with data for 7/ 2/2002.

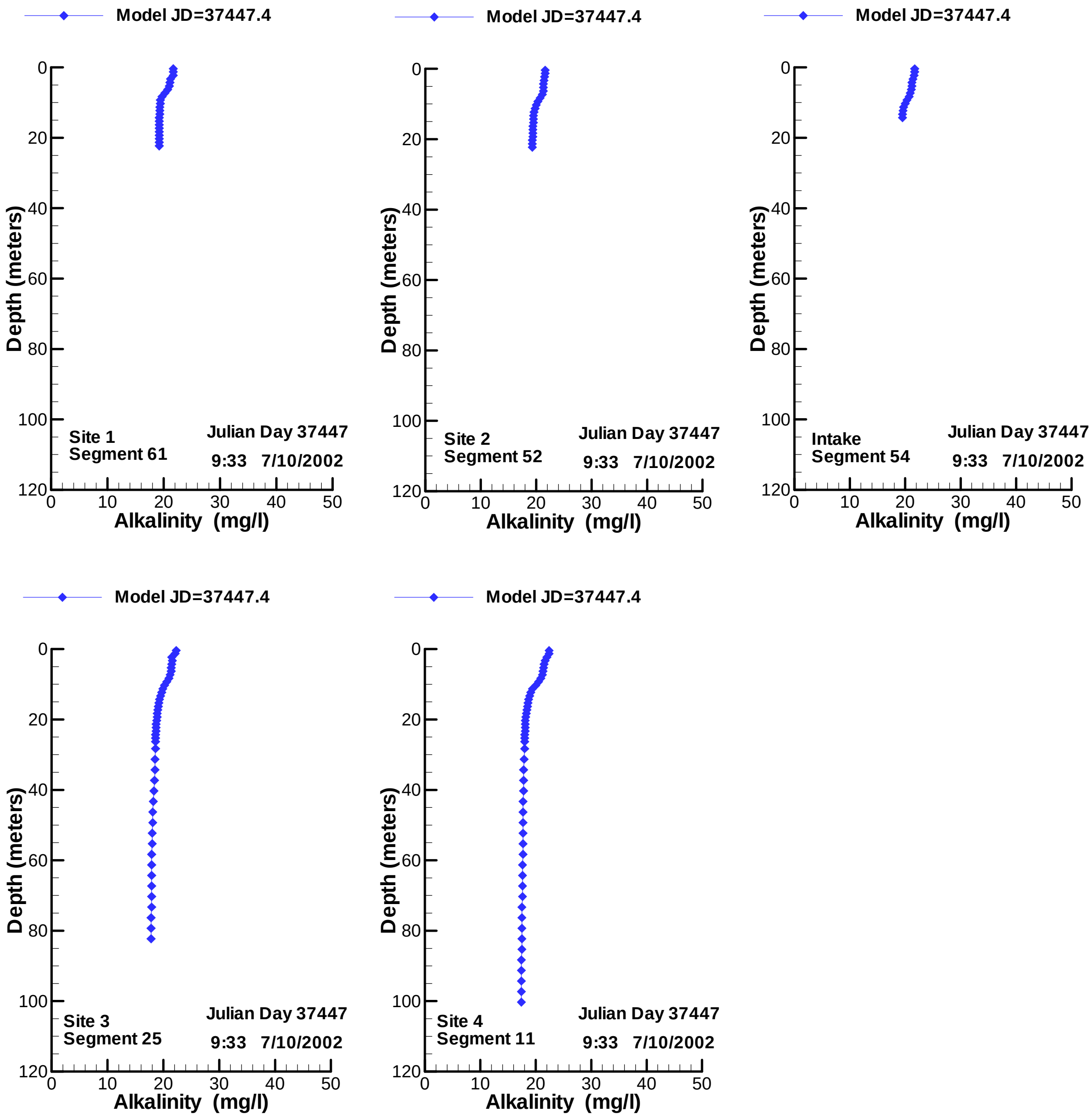

Figure 229. Vertical profiles of Alkalinity compared with data for 7/10/2002.

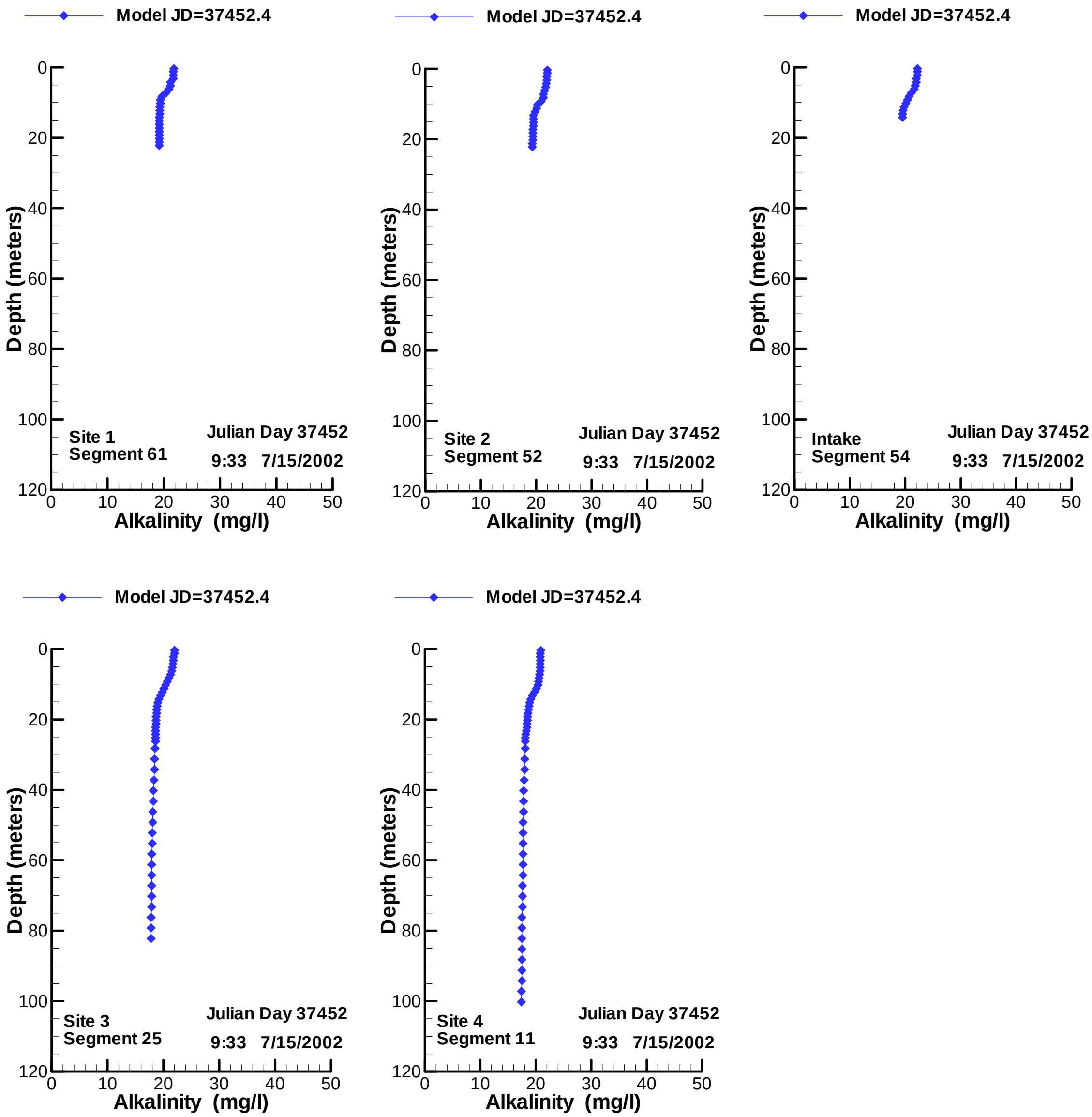

Figure 230. Vertical profiles of Alkalinity compared with data for 7/15/2002.

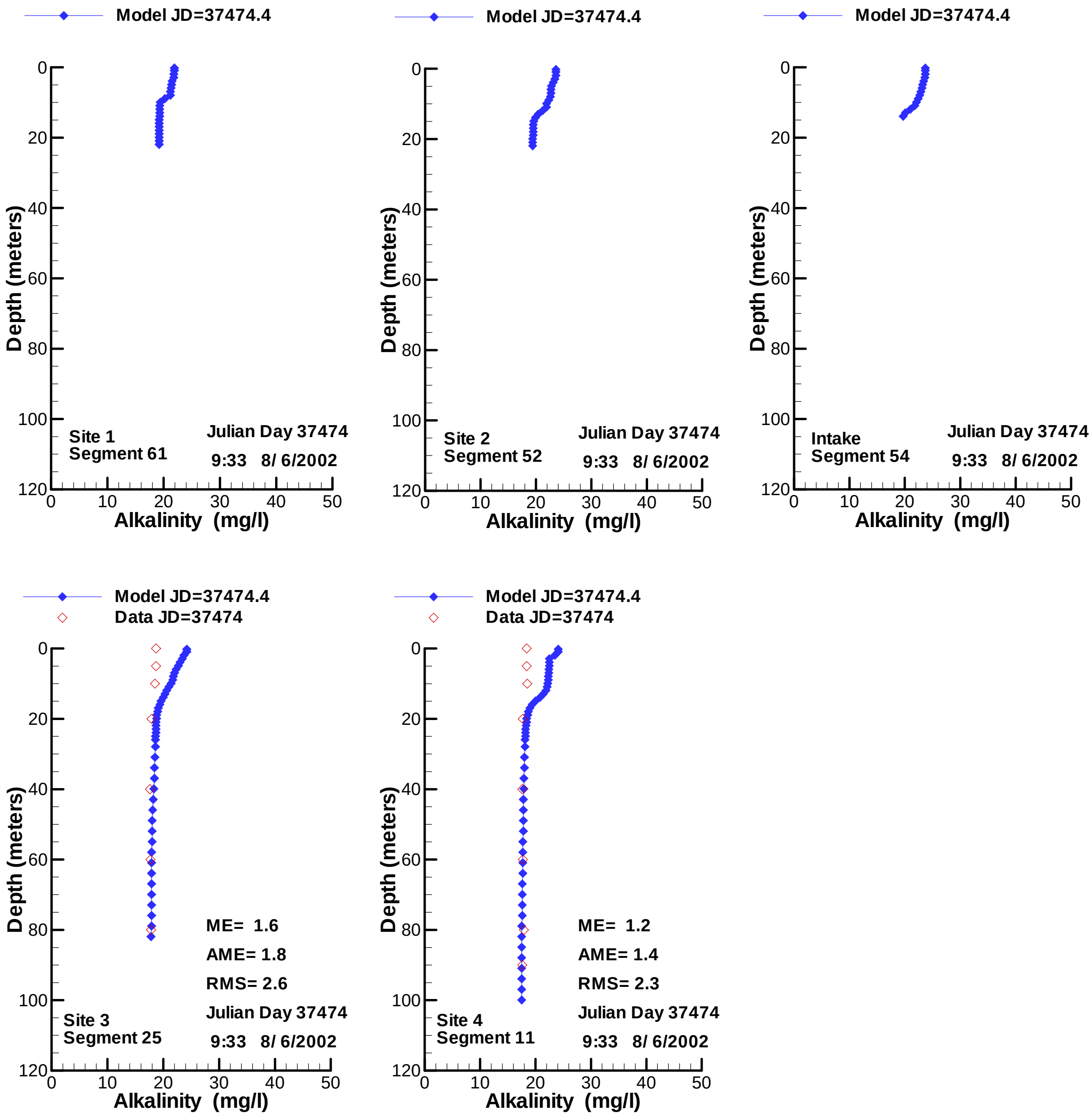

Figure 231. Vertical profiles of Alkalinity compared with data for 8/ 6/2002.

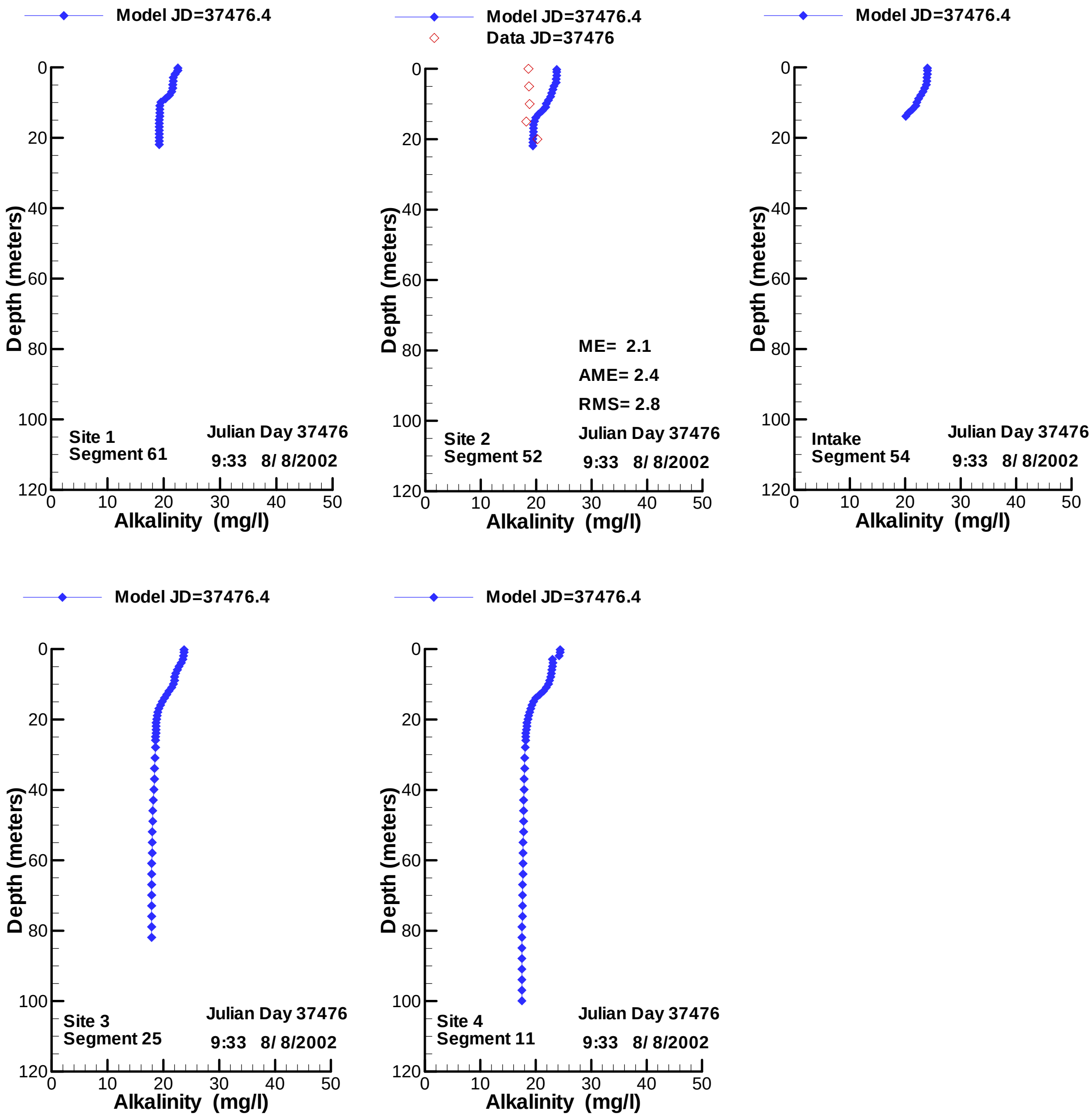

Figure 232. Vertical profiles of Alkalinity compared with data for 8/ 8/2002.

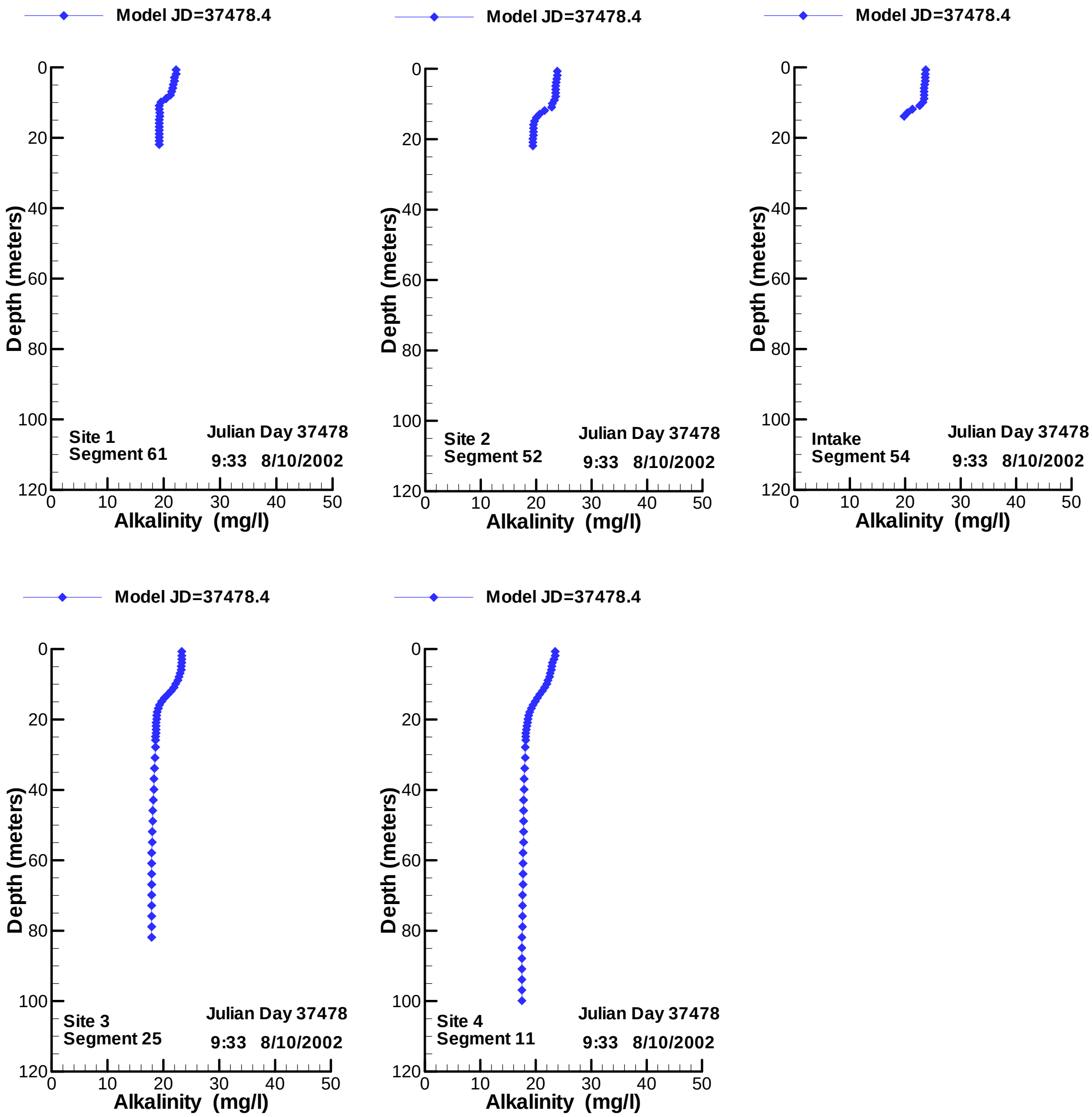

Figure 233. Vertical profiles of Alkalinity compared with data for 8/10/2002.

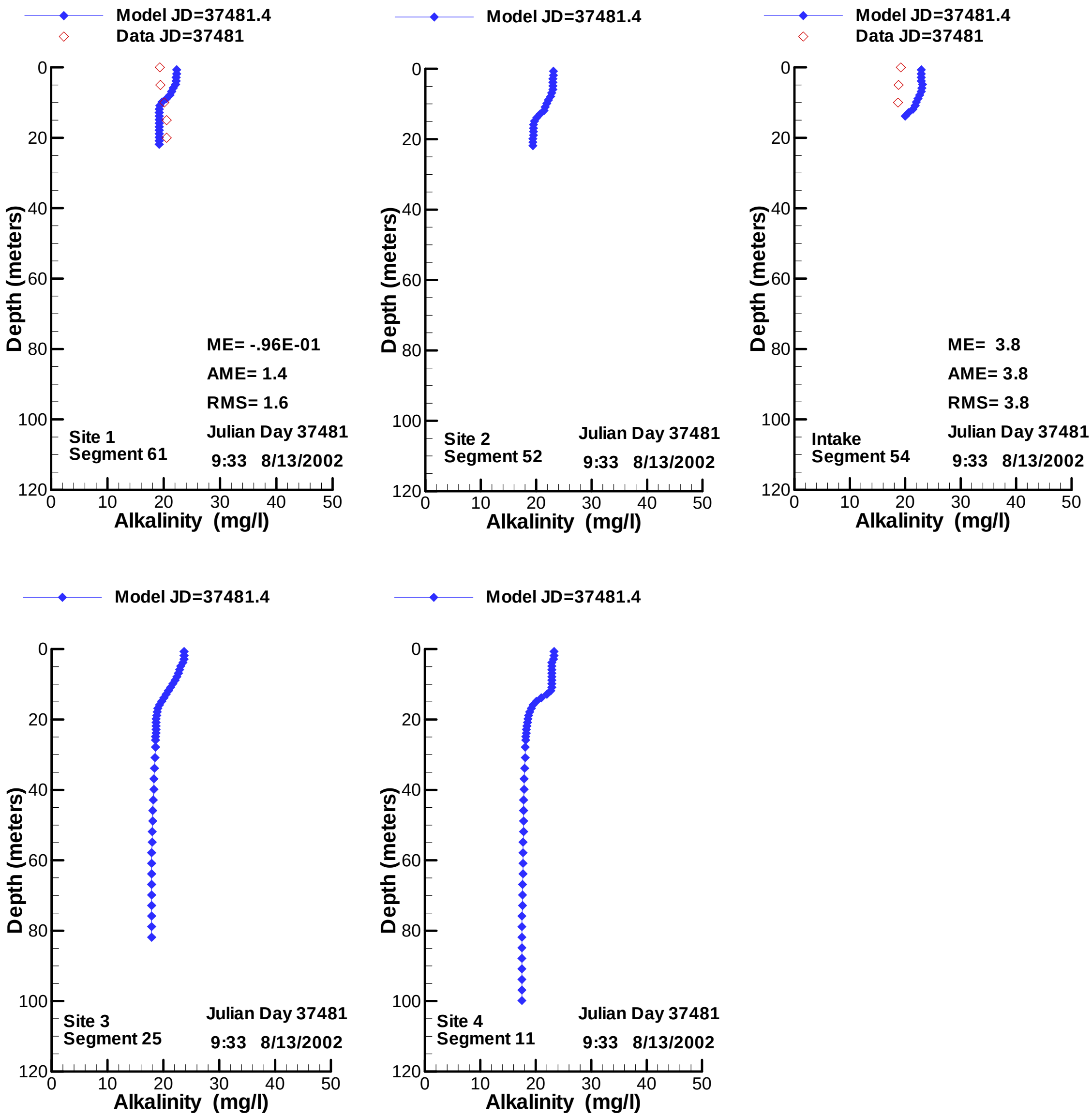

Figure 234. Vertical profiles of Alkalinity compared with data for 8/13/2002.

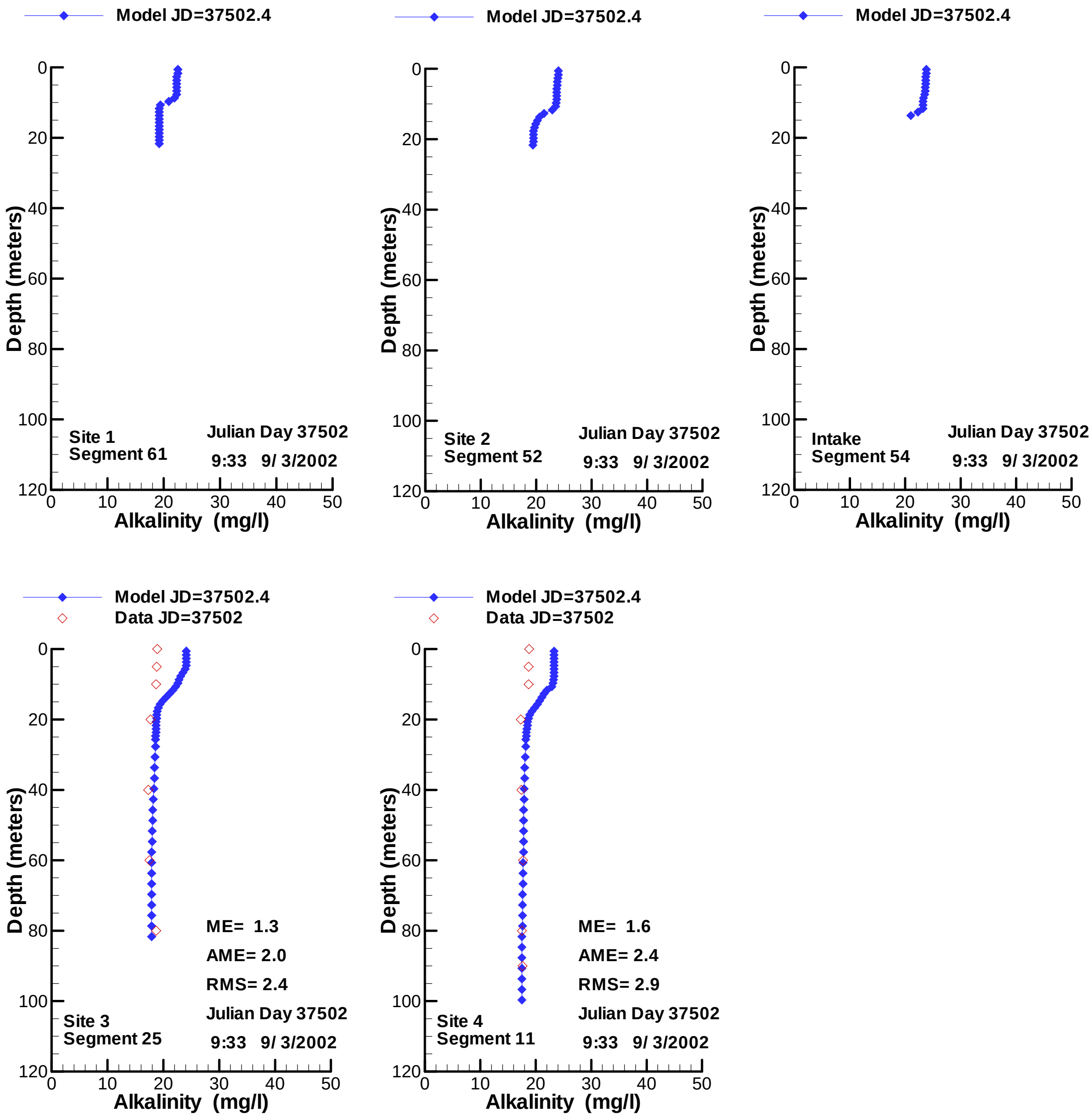

Figure 235. Vertical profiles of Alkalinity compared with data for 9/ 3/2002.

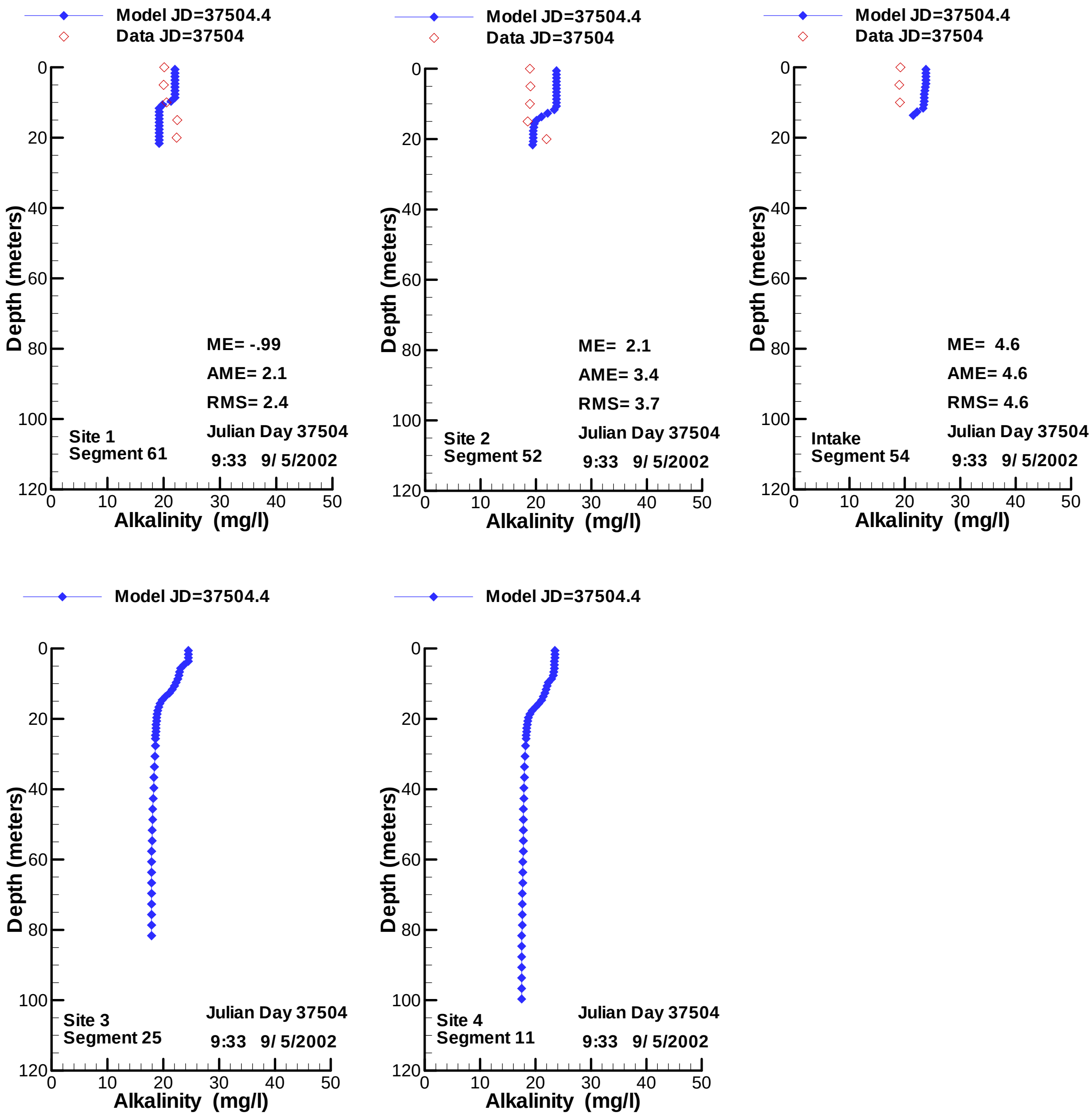

Figure 236. Vertical profiles of Alkalinity compared with data for 9/ 5/2002.

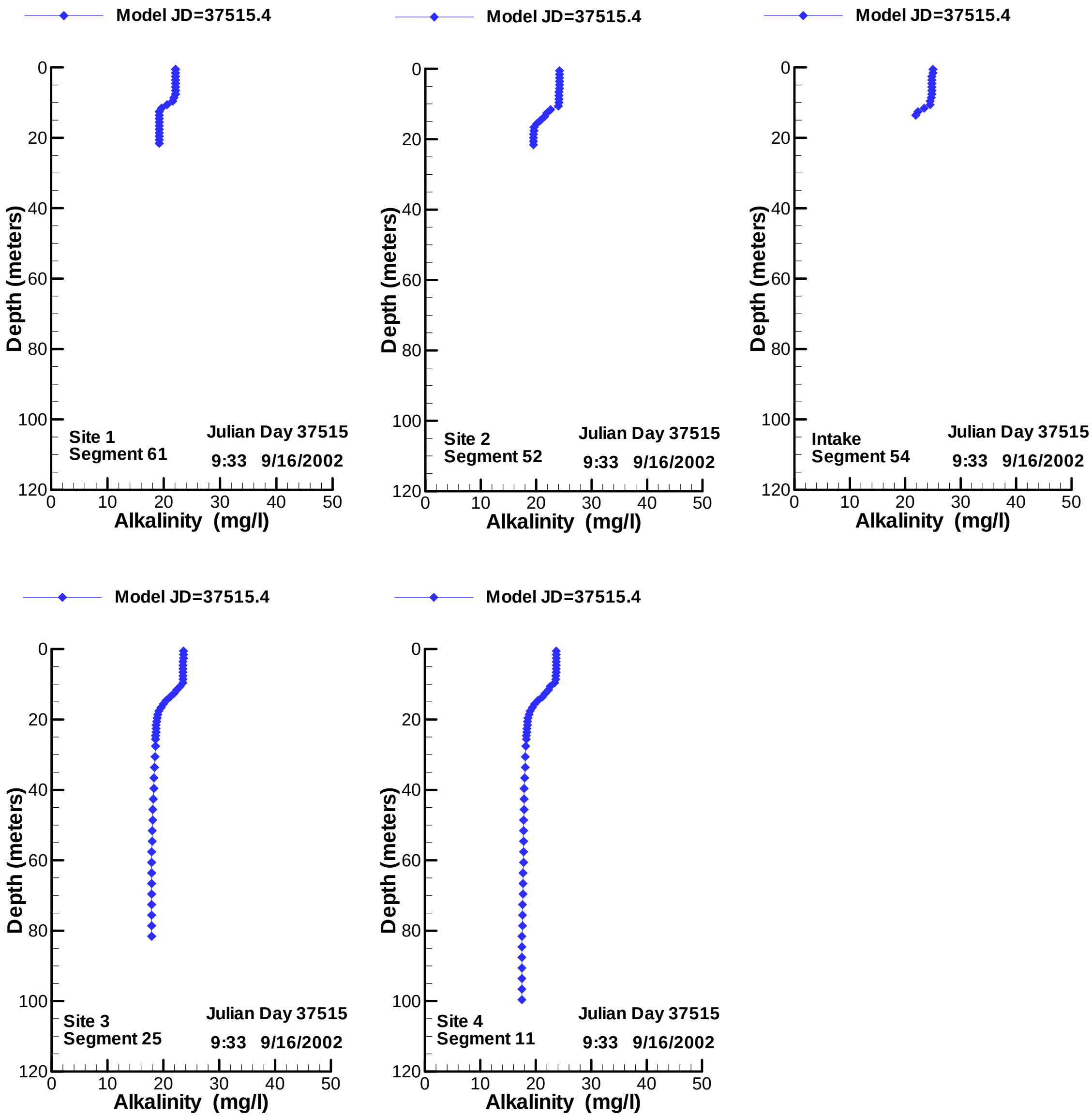

Figure 237. Vertical profiles of Alkalinity compared with data for 9/16/2002.

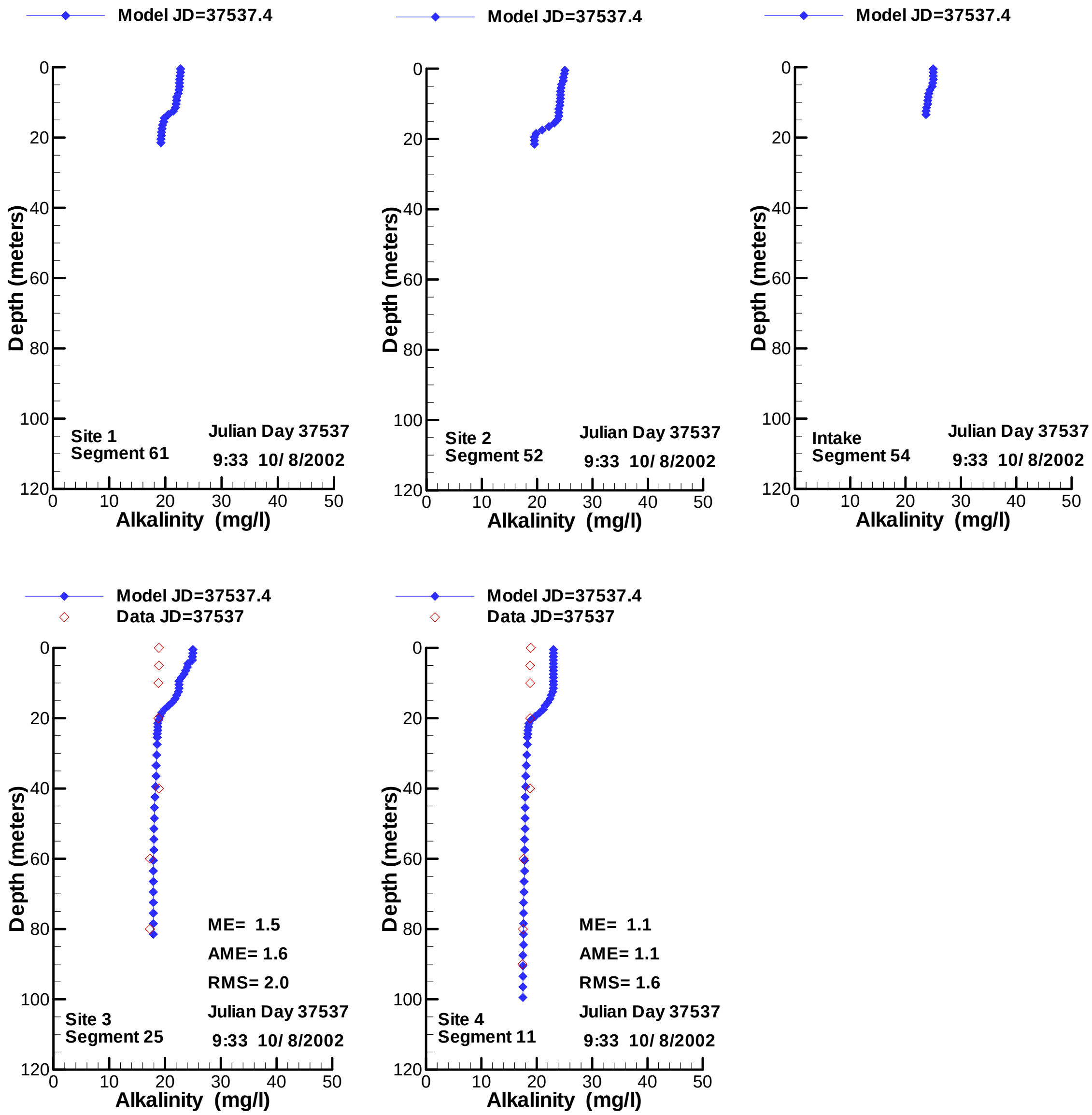

Figure 238. Vertical profiles of Alkalinity compared with data for 10/ 8/2002.

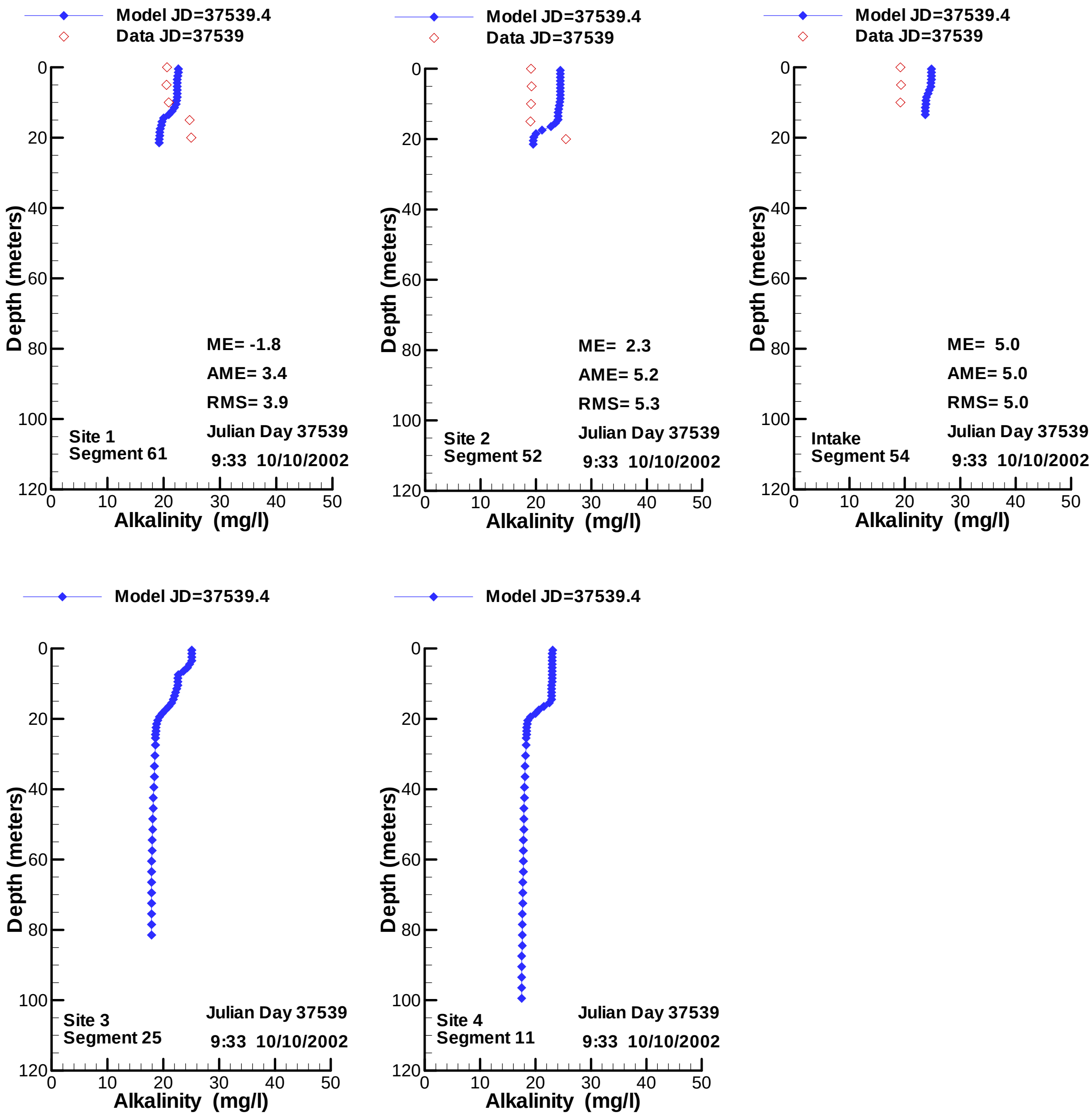

Figure 239. Vertical profiles of Alkalinity compared with data for 10/10/2002.

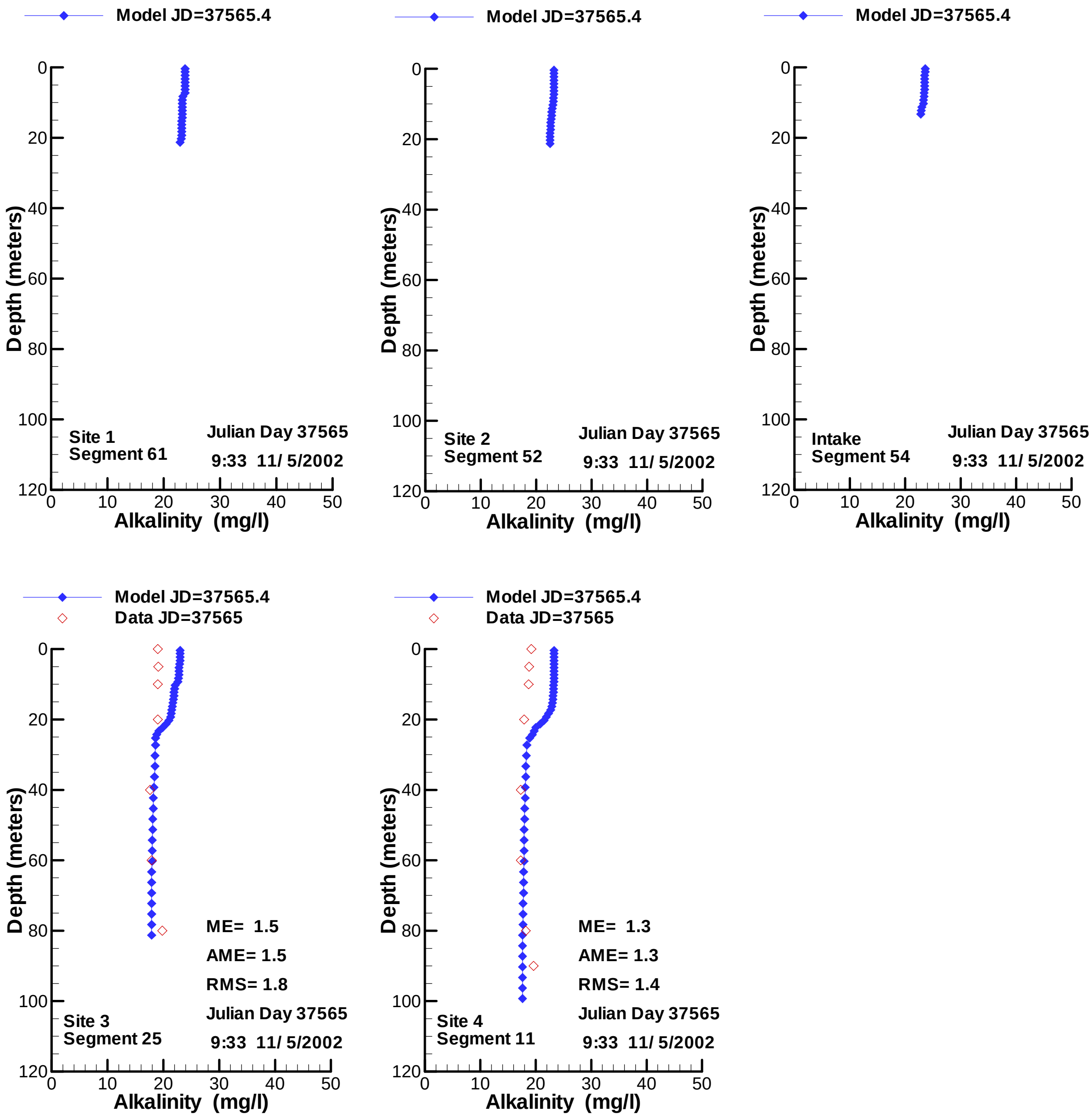

Figure 240. Vertical profiles of Alkalinity compared with data for 11/ 5/2002.

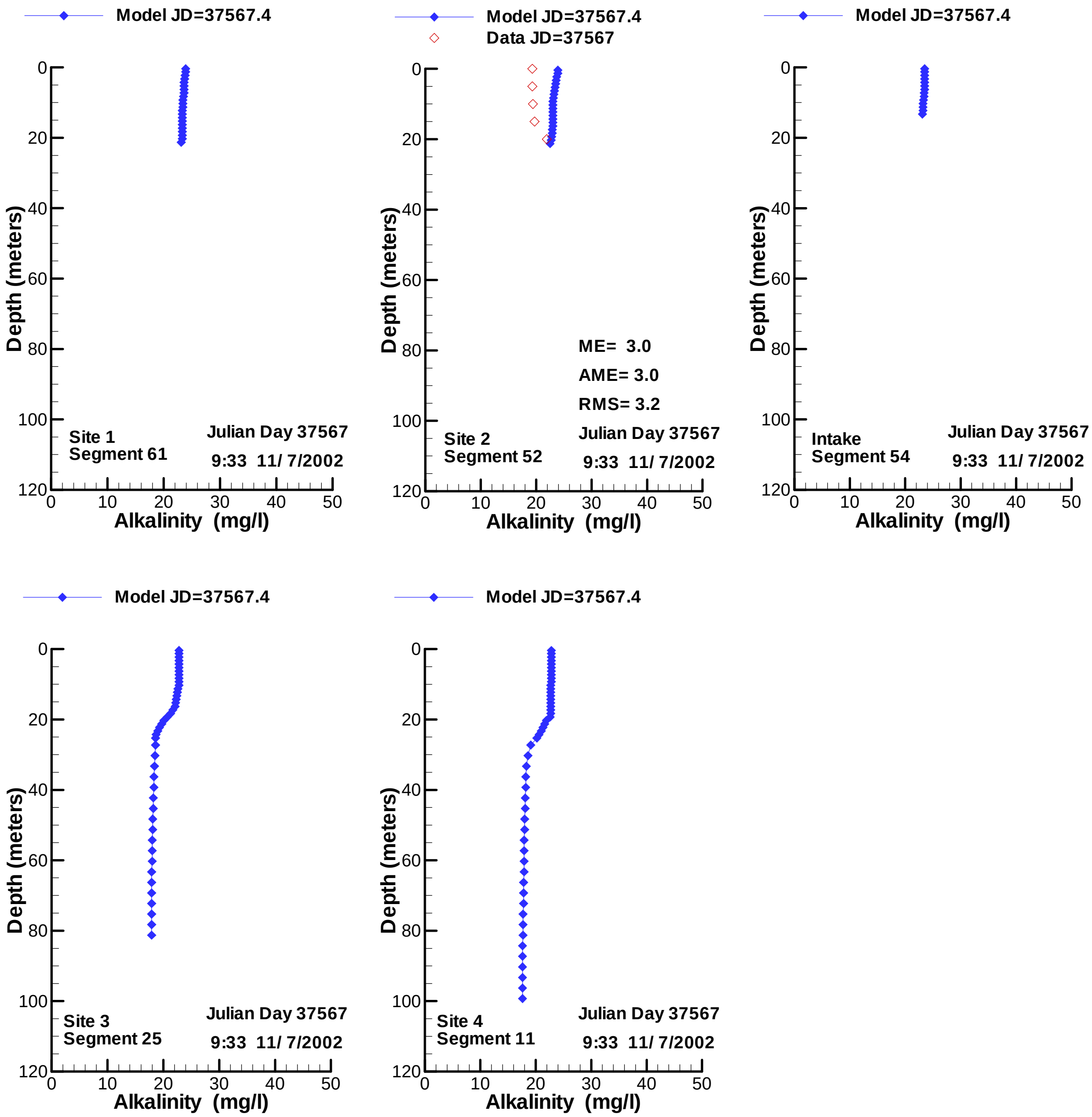

Figure 241. Vertical profiles of Alkalinity compared with data for 11/ 7/2002.

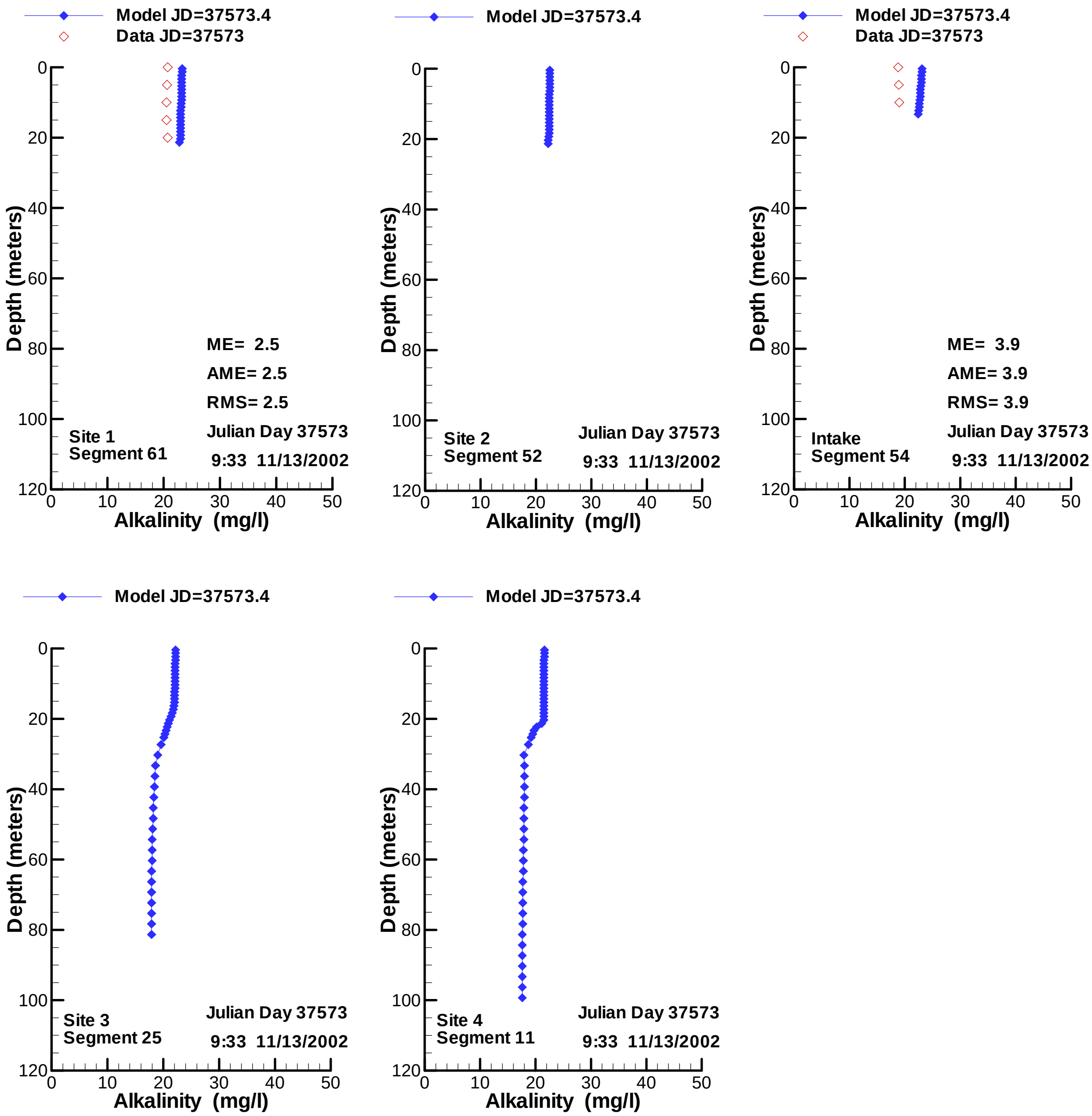

Figure 242. Vertical profiles of Alkalinity compared with data for 11/13/2002.

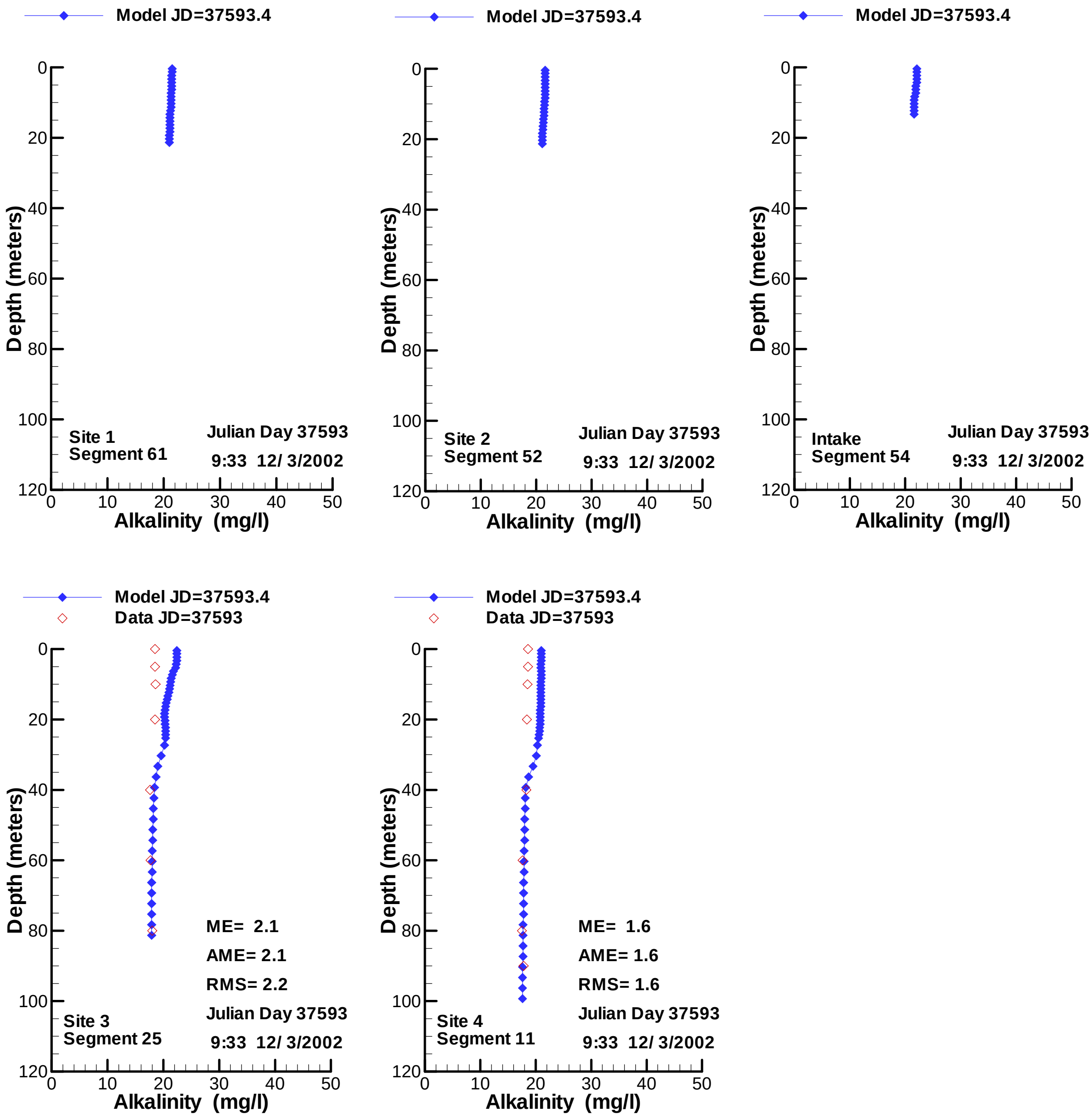

Figure 243. Vertical profiles of Alkalinity compared with data for 12/ 3/2002.

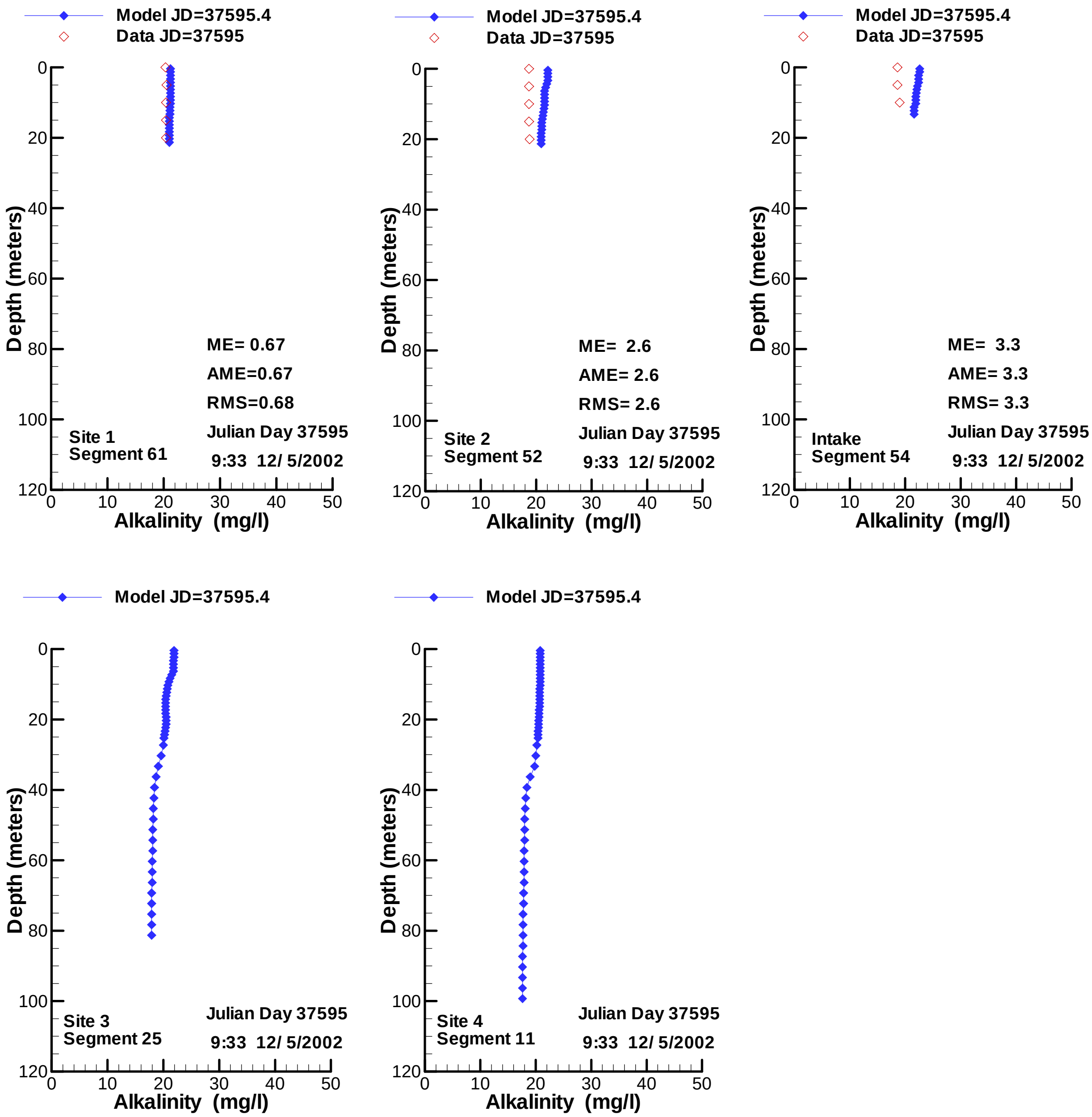

Figure 244. Vertical profiles of Alkalinity compared with data for 12/ 5/2002.

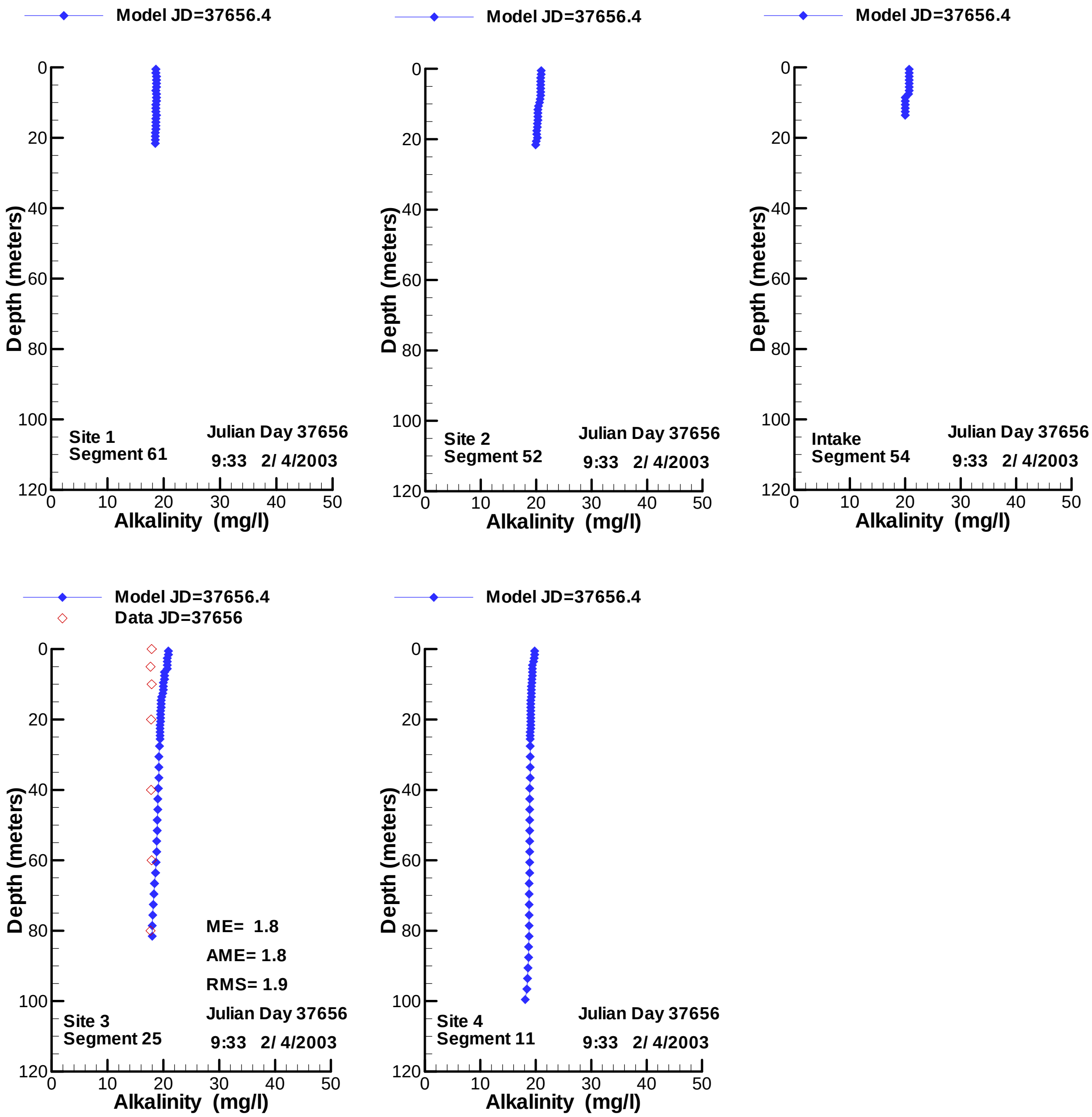

Figure 245. Vertical profiles of Alkalinity compared with data for 2/ 4/2003.

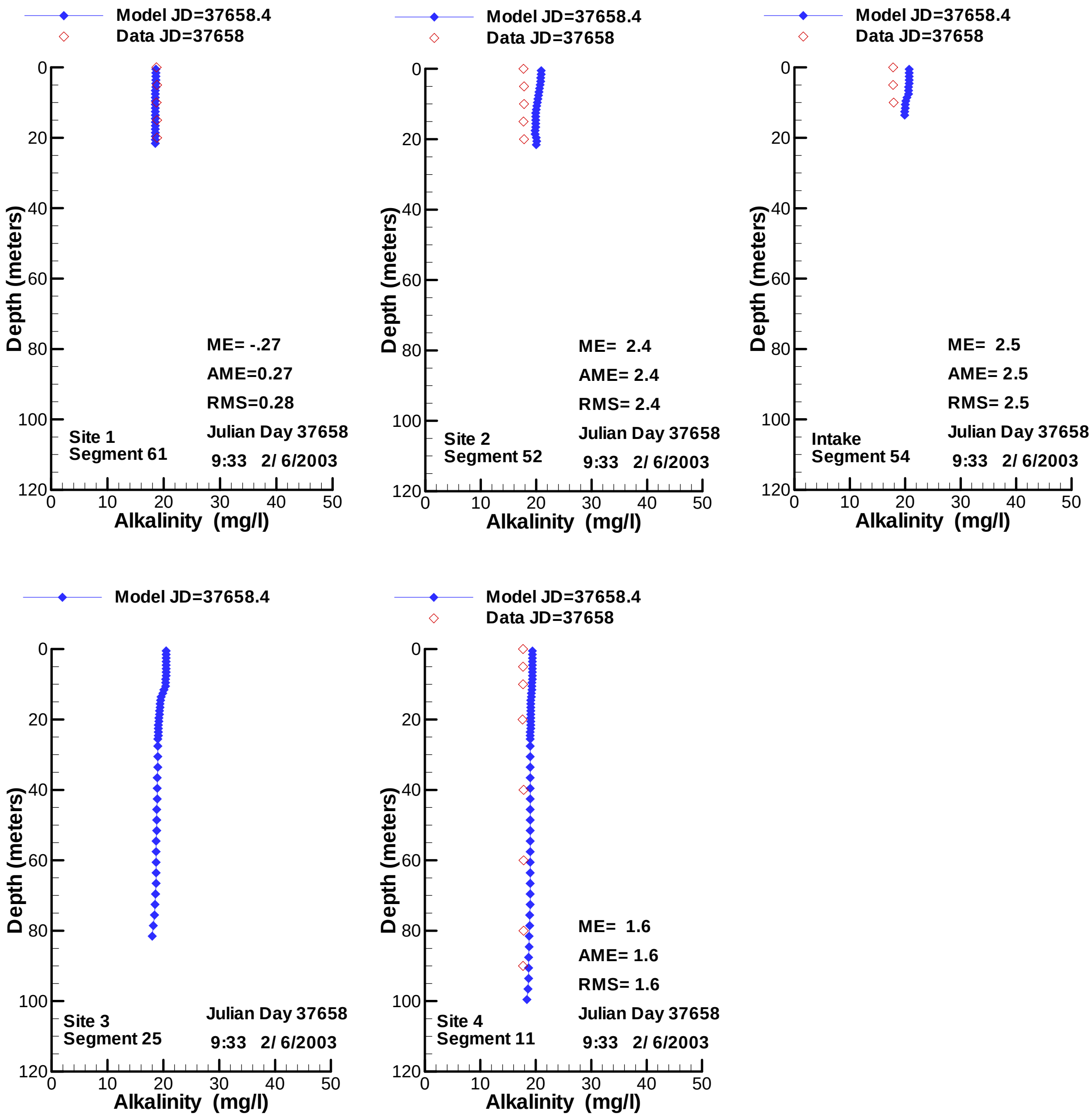

Figure 246. Vertical profiles of Alkalinity compared with data for 2/ 6/2003.

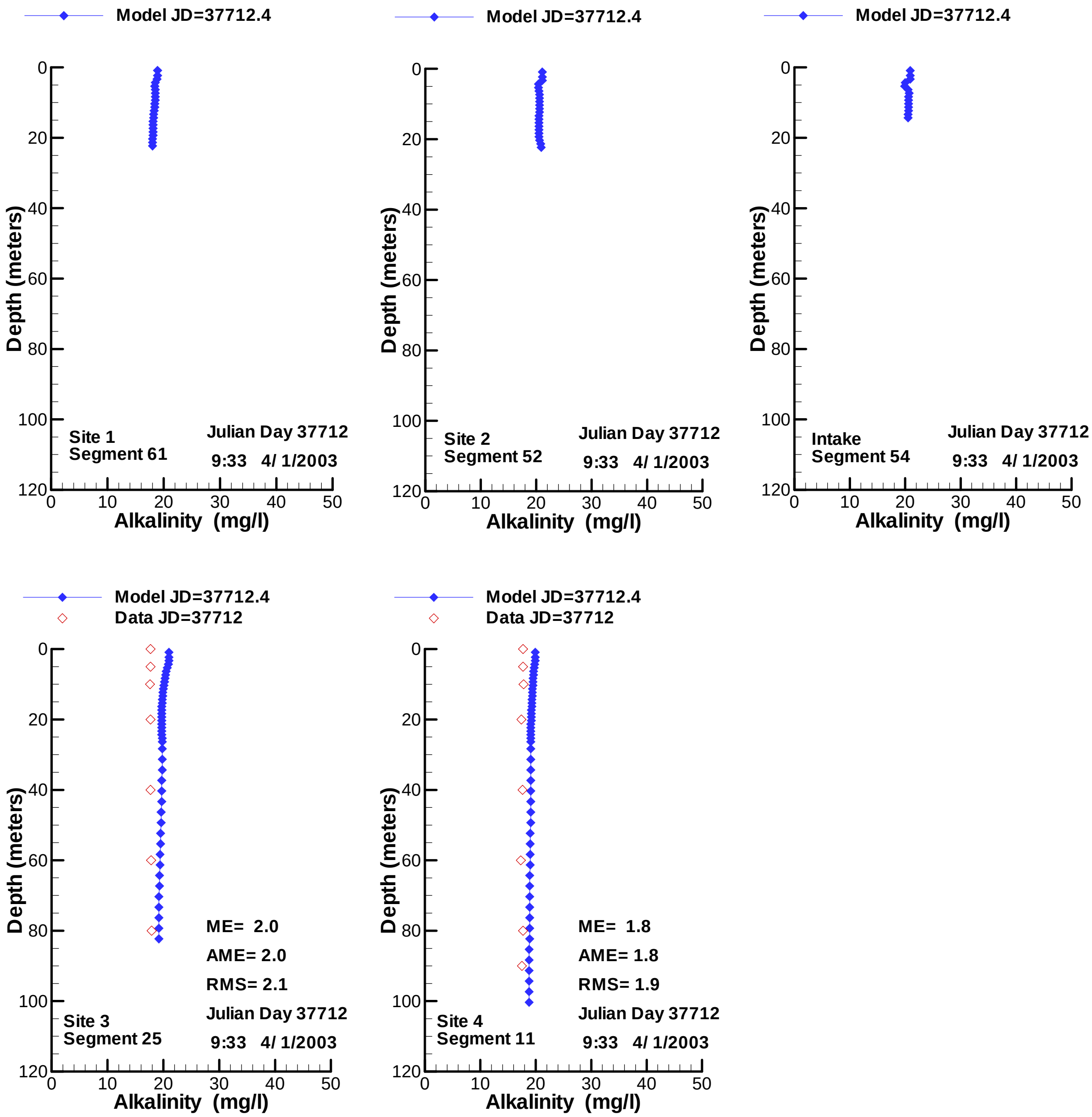

Figure 247. Vertical profiles of Alkalinity compared with data for 4/ 1/2003.

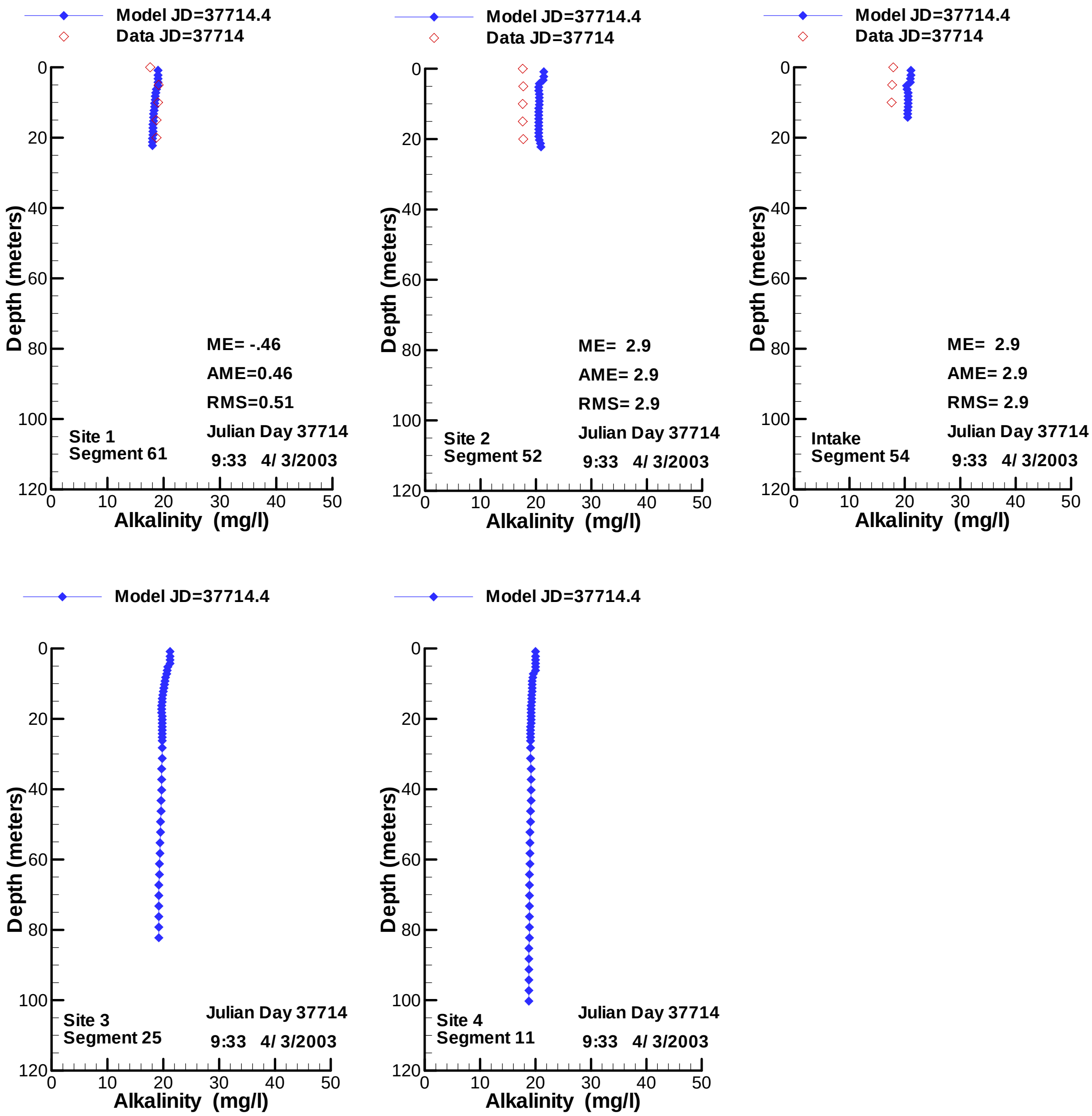

Figure 248. Vertical profiles of Alkalinity compared with data for 4/ 3/2003.

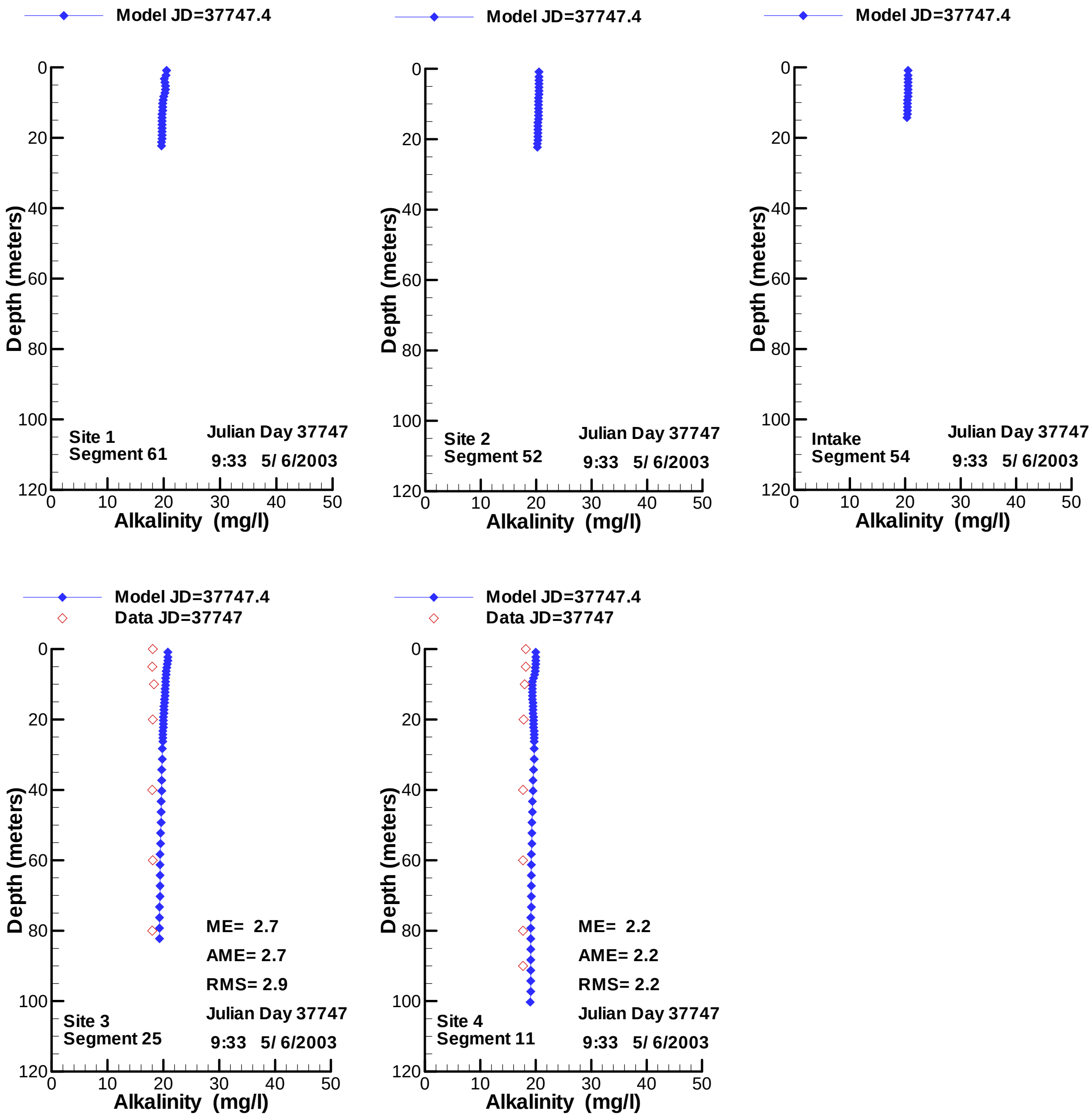

Figure 249. Vertical profiles of Alkalinity compared with data for 5/ 6/2003.

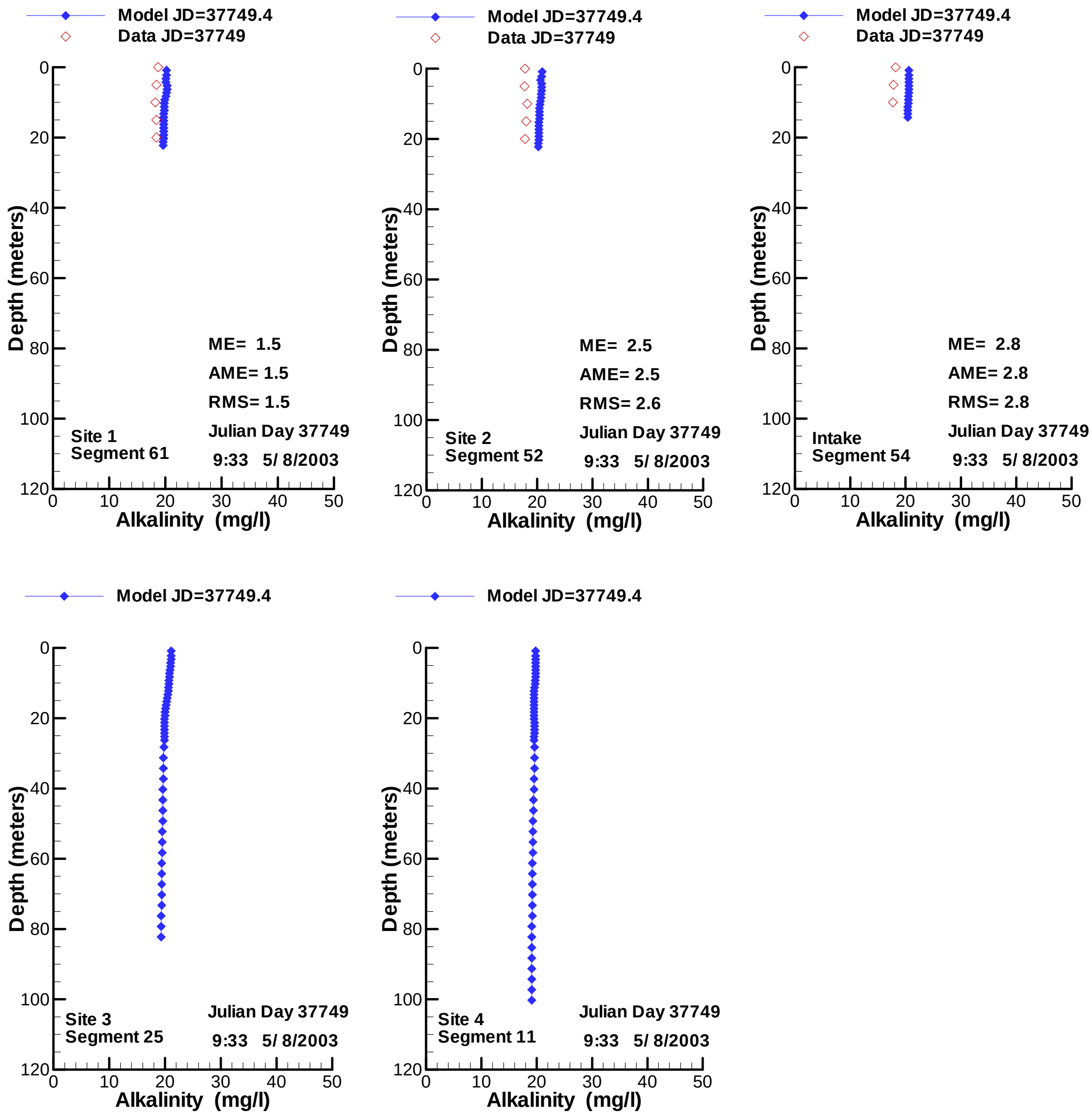

Figure 250. Vertical profiles of Alkalinity compared with data for 5/ 8/2003.

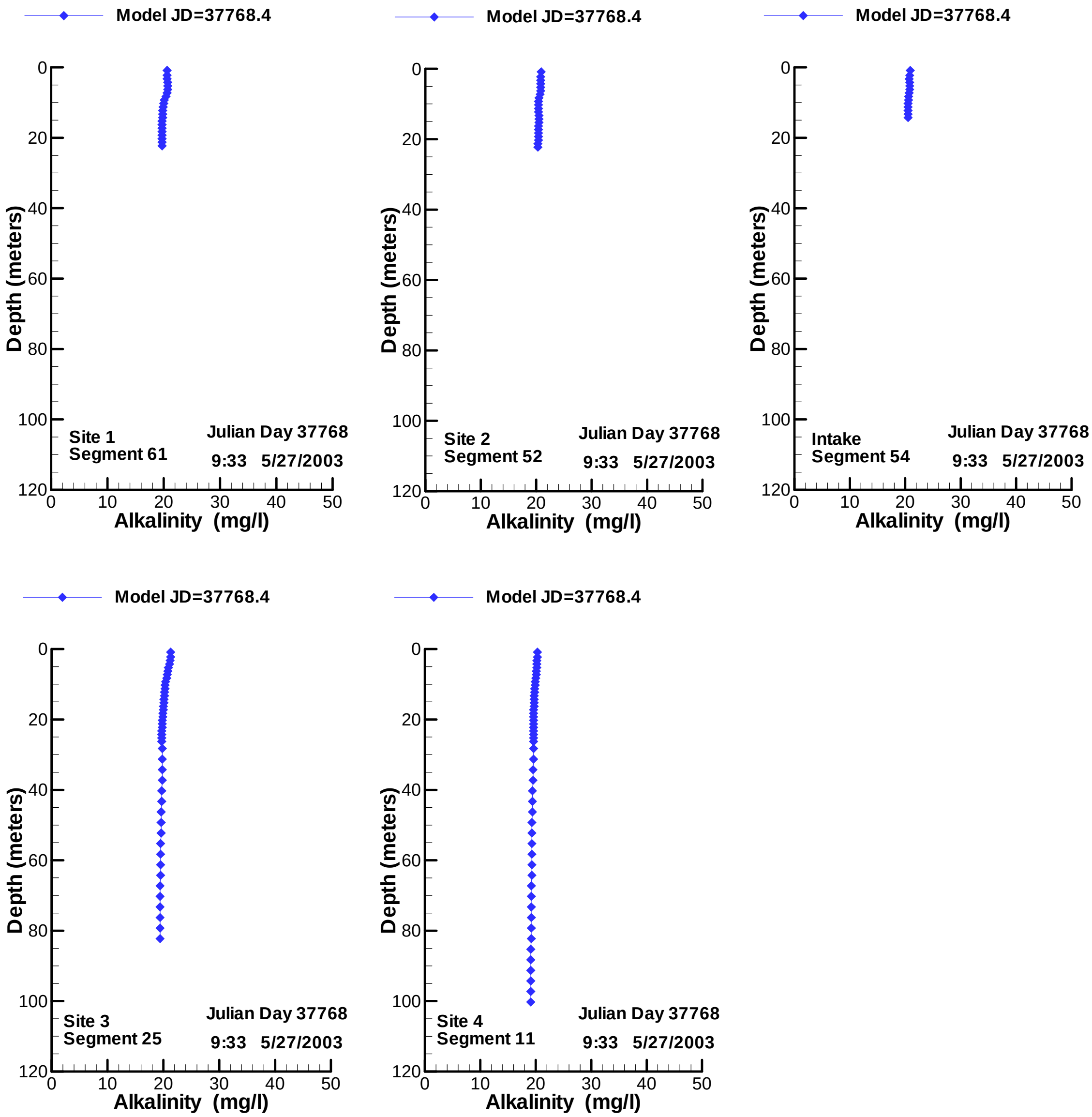

Figure 251. Vertical profiles of Alkalinity compared with data for 5/27/2003.

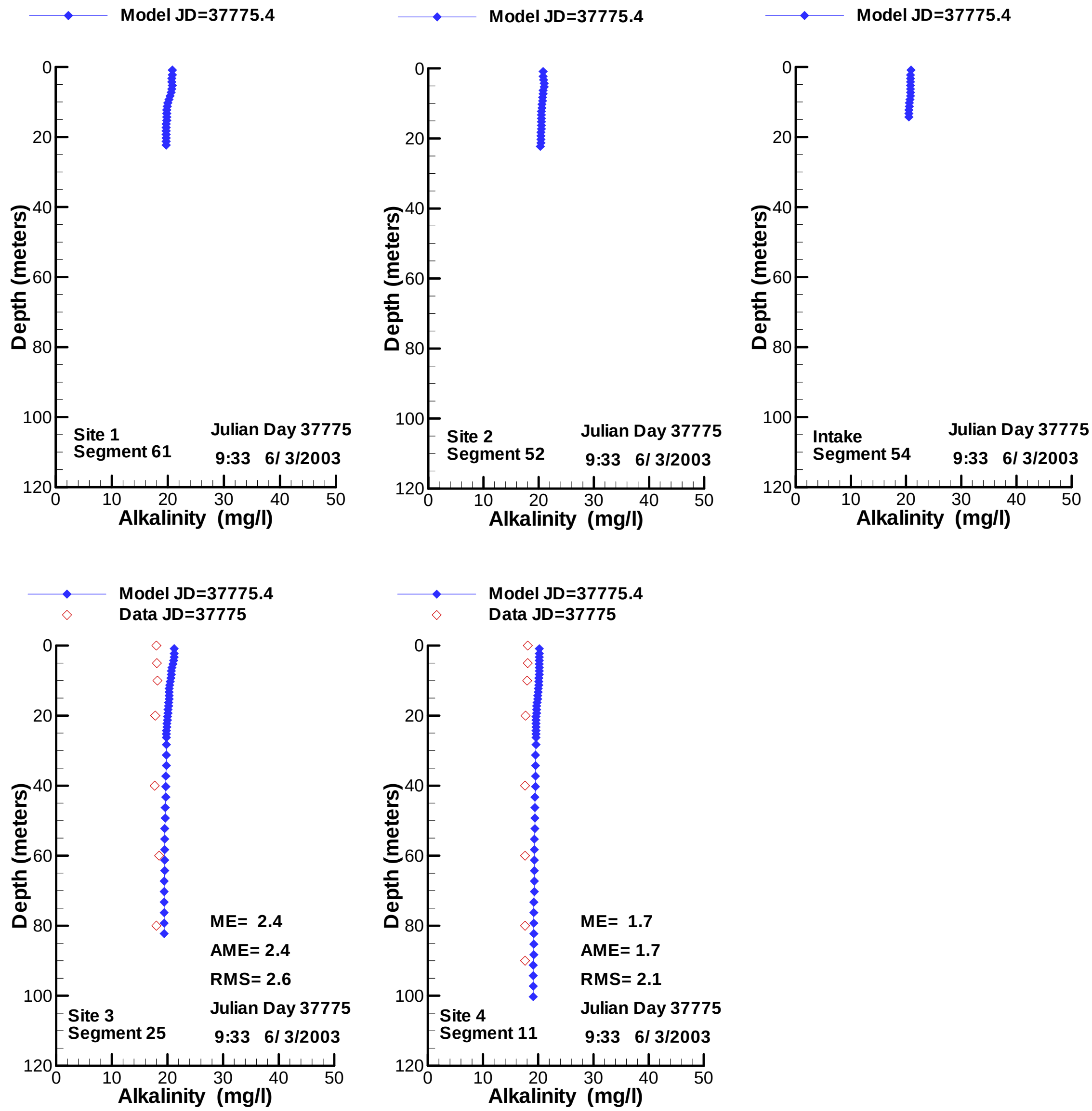

Figure 252. Vertical profiles of Alkalinity compared with data for 6/ 3/2003.

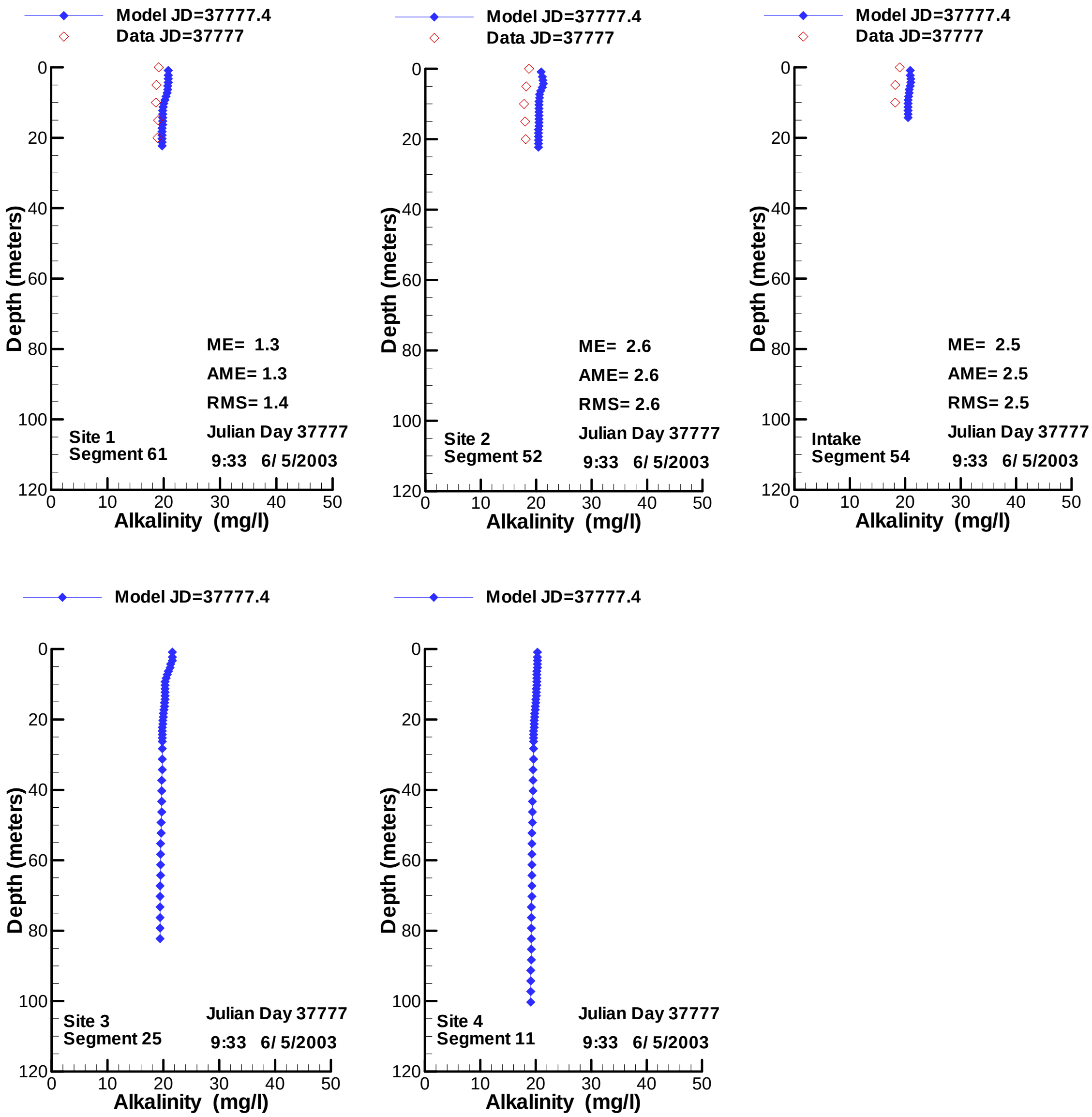

Figure 253. Vertical profiles of Alkalinity compared with data for 6/ 5/2003.

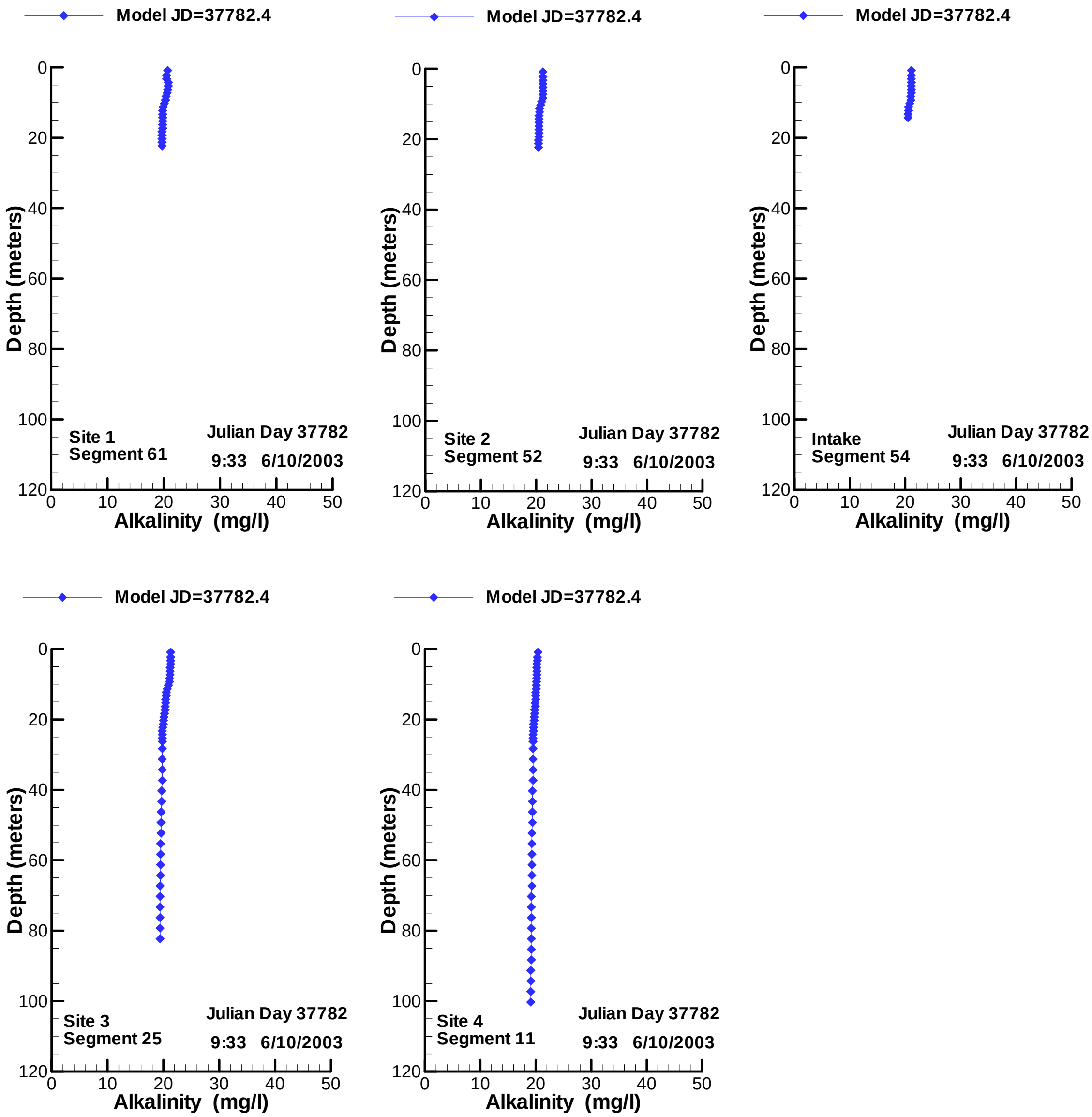

Figure 254. Vertical profiles of Alkalinity compared with data for 6/10/2003.

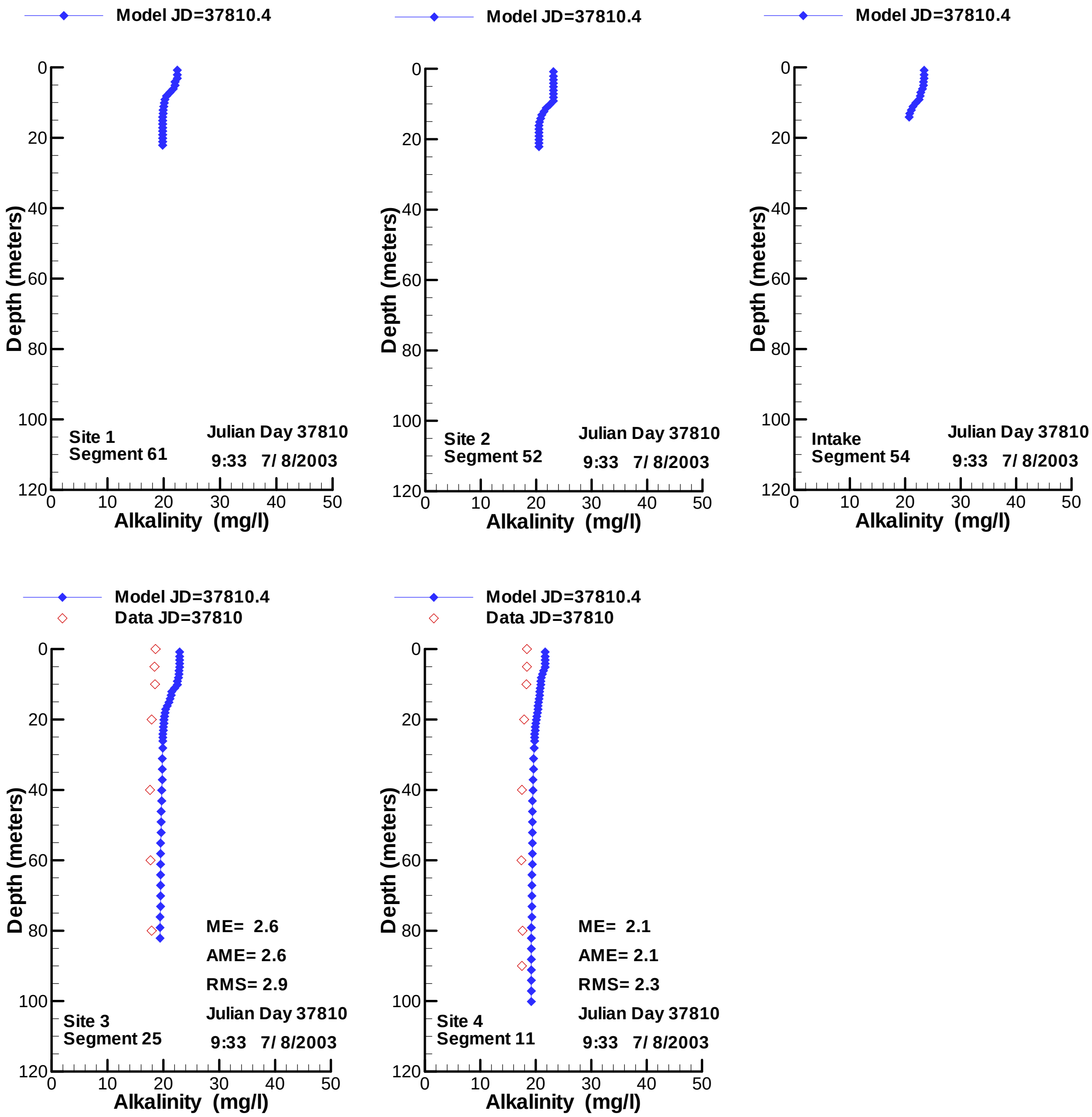

Figure 255. Vertical profiles of Alkalinity compared with data for 7/ 8/2003.

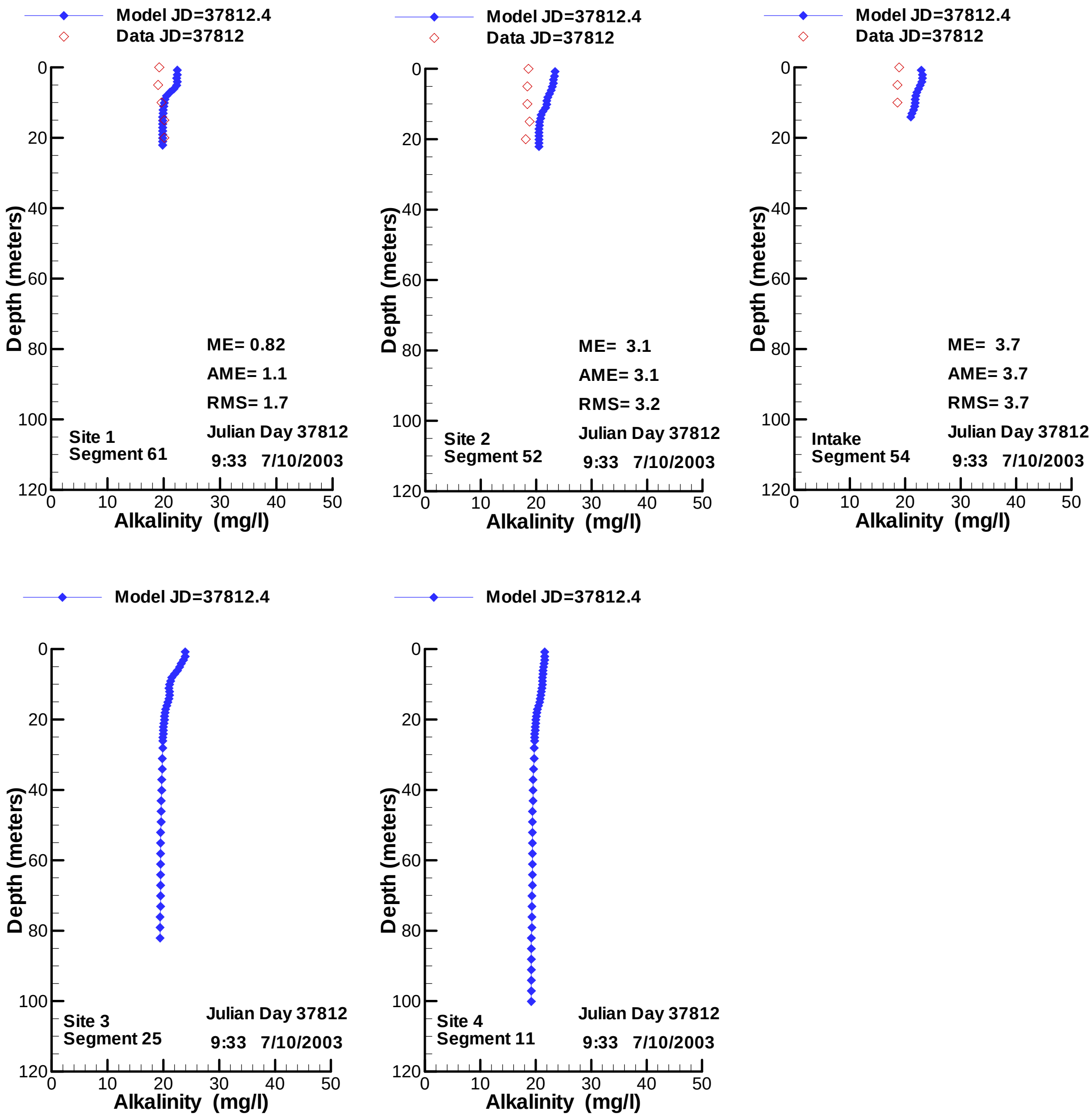

Figure 256. Vertical profiles of Alkalinity compared with data for 7/10/2003.

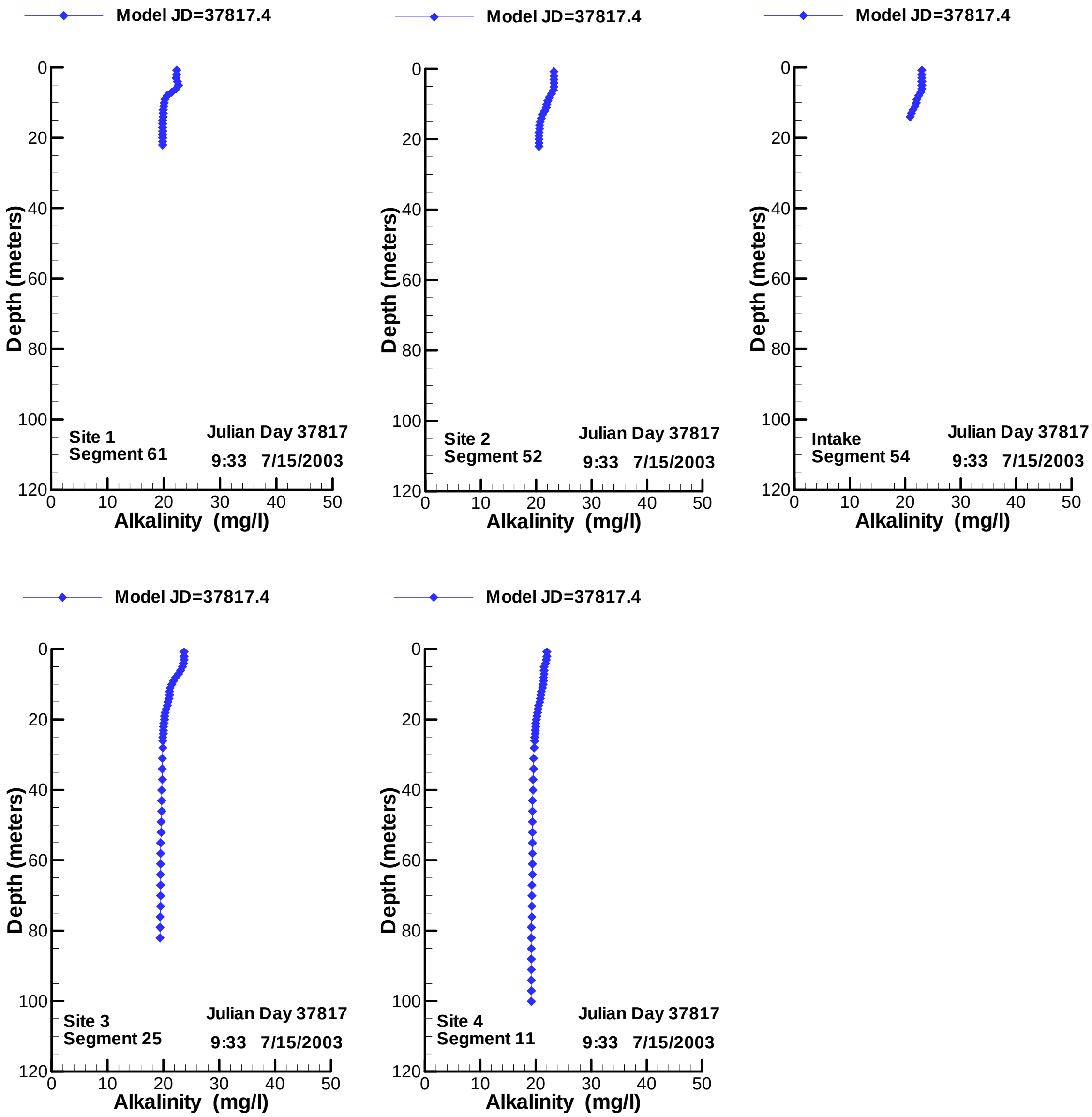

Figure 257. Vertical profiles of Alkalinity compared with data for 7/15/2003.

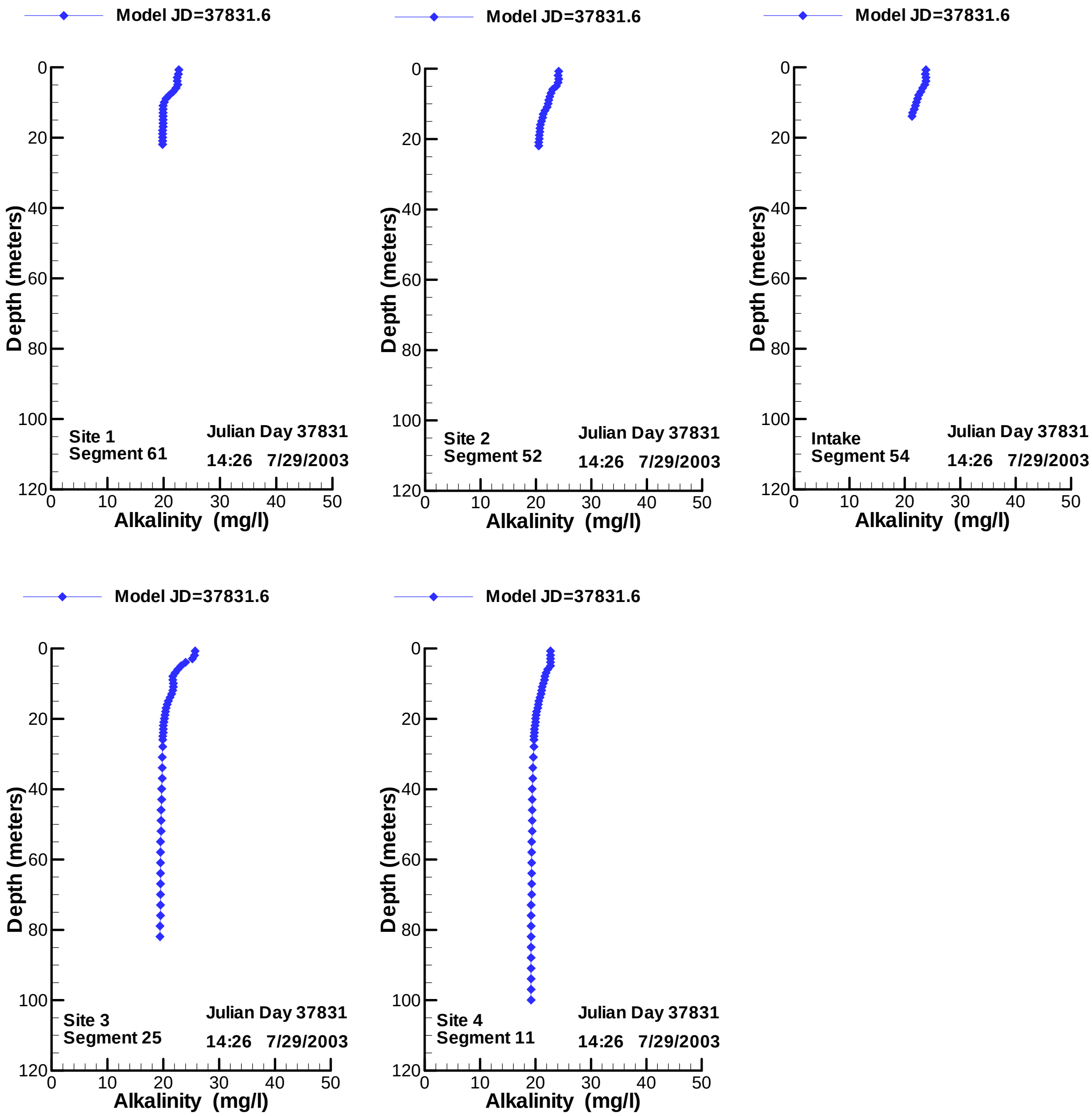

Figure 258. Vertical profiles of Alkalinity compared with data for 7/29/2003.

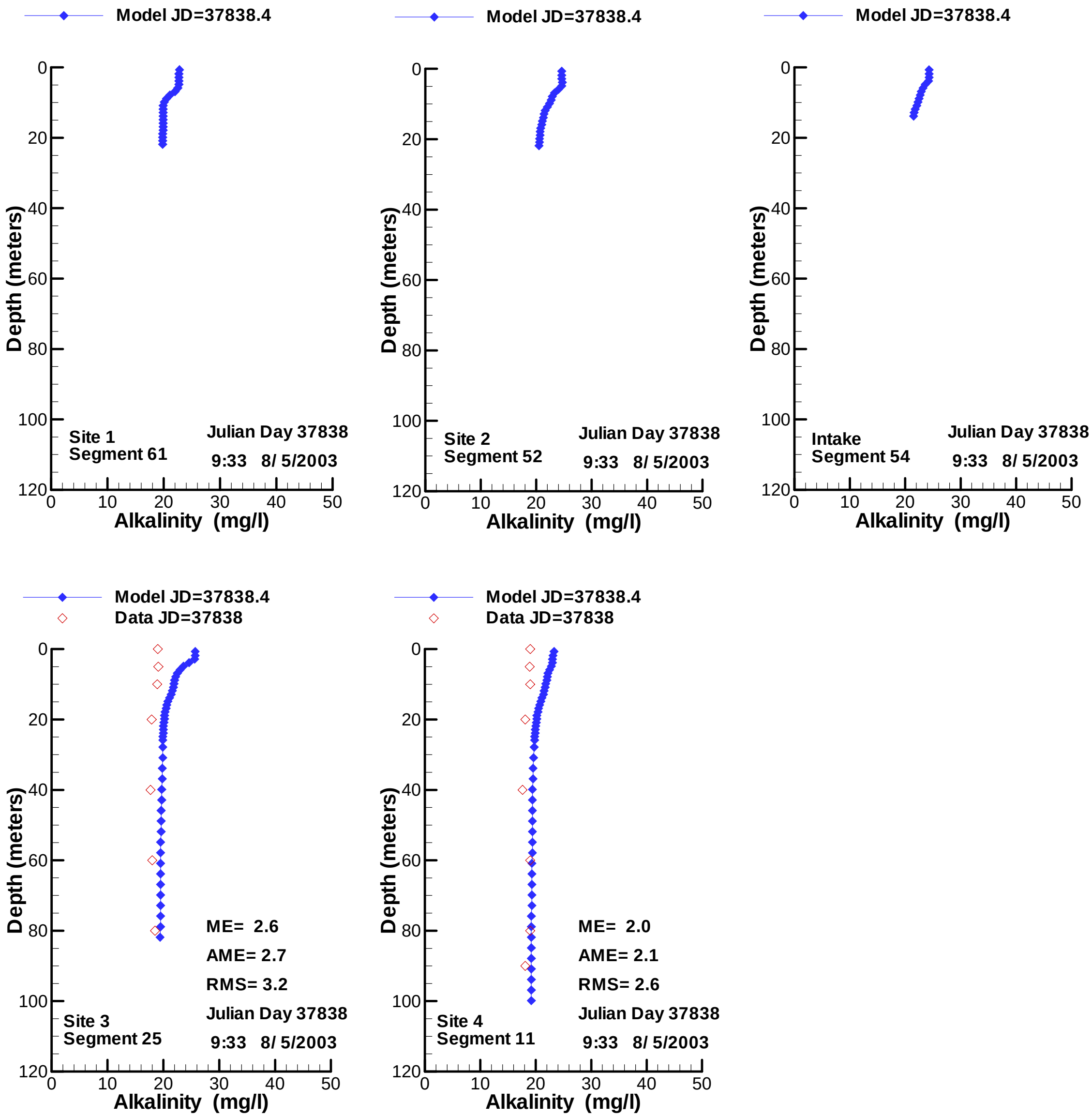

Figure 259. Vertical profiles of Alkalinity compared with data for 8/ 5/2003.

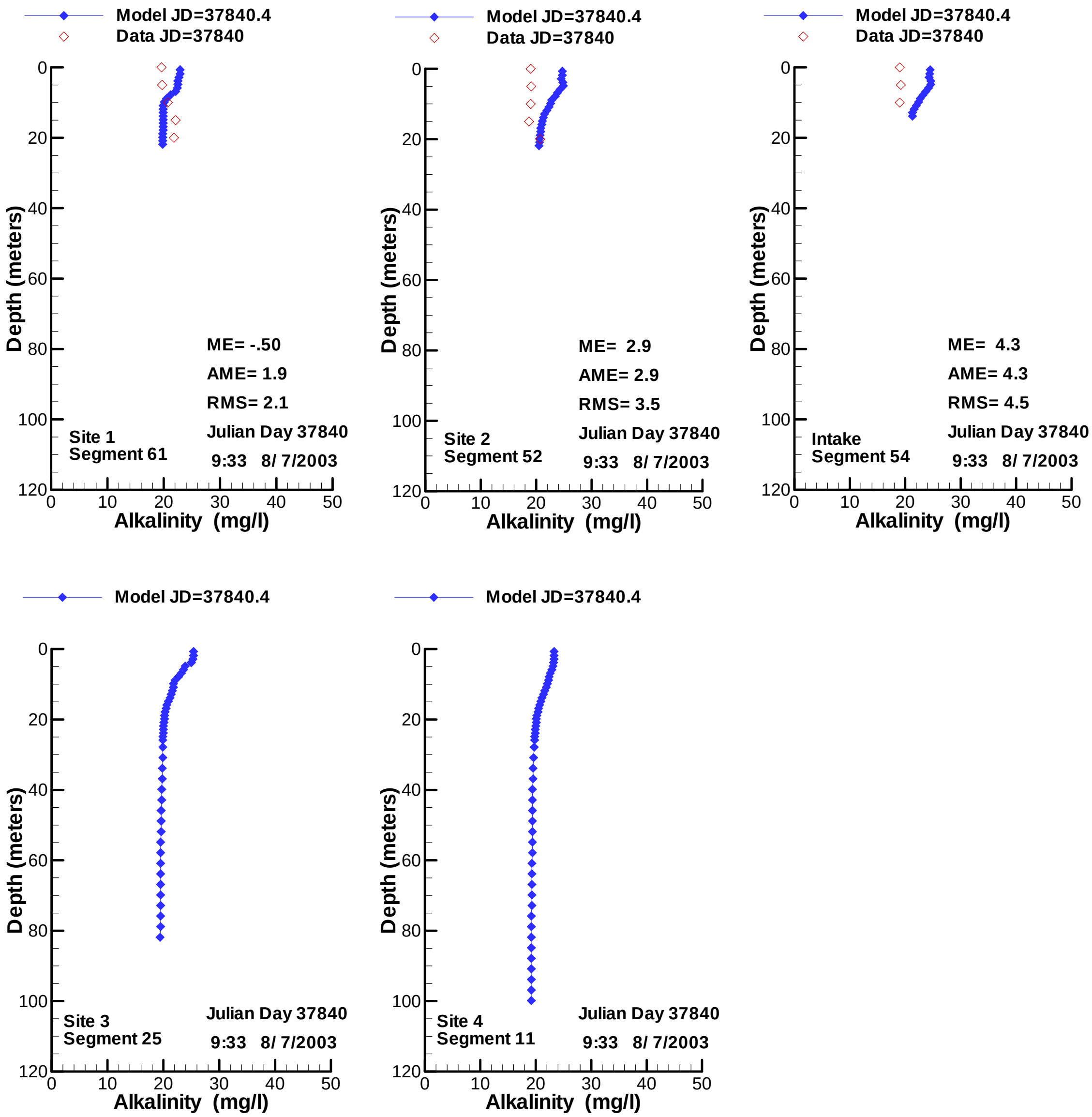

Figure 260. Vertical profiles of Alkalinity compared with data for 8/ 7/2003.

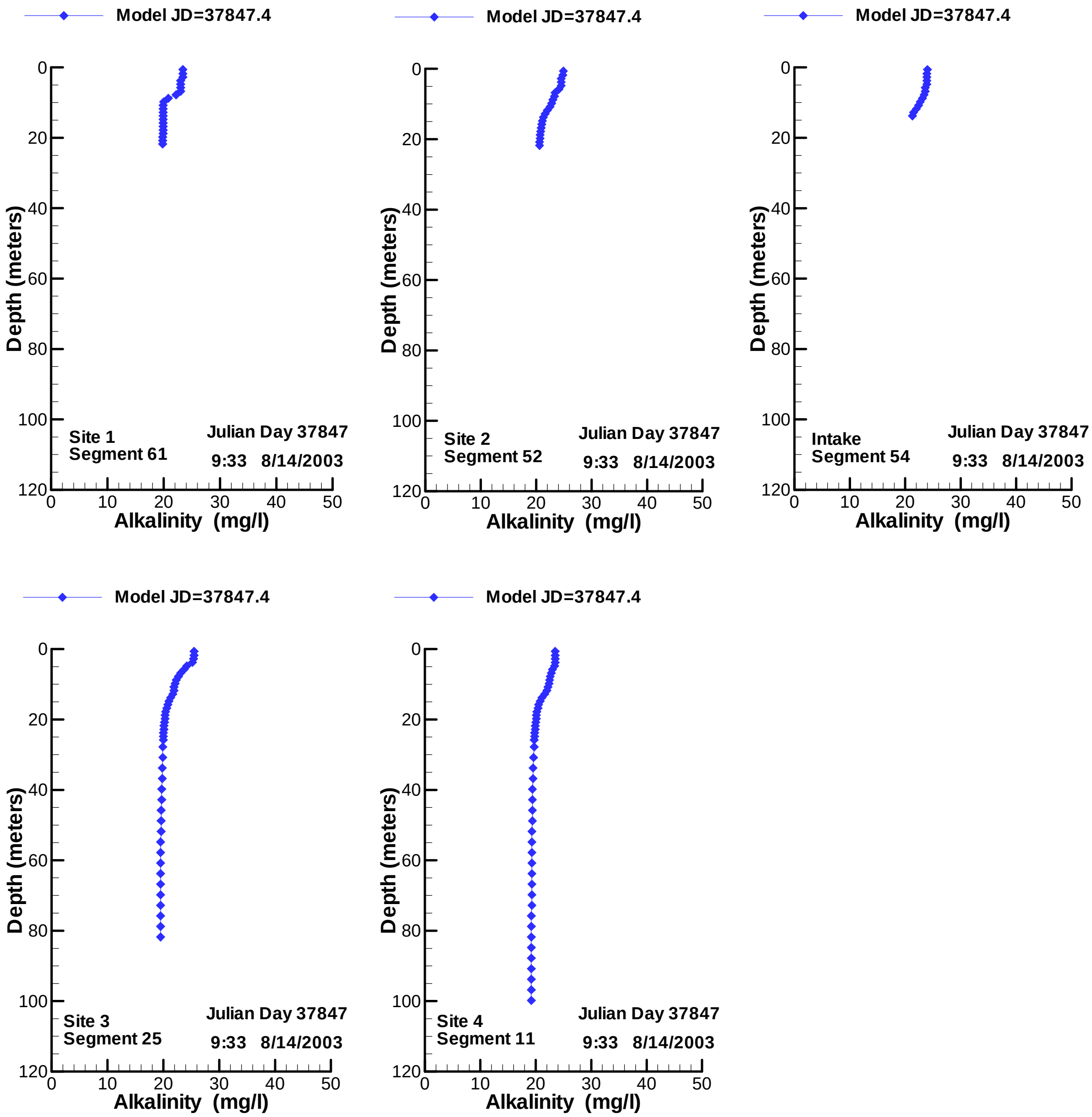

Figure 261. Vertical profiles of Alkalinity compared with data for 8/14/2003.

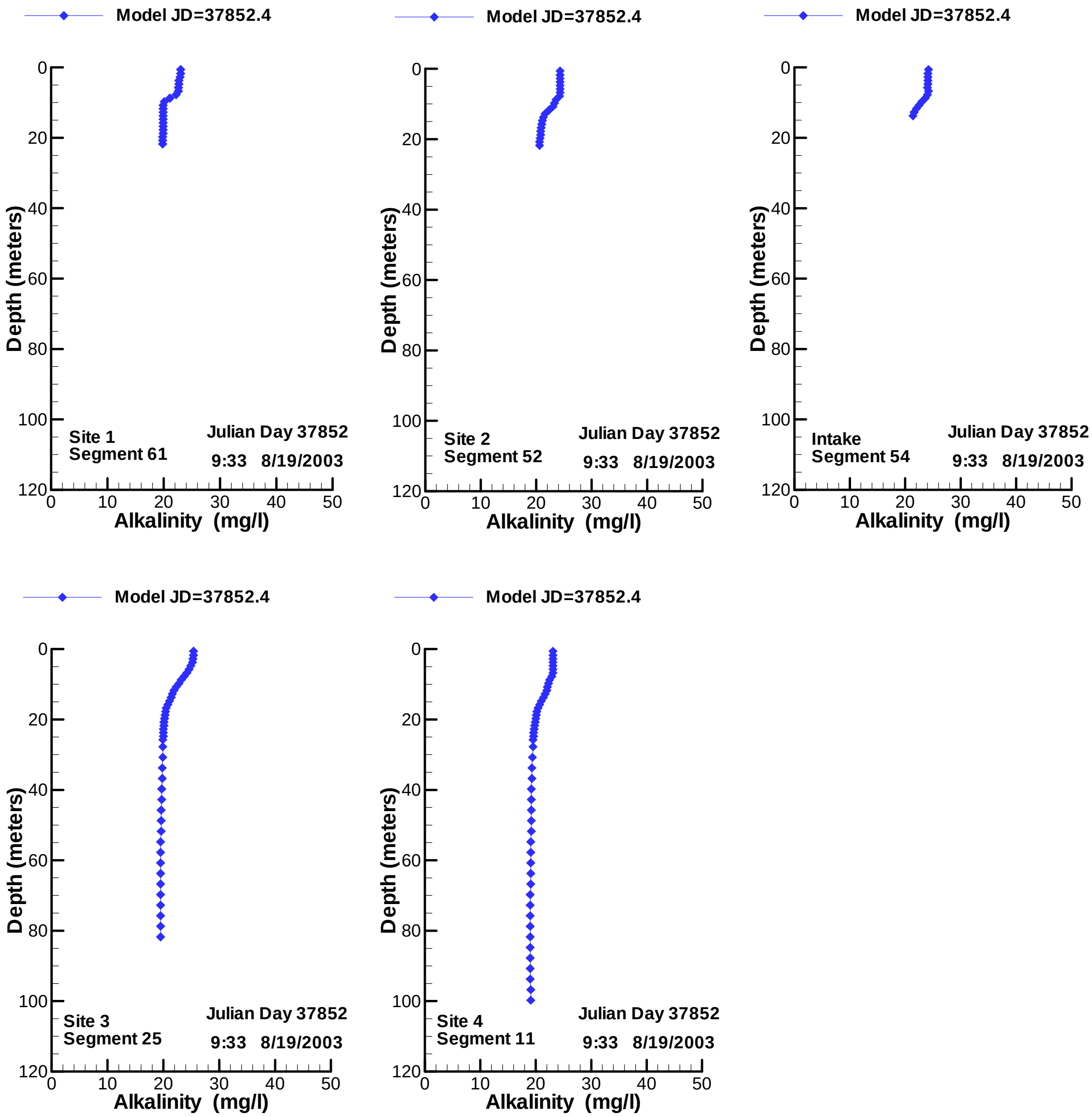

Figure 262. Vertical profiles of Alkalinity compared with data for 8/19/2003.

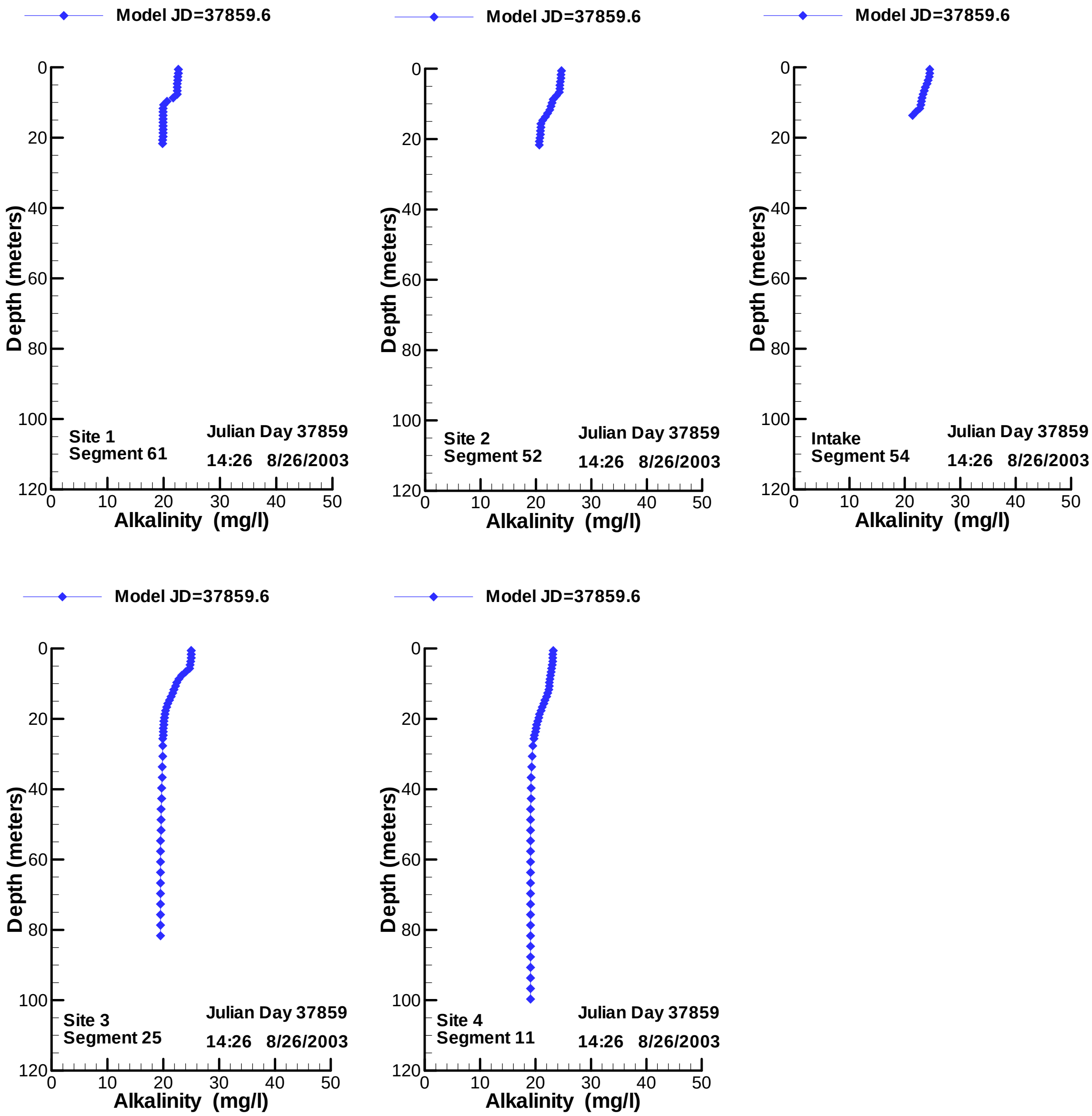

Figure 263. Vertical profiles of Alkalinity compared with data for 8/26/2003.

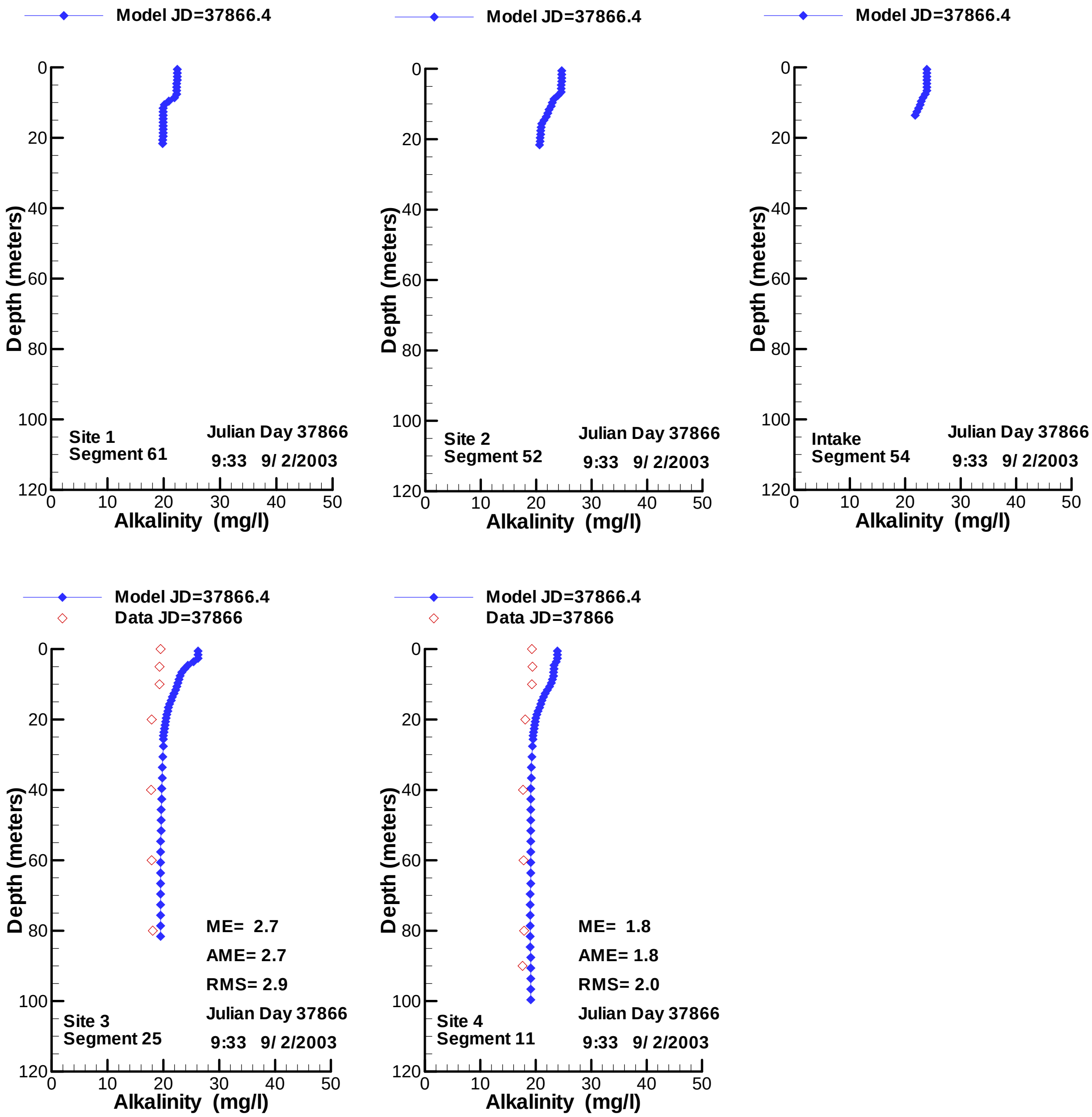

Figure 264. Vertical profiles of Alkalinity compared with data for 9/ 2/2003.

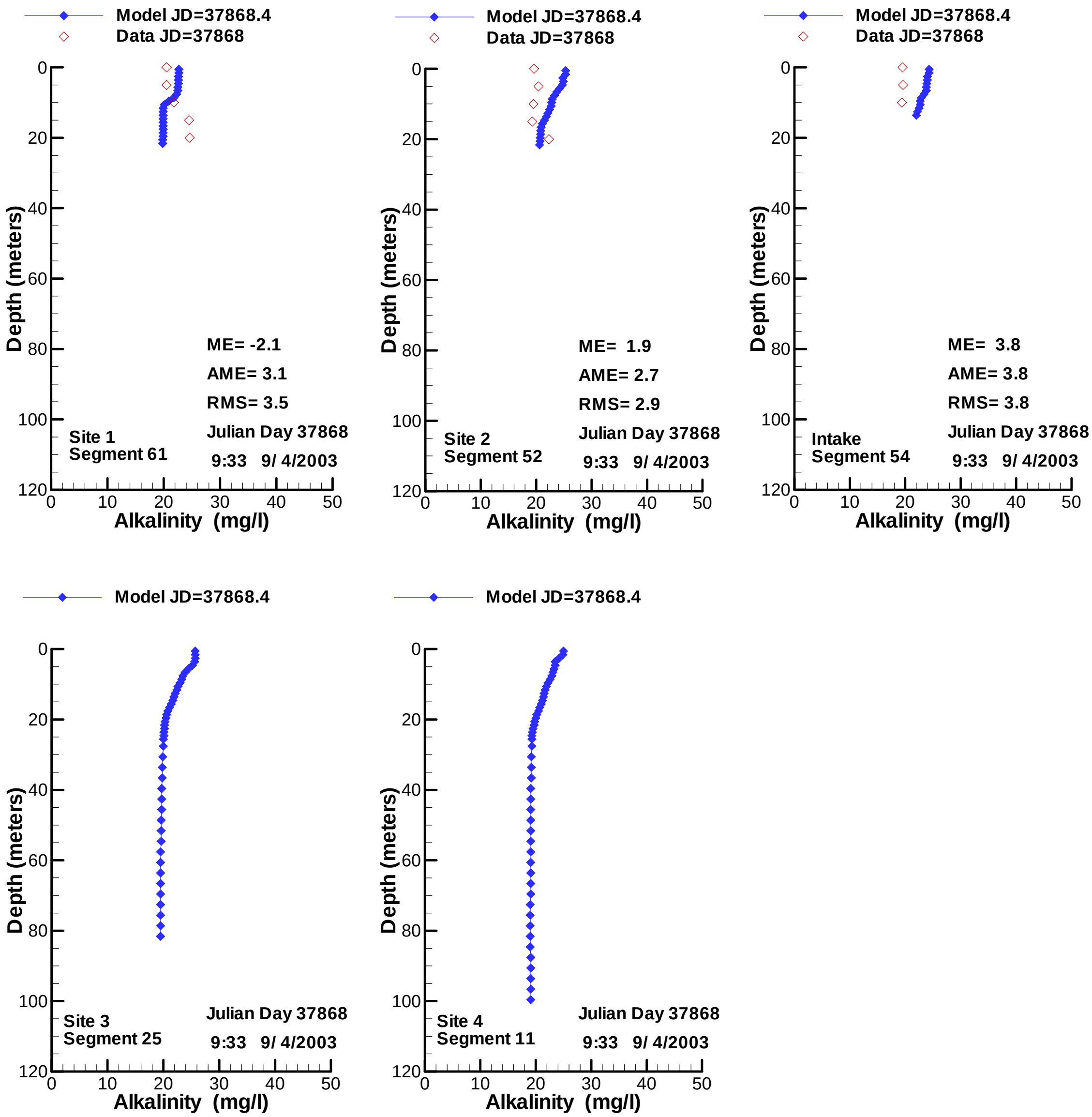

Figure 265. Vertical profiles of Alkalinity compared with data for 9/ 4/2003.

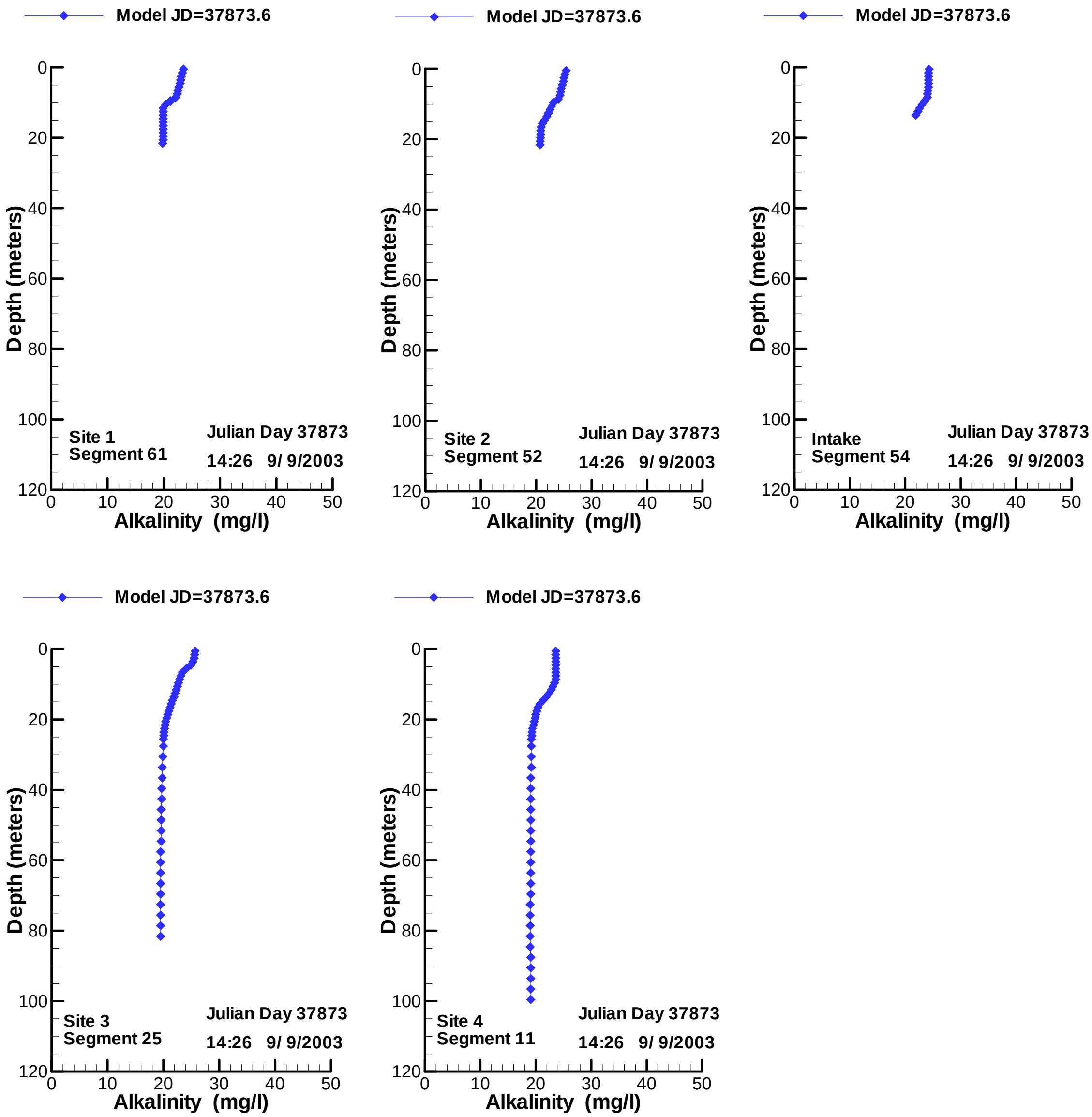

Figure 266. Vertical profiles of Alkalinity compared with data for 9/ 9/2003.

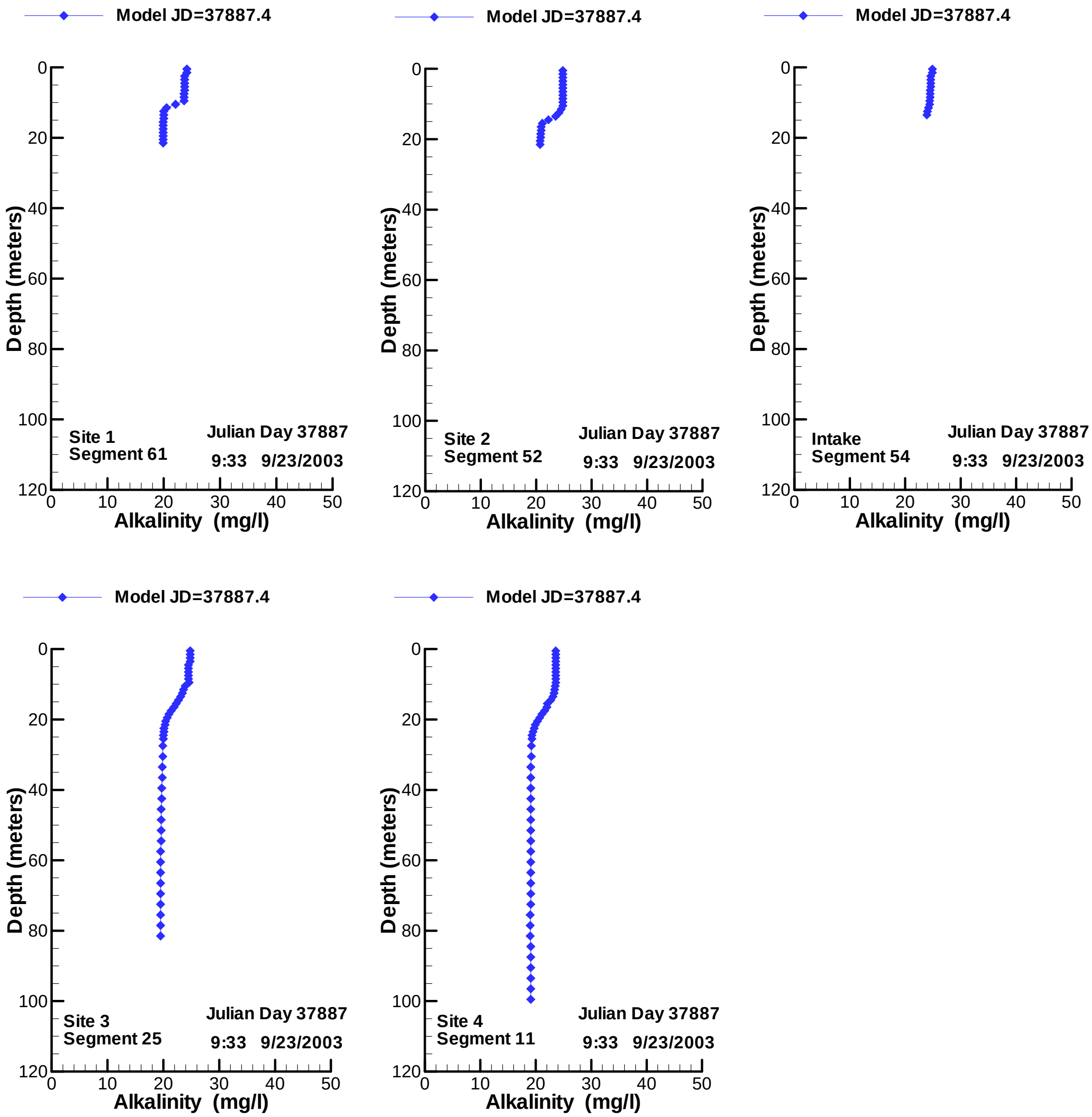

Figure 267. Vertical profiles of Alkalinity compared with data for 9/23/2003.

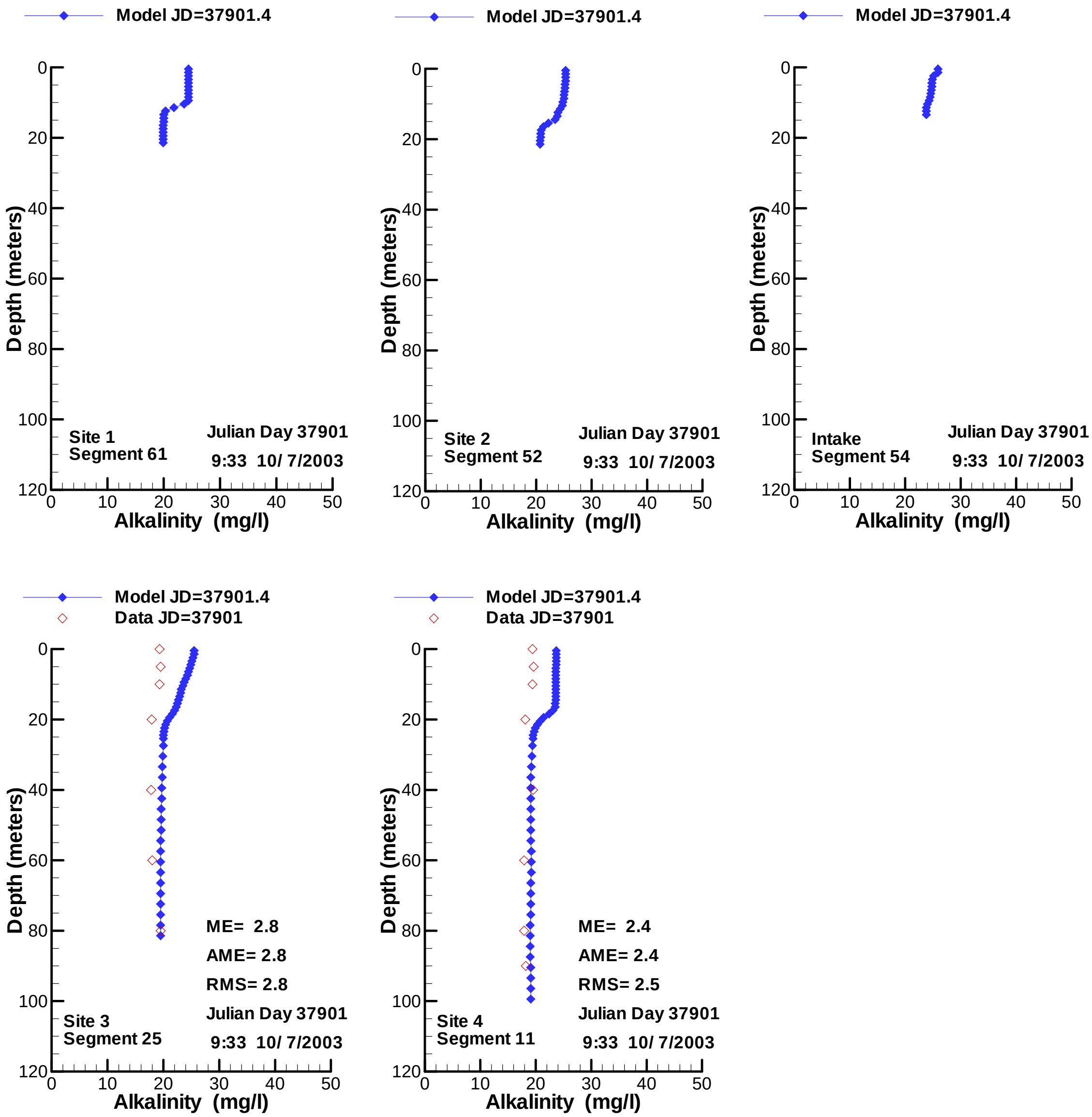

Figure 268. Vertical profiles of Alkalinity compared with data for 10/ 7/2003.

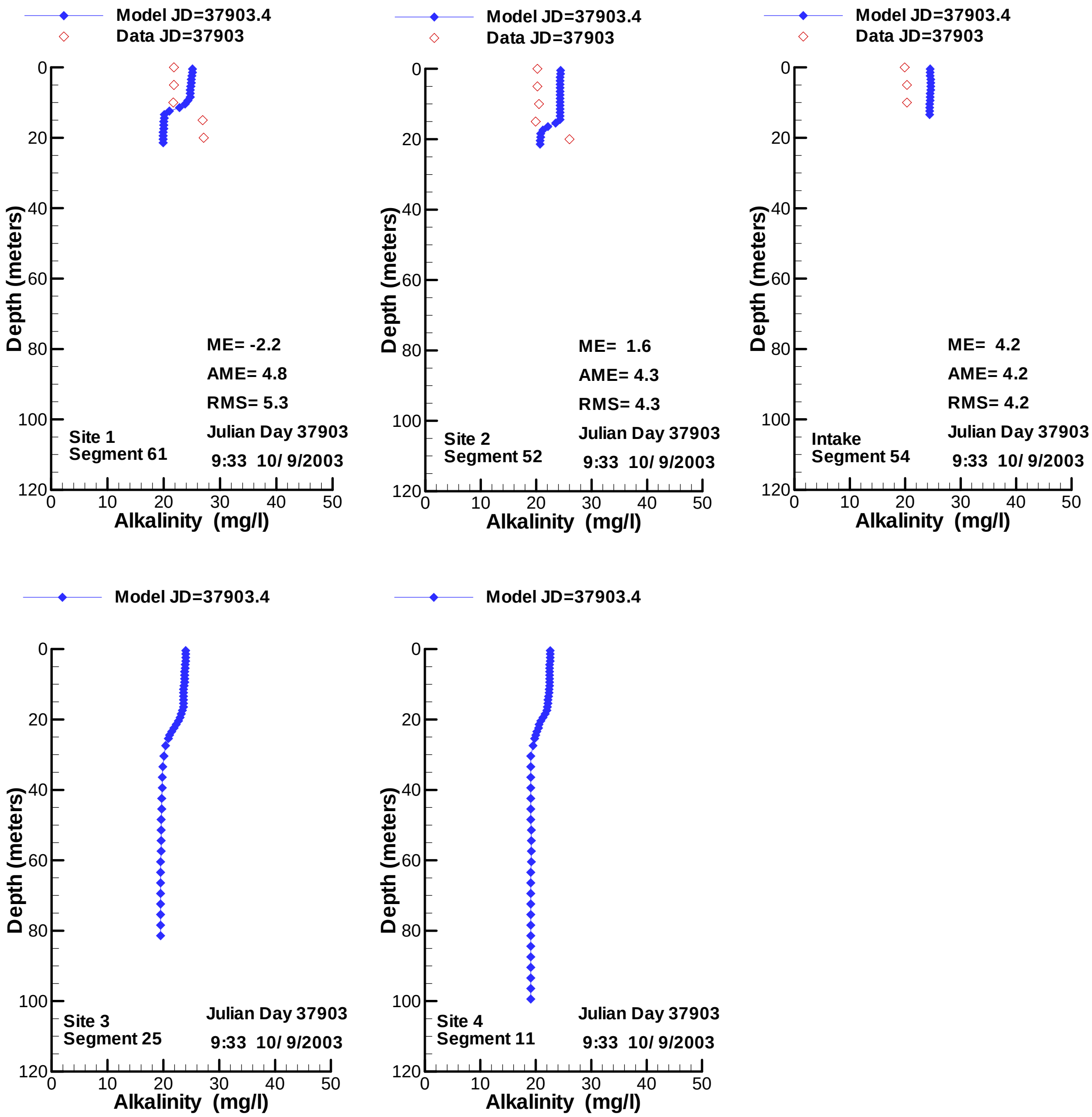

Figure 269. Vertical profiles of Alkalinity compared with data for 10/ 9/2003.

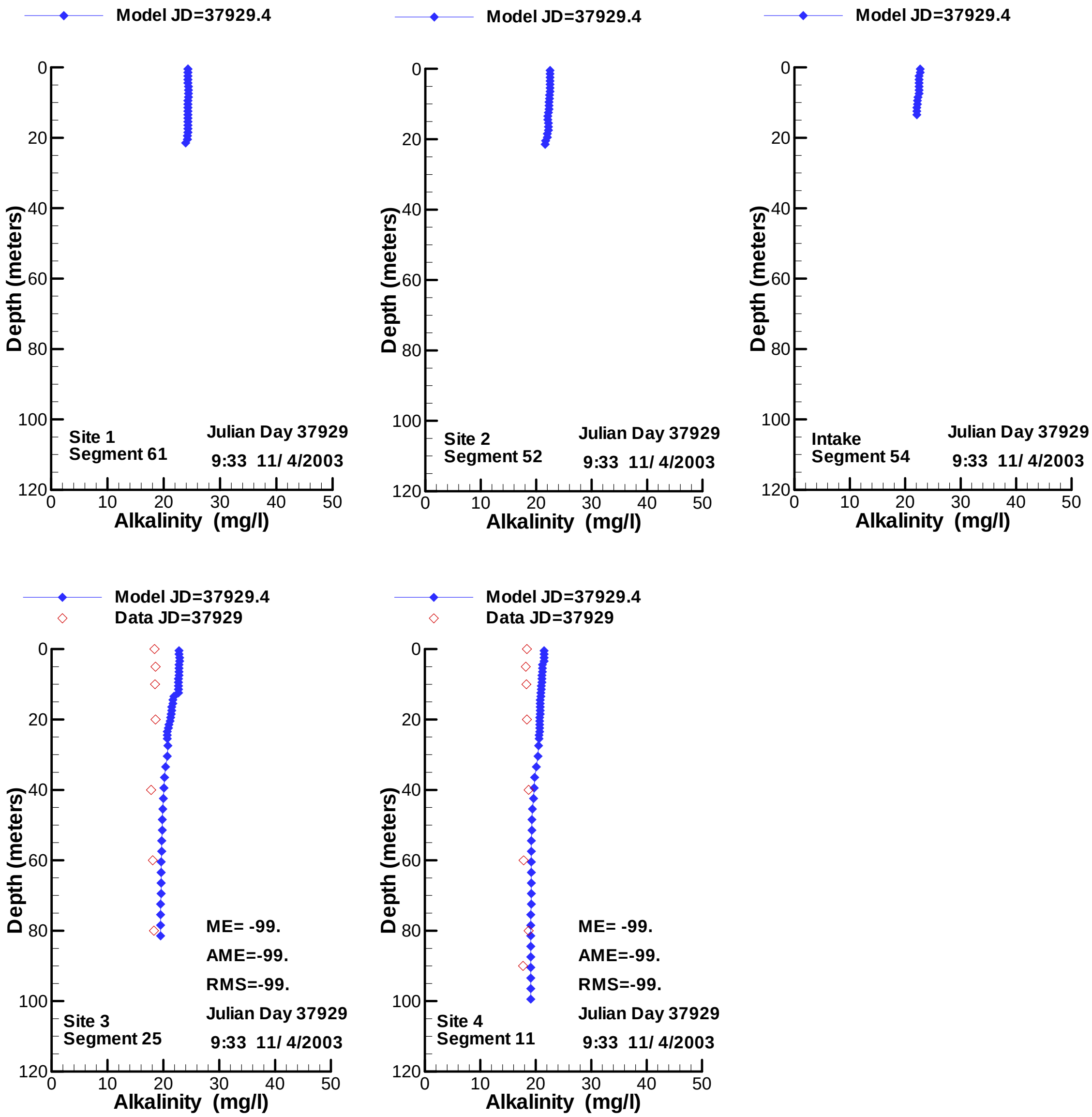

Figure 270. Vertical profiles of Alkalinity compared with data for 11/ 4/2003.

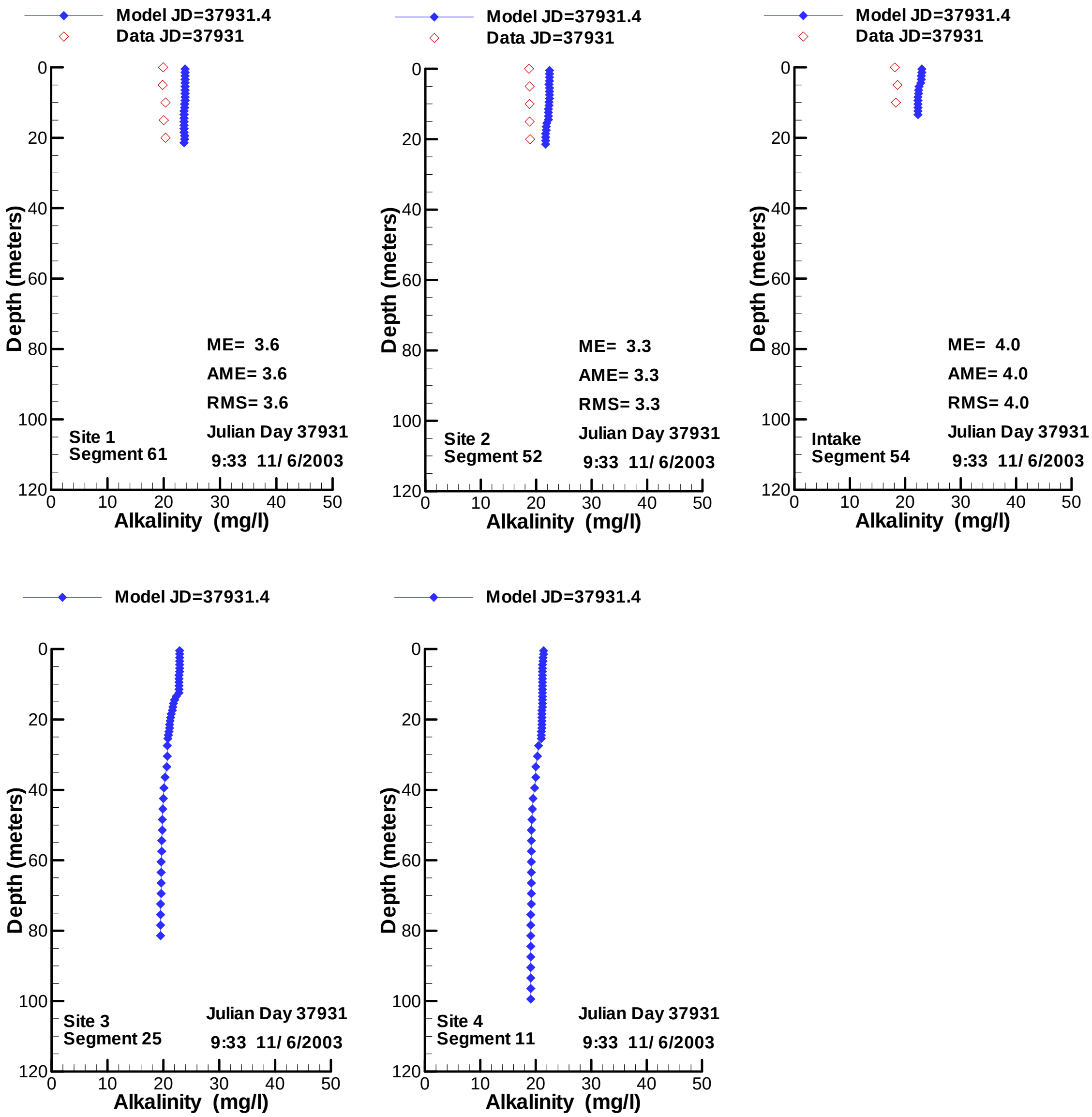

Figure 271. Vertical profiles of Alkalinity compared with data for 11/ 6/2003.

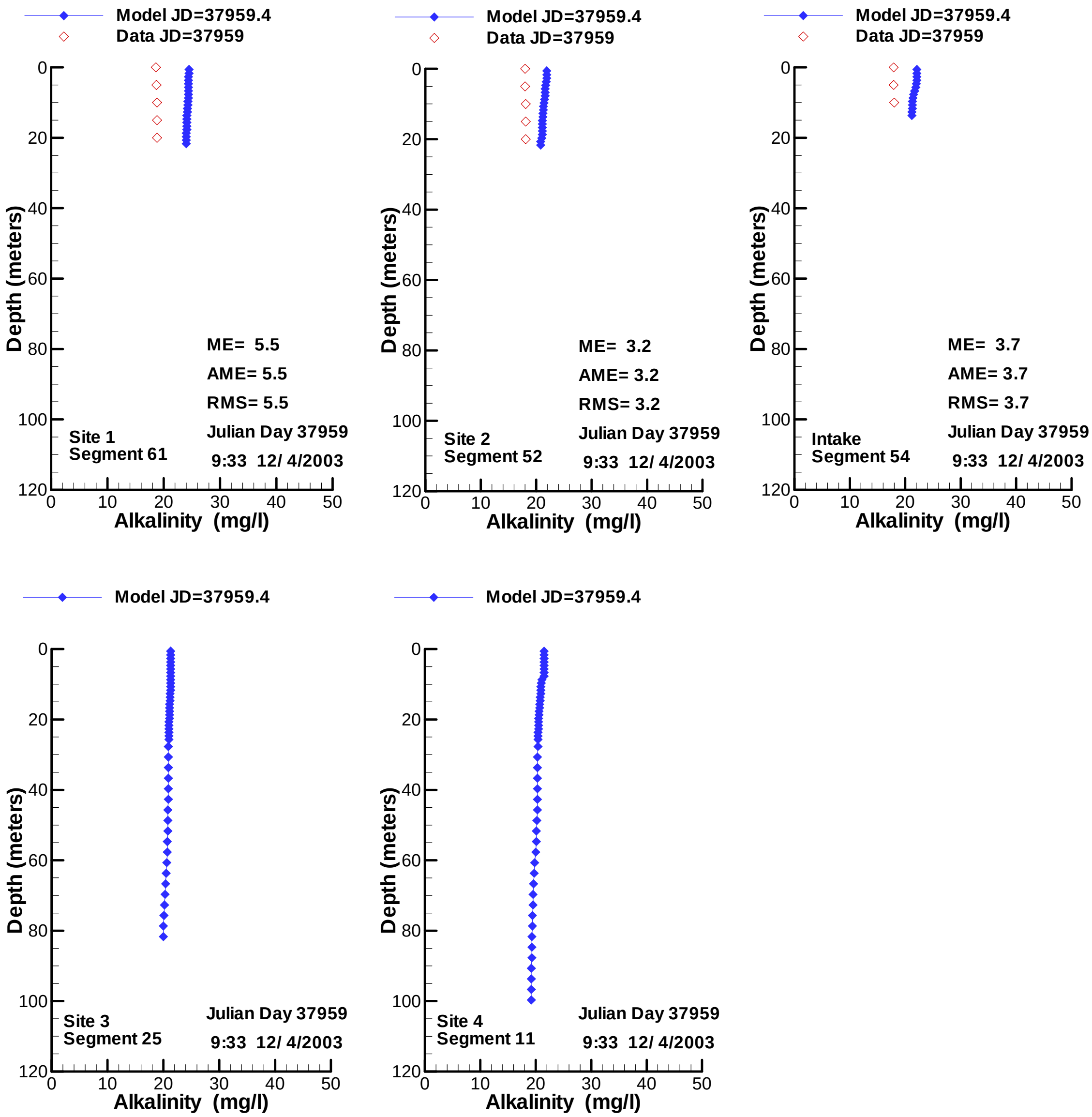

Figure 272. Vertical profiles of Alkalinity compared with data for 12/ 4/2003.

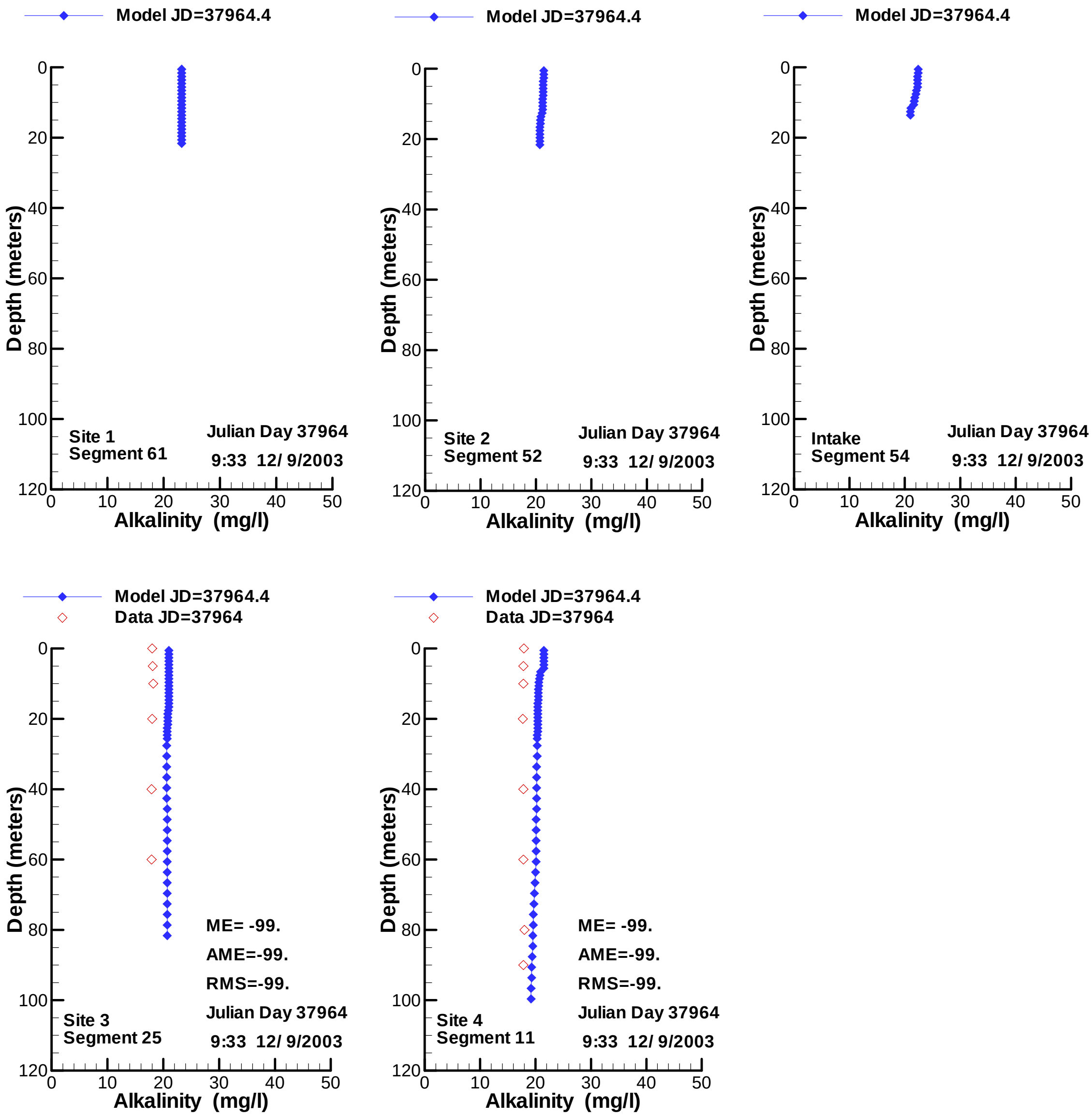

Figure 273. Vertical profiles of Alkalinity compared with data for 12/ 9/2003.

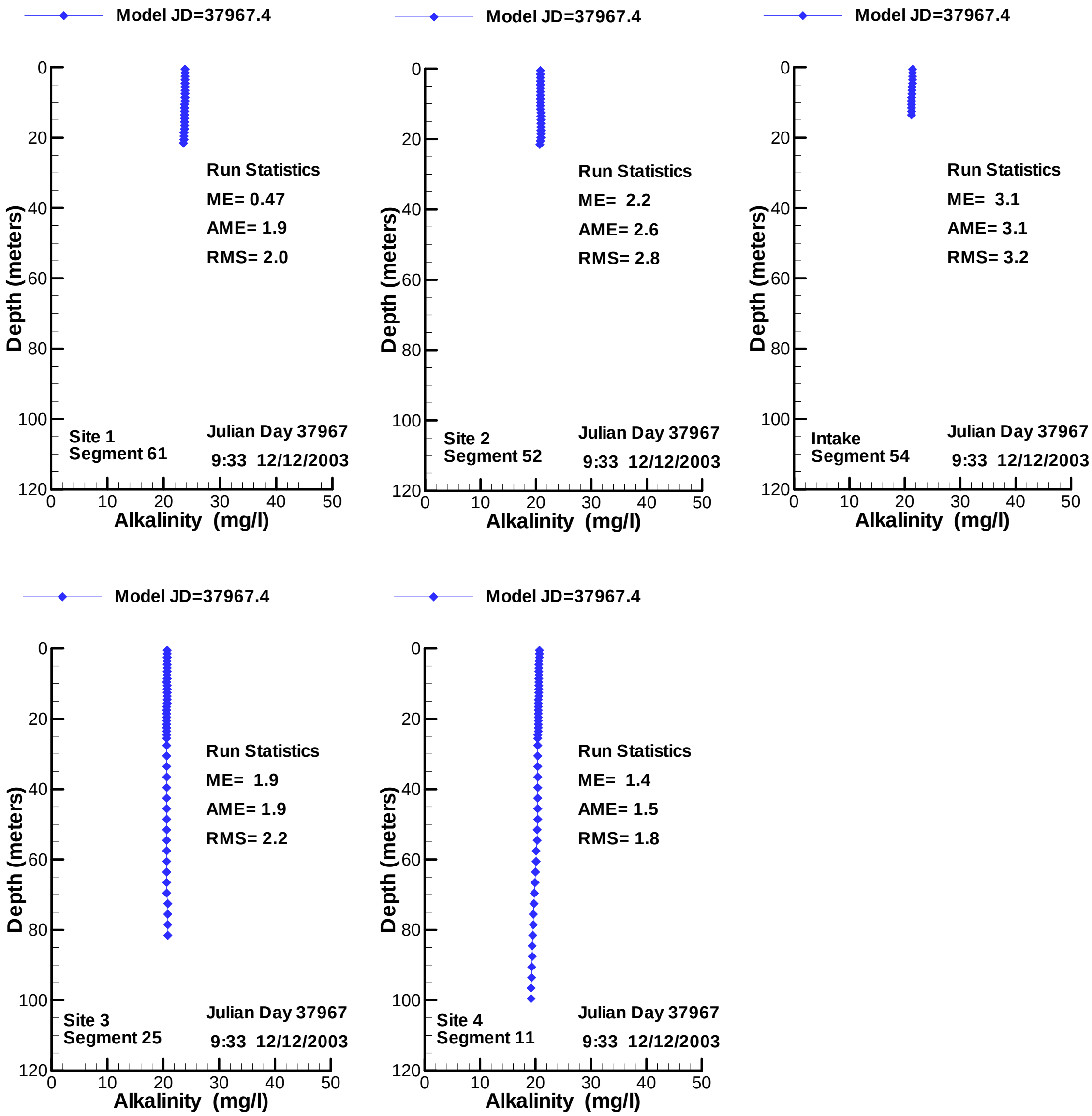

Figure 274. Vertical profiles of Alkalinity compared with data for 12/12/2003.

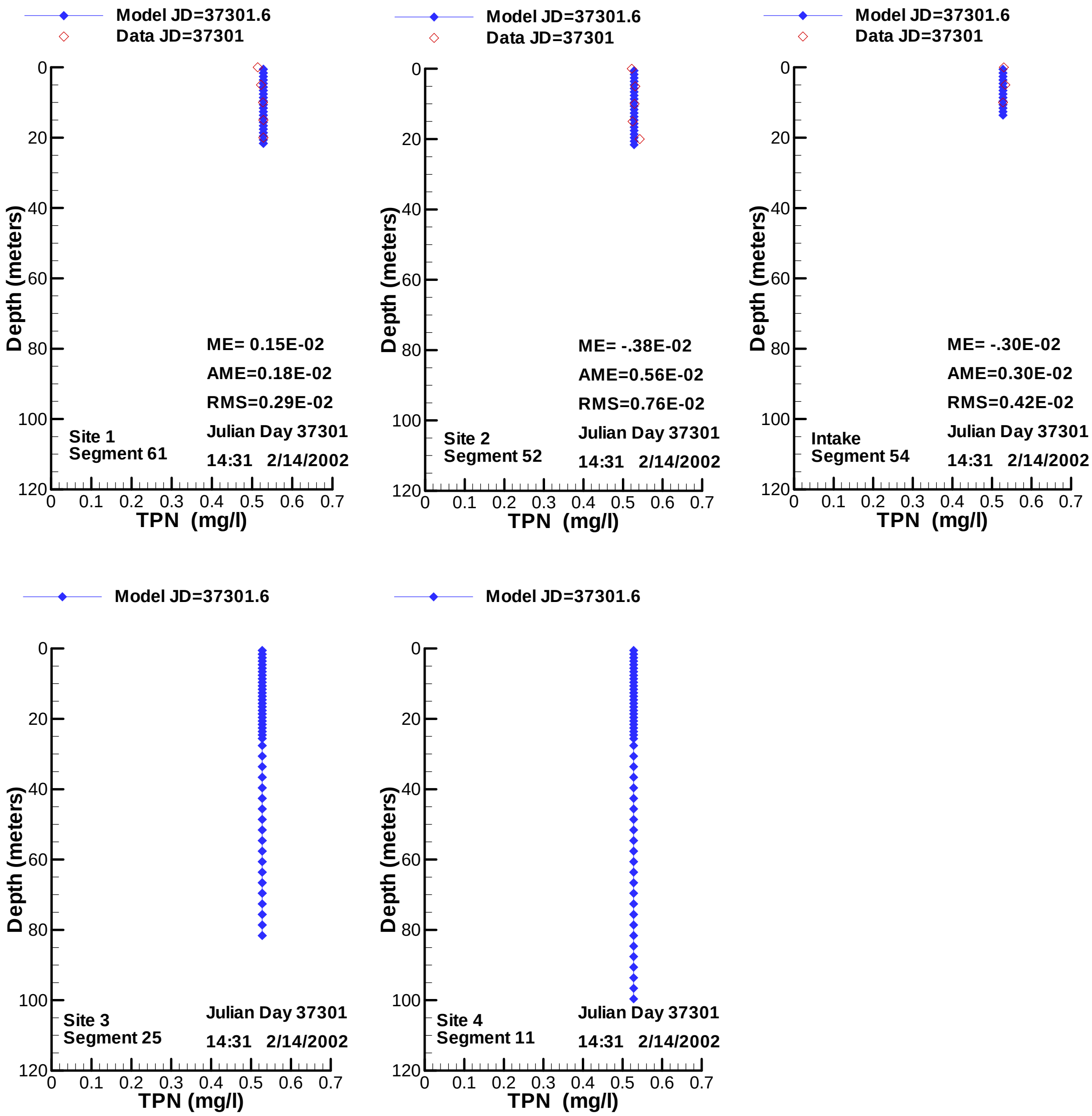

Figure 275. Vertical profiles of TOTAL NITROGEN compared with data for 2/14/2002.

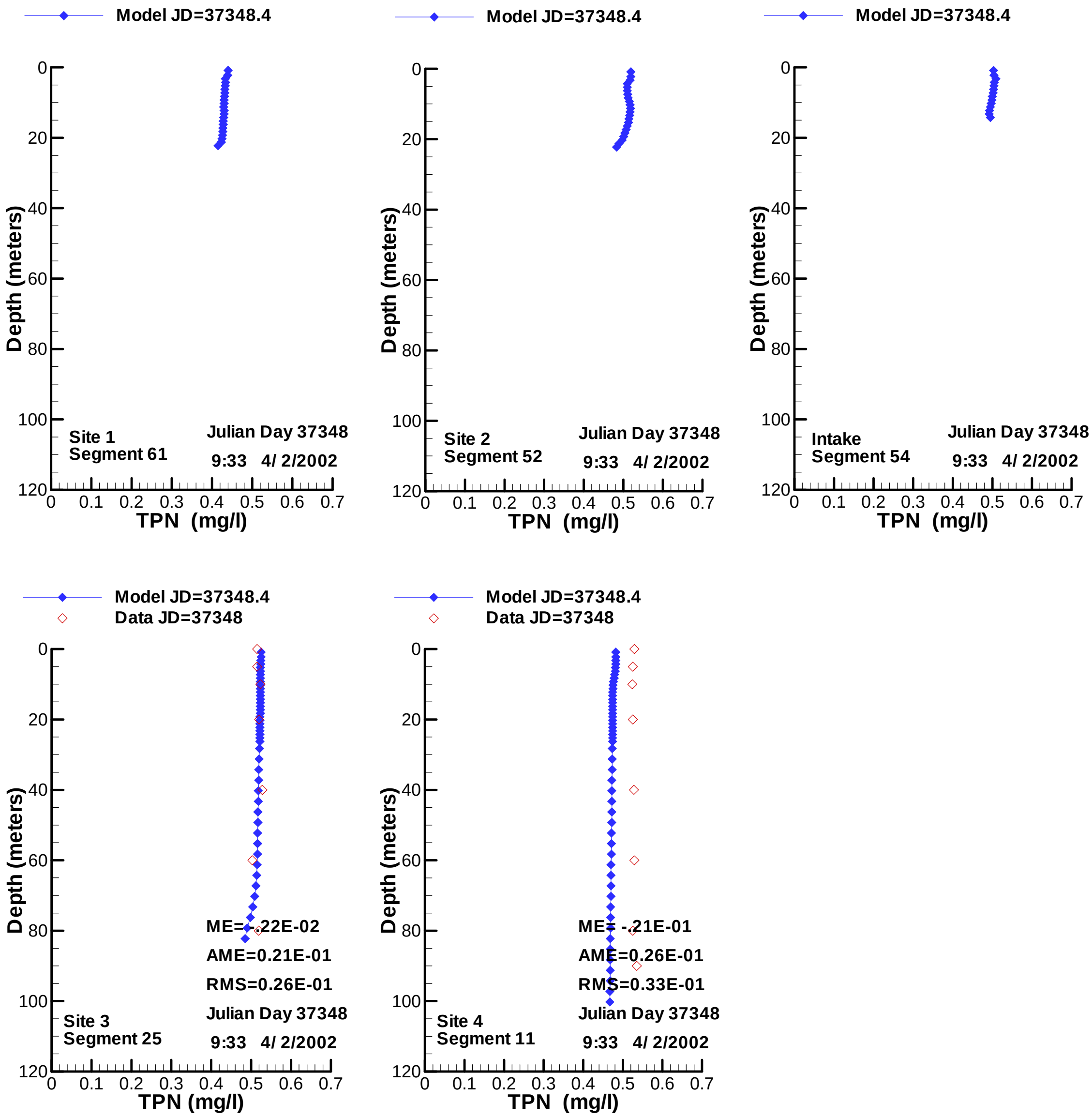

Figure 276. Vertical profiles of TOTAL NITROGEN compared with data for 4/ 2/2002.

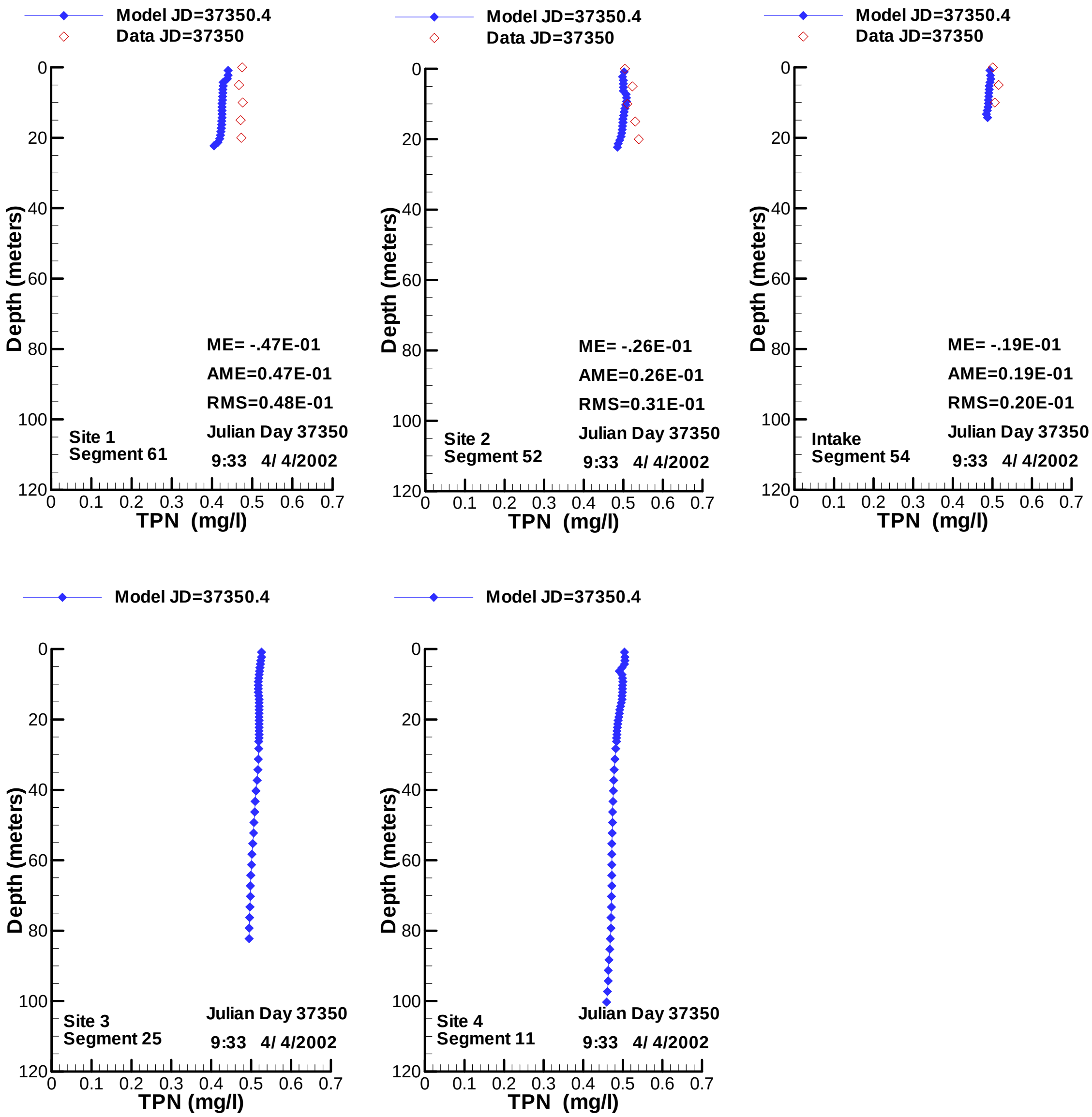

Figure 277. Vertical profiles of TOTAL NITROGEN compared with data for 4/ 4/2002.

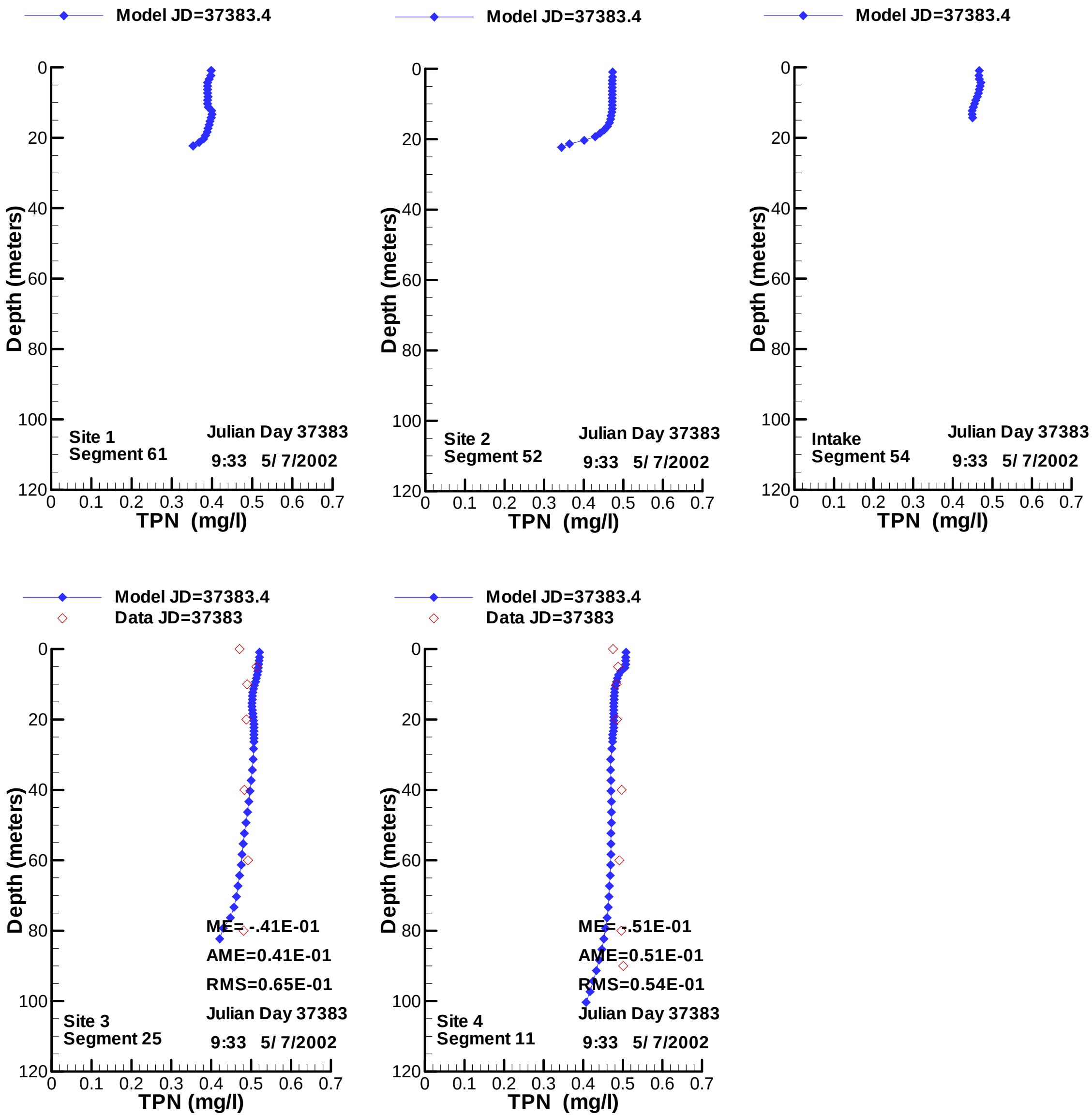

Figure 278. Vertical profiles of TOTAL NITROGEN compared with data for 5/ 7/2002.

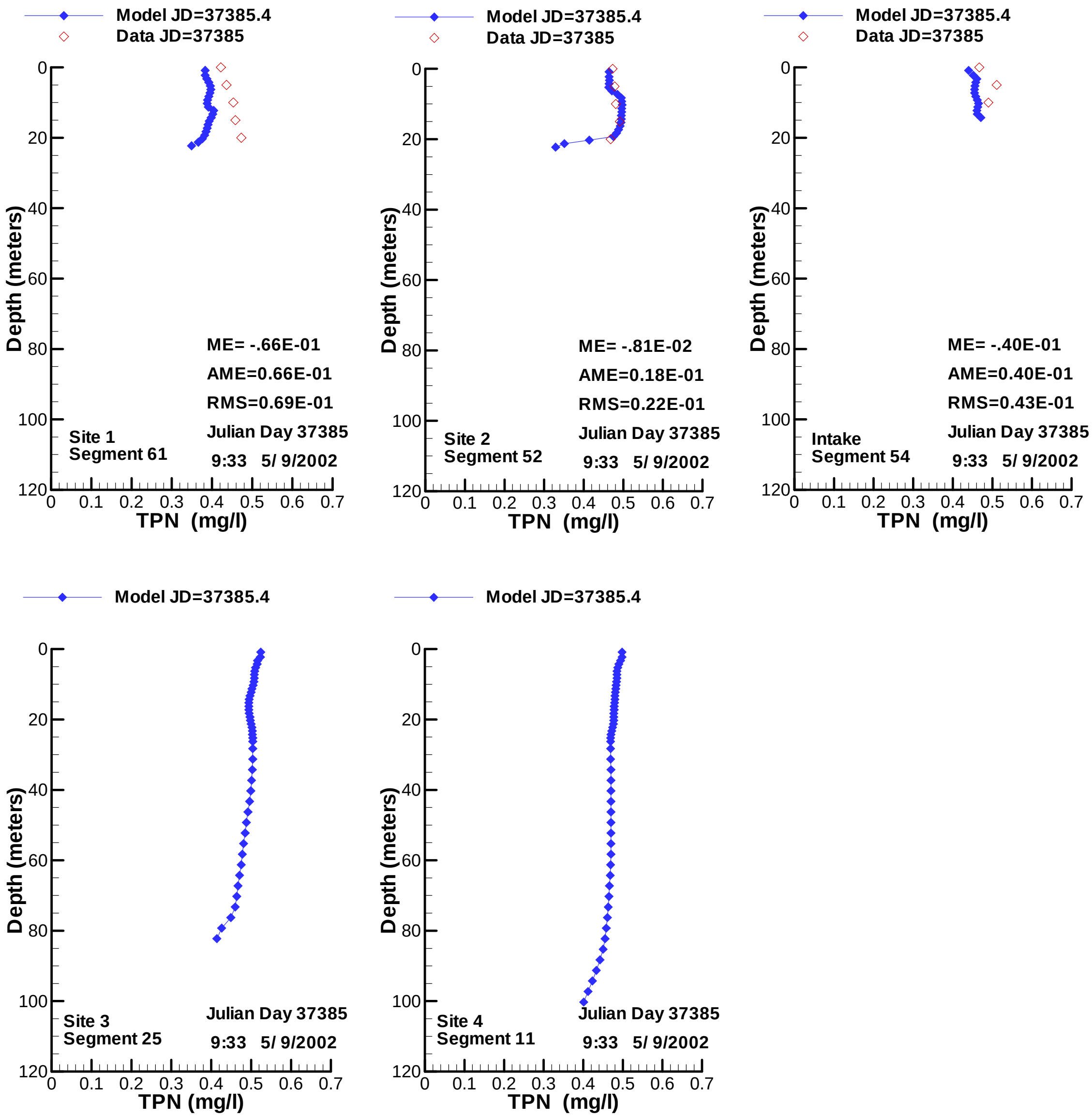

Figure 279. Vertical profiles of TOTAL NITROGEN compared with data for 5/ 9/2002.

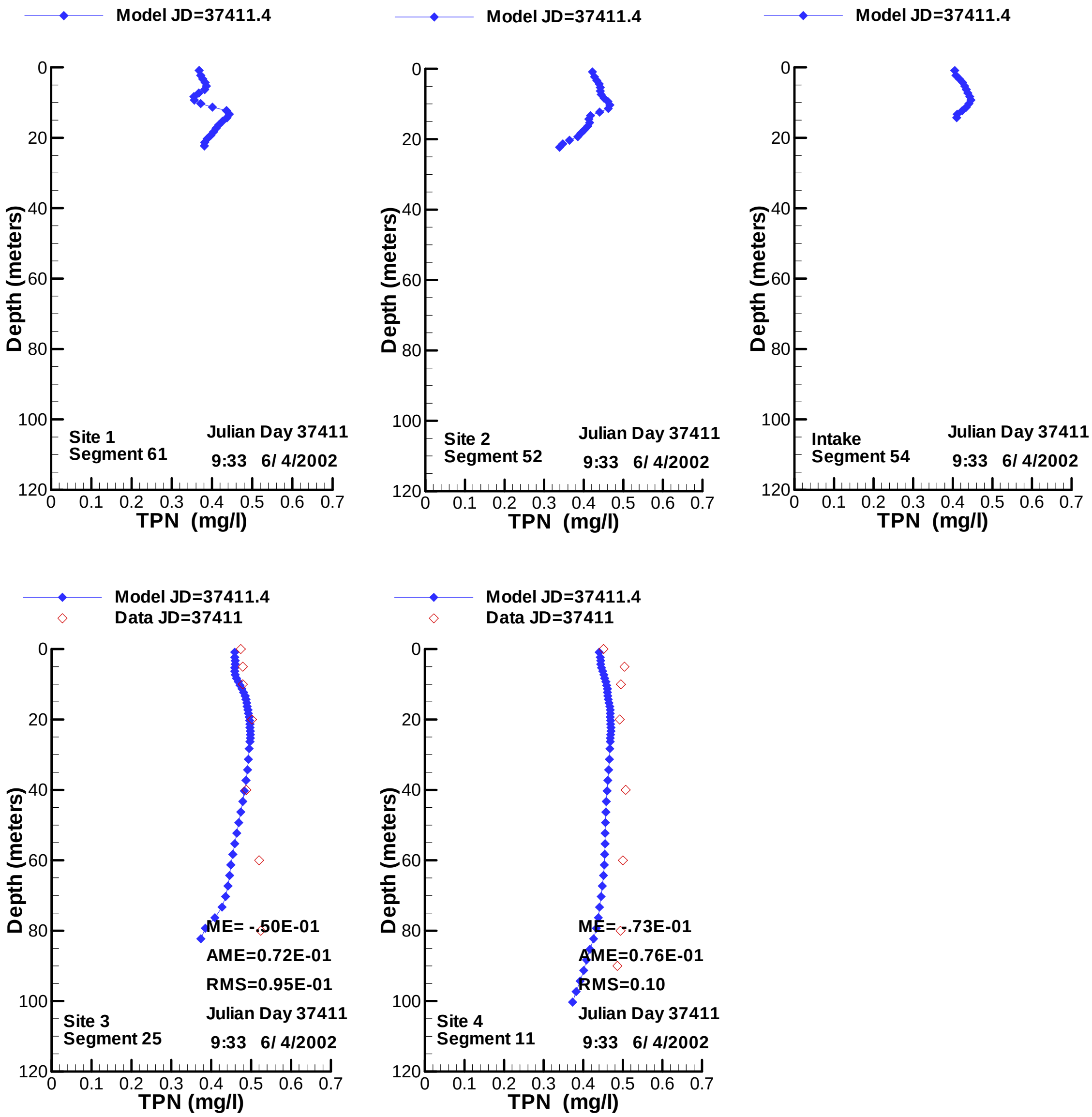

Figure 280. Vertical profiles of TOTAL NITROGEN compared with data for 6/ 4/2002.

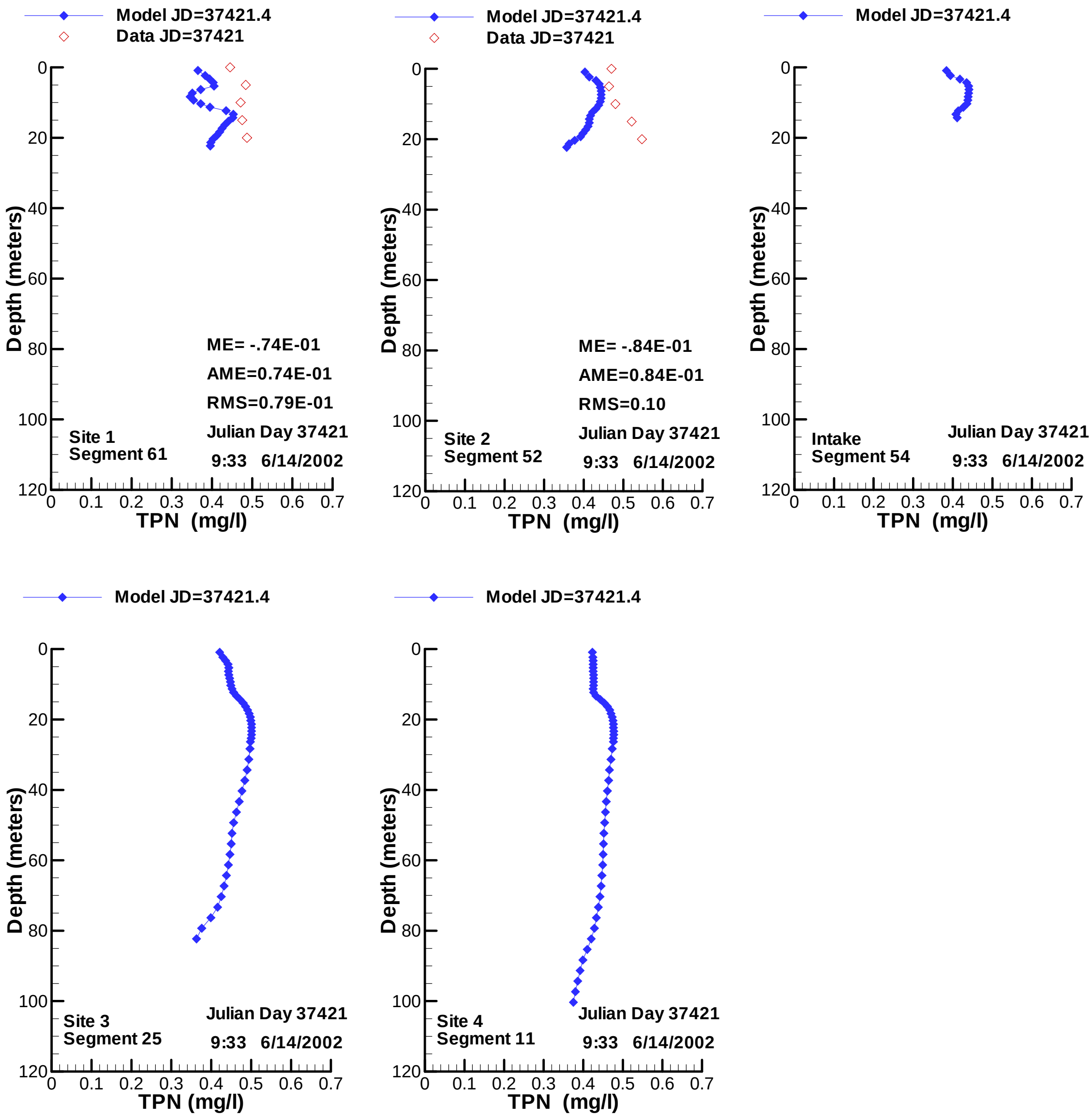

Figure 281. Vertical profiles of TOTAL NITROGEN compared with data for 6/14/2002.

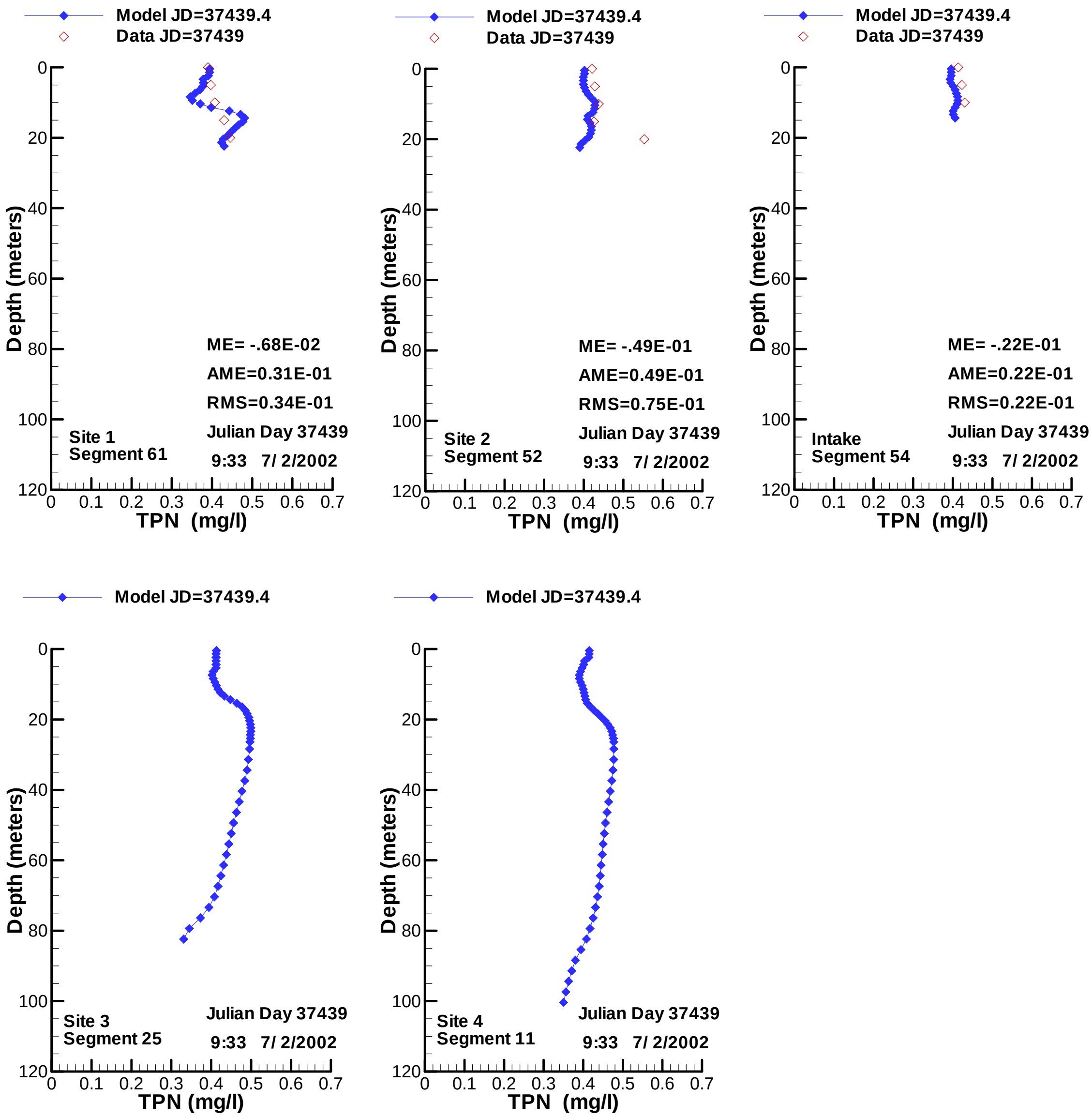

Figure 282. Vertical profiles of TOTAL NITROGEN compared with data for 7/ 2/2002.

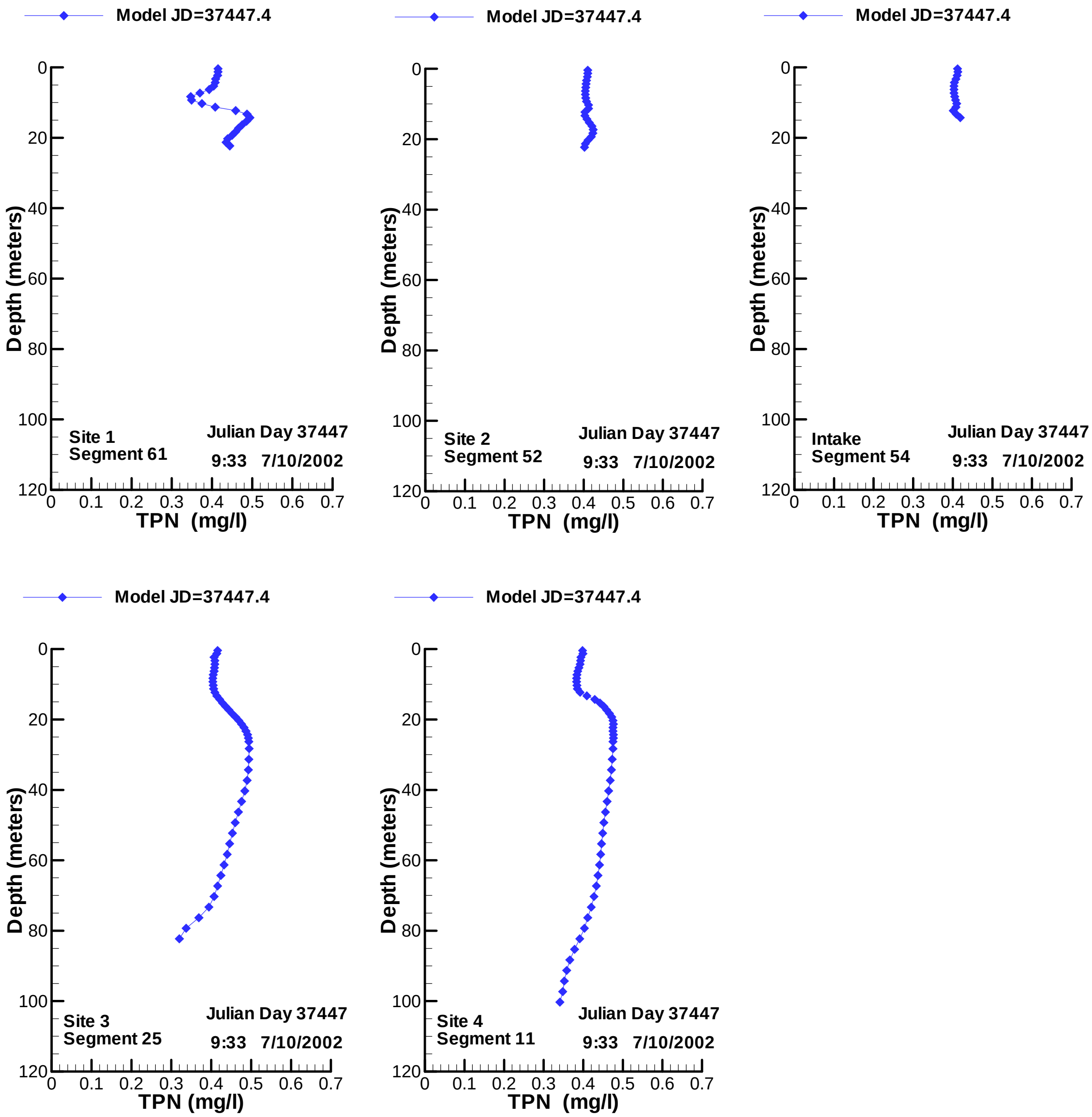

Figure 283. Vertical profiles of TOTAL NITROGEN compared with data for 7/10/2002.

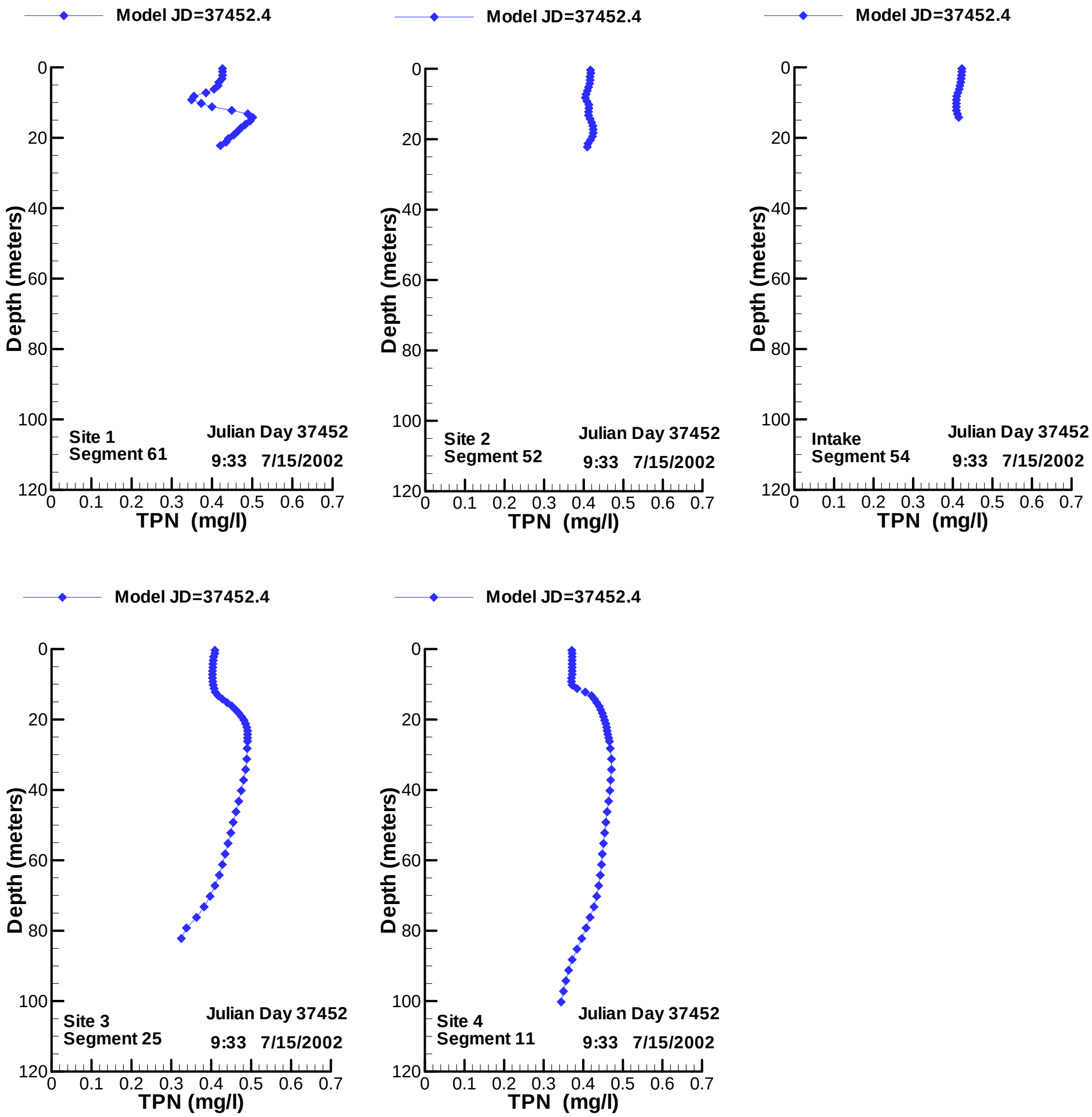

Figure 284. Vertical profiles of TOTAL NITROGEN compared with data for 7/15/2002.

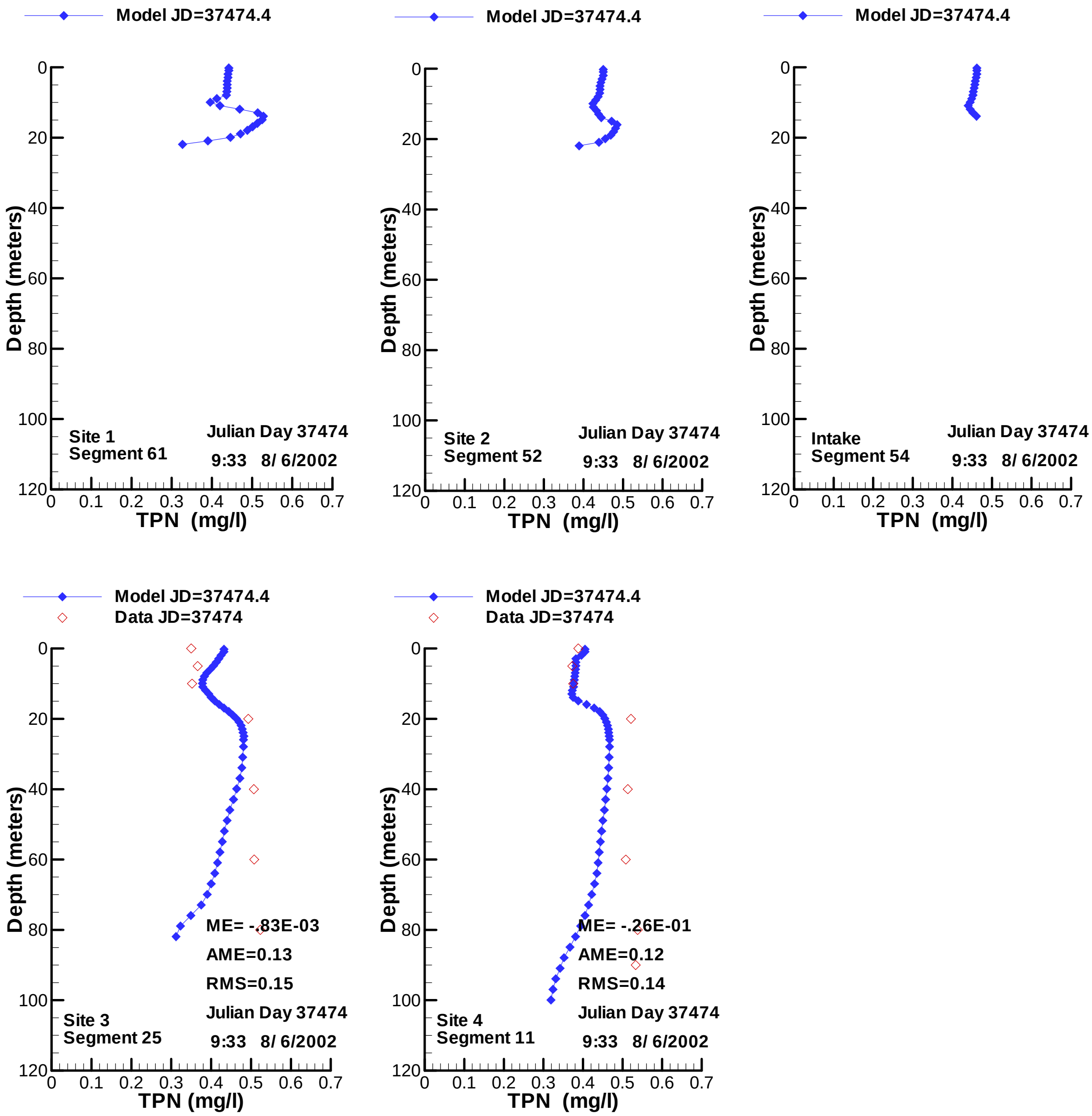

Figure 285. Vertical profiles of TOTAL NITROGEN compared with data for 8/ 6/2002.

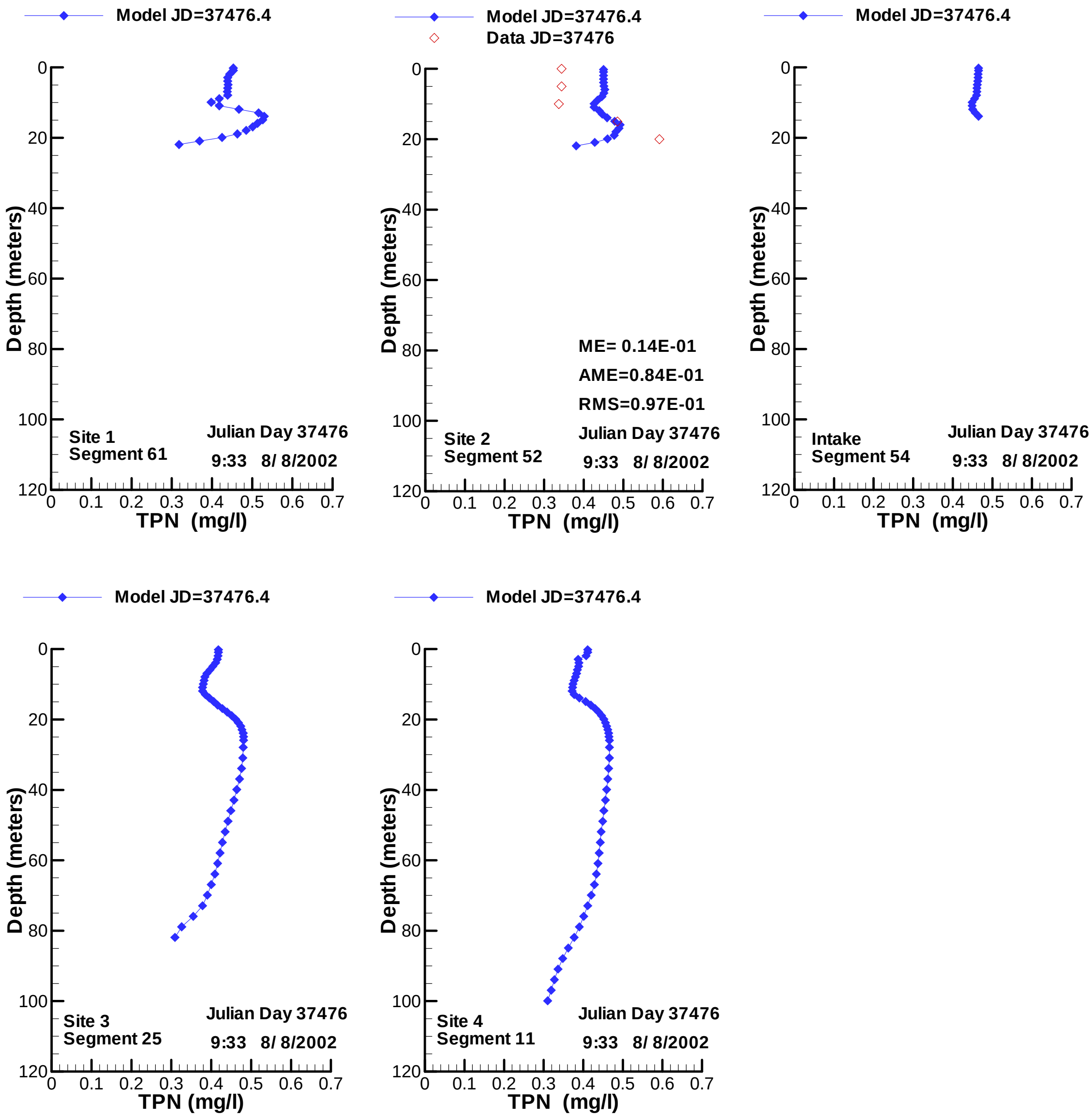

Figure 286. Vertical profiles of TOTAL NITROGEN compared with data for 8/ 8/2002.

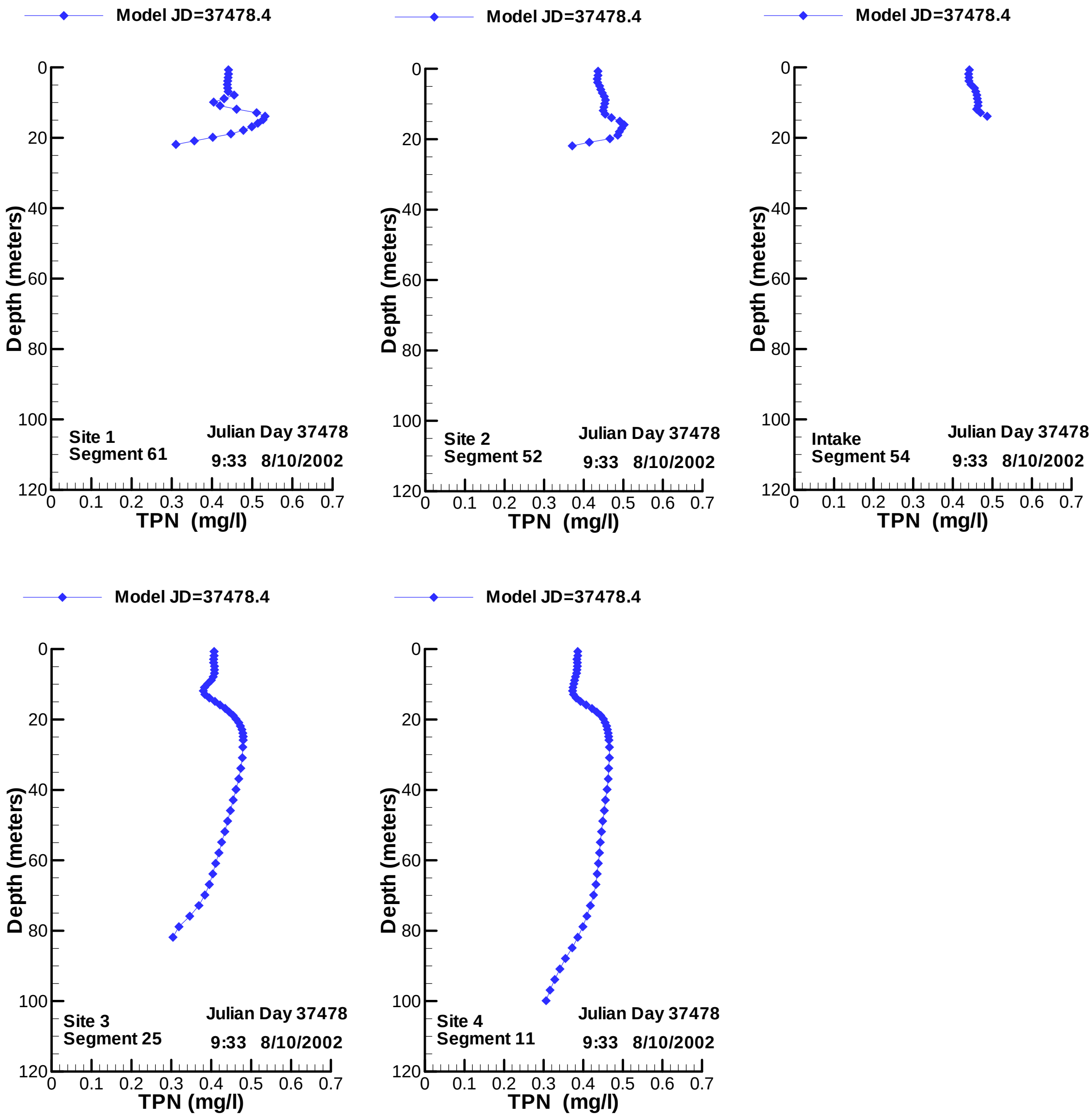

Figure 287. Vertical profiles of TOTAL NITROGEN compared with data for 8/10/2002.

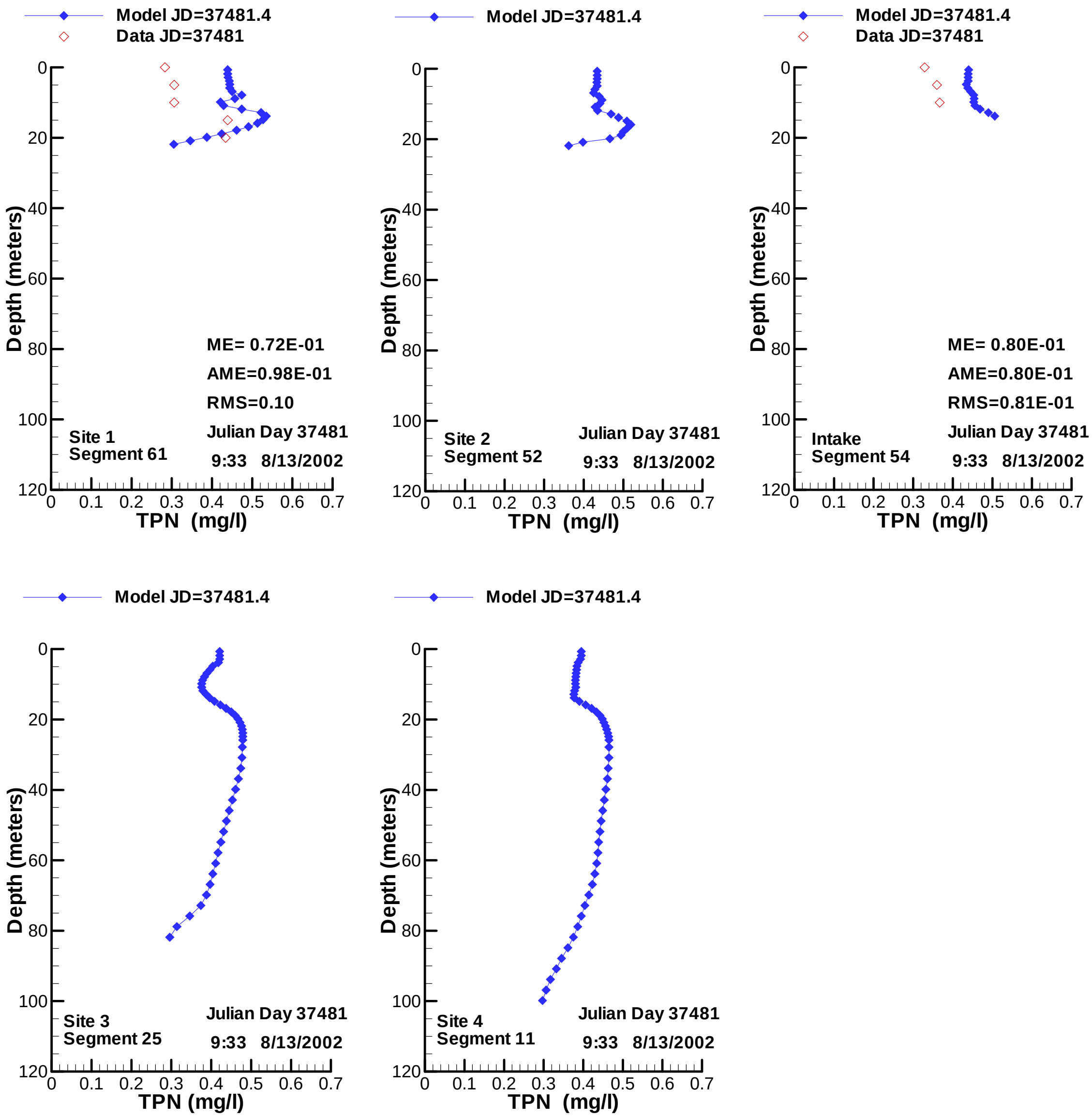

Figure 288. Vertical profiles of TOTAL NITROGEN compared with data for 8/13/2002.

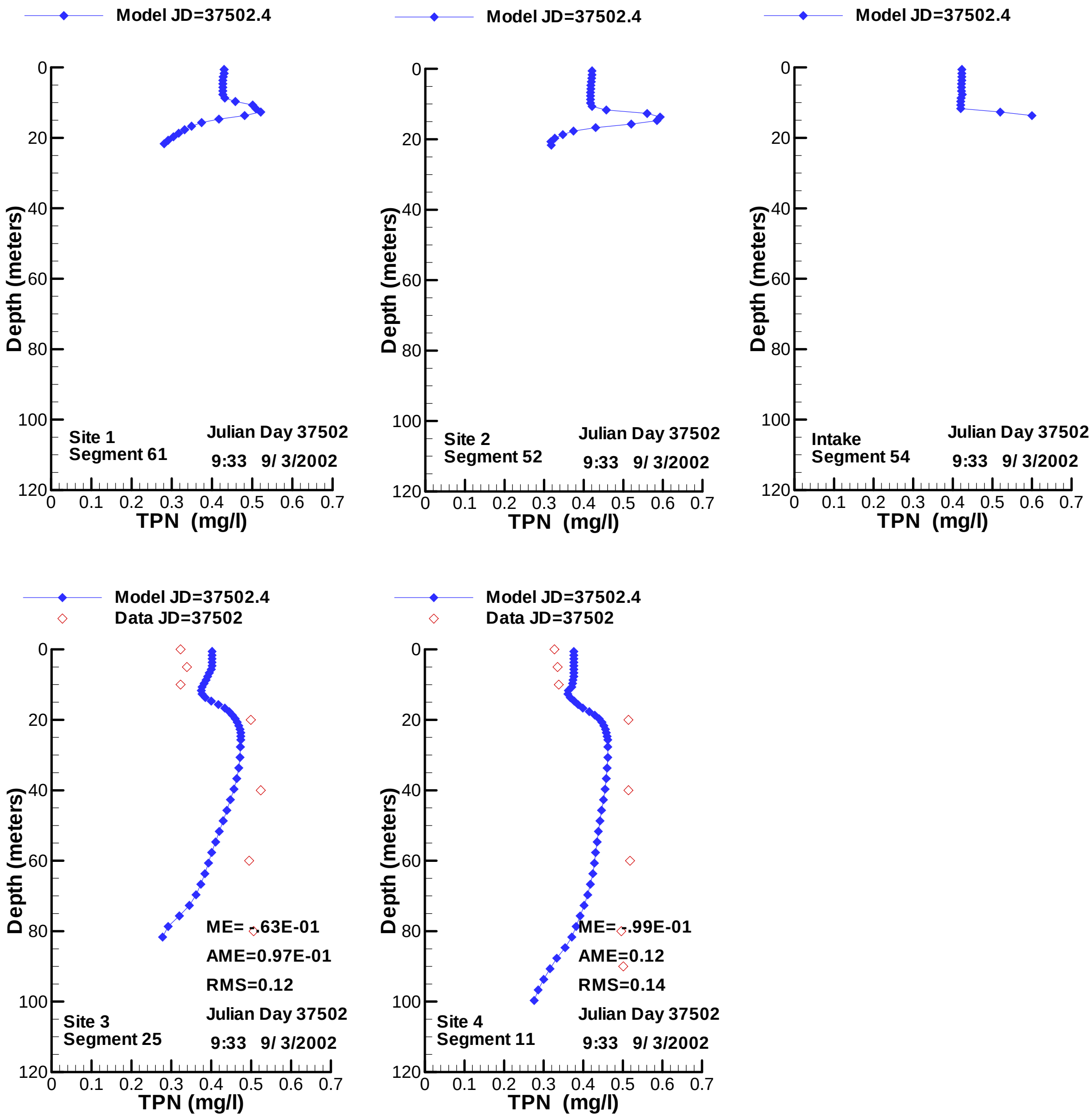

Figure 289. Vertical profiles of TOTAL NITROGEN compared with data for 9/ 3/2002.

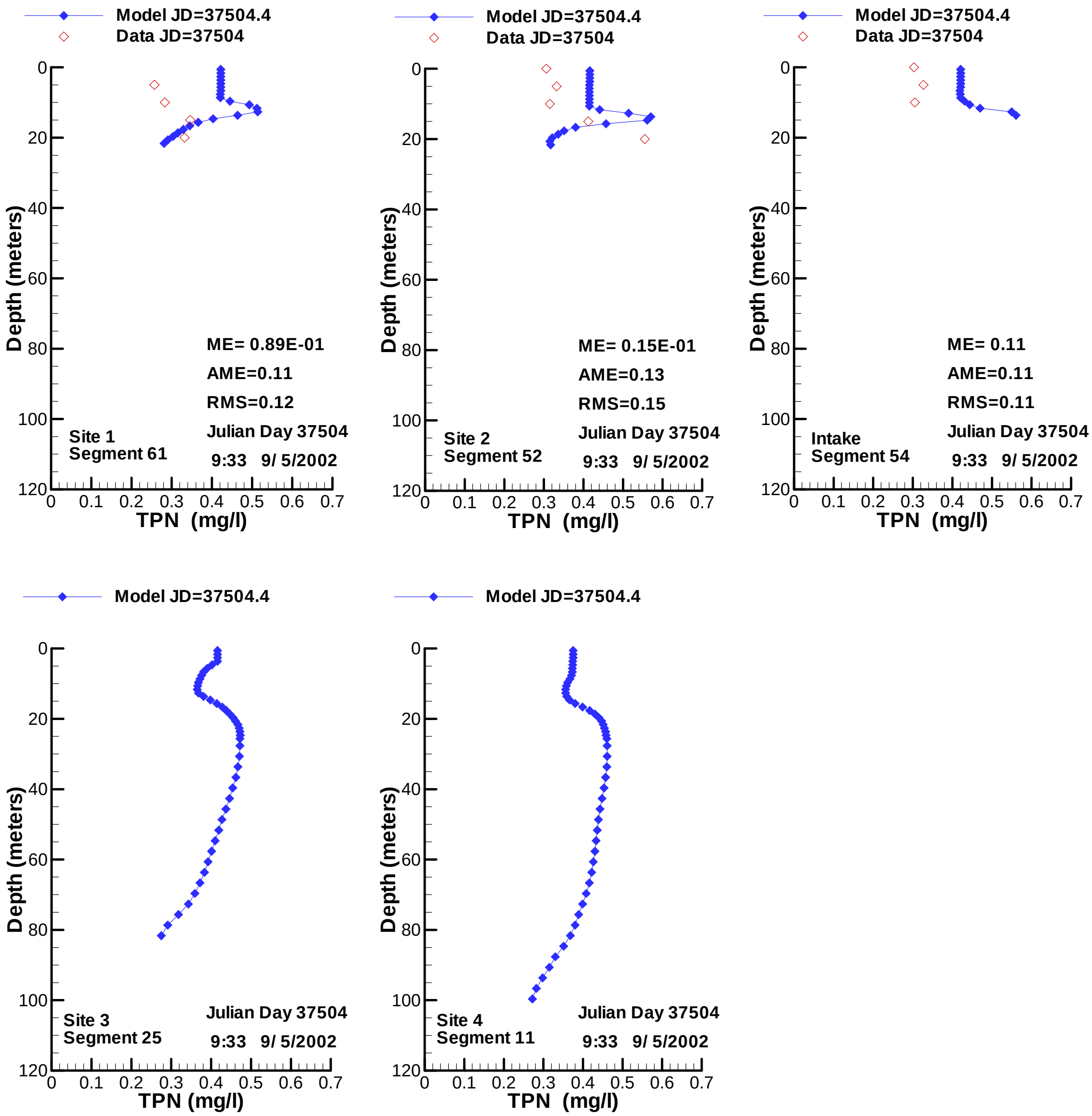

Figure 290. Vertical profiles of TOTAL NITROGEN compared with data for 9/ 5/2002.

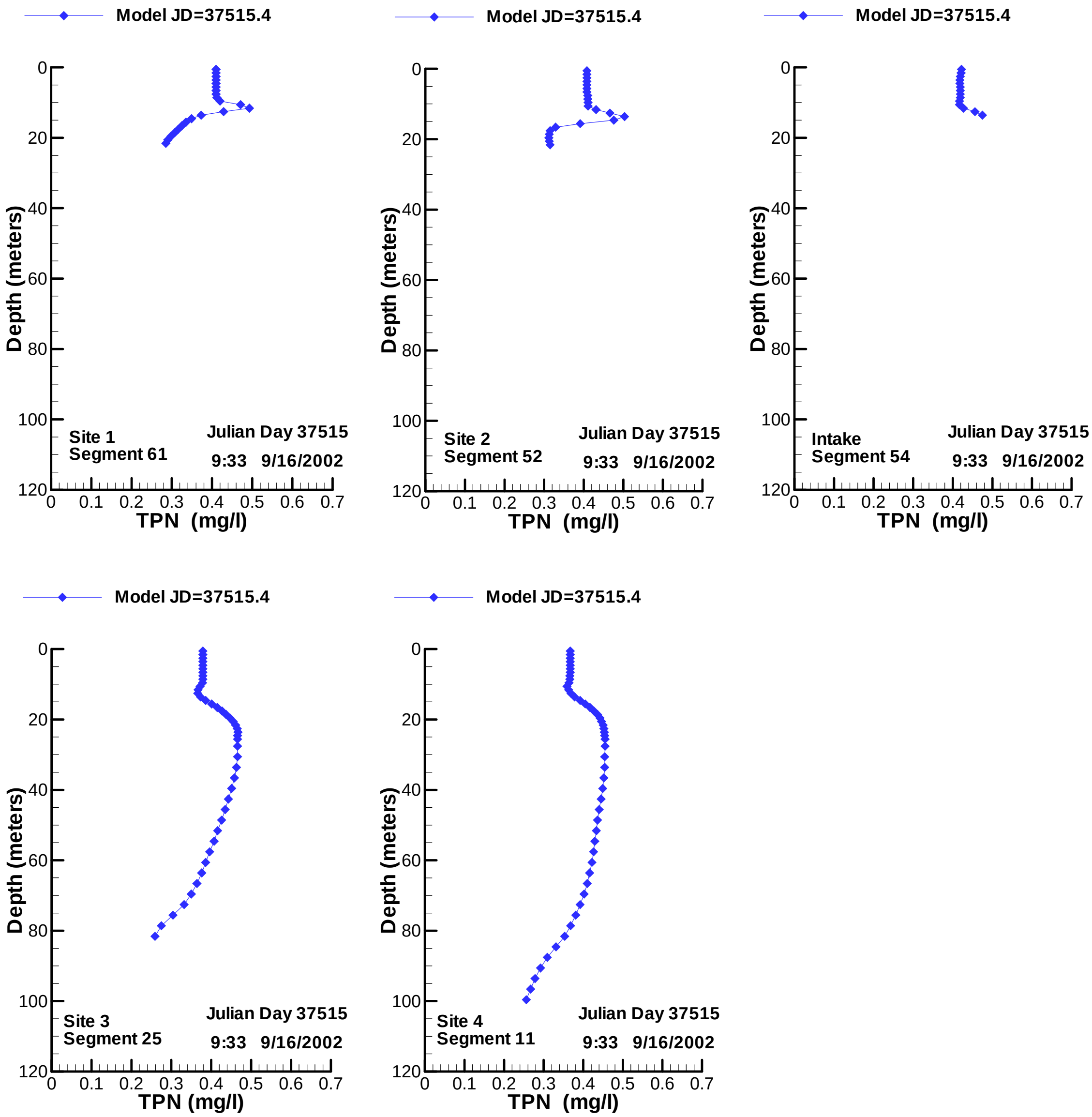

Figure 291. Vertical profiles of TOTAL NITROGEN compared with data for 9/16/2002.

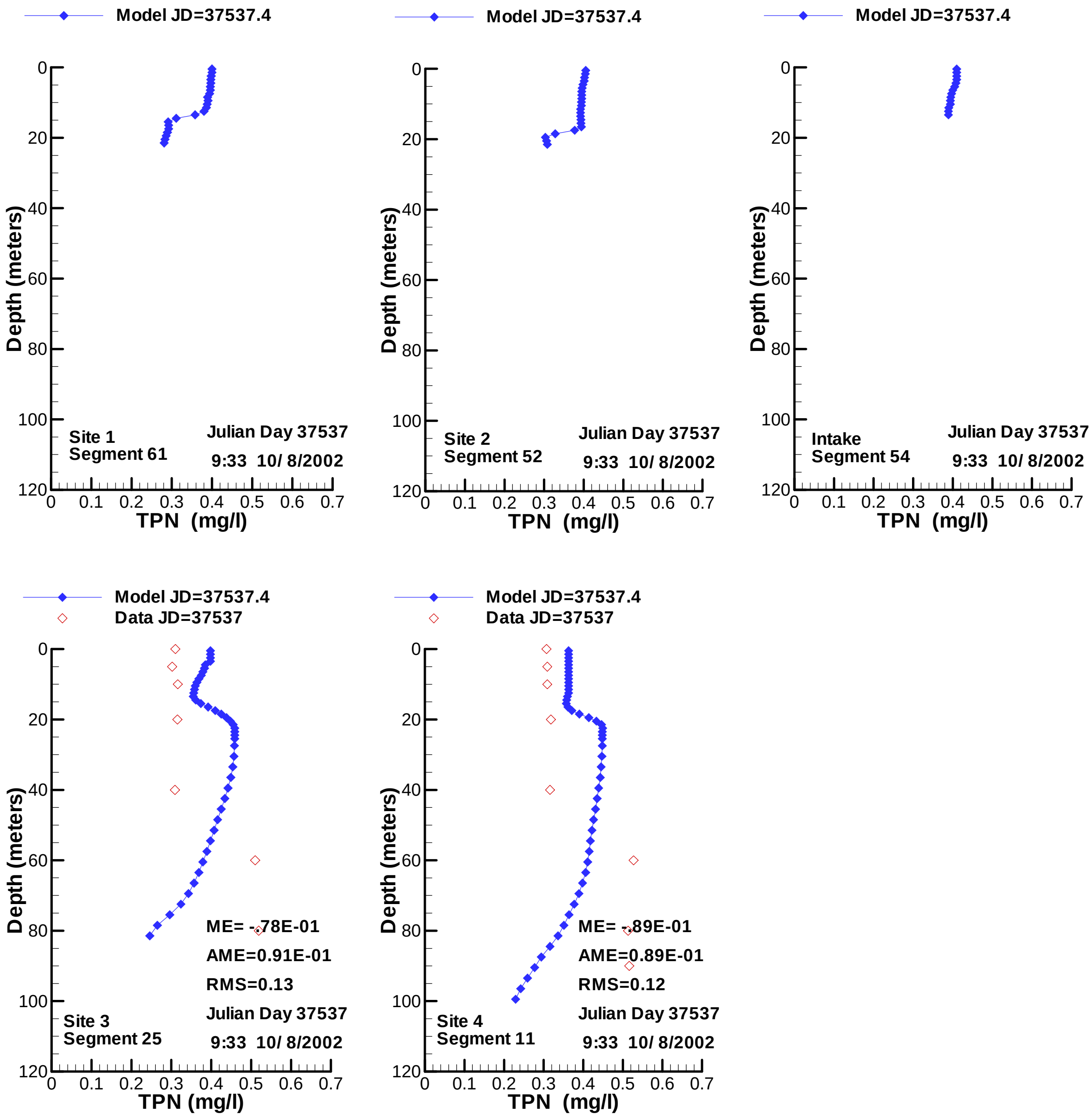

Figure 292. Vertical profiles of TOTAL NITROGEN compared with data for 10/ 8/2002.

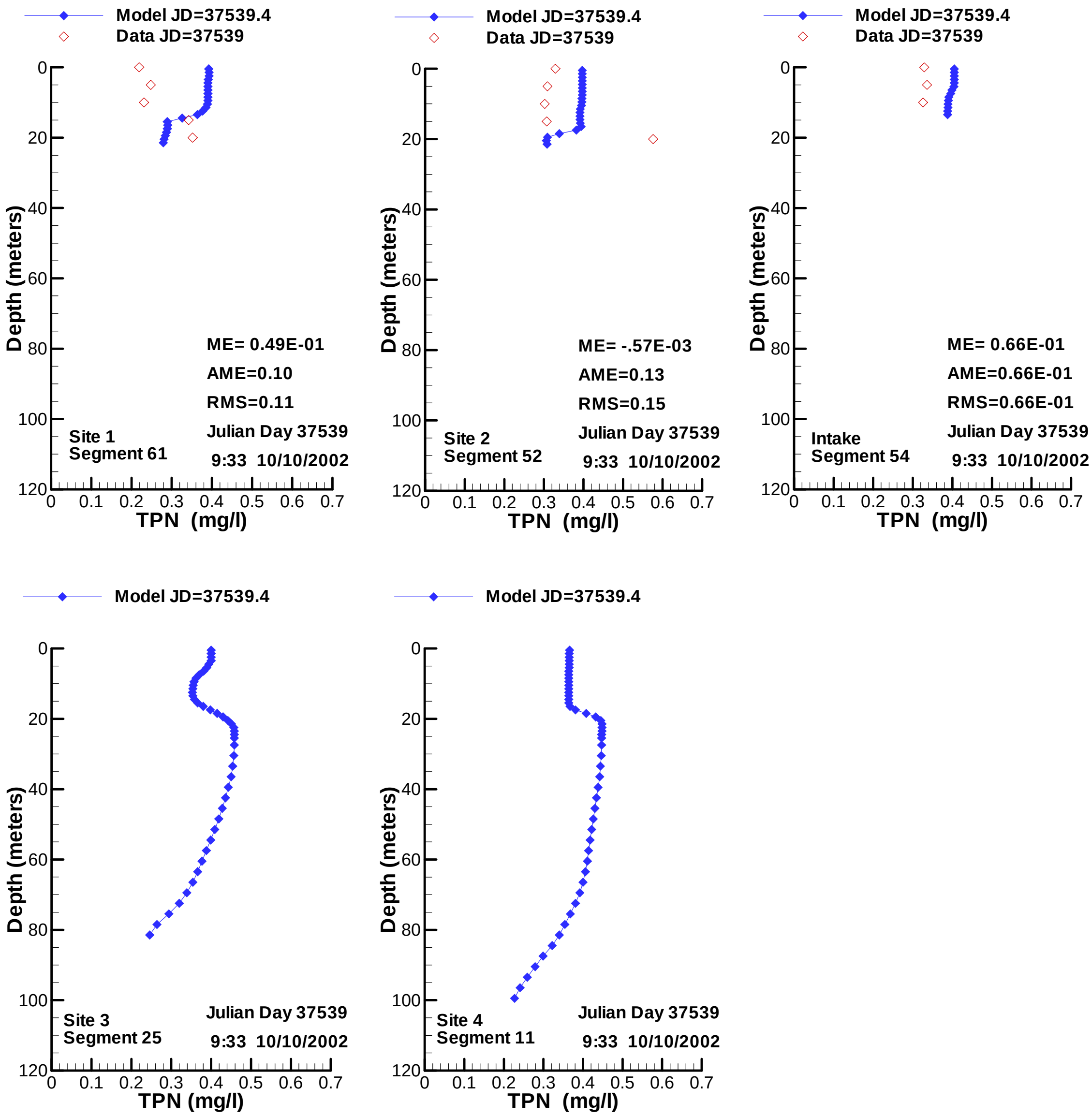

Figure 293. Vertical profiles of TOTAL NITROGEN compared with data for 10/10/2002.

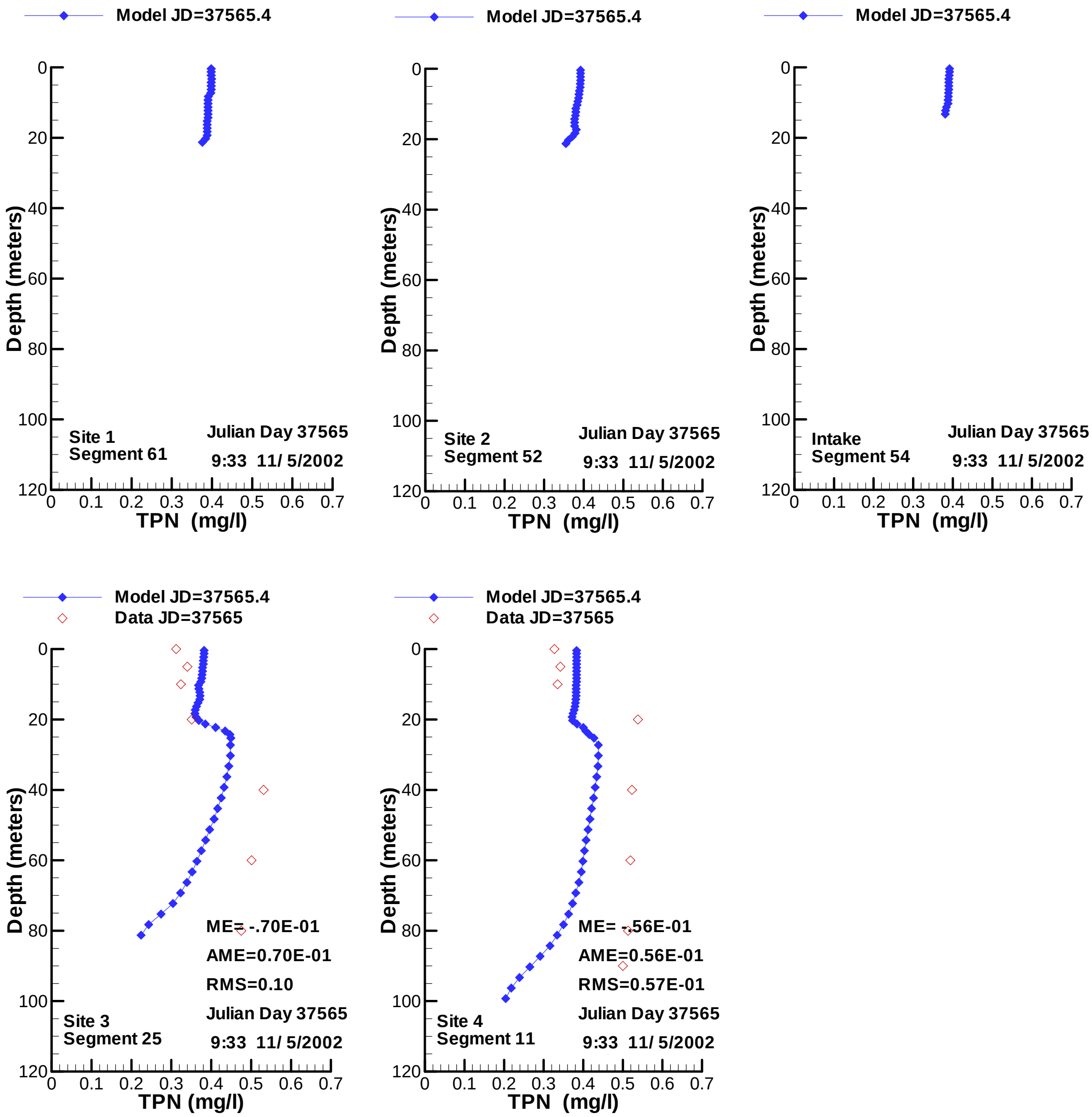

Figure 294. Vertical profiles of TOTAL NITROGEN compared with data for 11/ 5/2002.

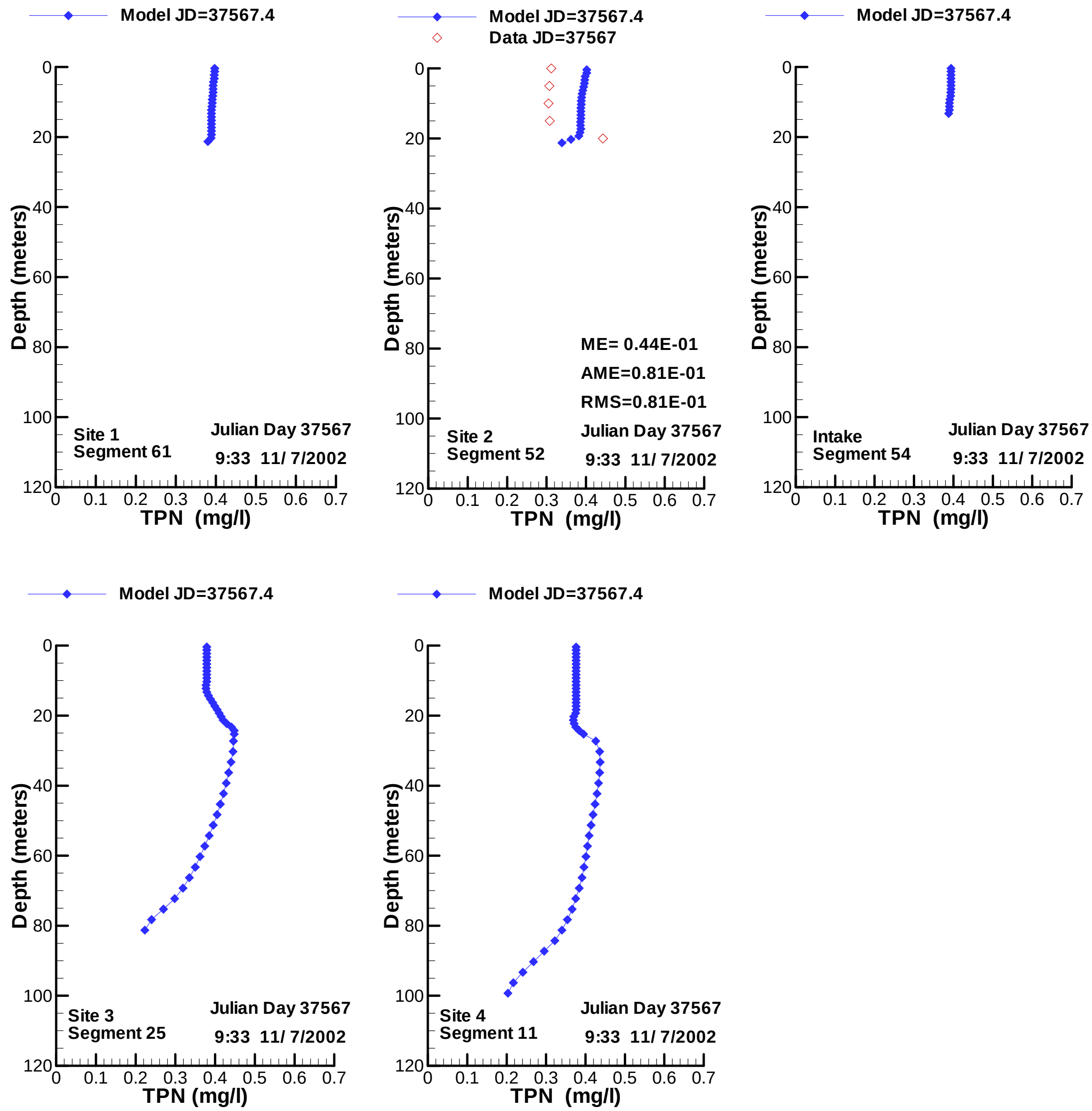

Figure 295. Vertical profiles of TOTAL NITROGEN compared with data for 11/ 7/2002.

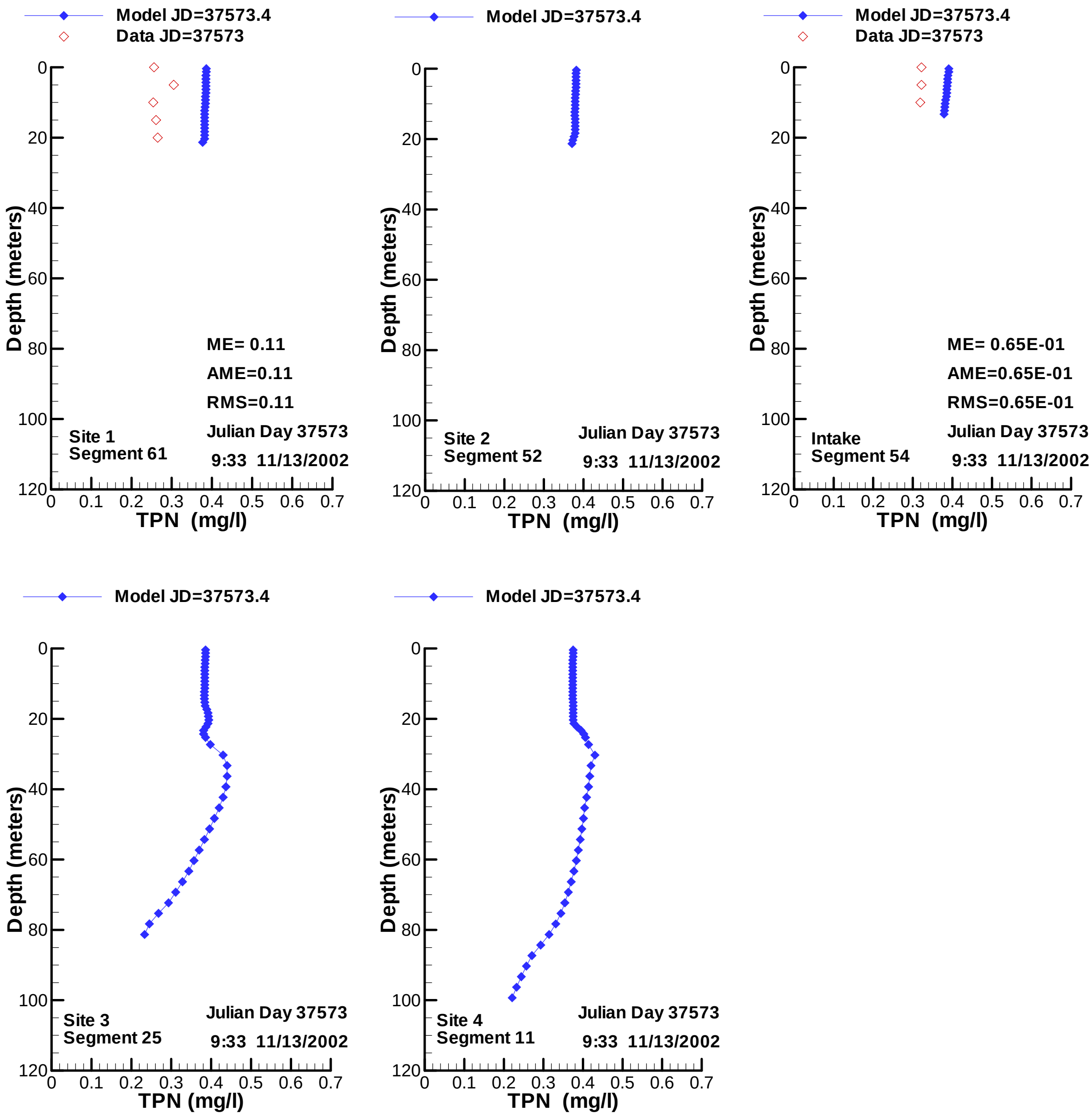

Figure 296. Vertical profiles of TOTAL NITROGEN compared with data for 11/13/2002.

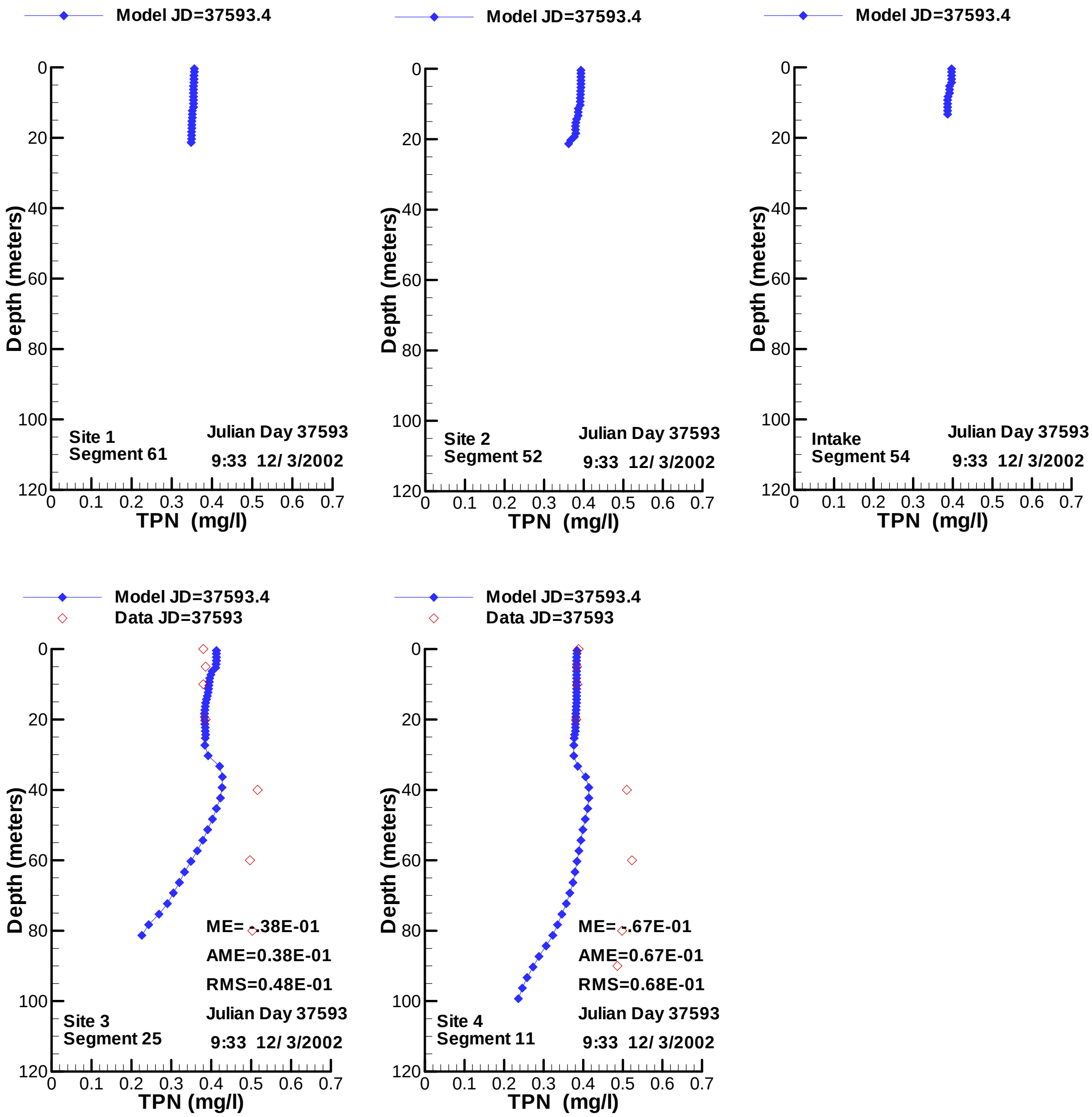

Figure 297. Vertical profiles of TOTAL NITROGEN compared with data for 12/ 3/2002.

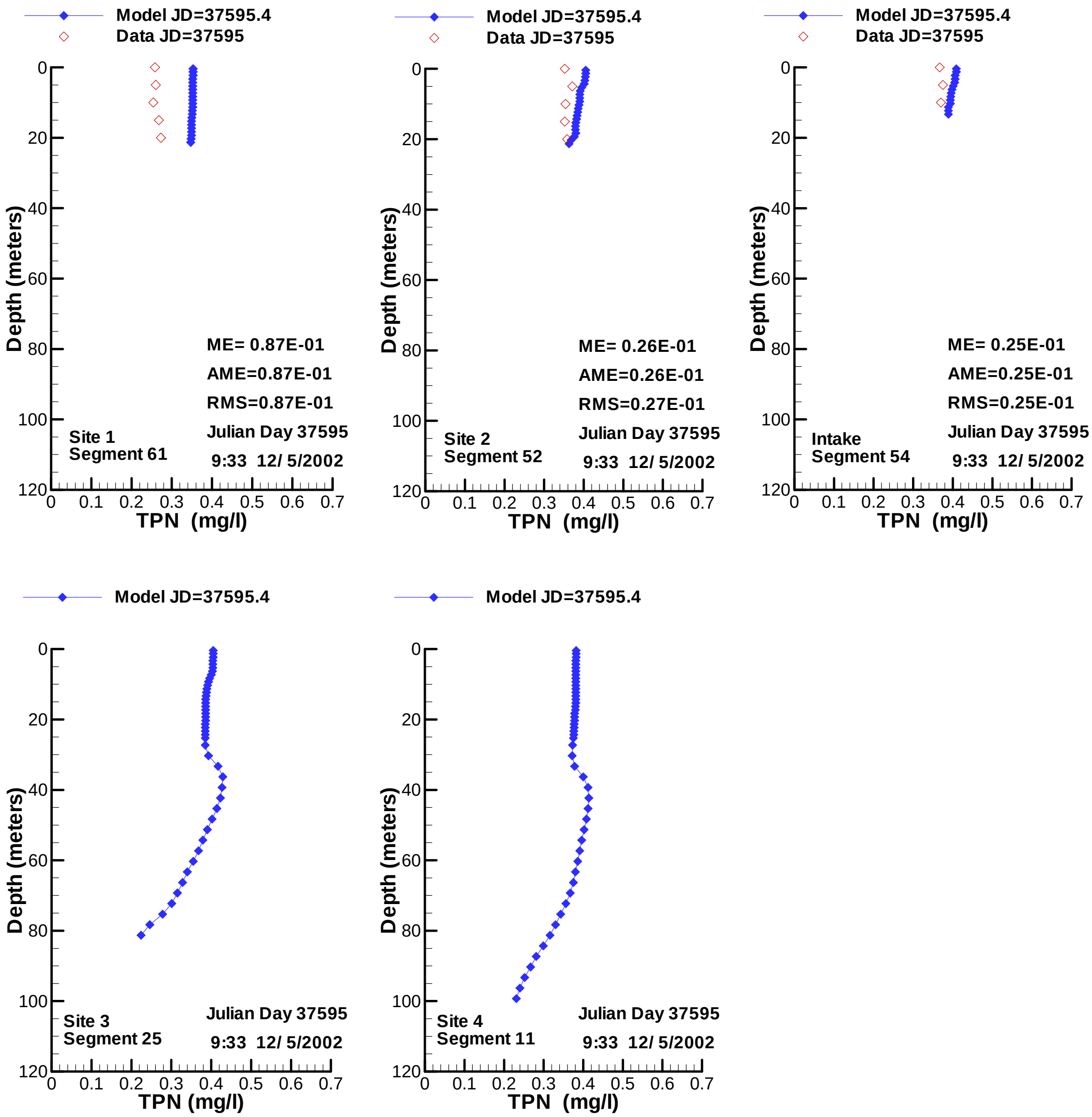

Figure 298. Vertical profiles of TOTAL NITROGEN compared with data for 12/ 5/2002.

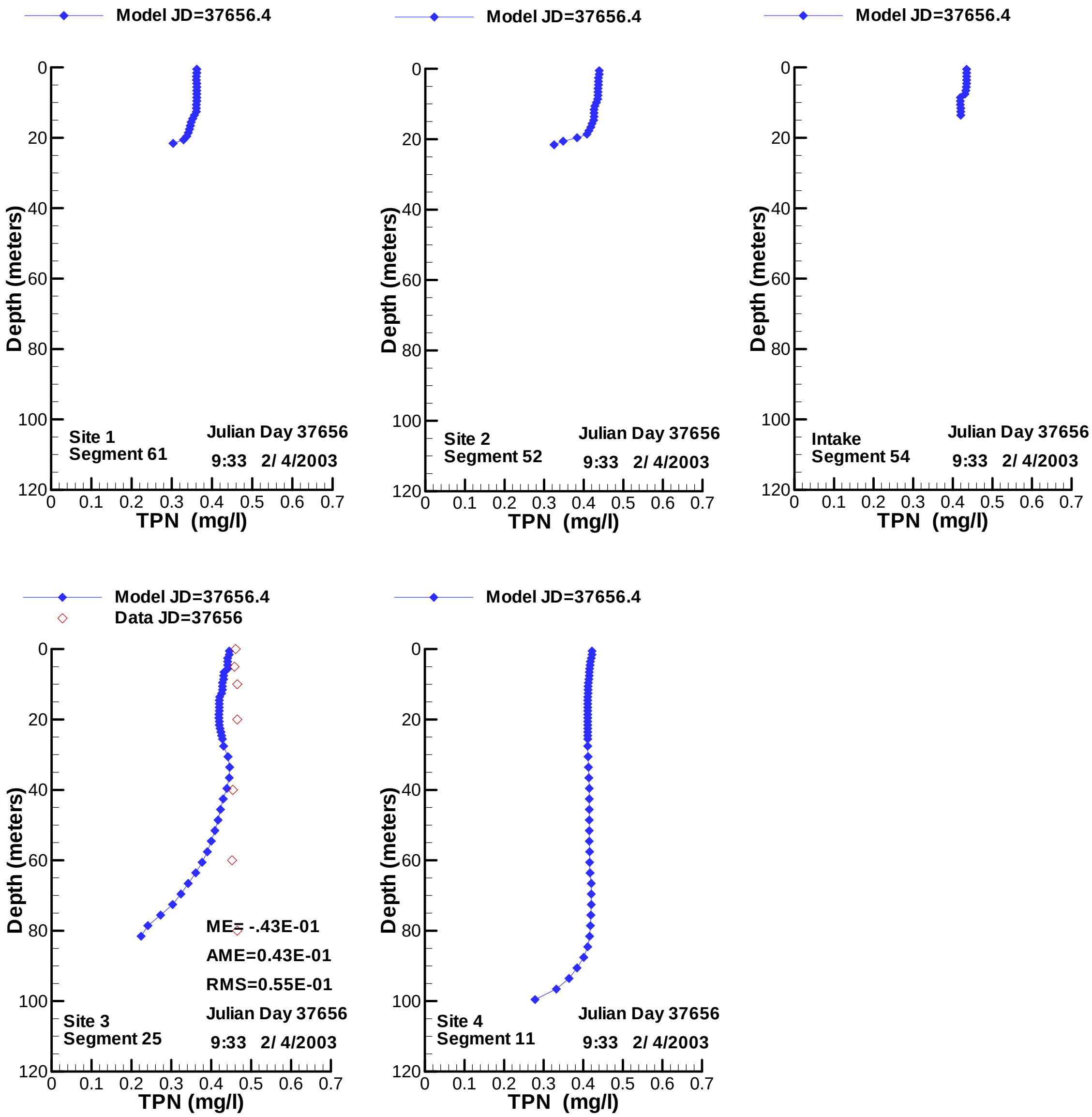

Figure 299. Vertical profiles of TOTAL NITROGEN compared with data for 2/ 4/2003.

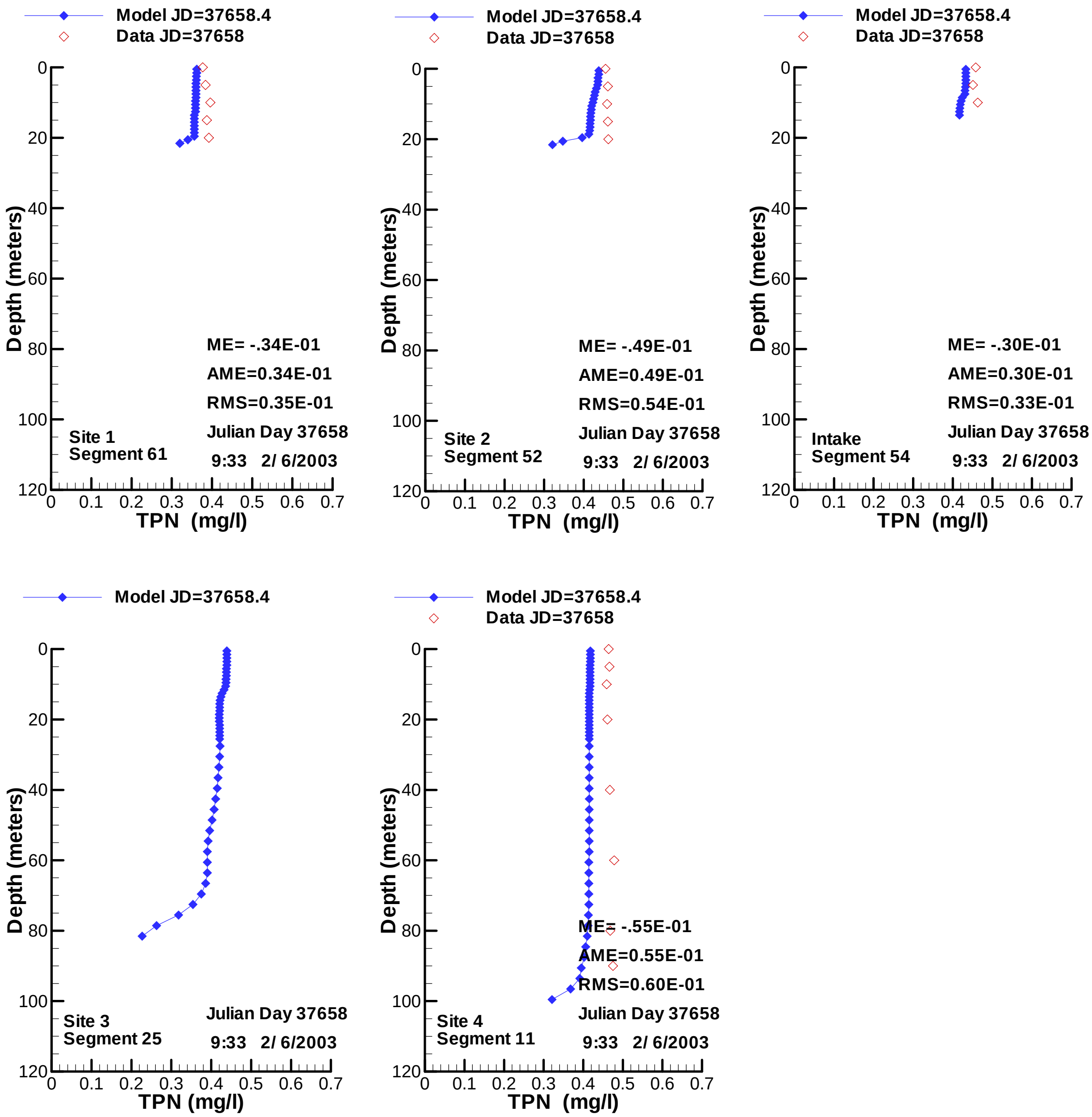

Figure 300. Vertical profiles of TOTAL NITROGEN compared with data for 2/ 6/2003.

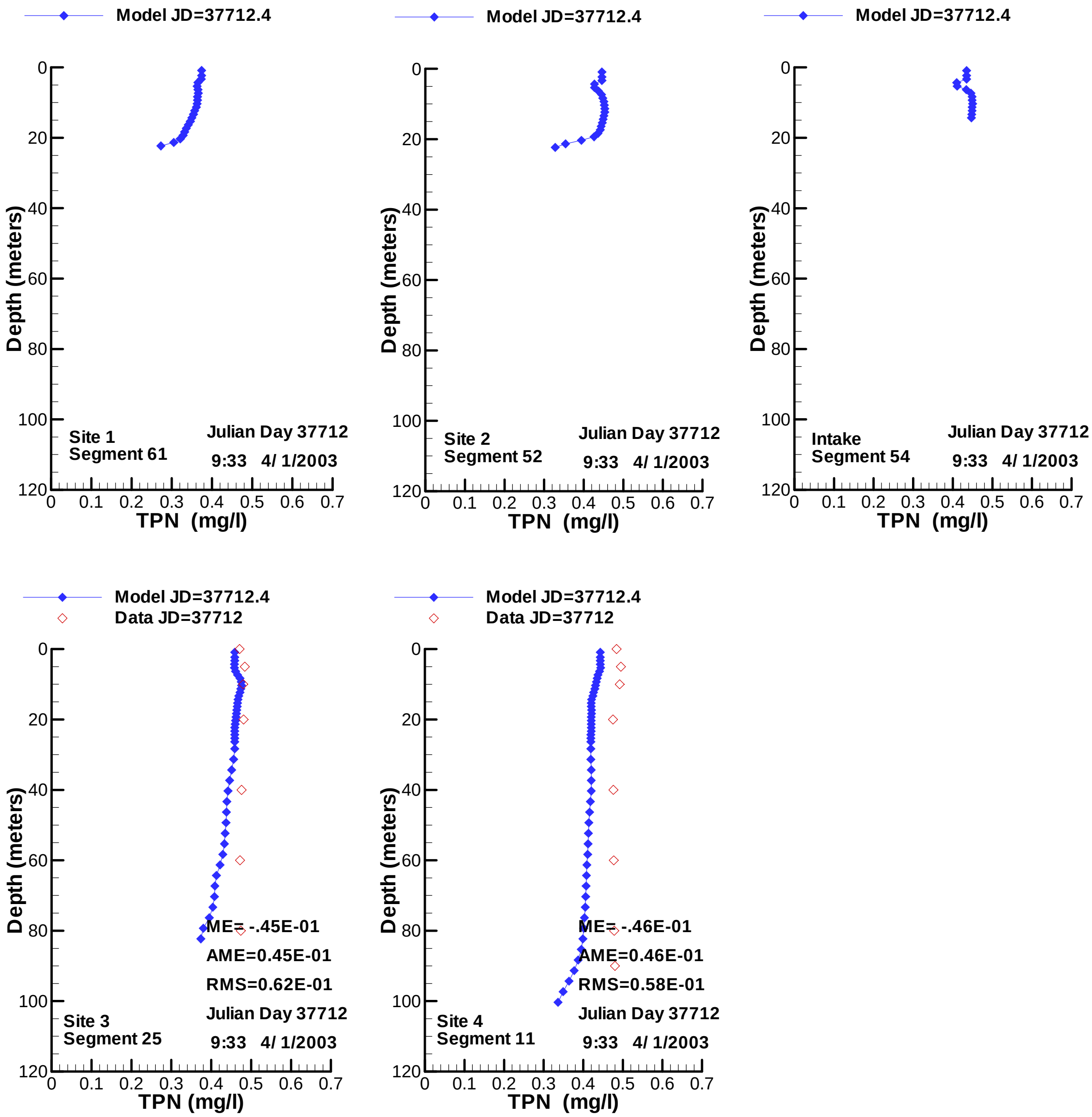

Figure 301. Vertical profiles of TOTAL NITROGEN compared with data for 4/ 1/2003.

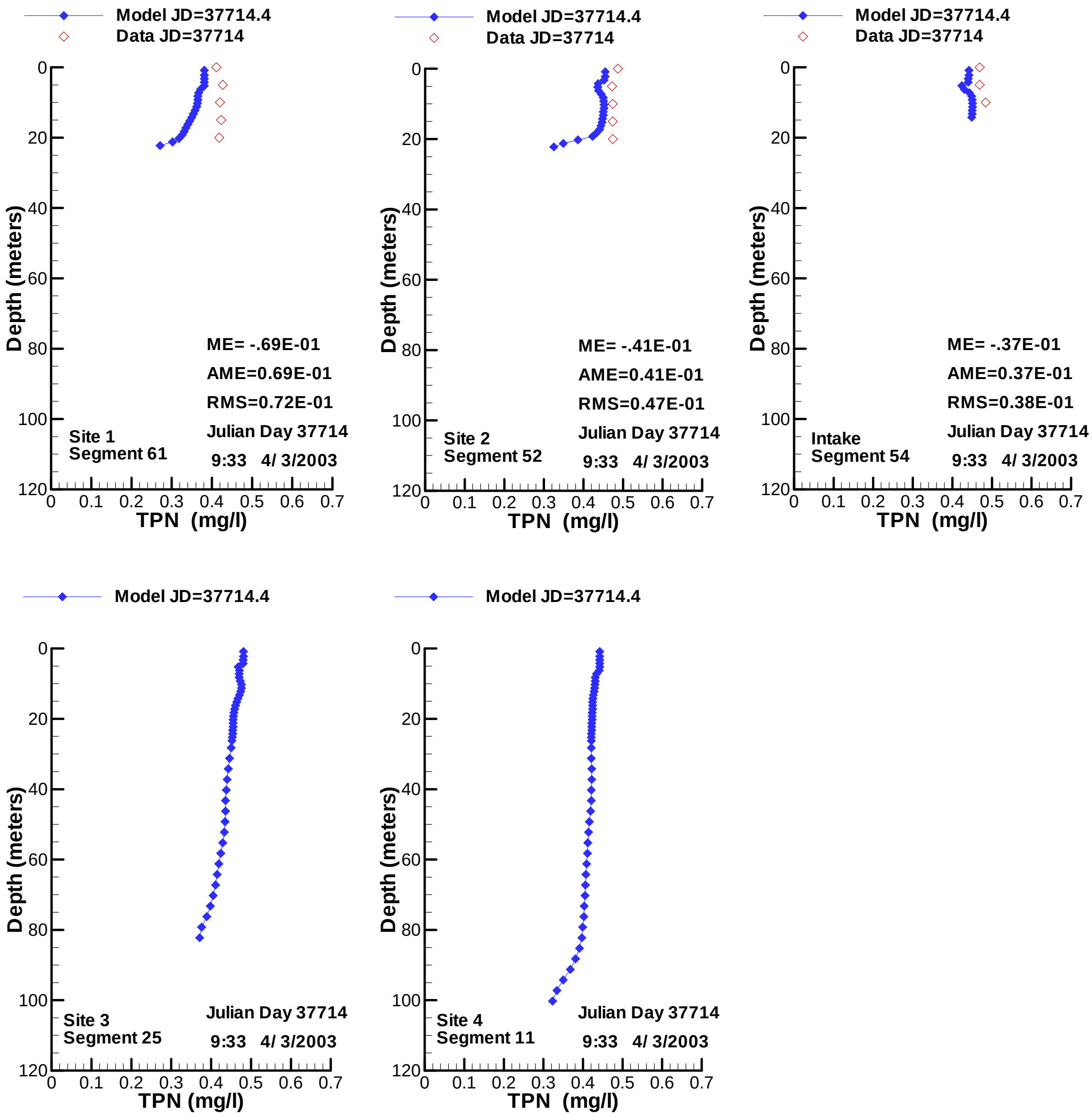

Figure 302. Vertical profiles of TOTAL NITROGEN compared with data for 4/ 3/2003.

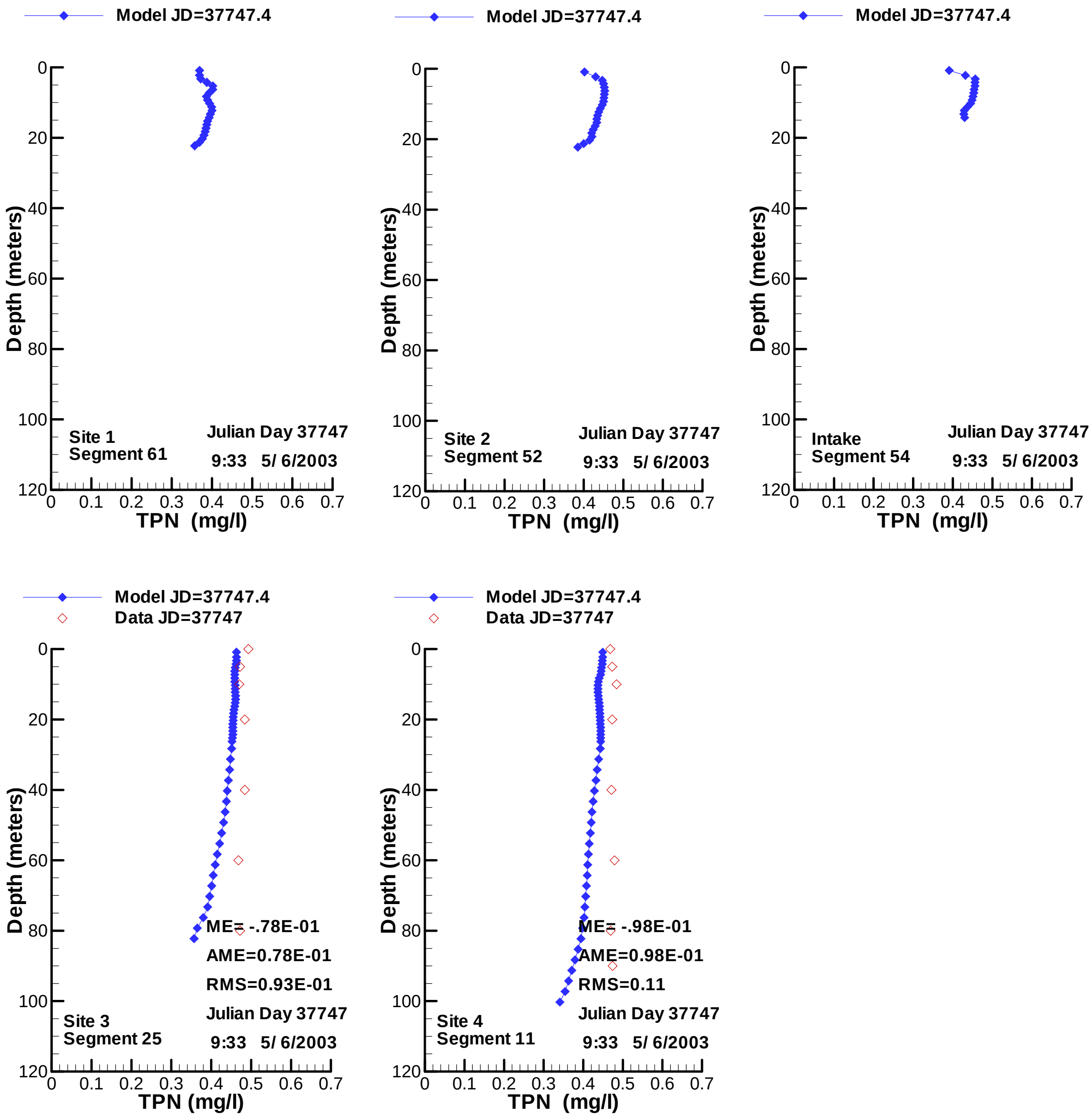

Figure 303. Vertical profiles of TOTAL NITROGEN compared with data for 5/ 6/2003.

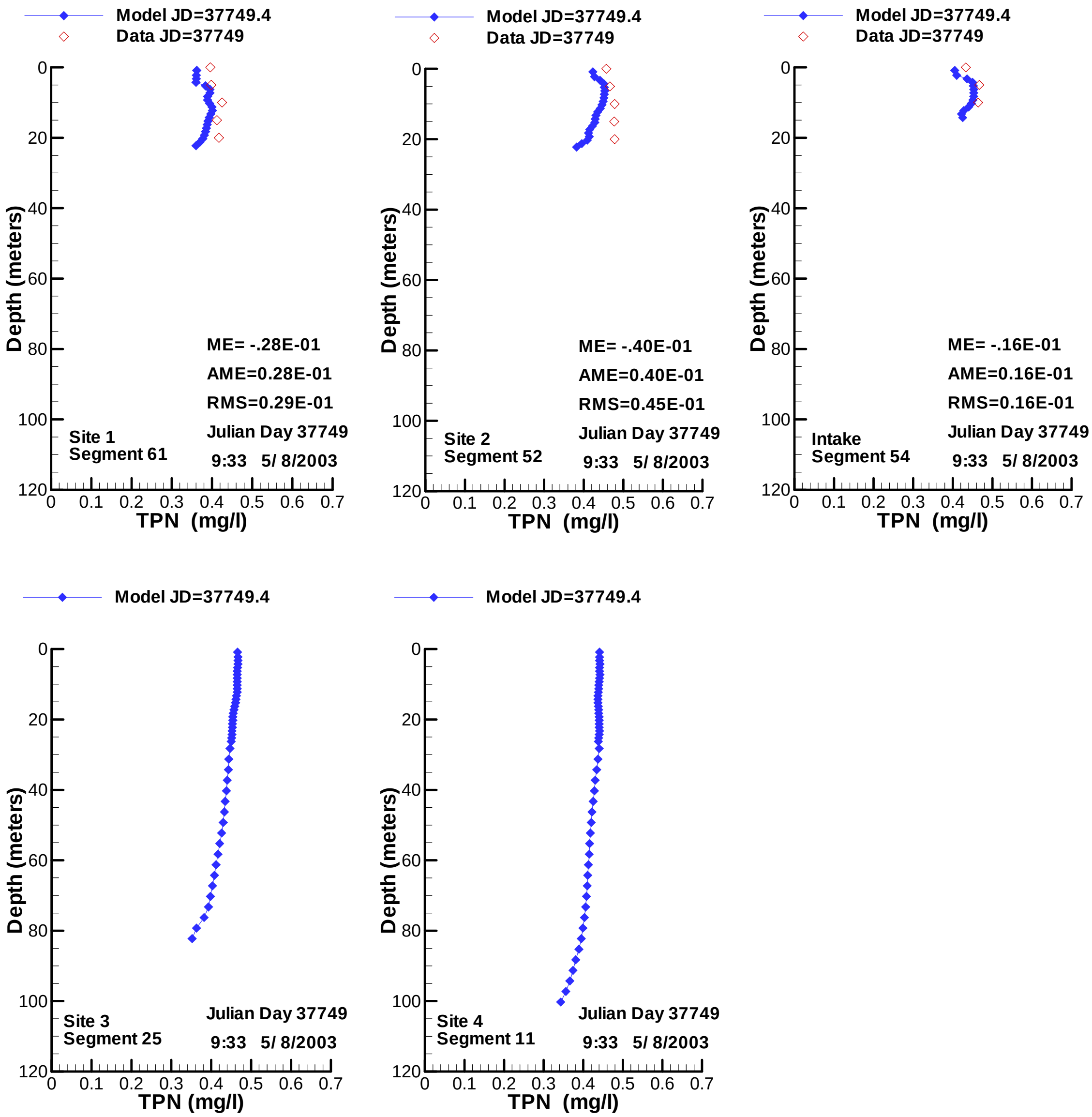

Figure 304. Vertical profiles of TOTAL NITROGEN compared with data for 5/ 8/2003.

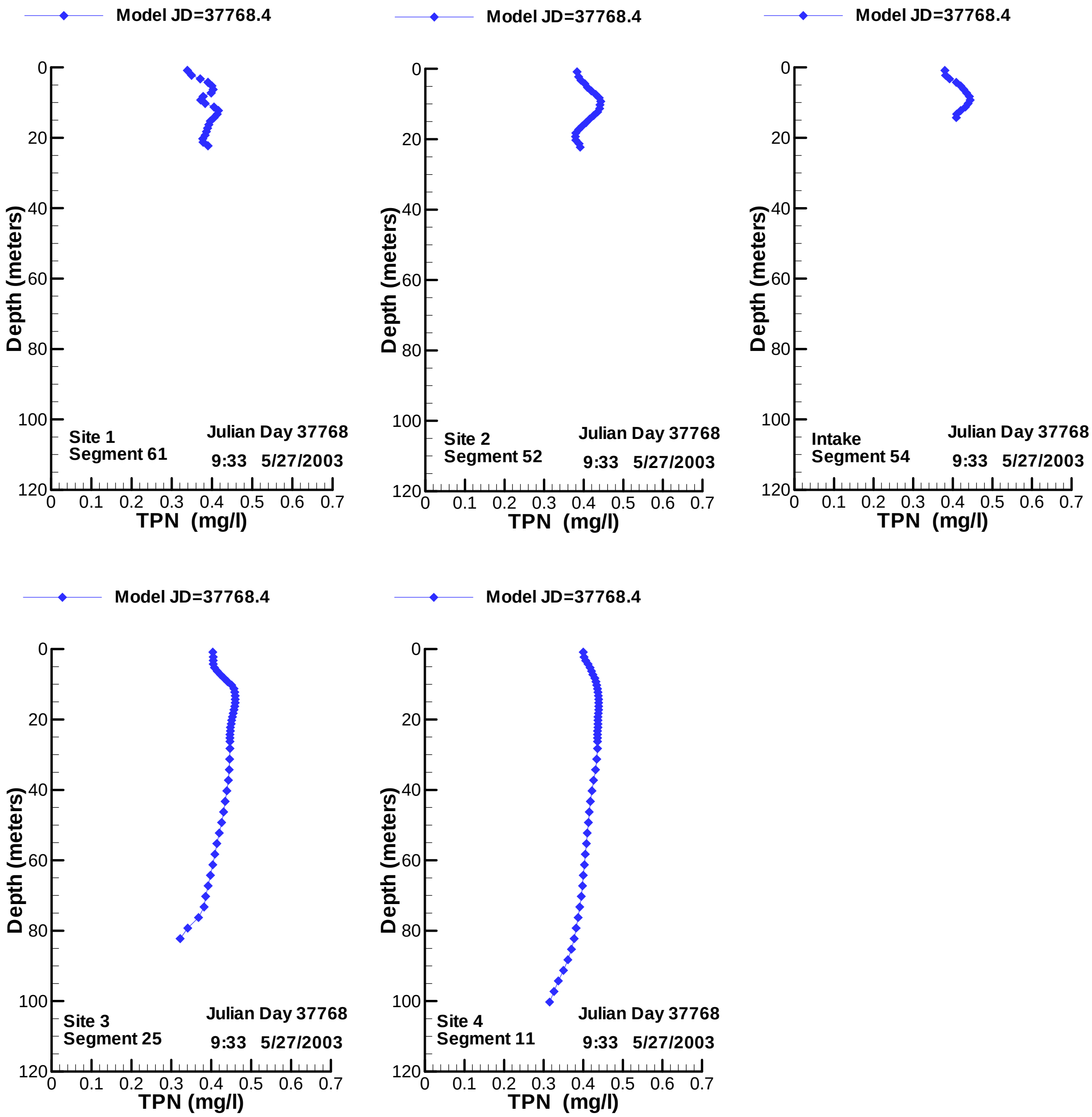

Figure 305. Vertical profiles of TOTAL NITROGEN compared with data for 5/27/2003.

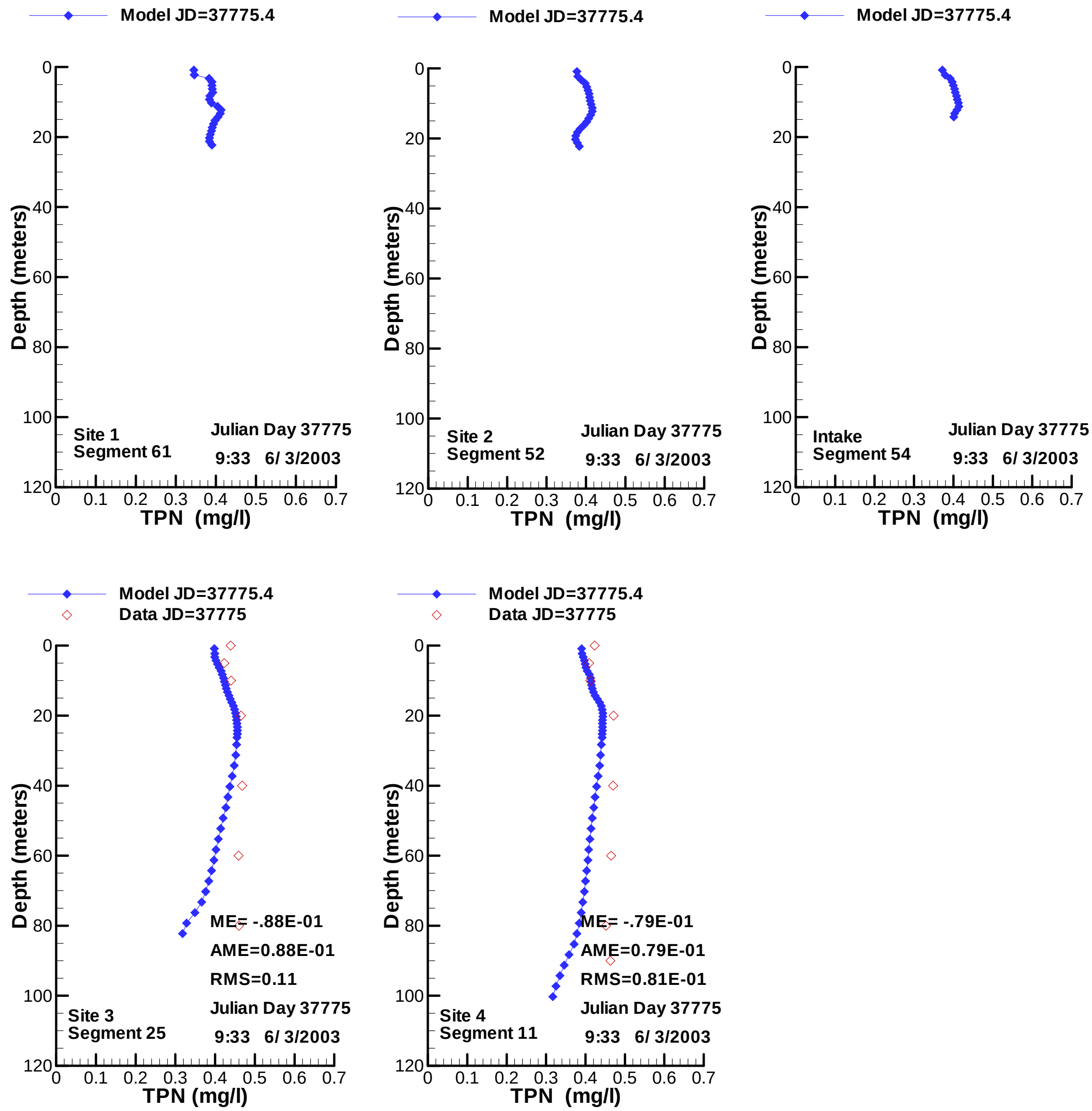

Figure 306. Vertical profiles of TOTAL NITROGEN compared with data for 6/ 3/2003.

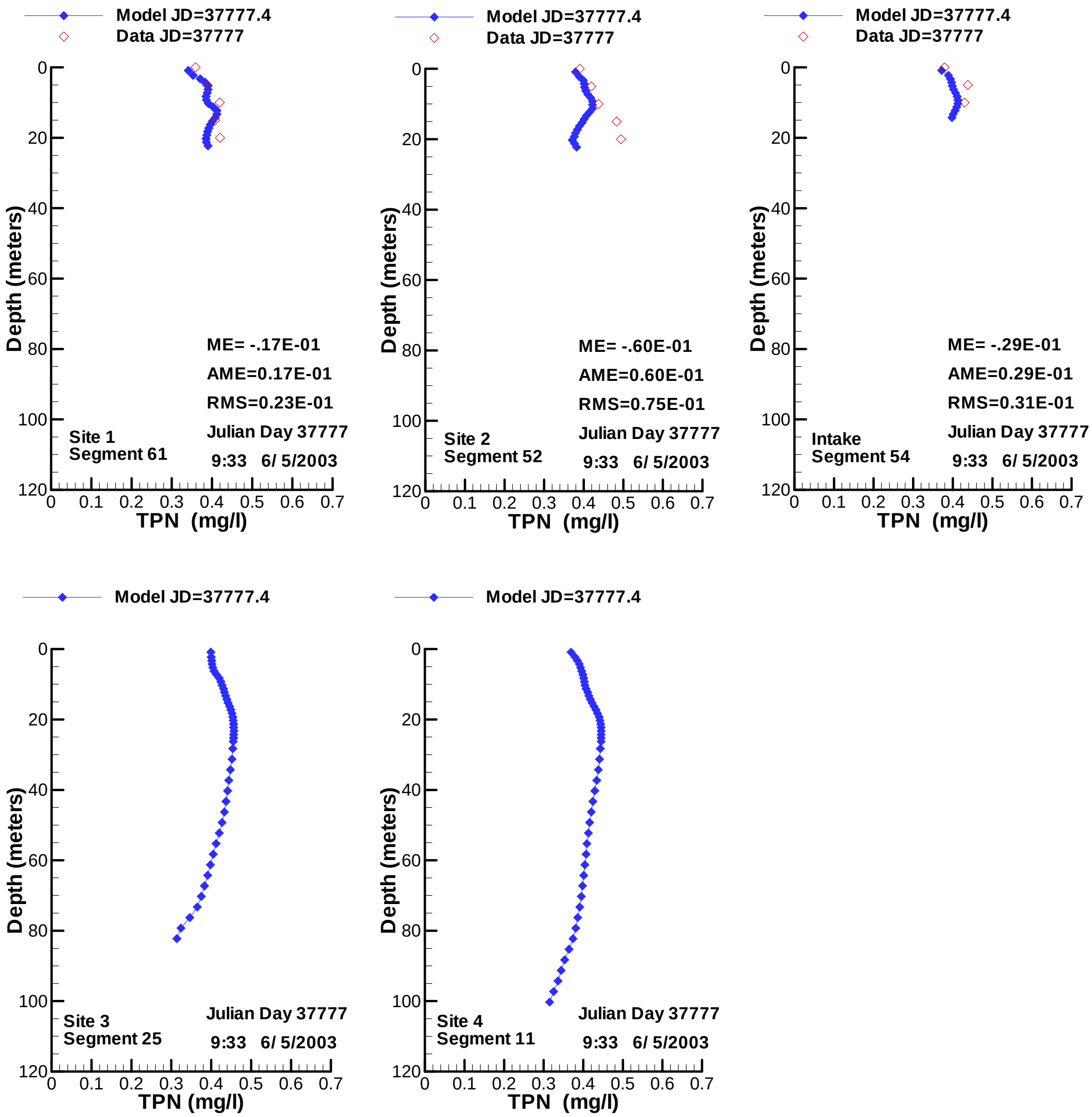

Figure 307. Vertical profiles of TOTAL NITROGEN compared with data for 6/ 5/2003.

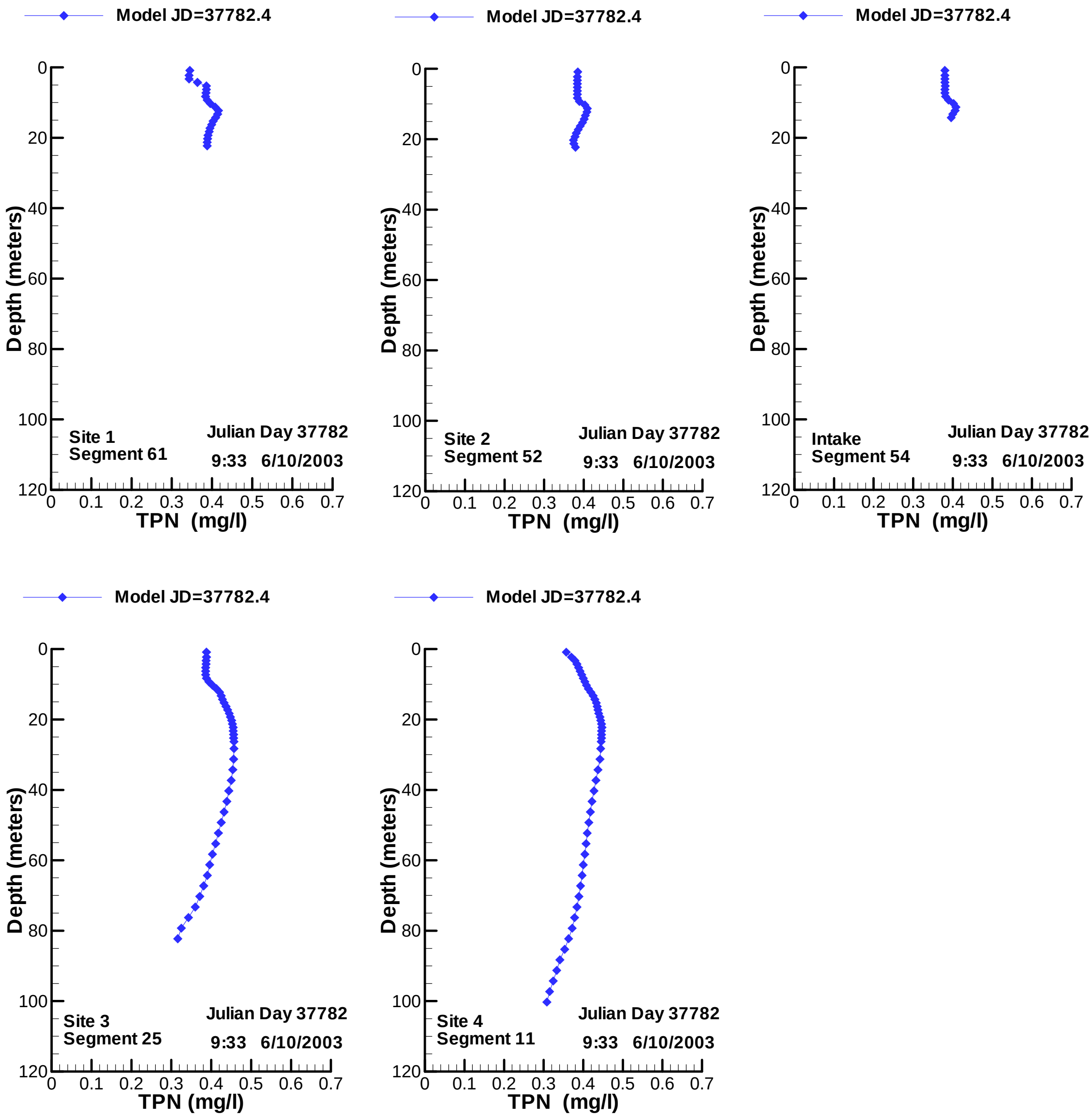

Figure 308. Vertical profiles of TOTAL NITROGEN compared with data for 6/10/2003.

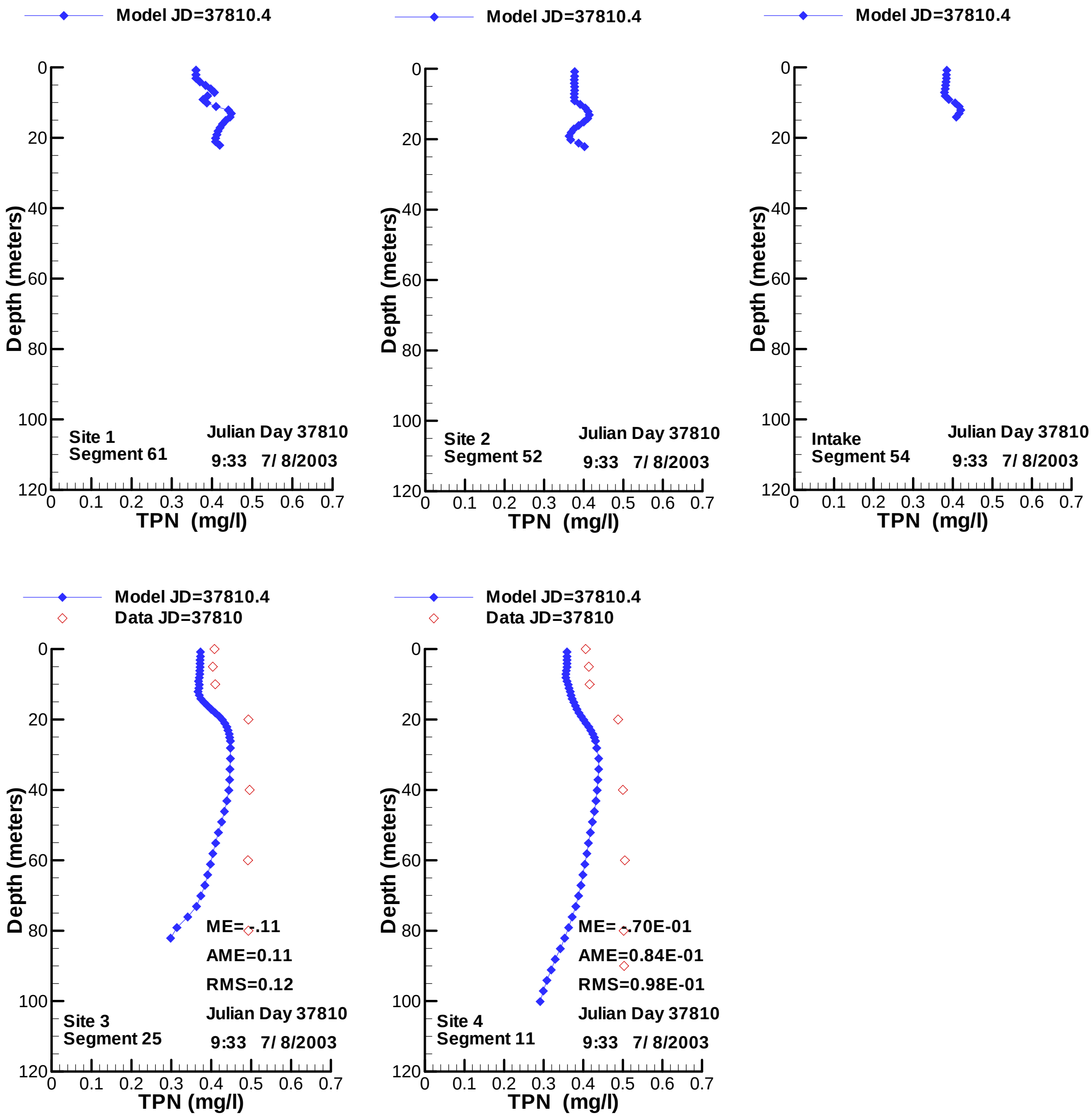

Figure 309. Vertical profiles of TOTAL NITROGEN compared with data for 7/ 8/2003.

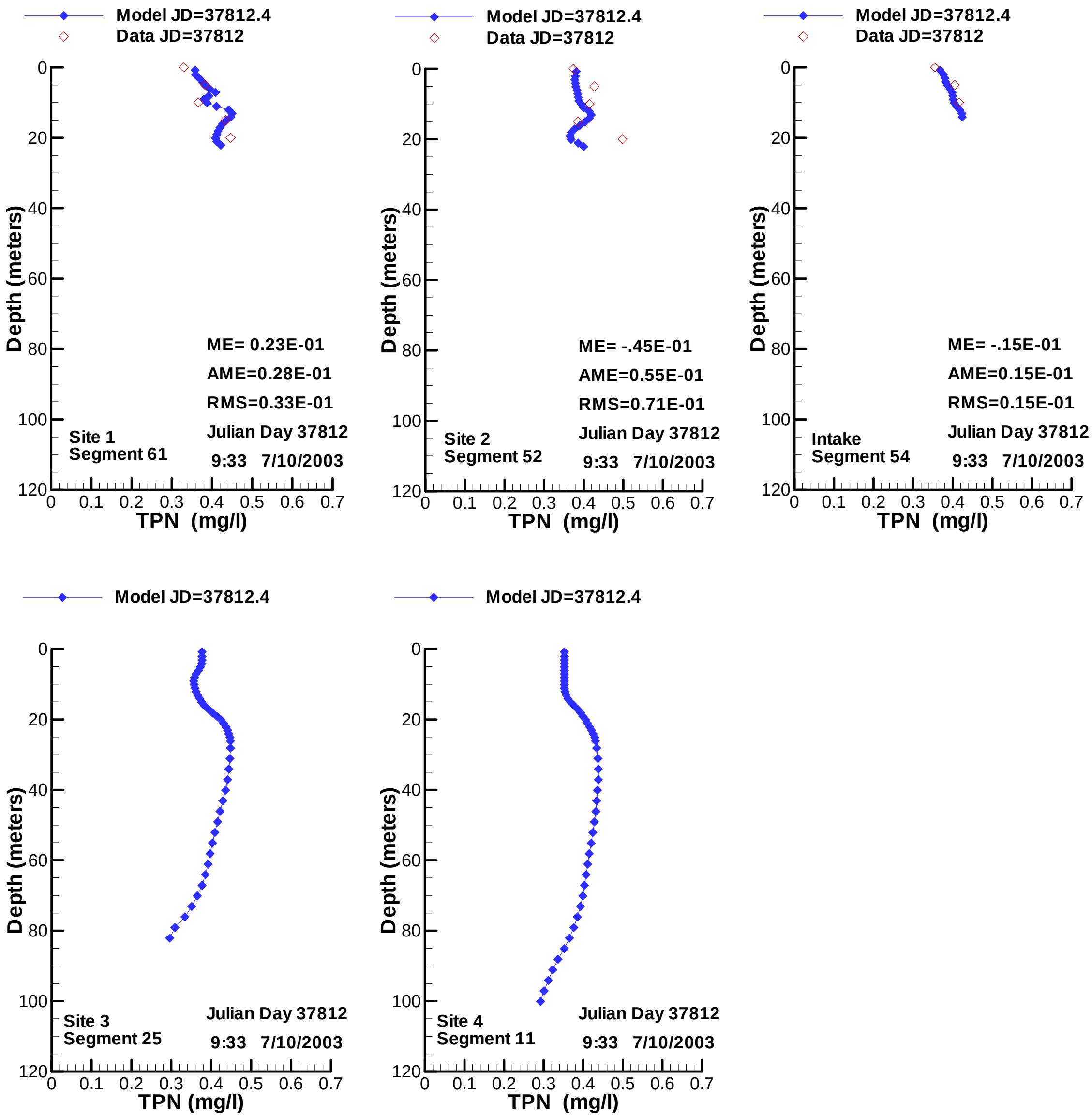

Figure 310. Vertical profiles of TOTAL NITROGEN compared with data for 7/10/2003.

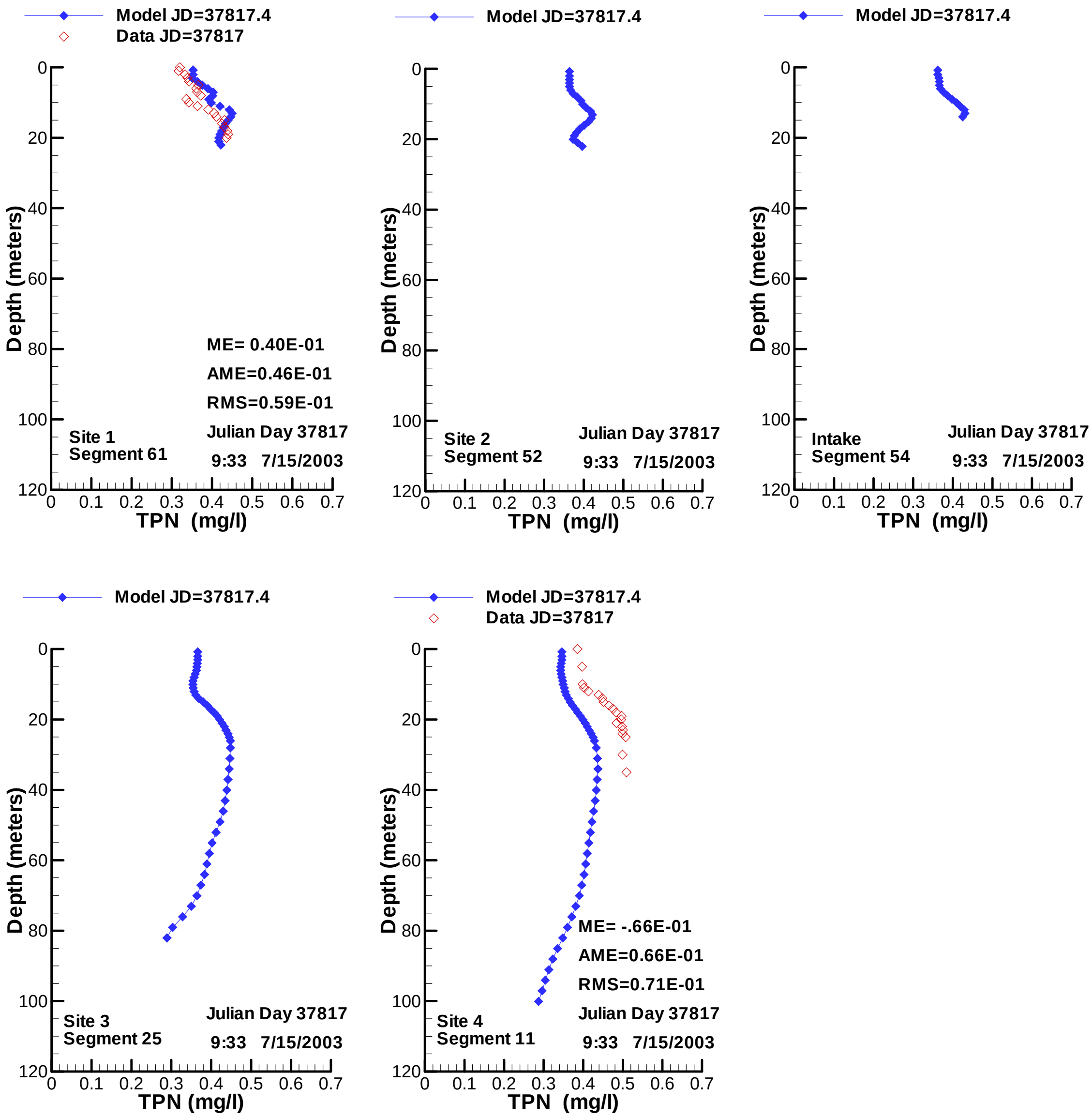

Figure 311. Vertical profiles of TOTAL NITROGEN compared with data for 7/15/2003.

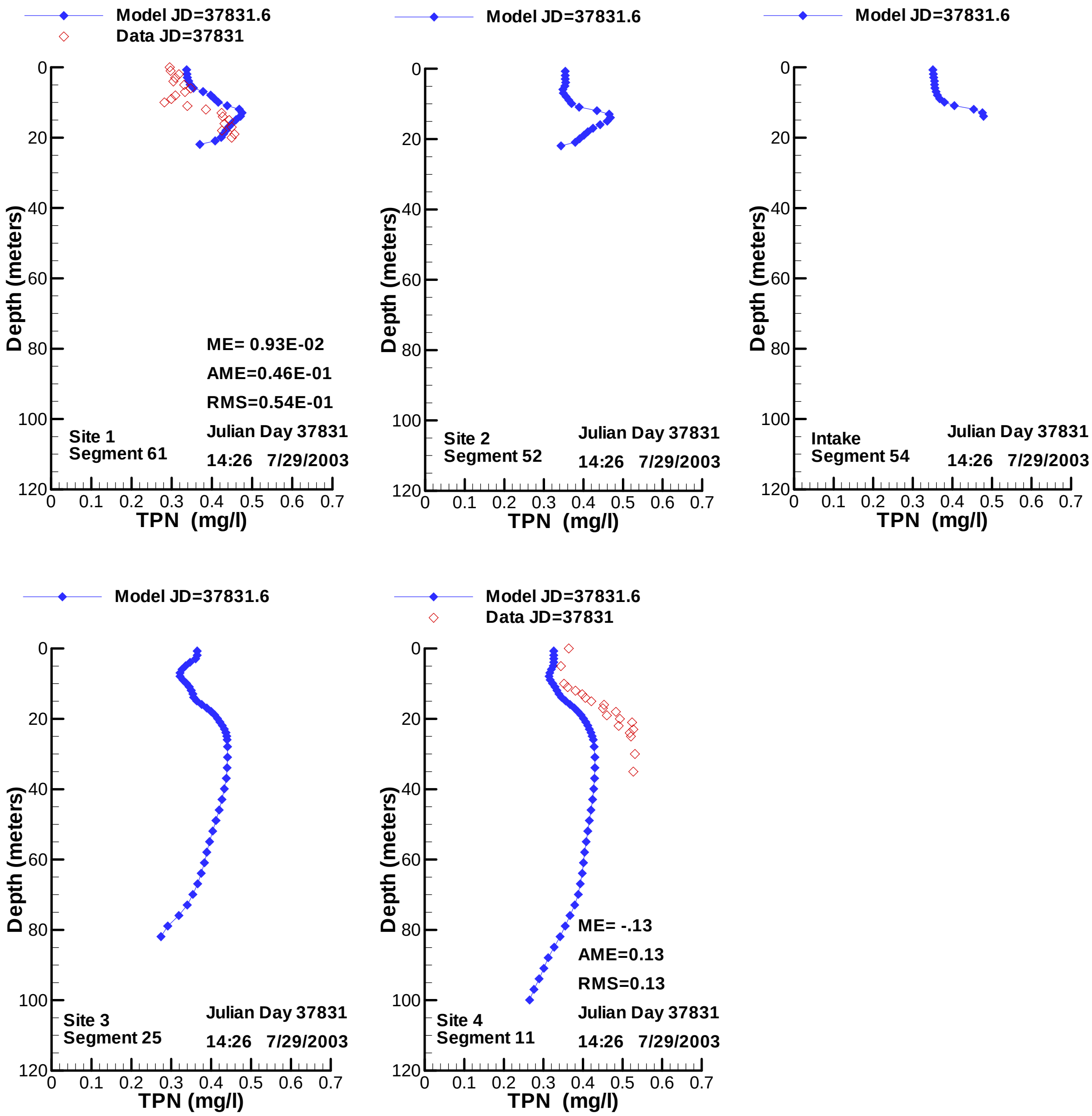

Figure 312. Vertical profiles of TOTAL NITROGEN compared with data for 7/29/2003.

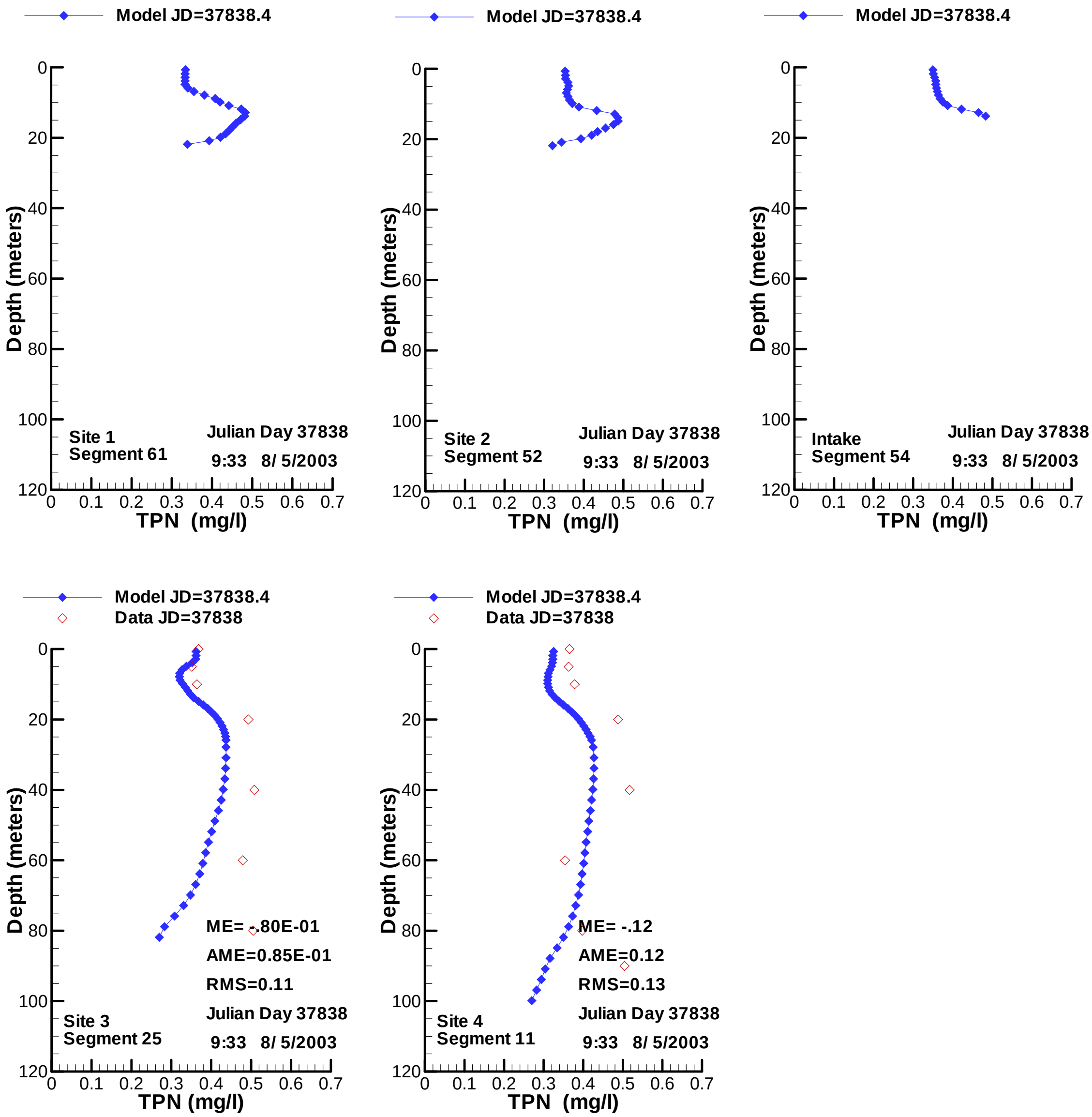

Figure 313. Vertical profiles of TOTAL NITROGEN compared with data for 8/ 5/2003.

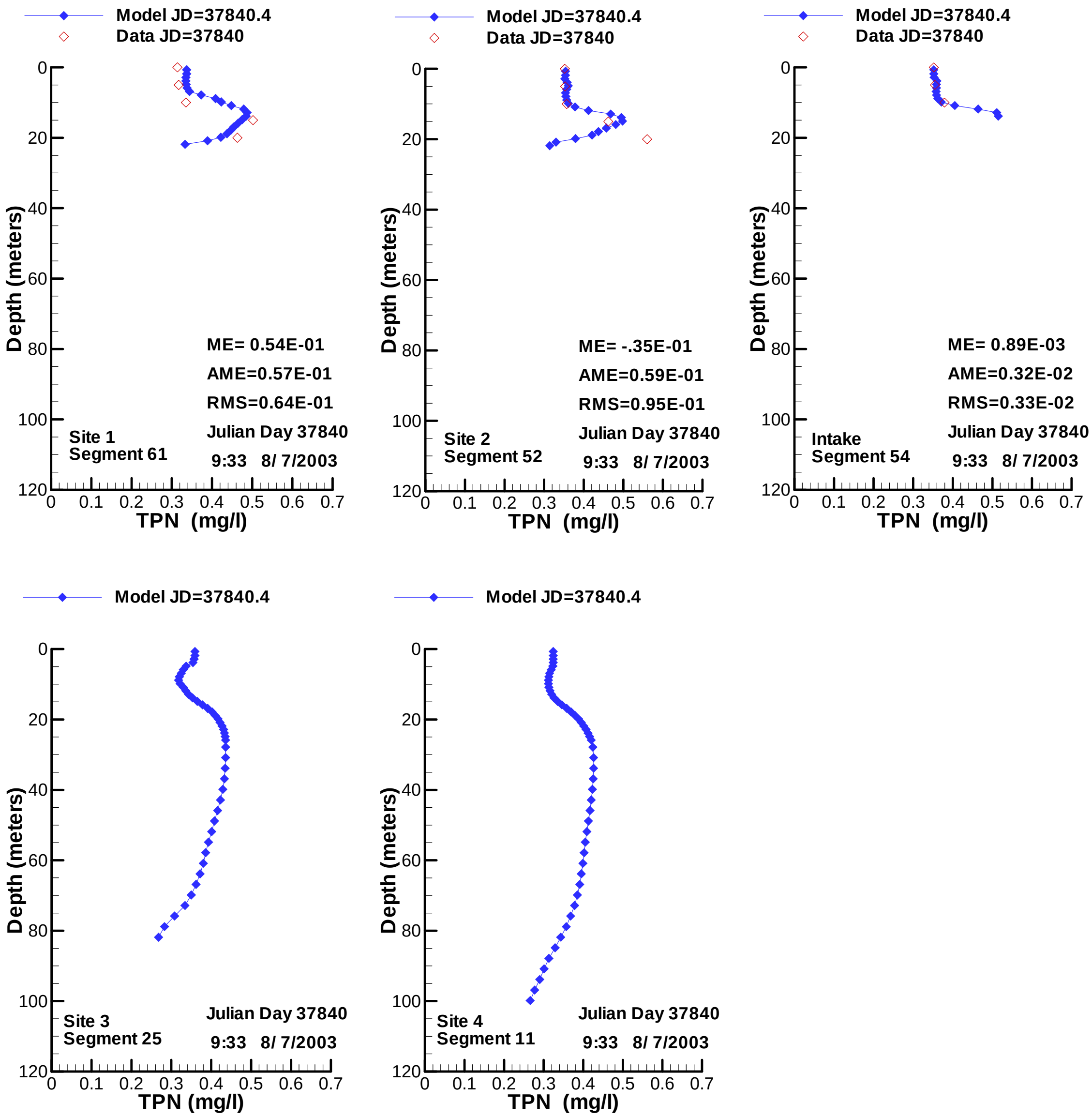

Figure 314. Vertical profiles of TOTAL NITROGEN compared with data for 8/ 7/2003.

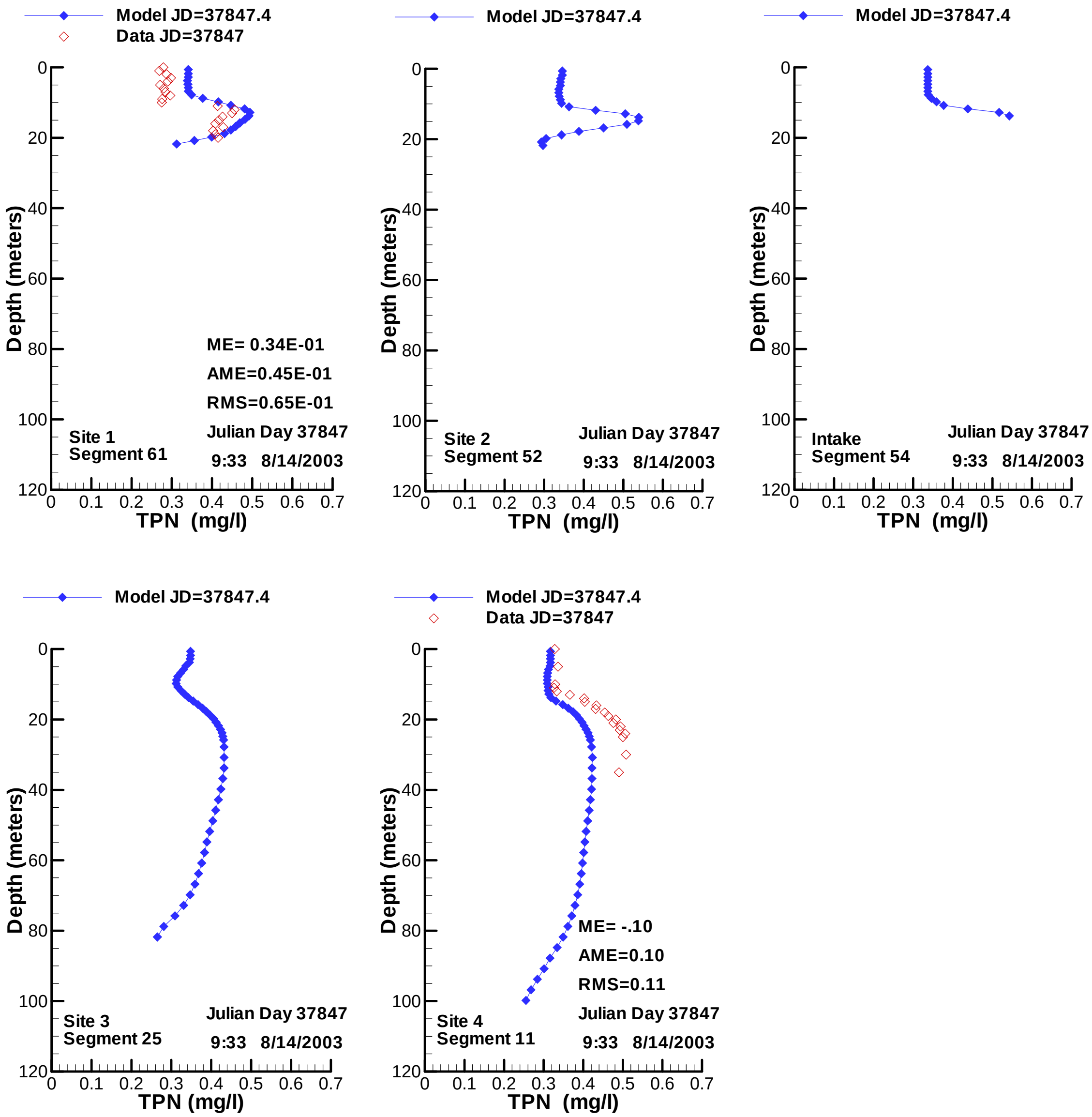

Figure 315. Vertical profiles of TOTAL NITROGEN compared with data for 8/14/2003.

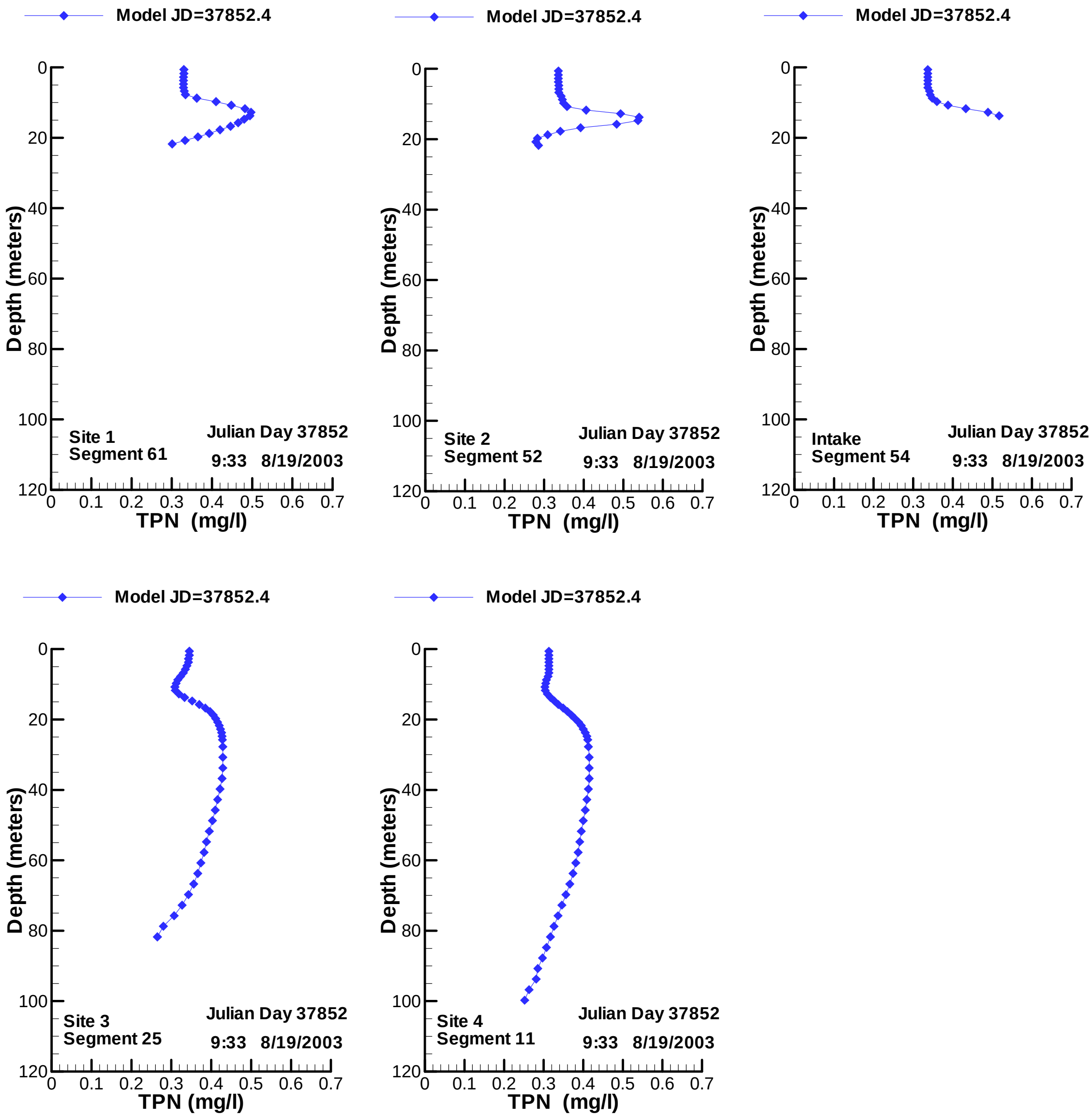

Figure 316. Vertical profiles of TOTAL NITROGEN compared with data for 8/19/2003.

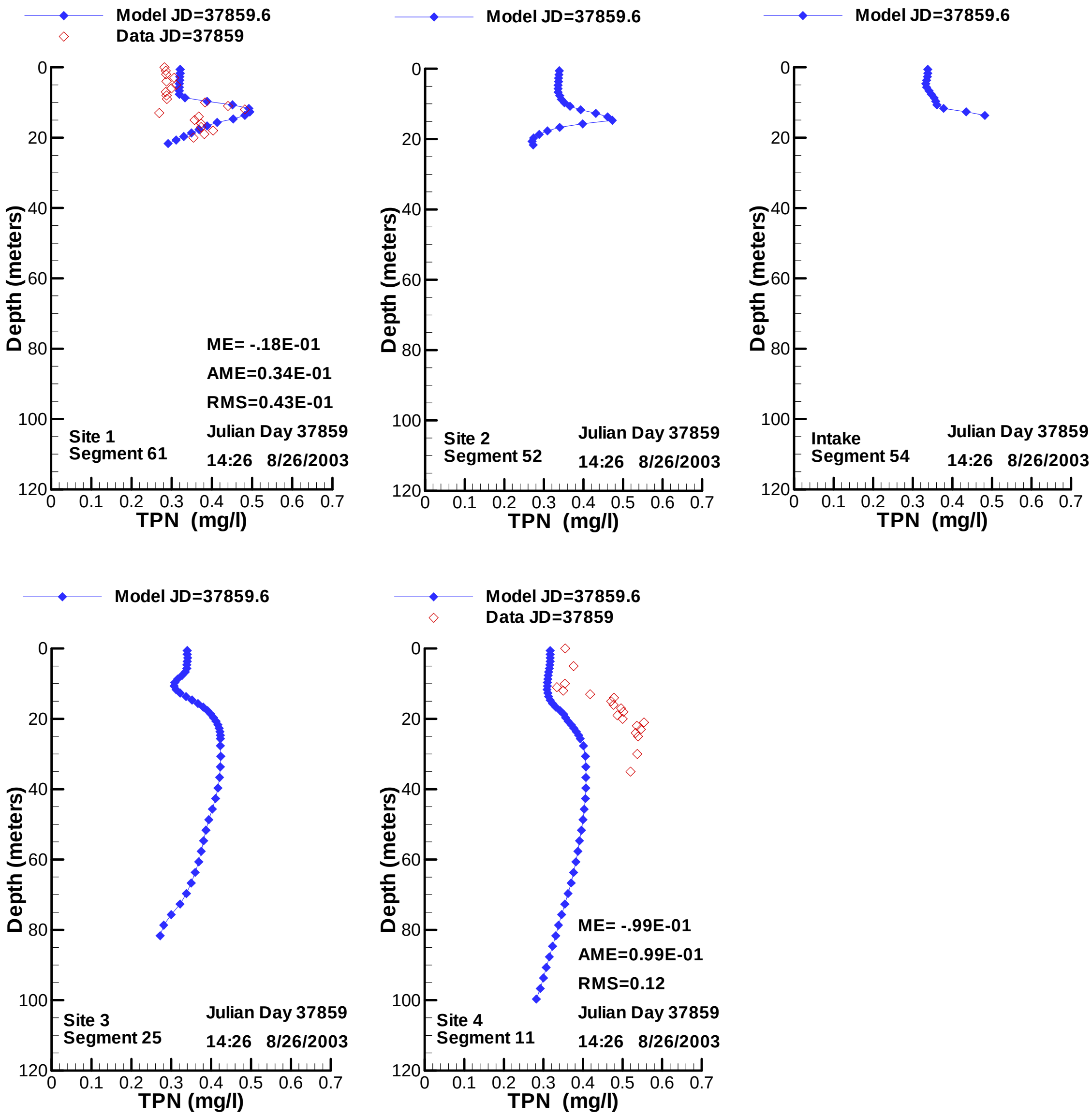

Figure 317. Vertical profiles of TOTAL NITROGEN compared with data for 8/26/2003.

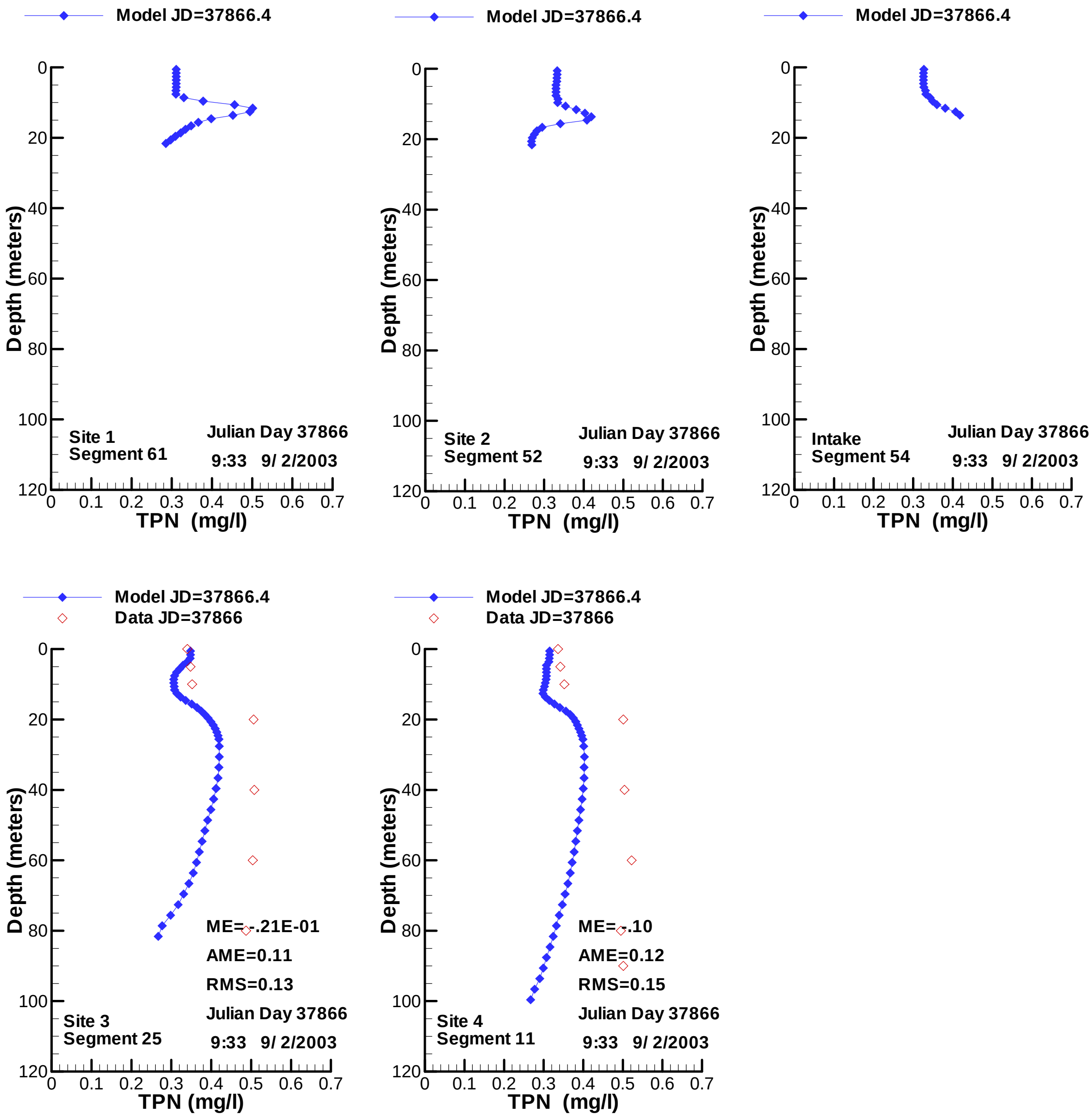

Figure 318. Vertical profiles of TOTAL NITROGEN compared with data for 9/ 2/2003.

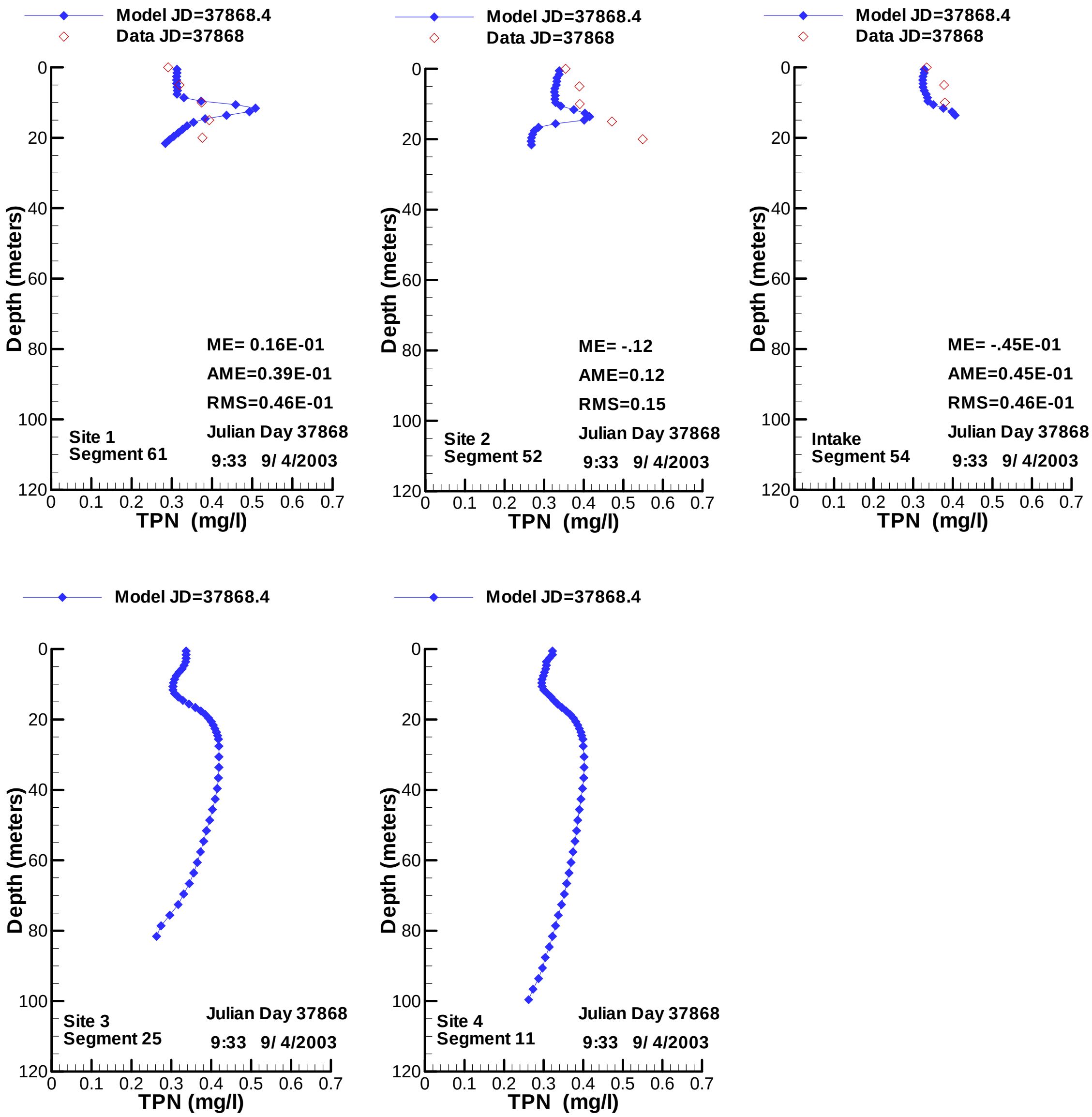

Figure 319. Vertical profiles of TOTAL NITROGEN compared with data for 9/ 4/2003.

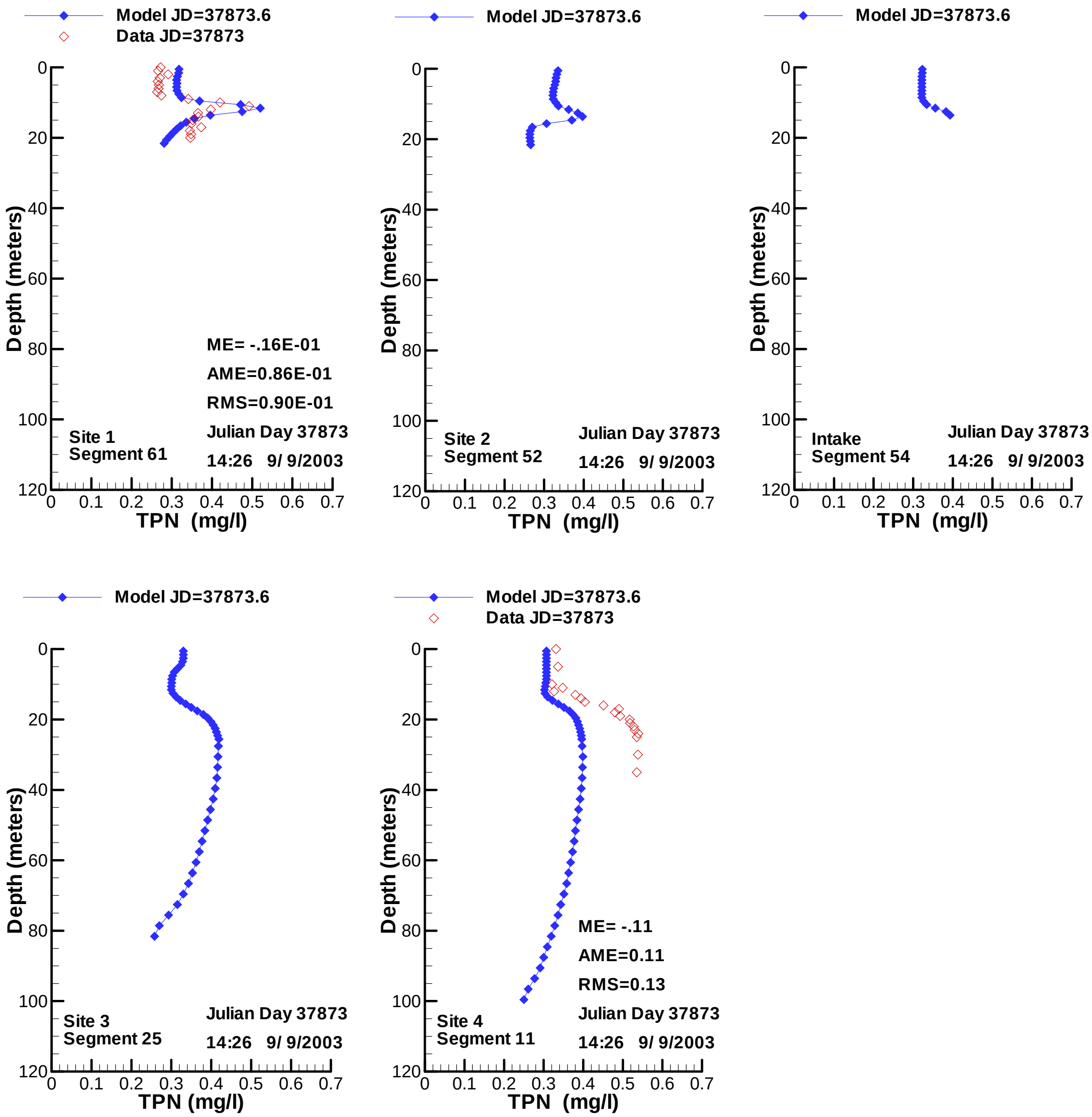

Figure 320. Vertical profiles of TOTAL NITROGEN compared with data for 9/ 9/2003.

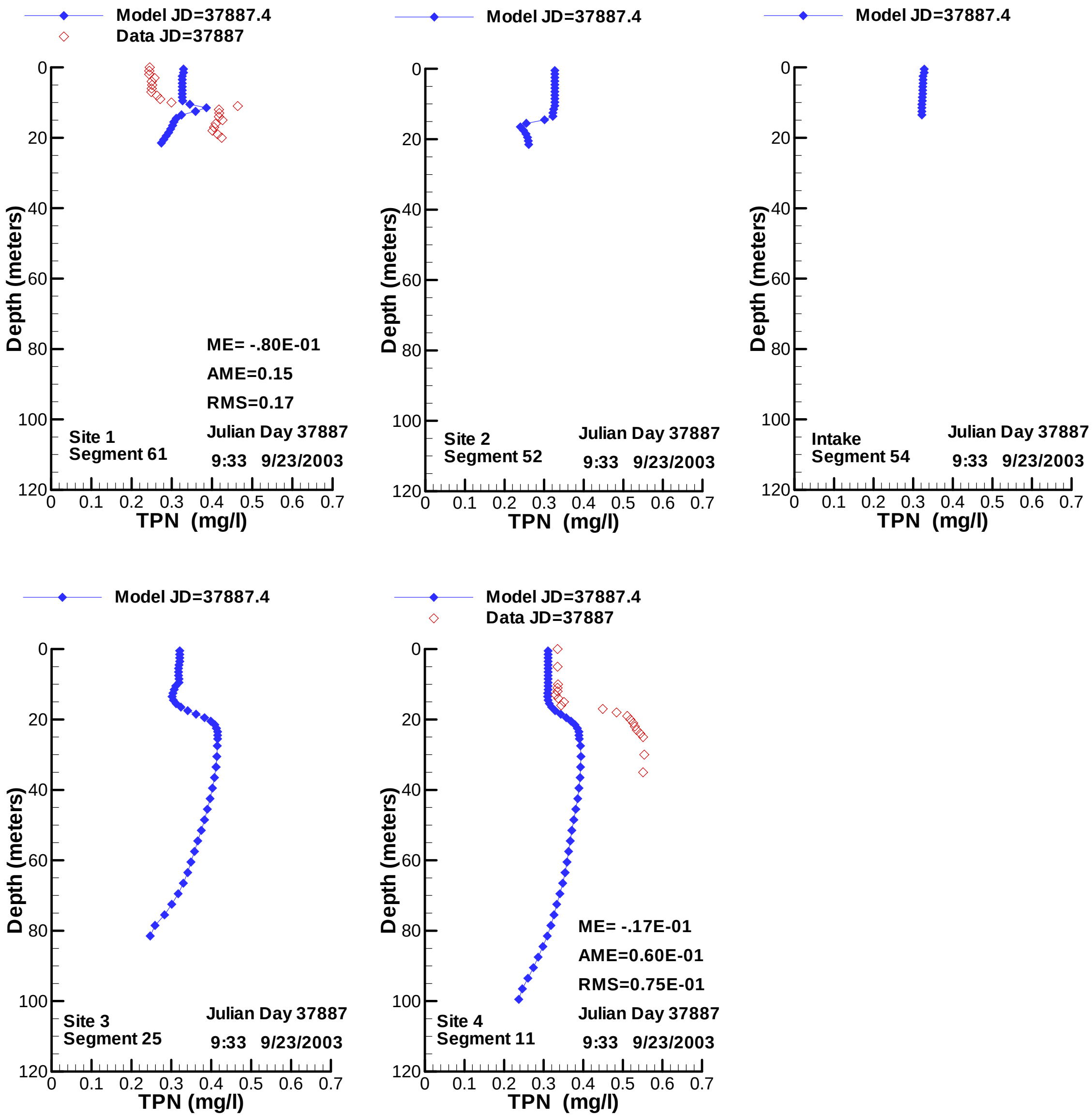

Figure 321. Vertical profiles of TOTAL NITROGEN compared with data for 9/23/2003.

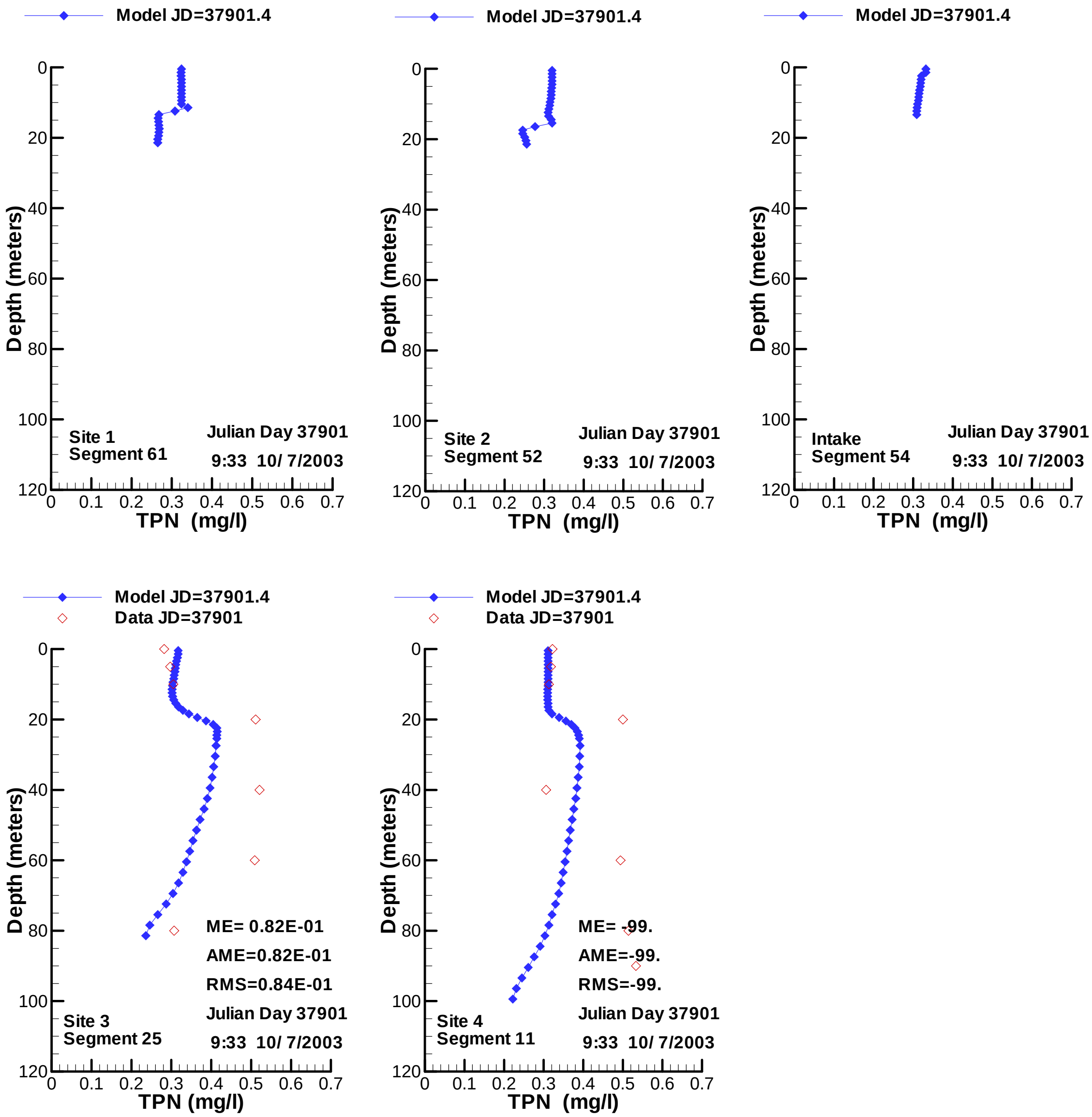

Figure 322. Vertical profiles of TOTAL NITROGEN compared with data for 10/ 7/2003.

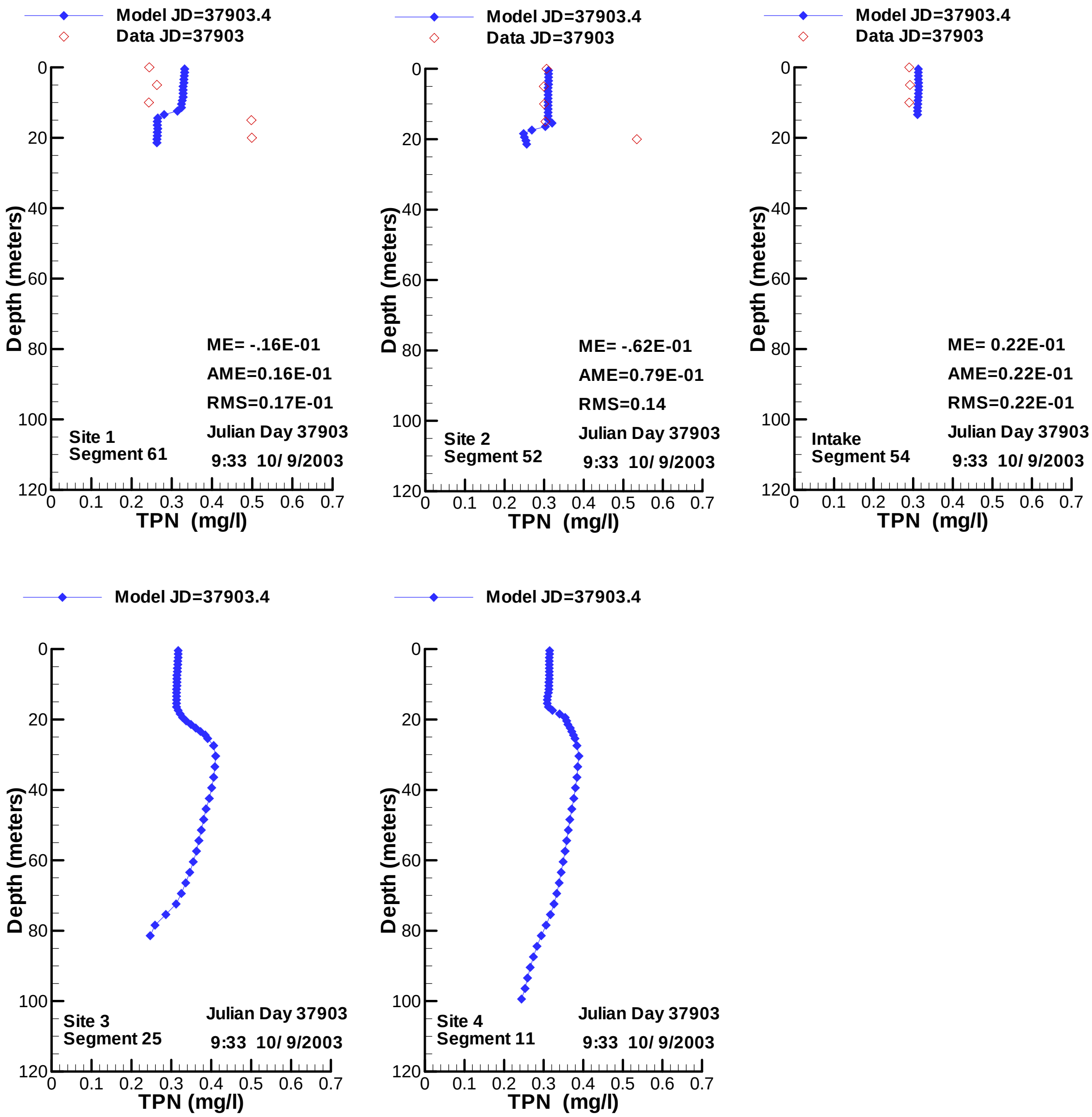

Figure 323. Vertical profiles of TOTAL NITROGEN compared with data for 10/ 9/2003.

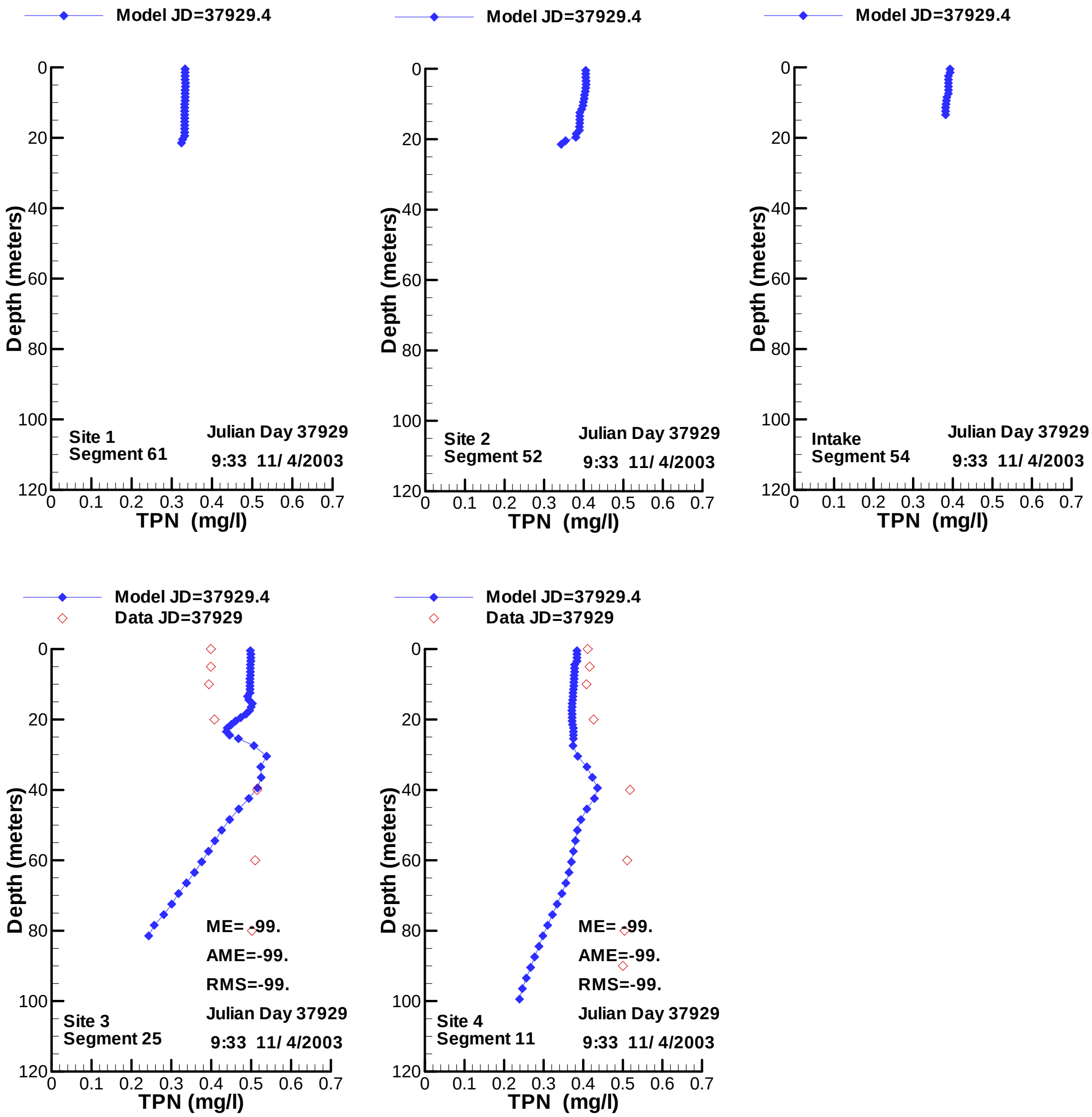

Figure 324. Vertical profiles of TOTAL NITROGEN compared with data for 11/ 4/2003.

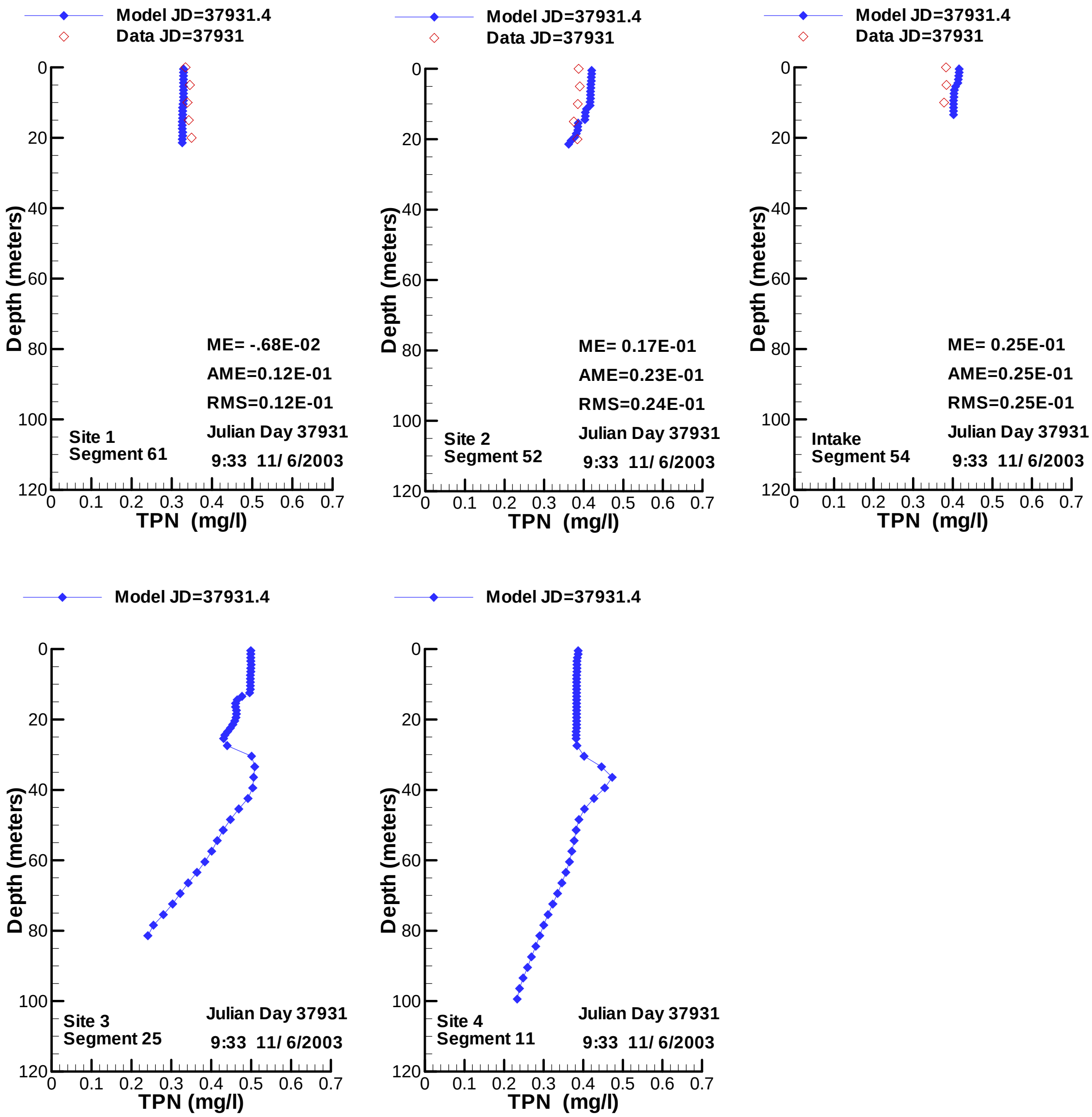

Figure 325. Vertical profiles of TOTAL NITROGEN compared with data for 11/ 6/2003.

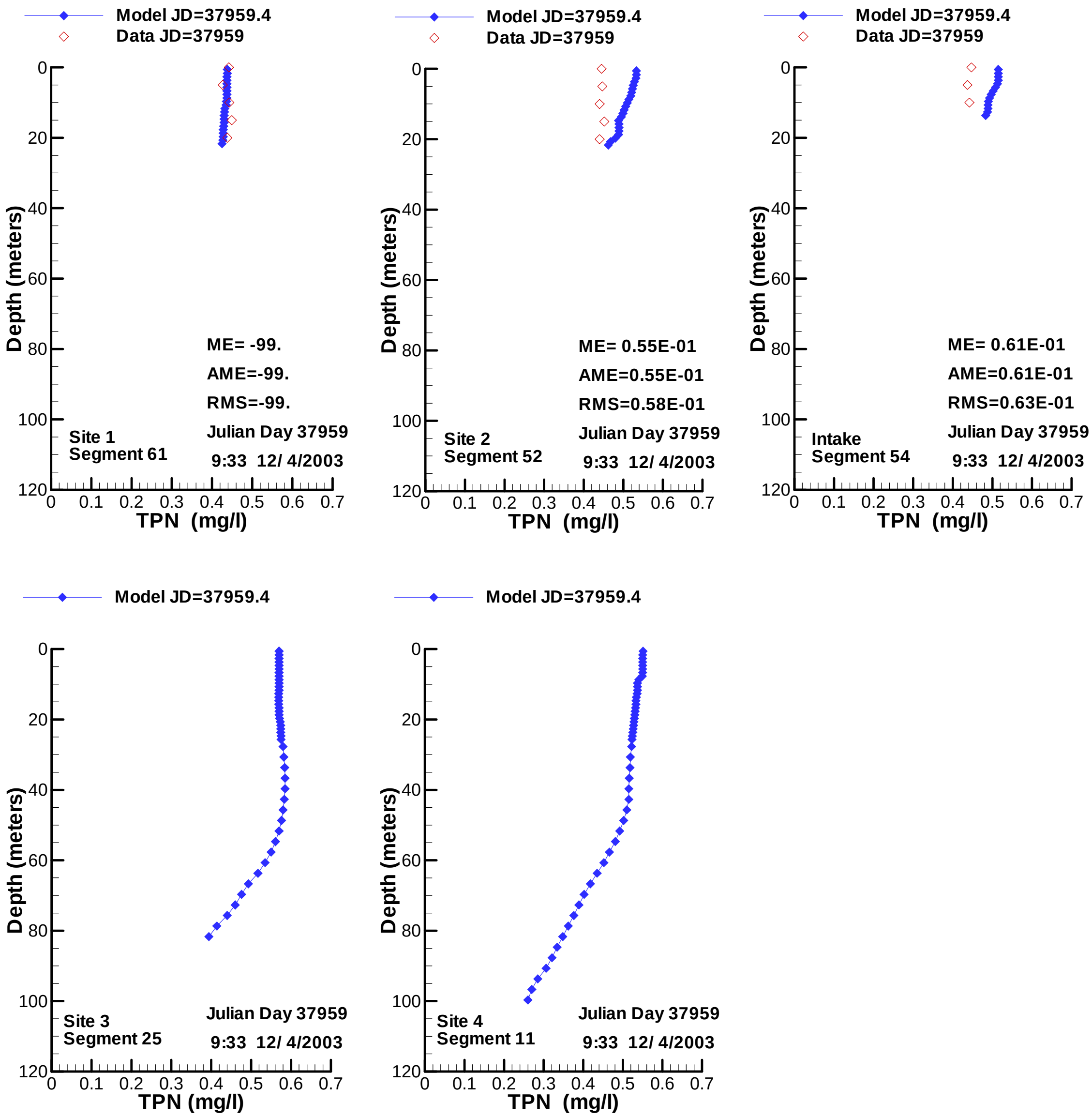

Figure 326. Vertical profiles of TOTAL NITROGEN compared with data for 12/ 4/2003.

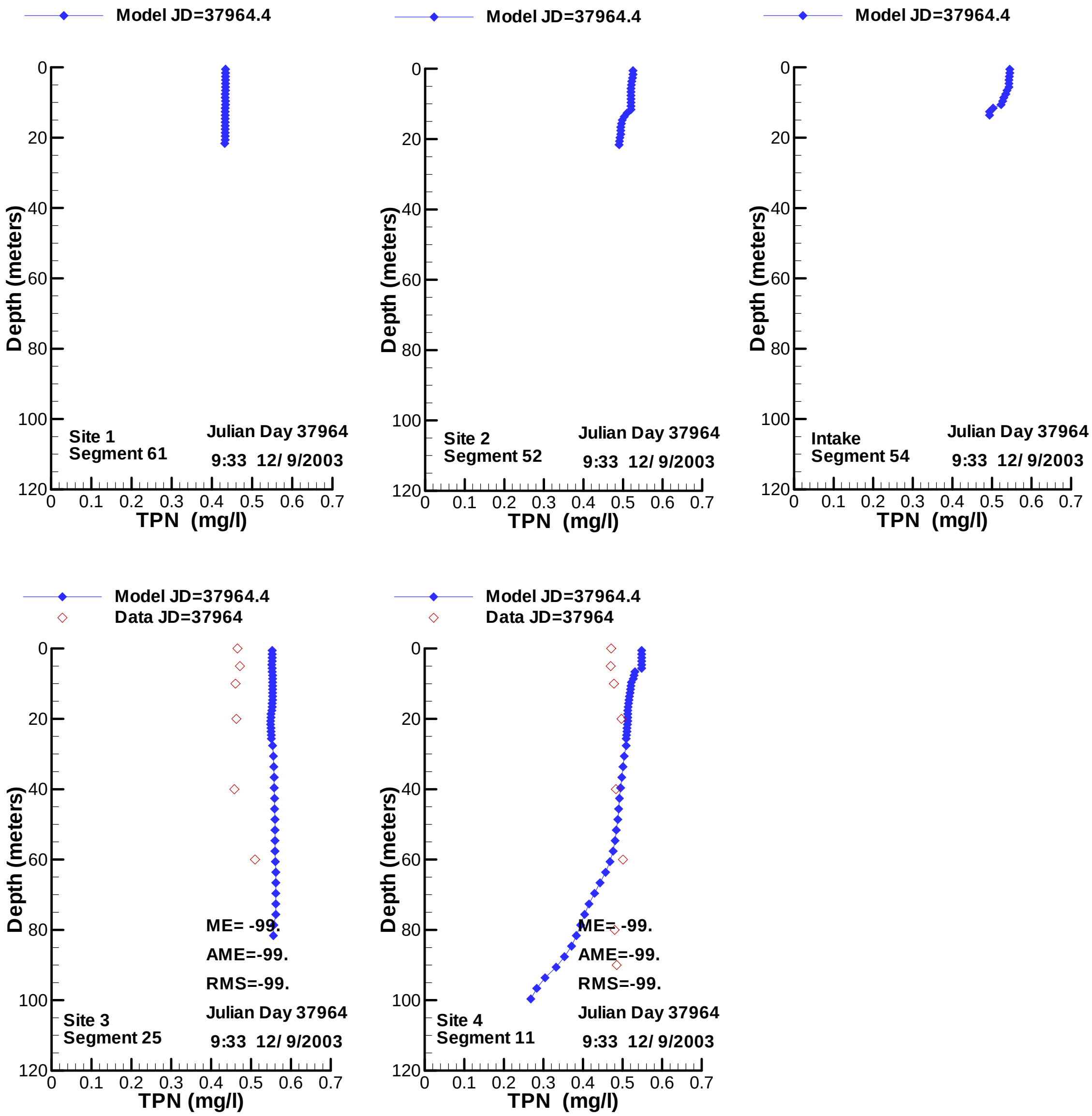

Figure 327. Vertical profiles of TOTAL NITROGEN compared with data for 12/ 9/2003.

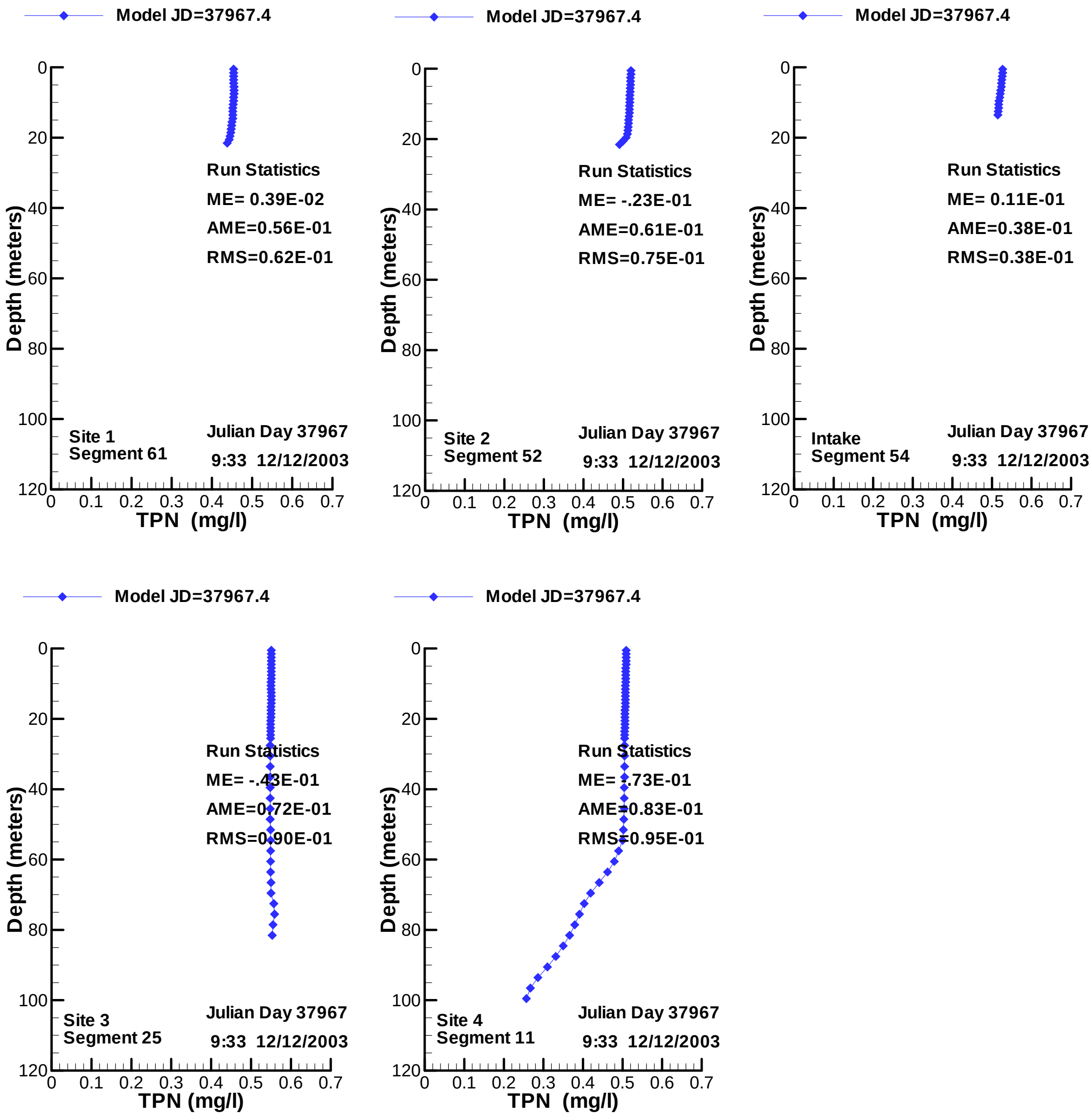

Figure 328. Vertical profiles of TOTAL NITROGEN compared with data for 12/12/2003.

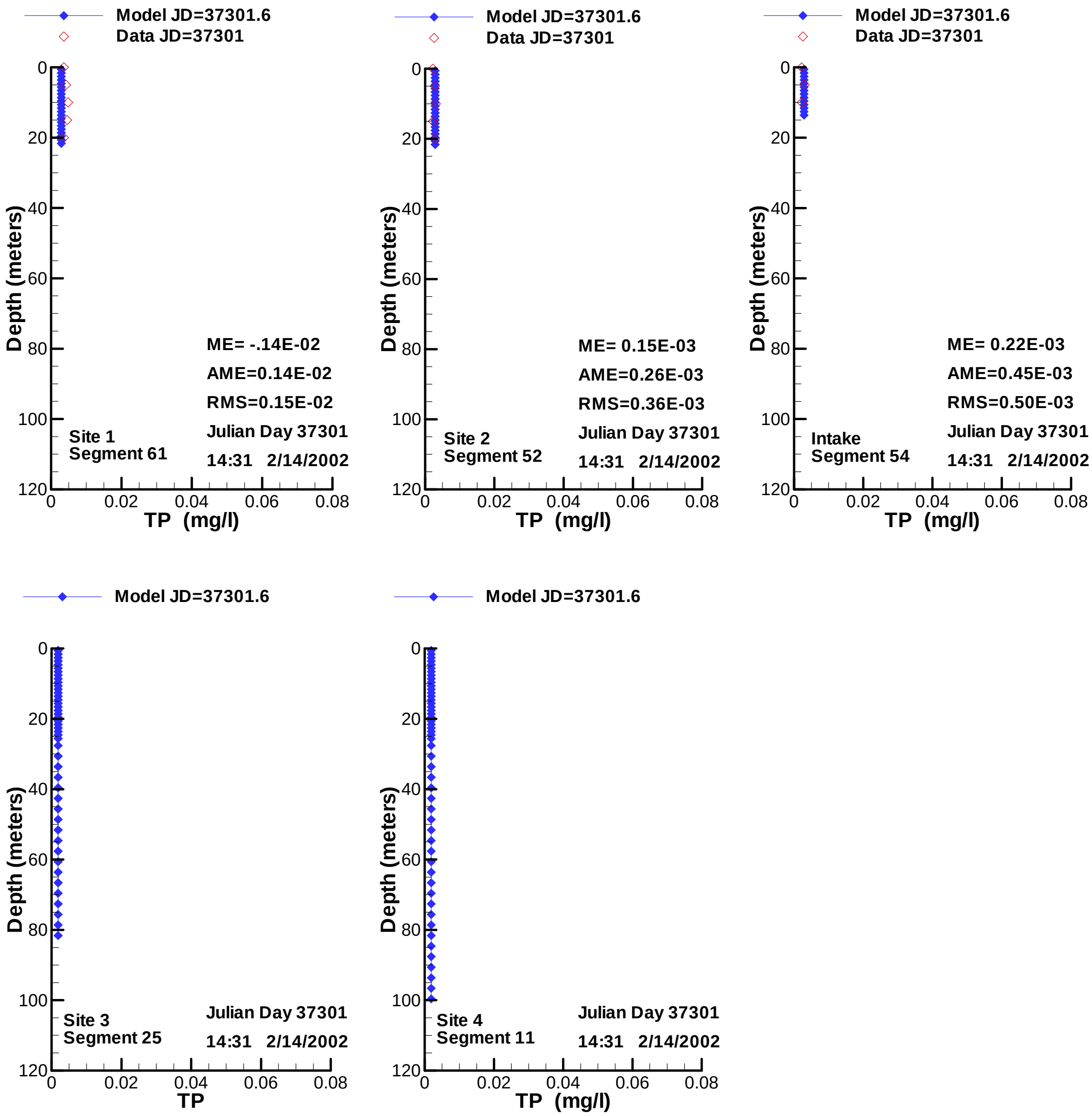

Figure 329. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 2/14/2002.

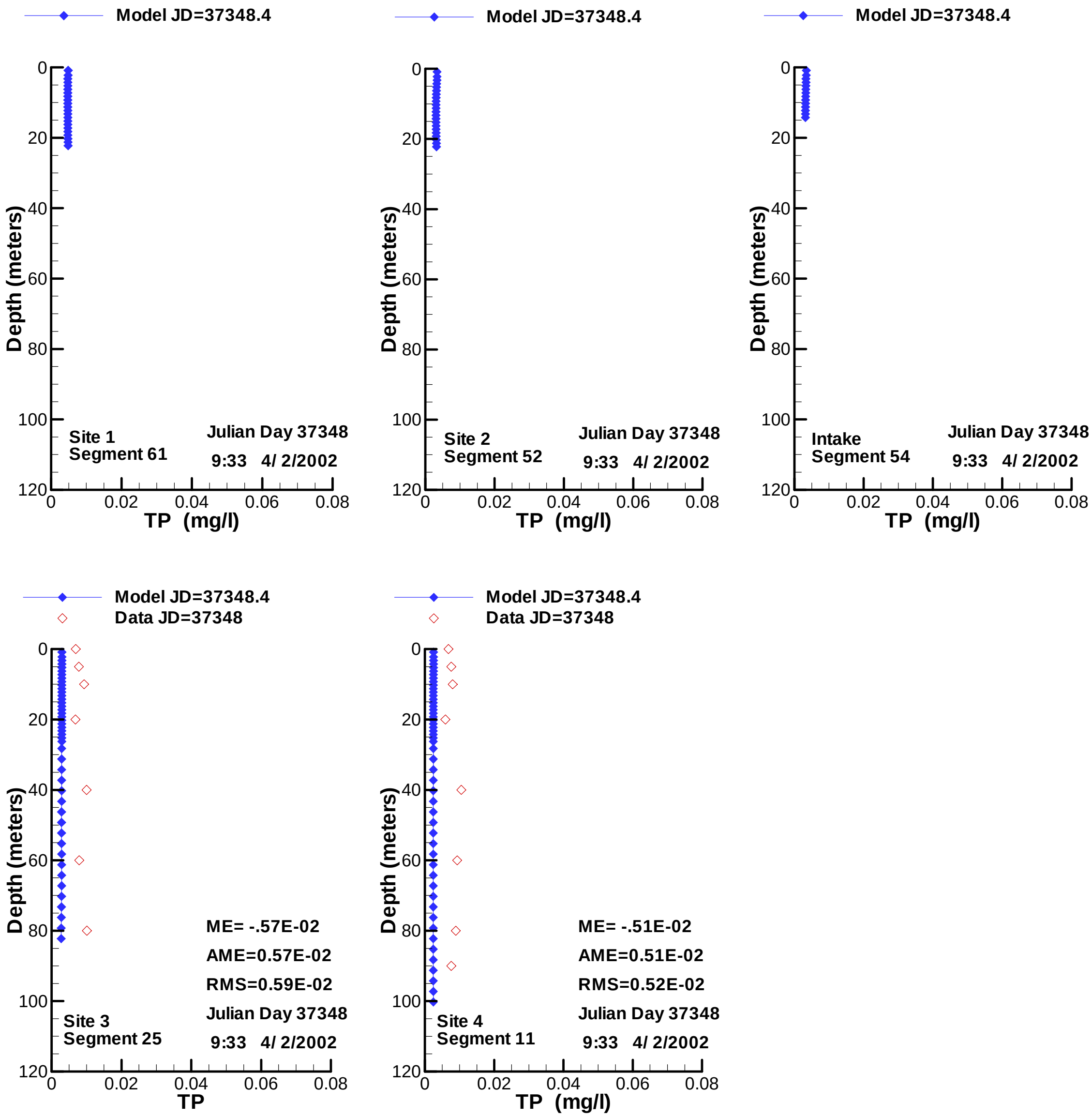

Figure 330. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 4/ 2/2002.

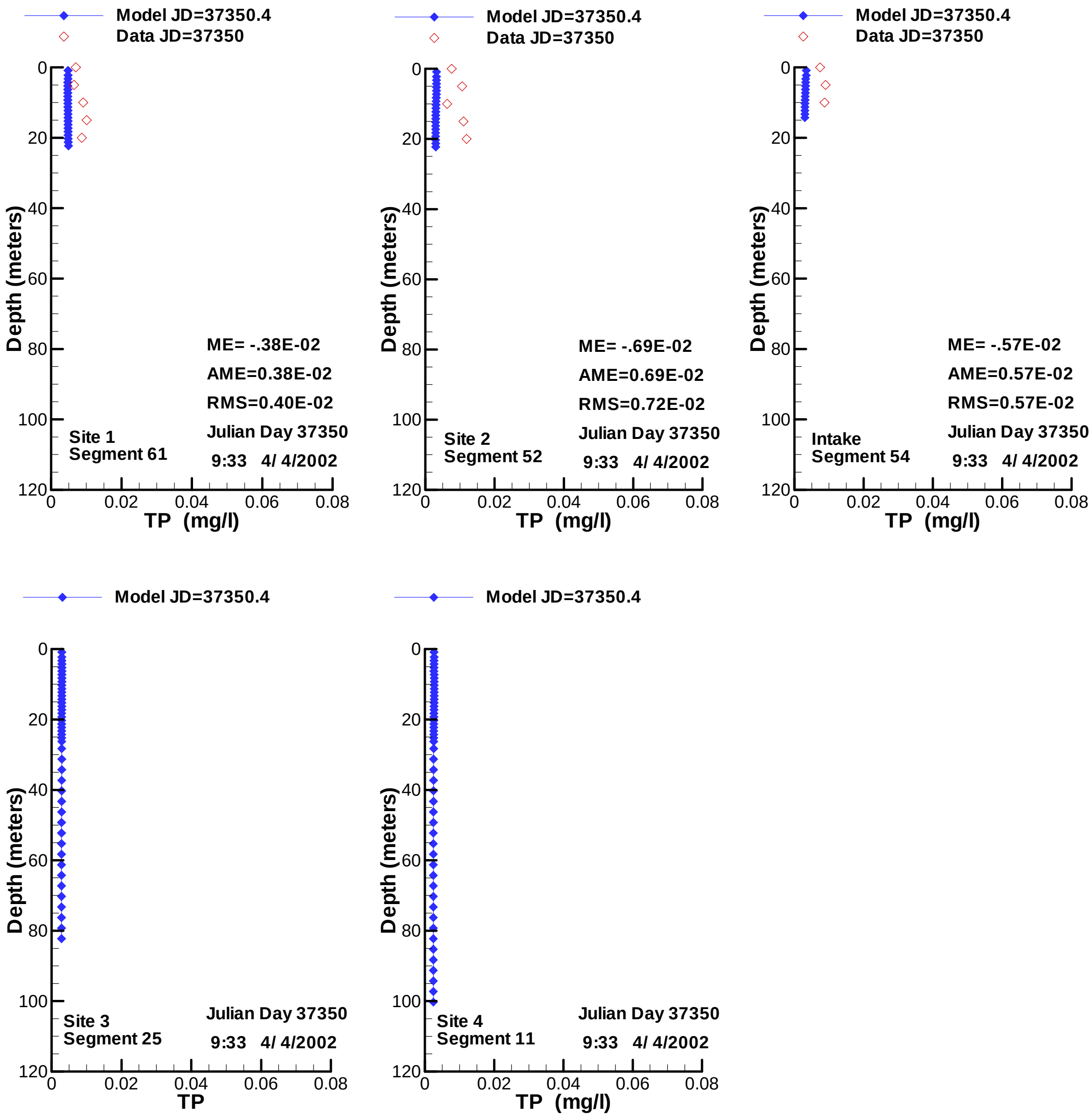

Figure 331. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 4/ 4/2002.

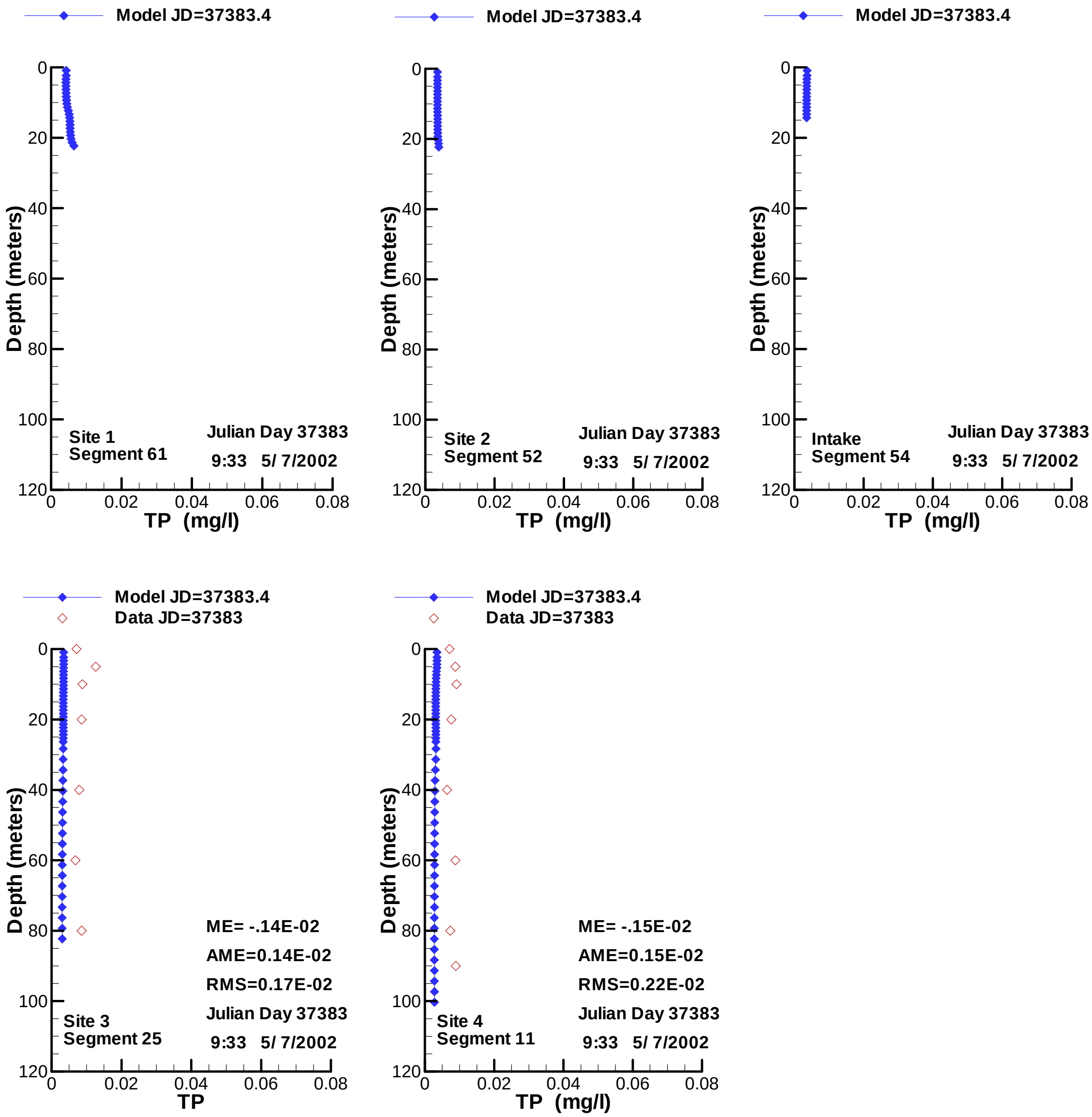

Figure 332. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 5/ 7/2002.

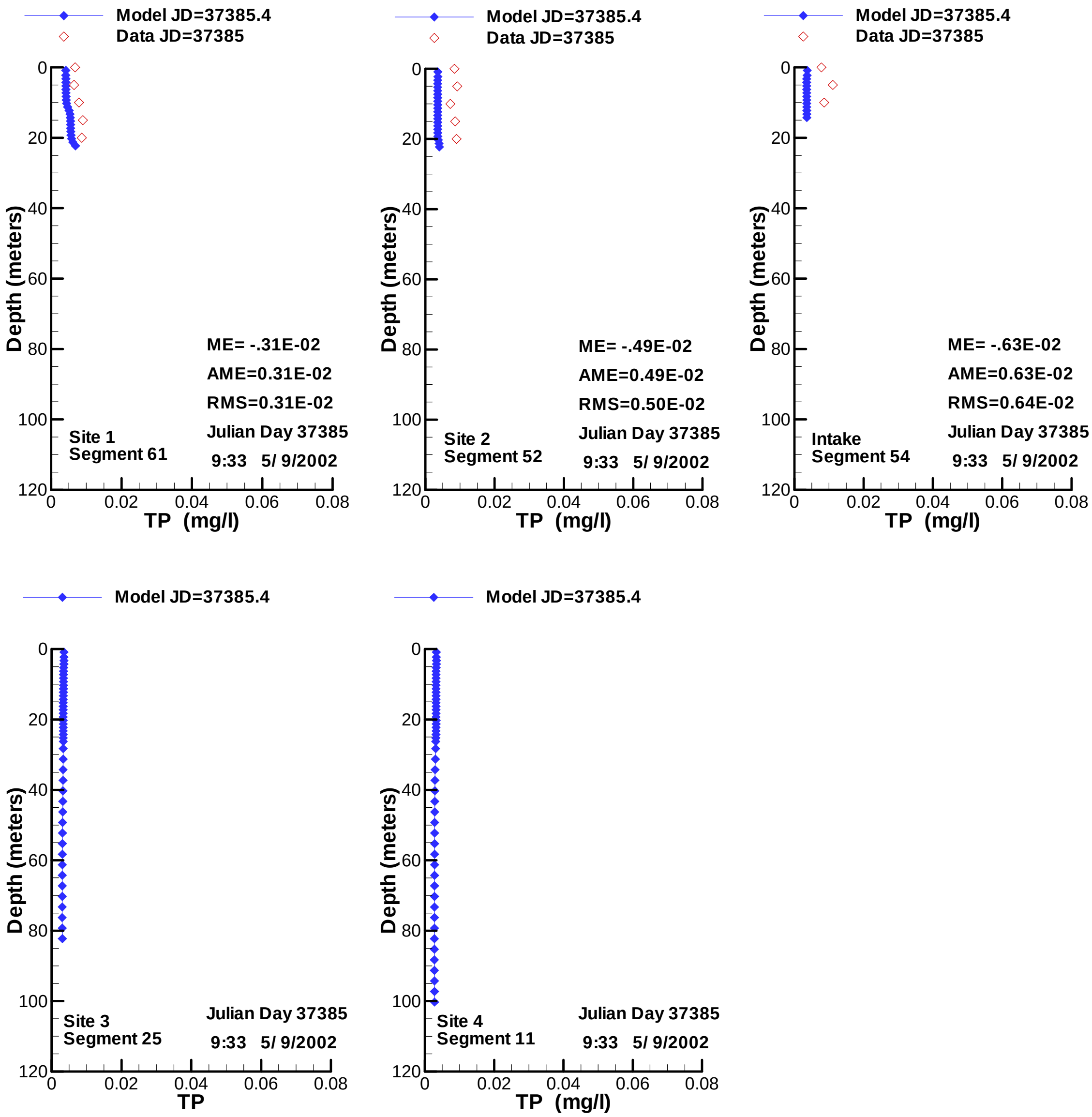

Figure 333. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 5/ 9/2002.

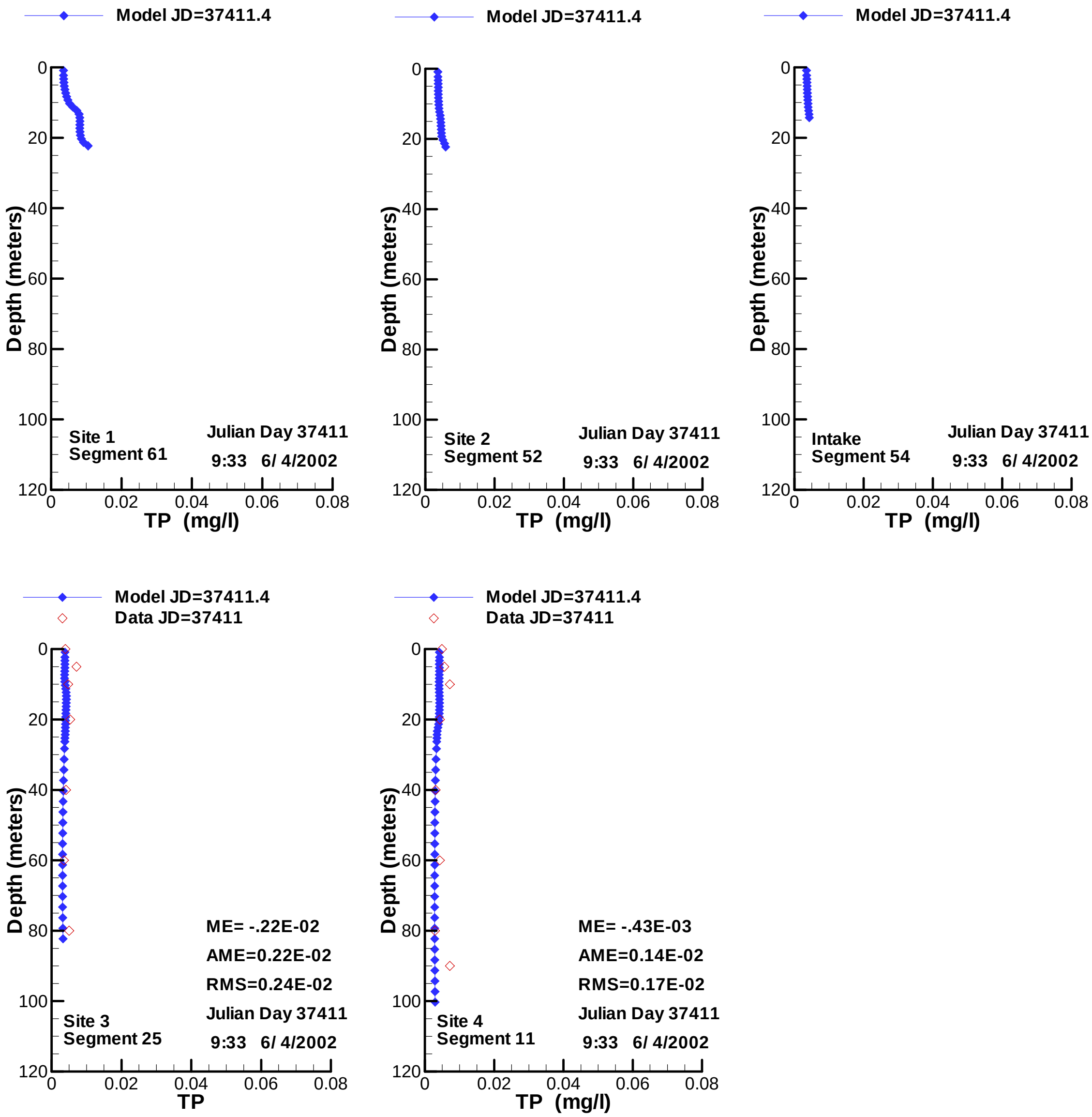

Figure 334. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 6/ 4/2002.

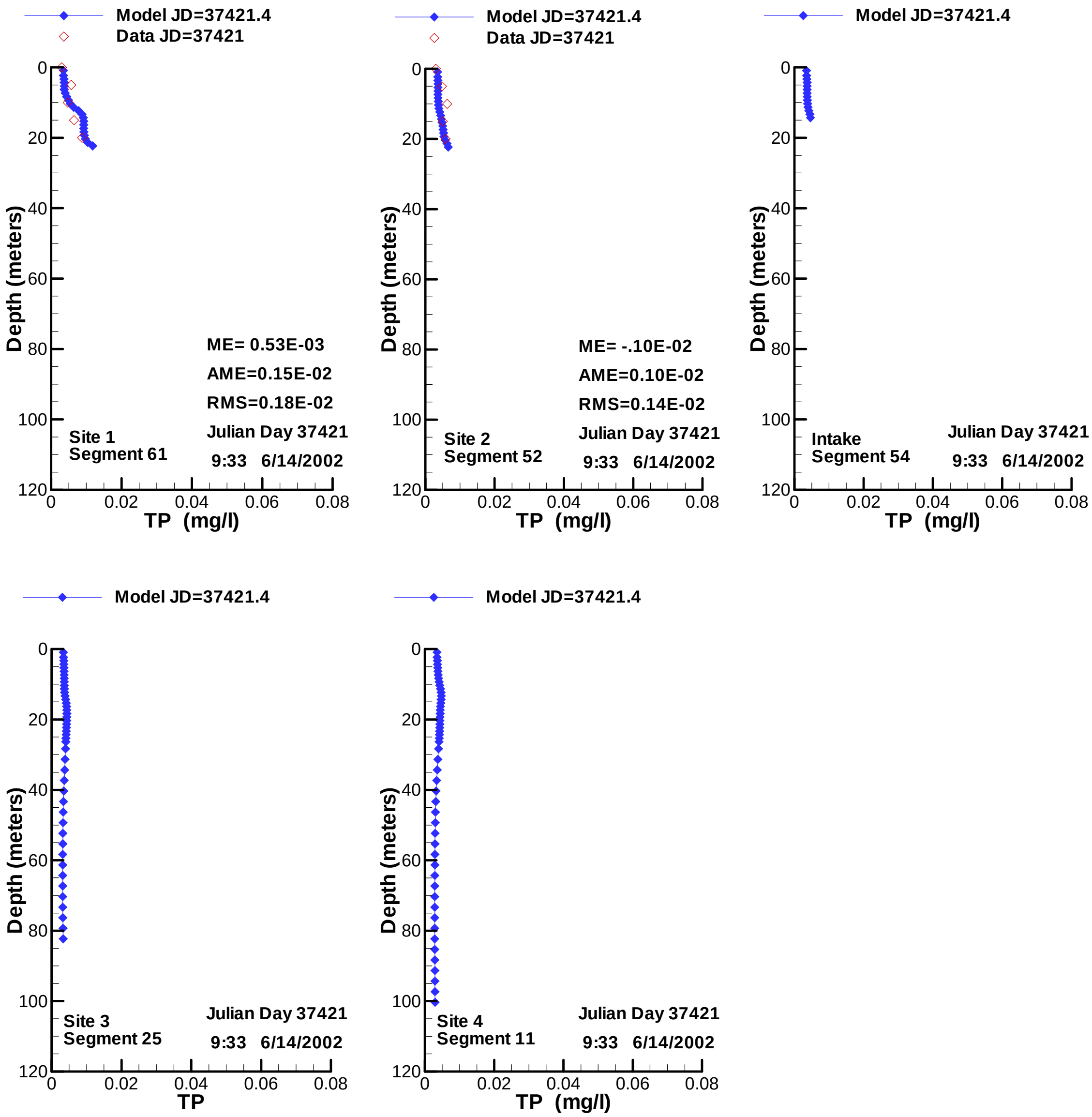

Figure 335. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 6/14/2002.

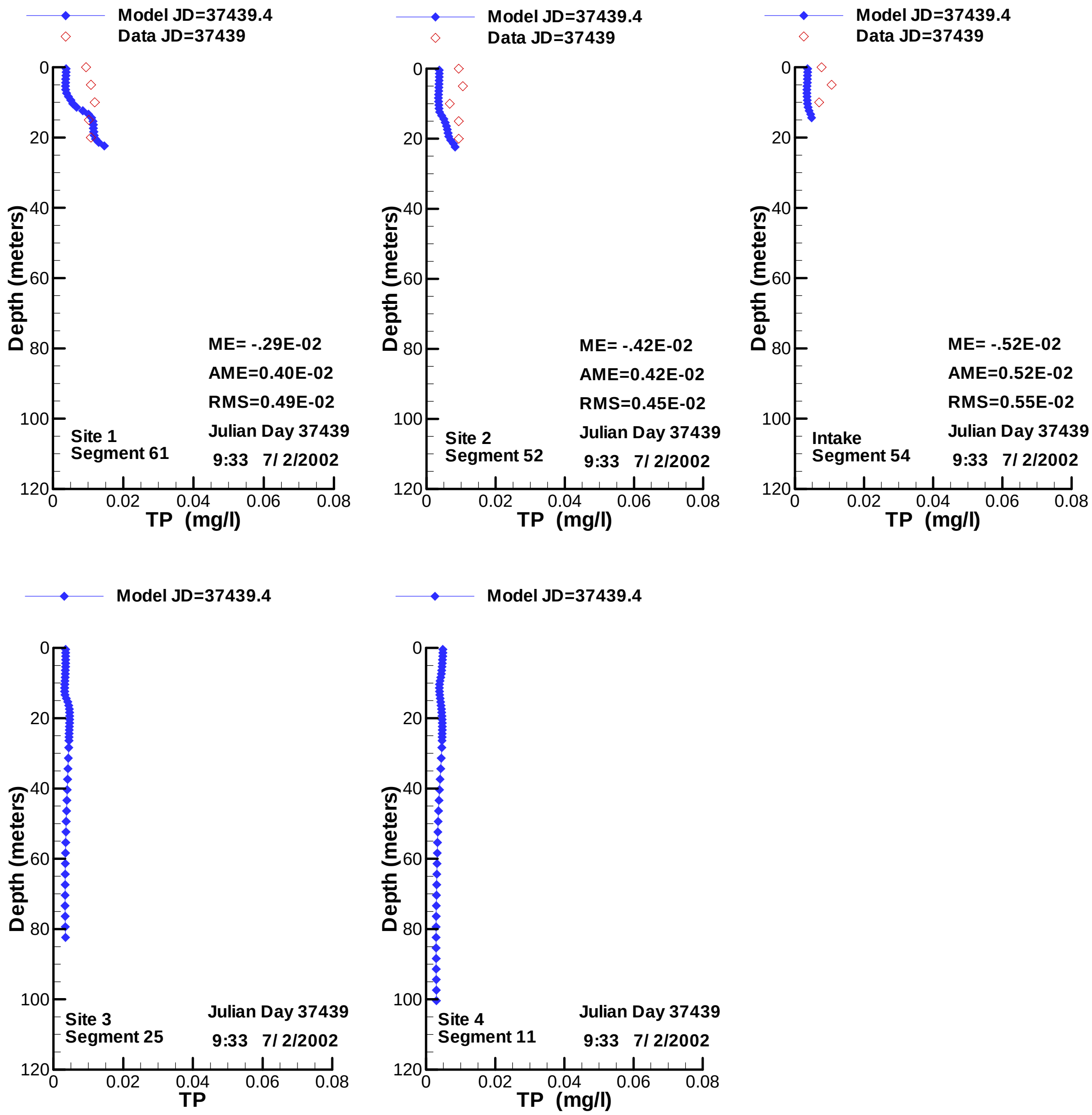

Figure 336. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/ 2/2002.

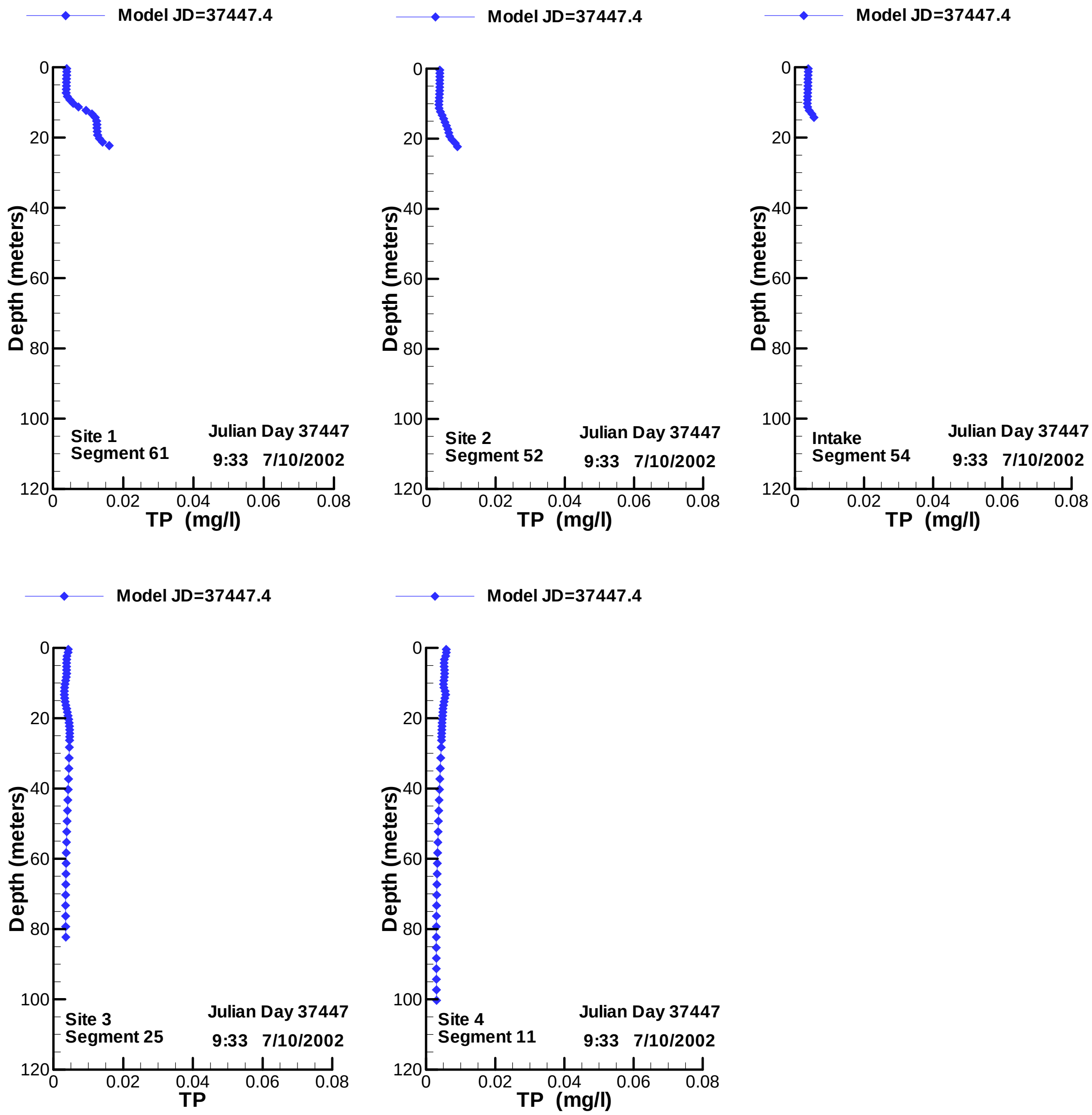

Figure 337. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/10/2002.

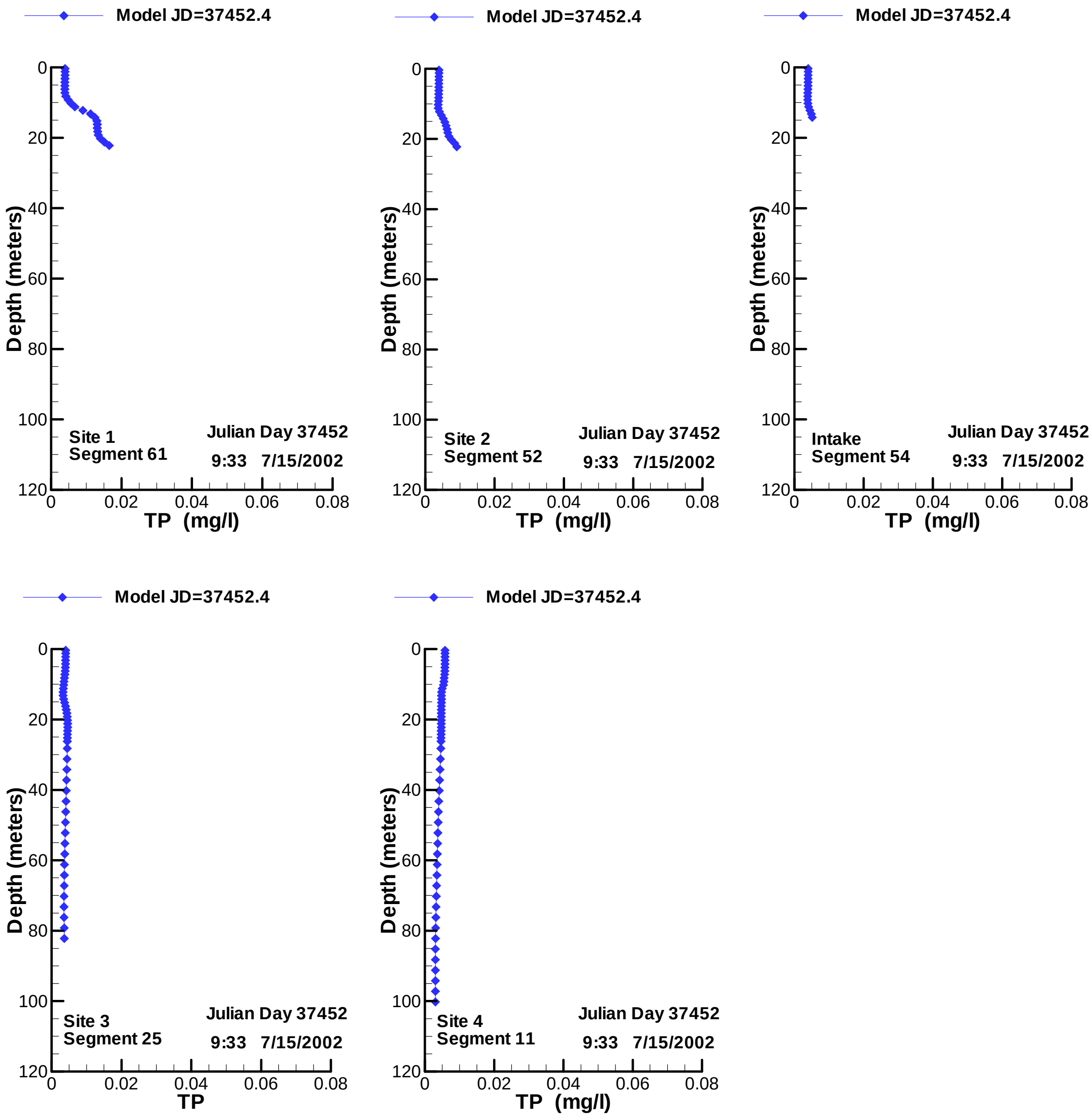

Figure 338. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/15/2002.

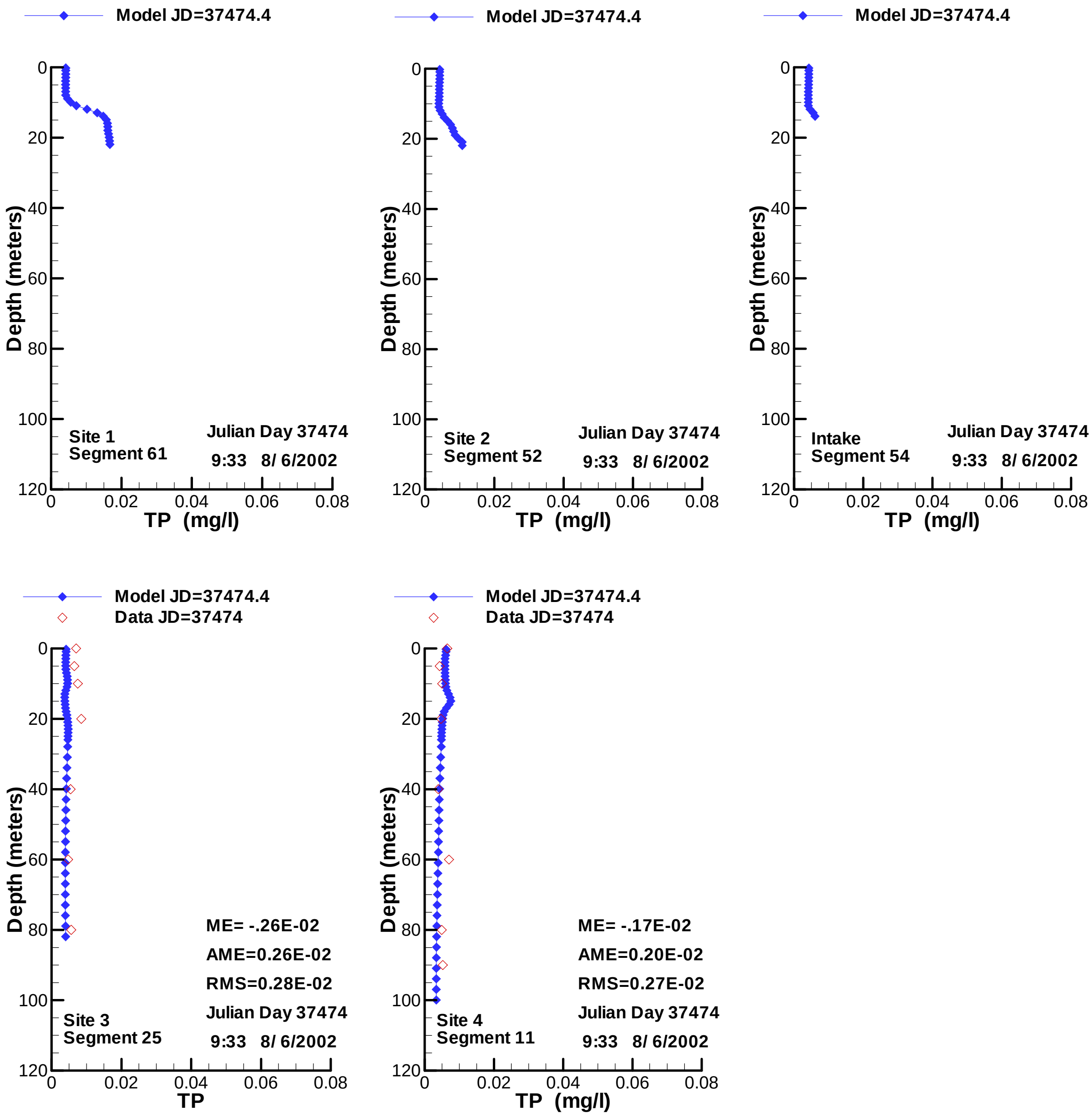

Figure 339. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/ 6/2002.

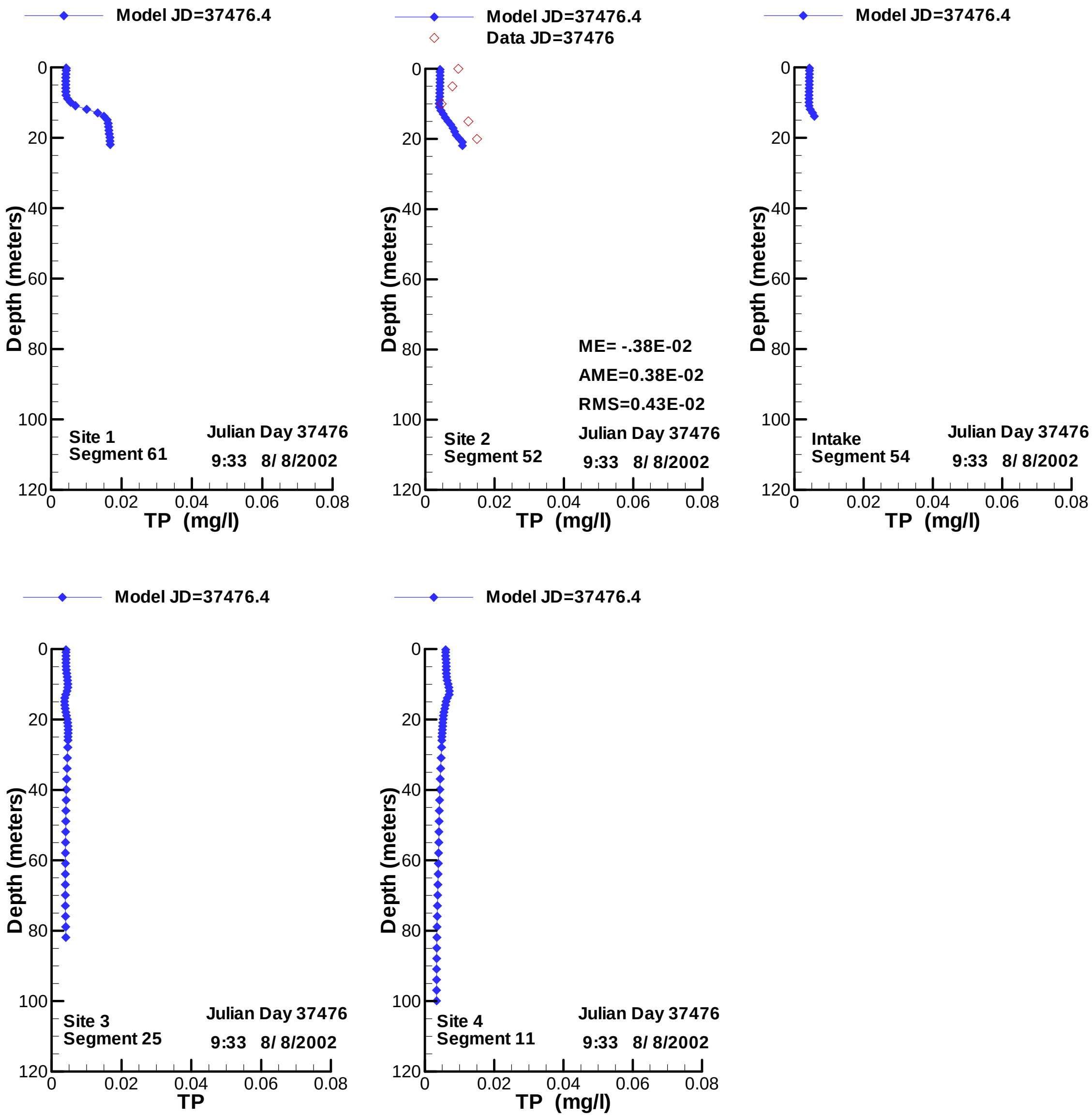

Figure 340. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/ 8/2002.

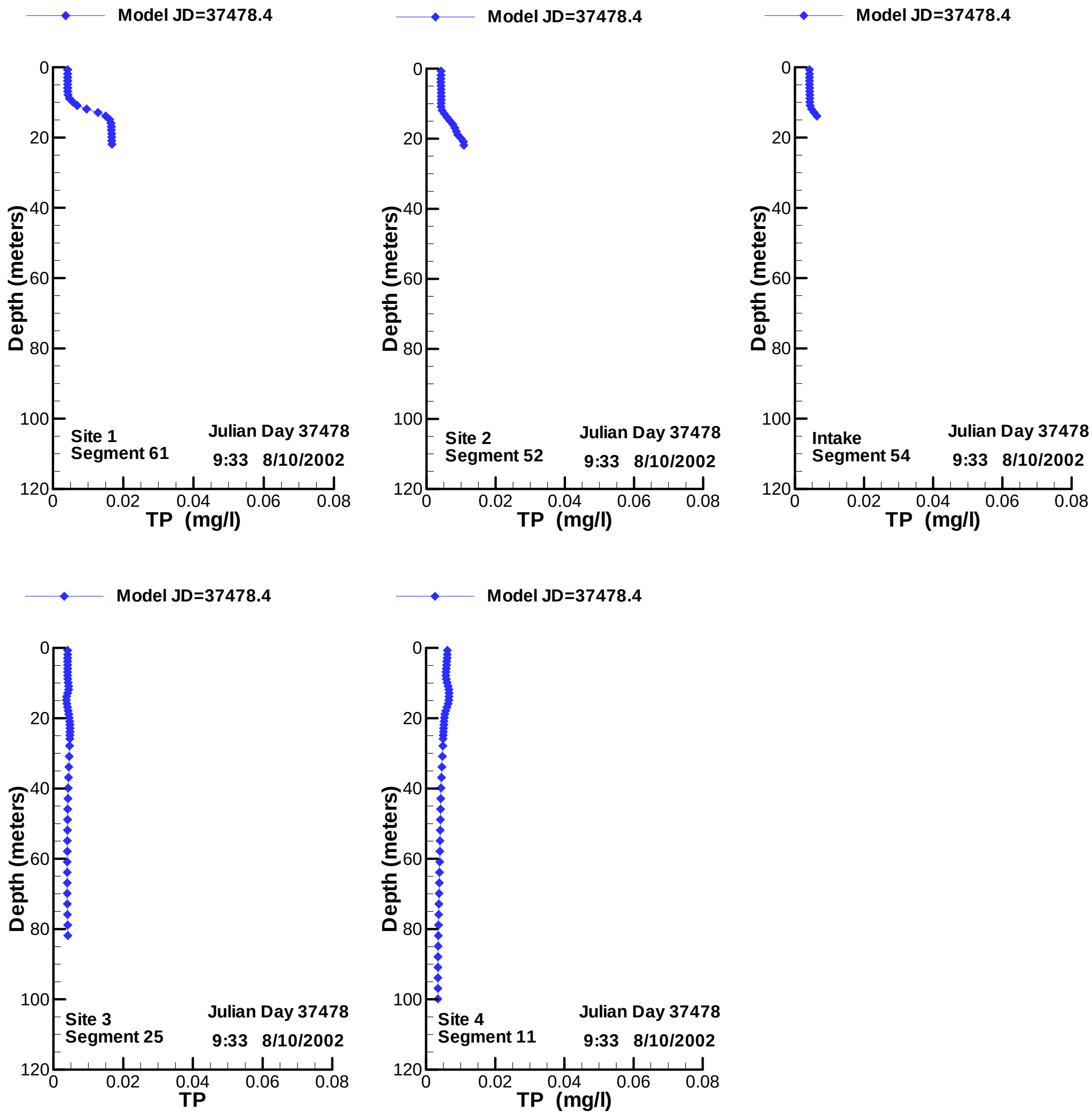

Figure 341. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/10/2002.

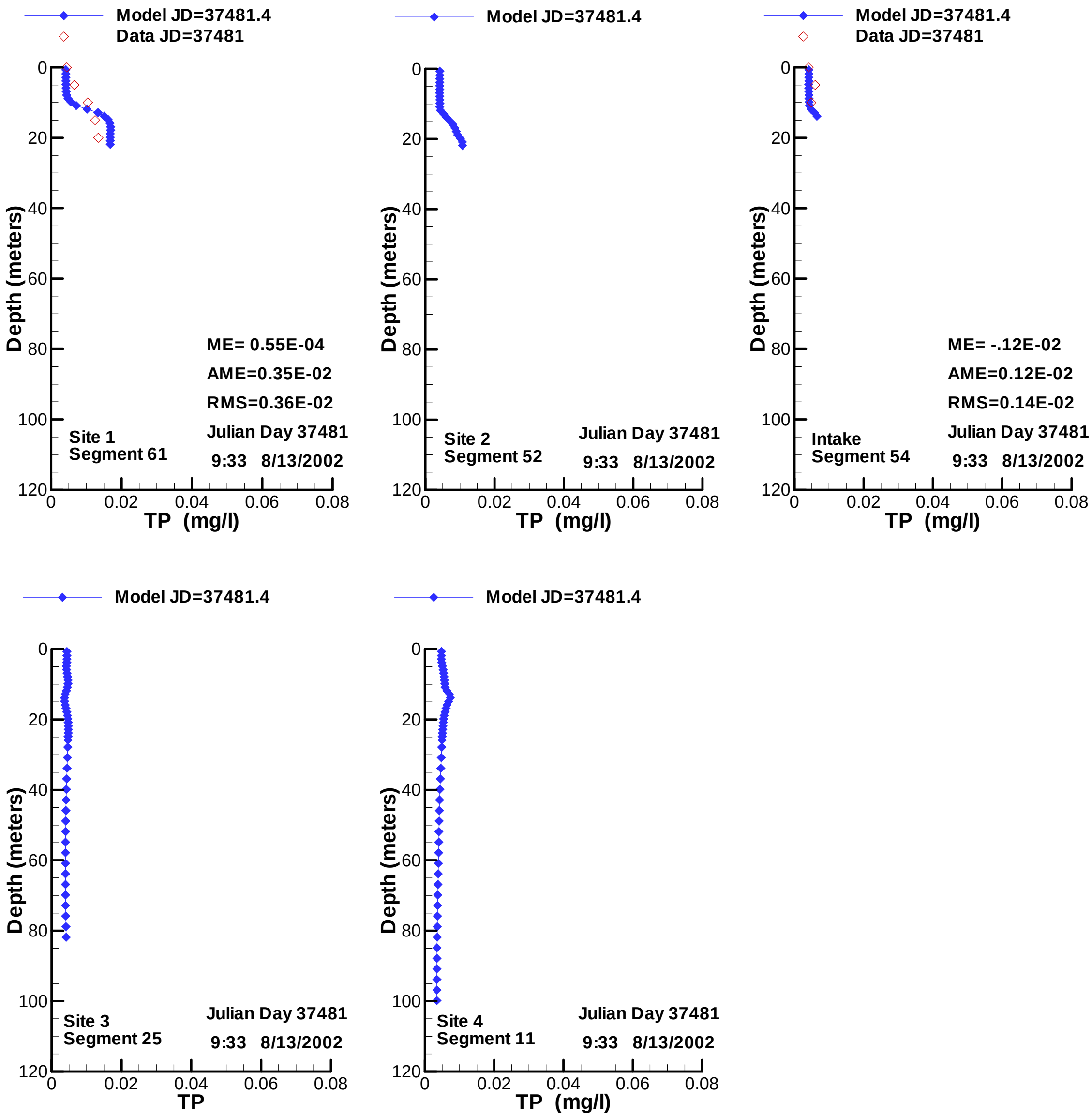

Figure 342. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/13/2002.

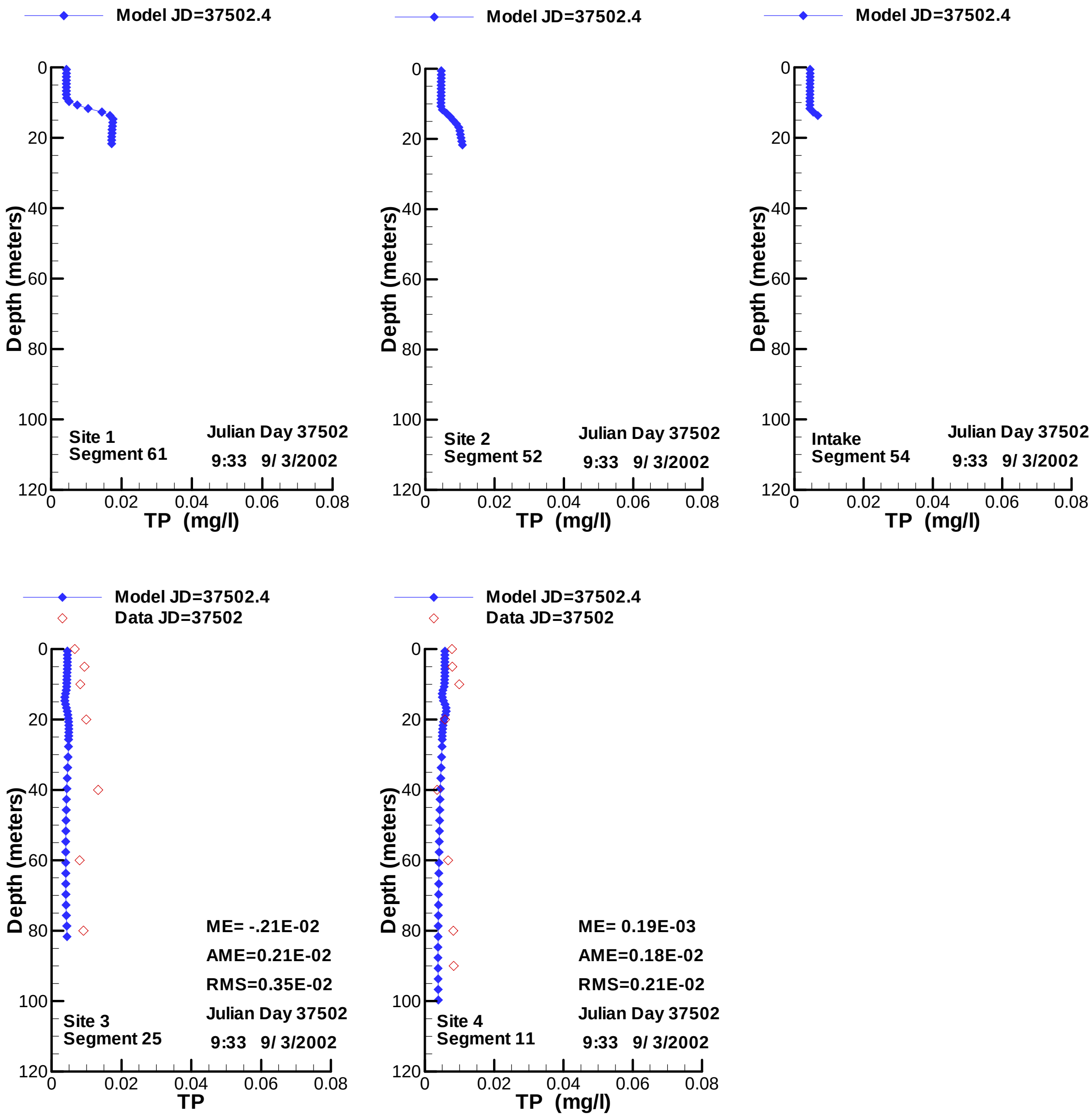

Figure 343. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/ 3/2002.

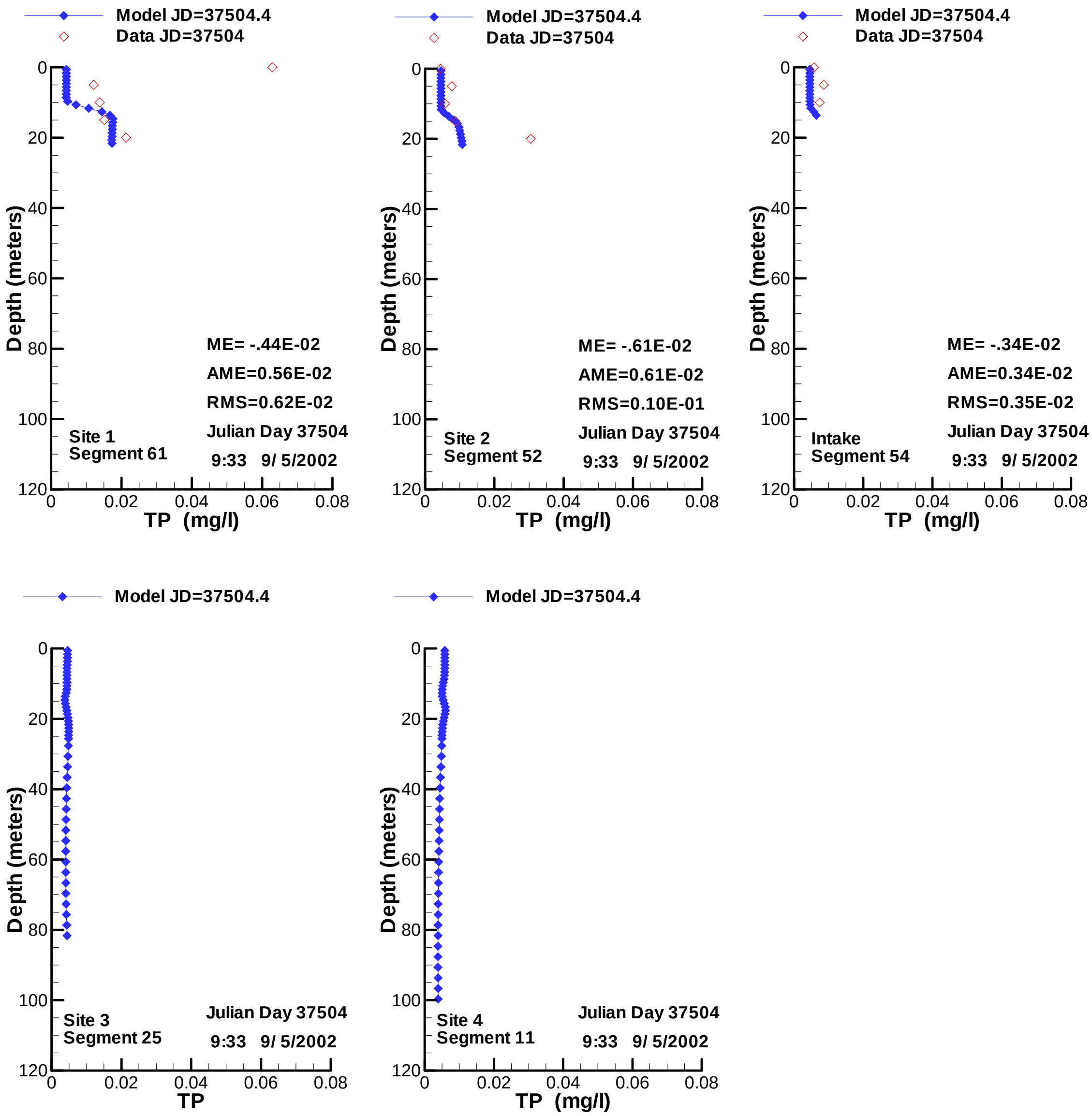

Figure 344. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/ 5/2002.

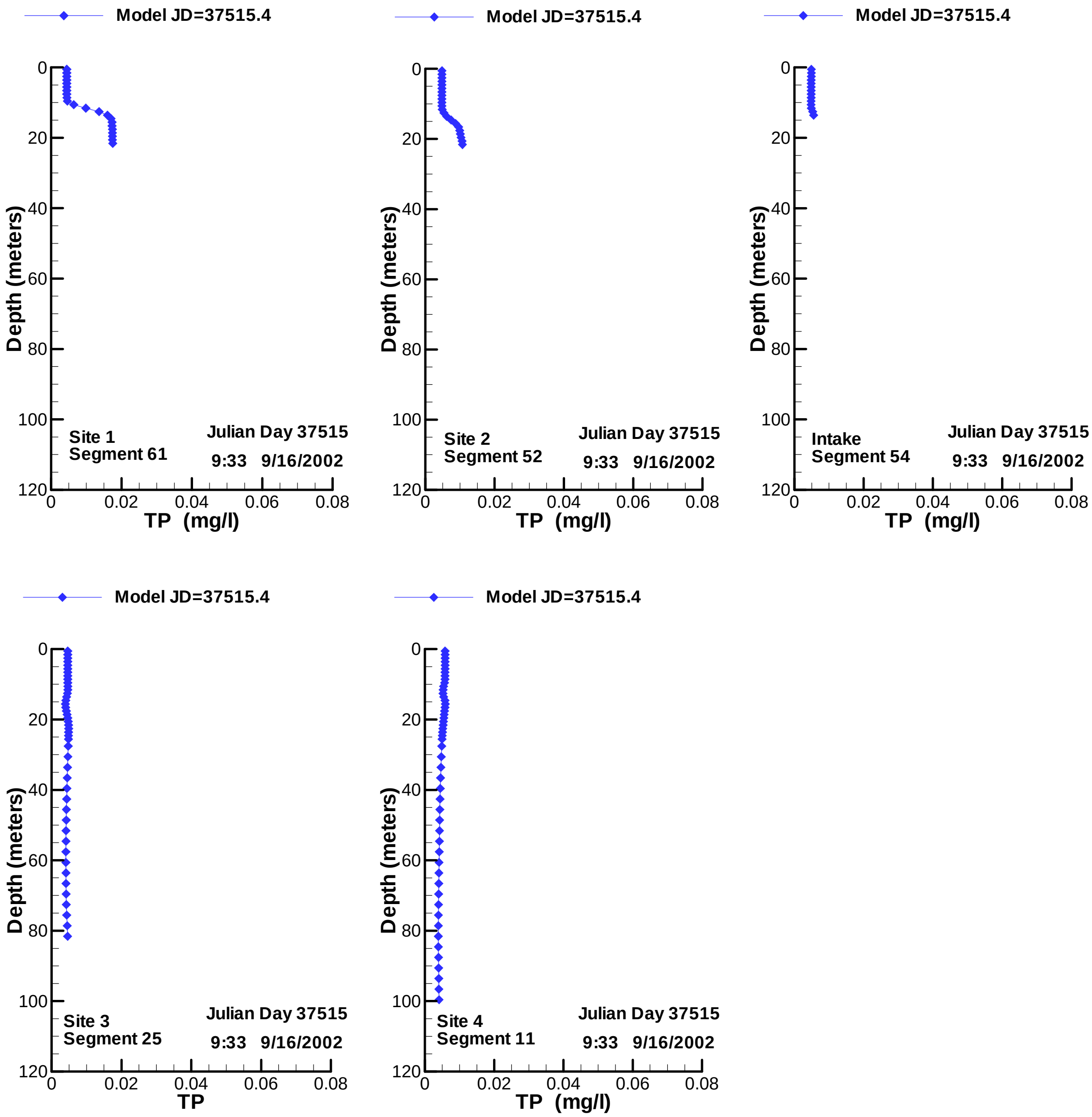

Figure 345. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/16/2002.

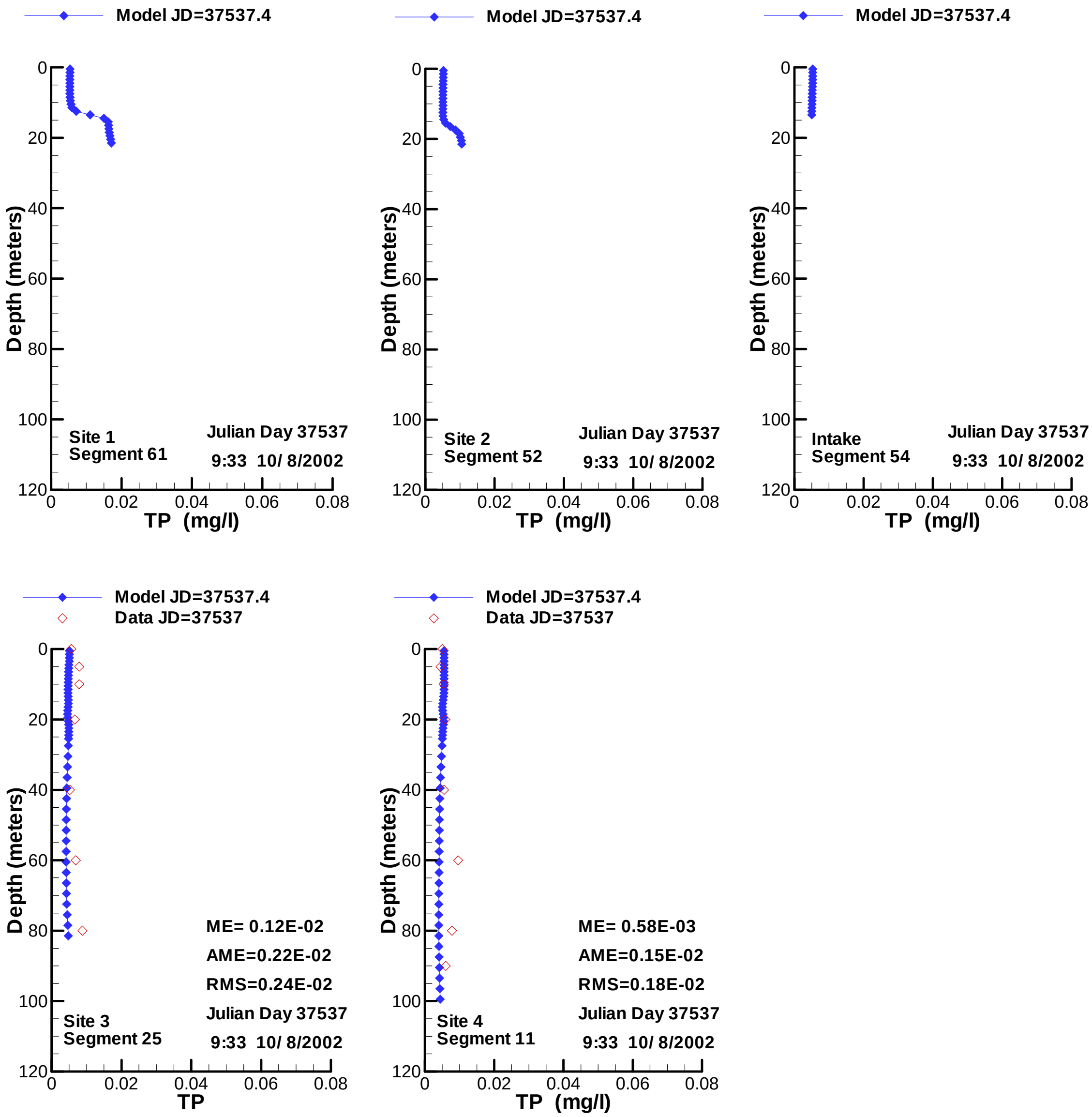

Figure 346. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 10/ 8/2002.

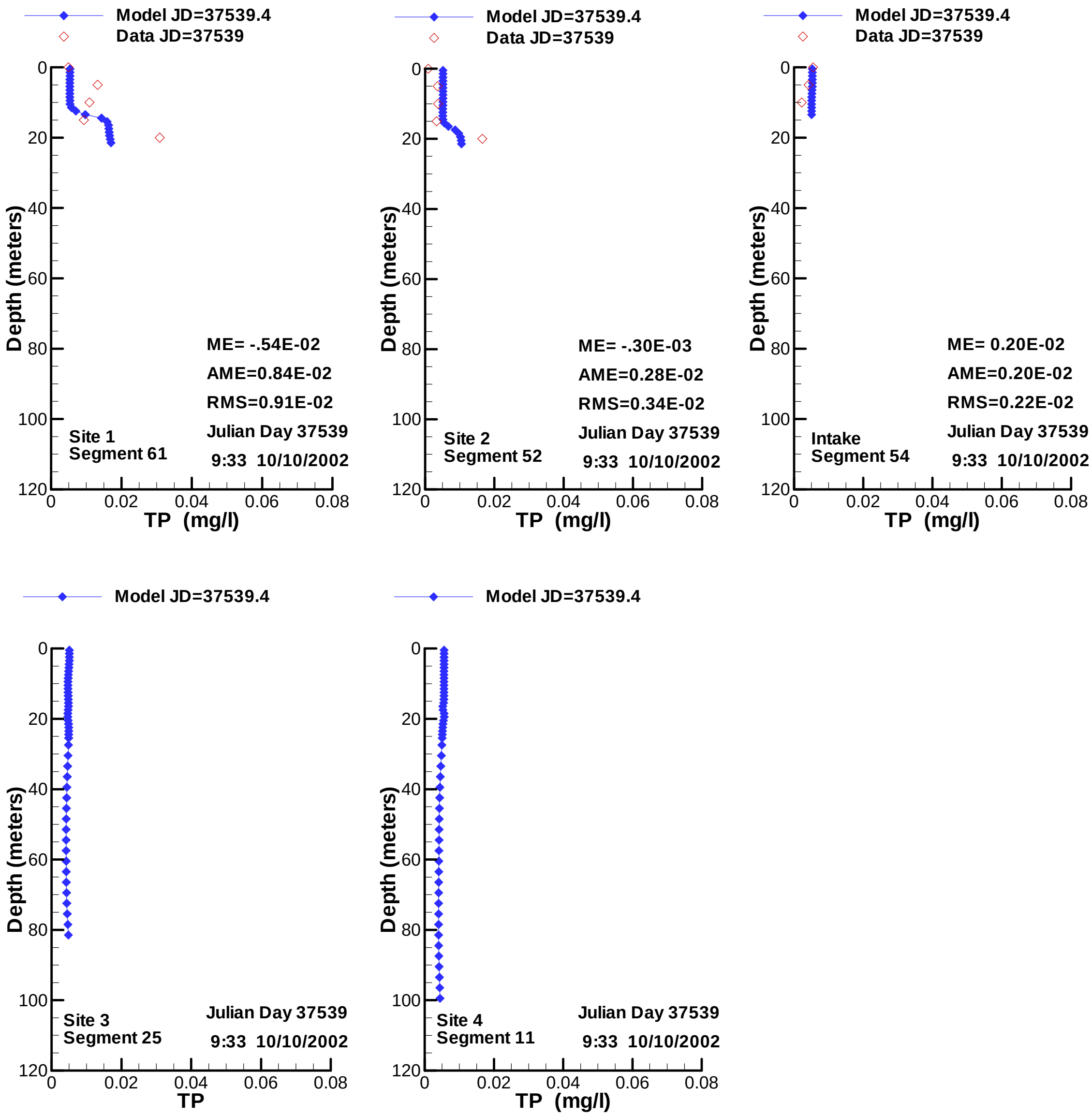

Figure 347. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 10/10/2002.

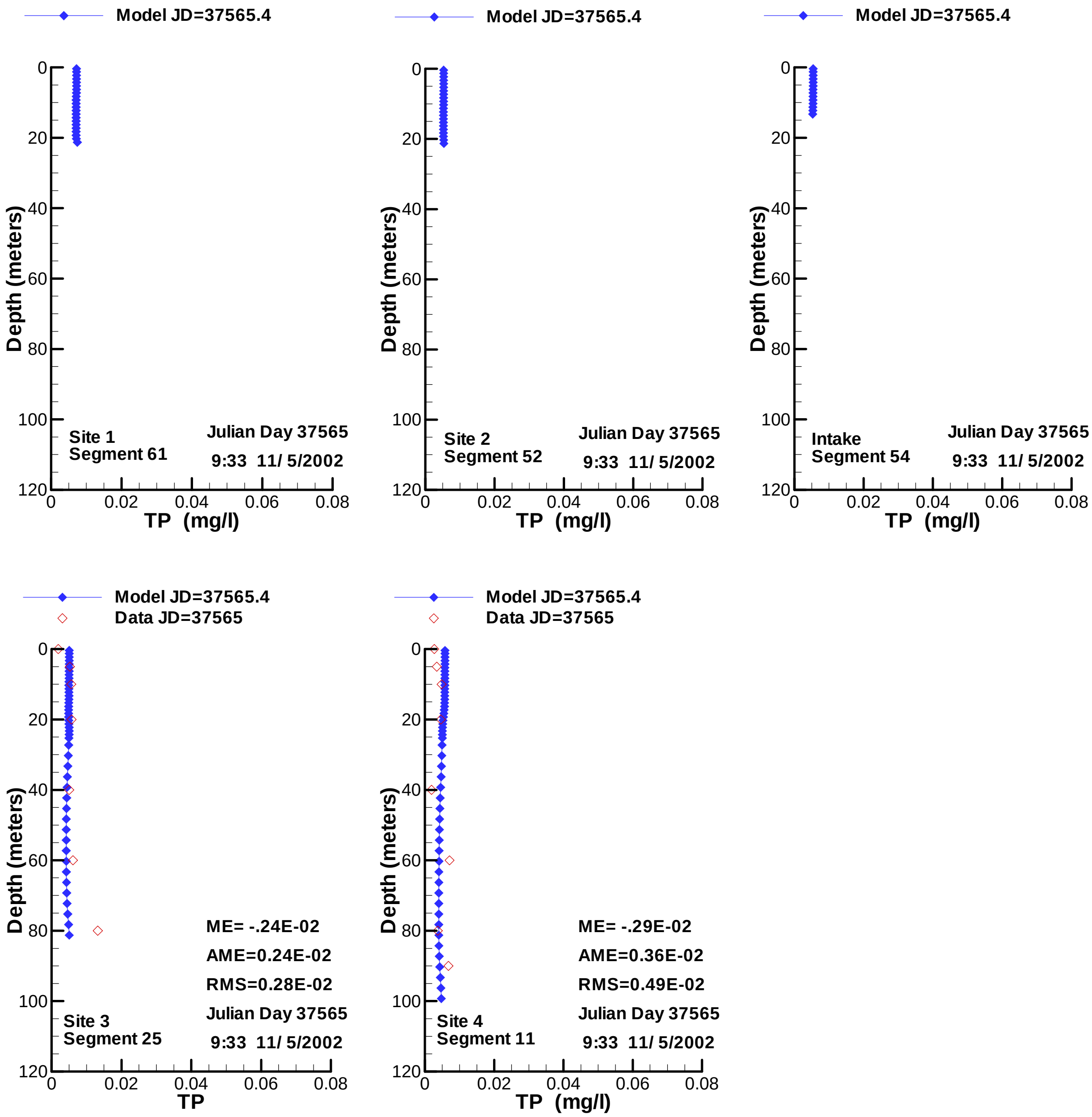

Figure 348. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 11/ 5/2002.

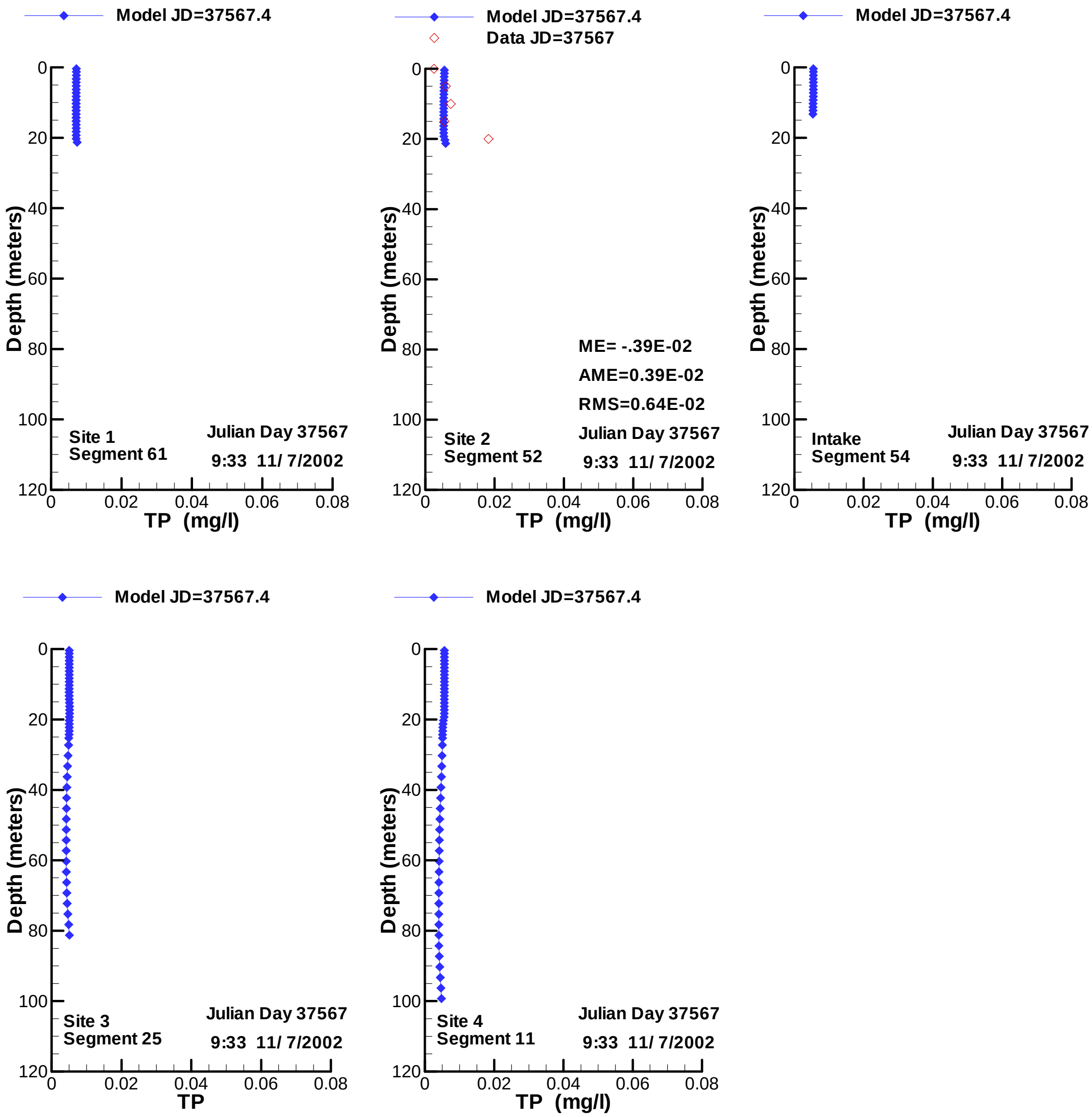

Figure 349. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 11/ 7/2002.

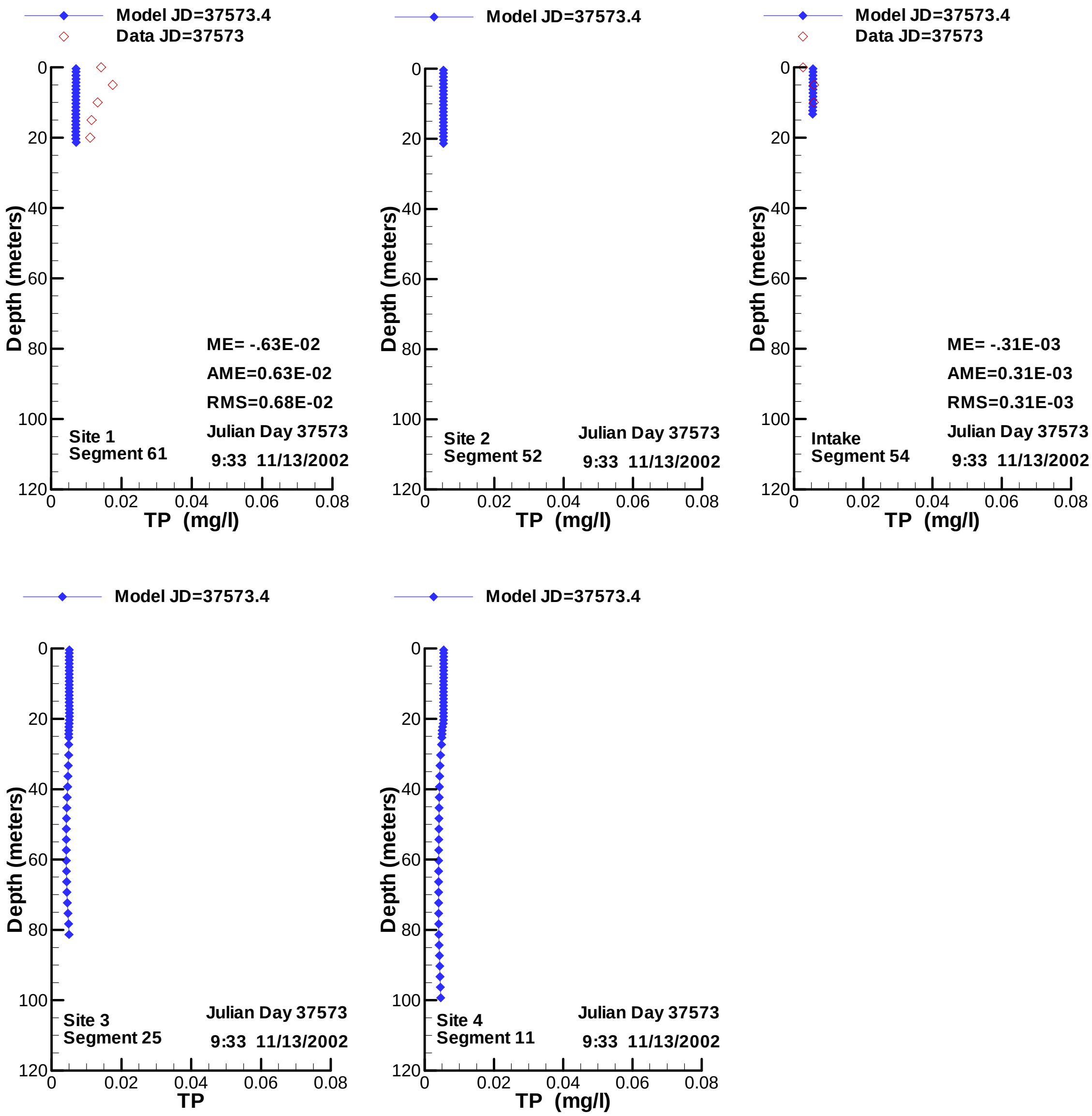

Figure 350. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 11/13/2002.

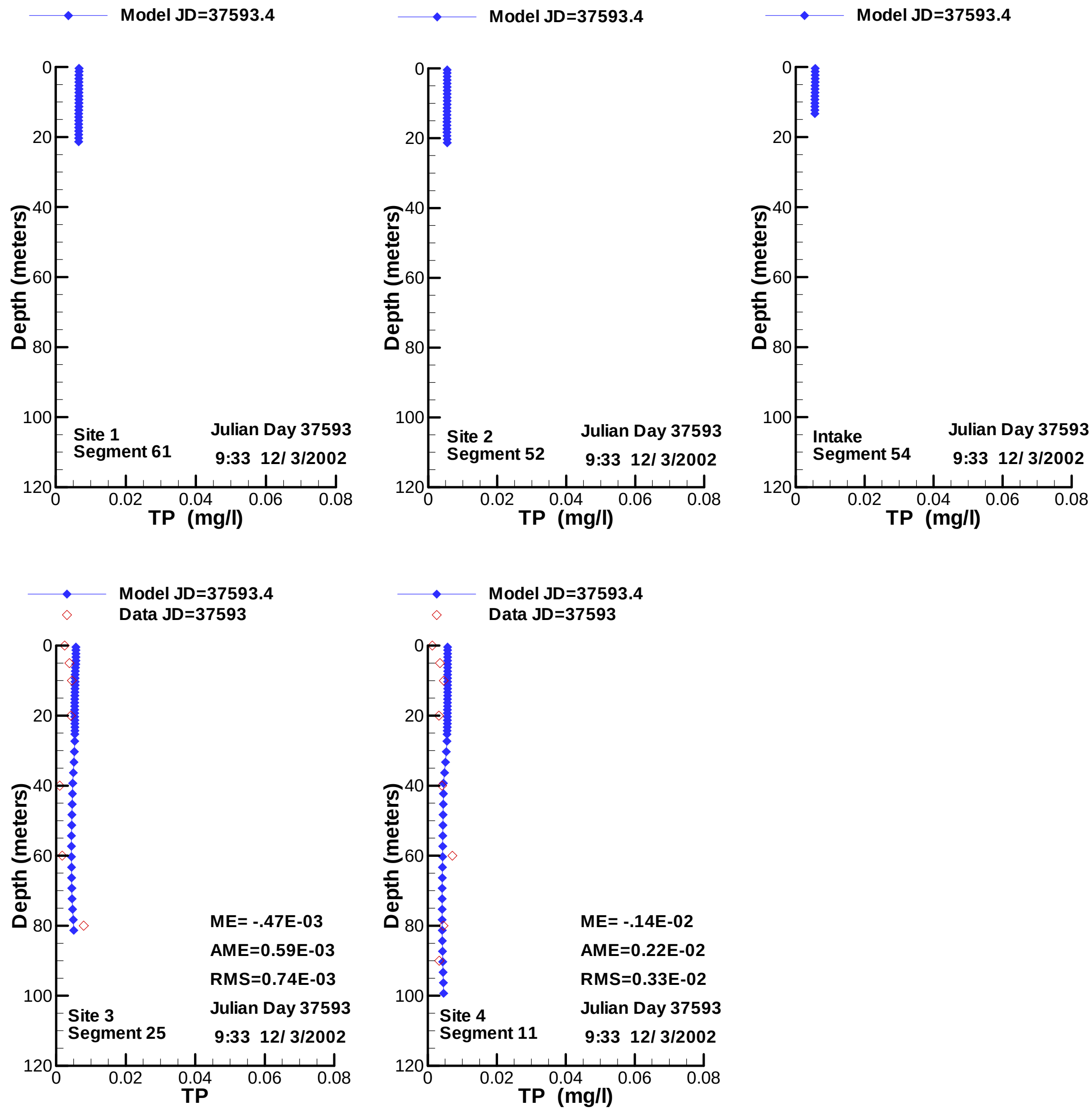

Figure 351. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 12/ 3/2002.

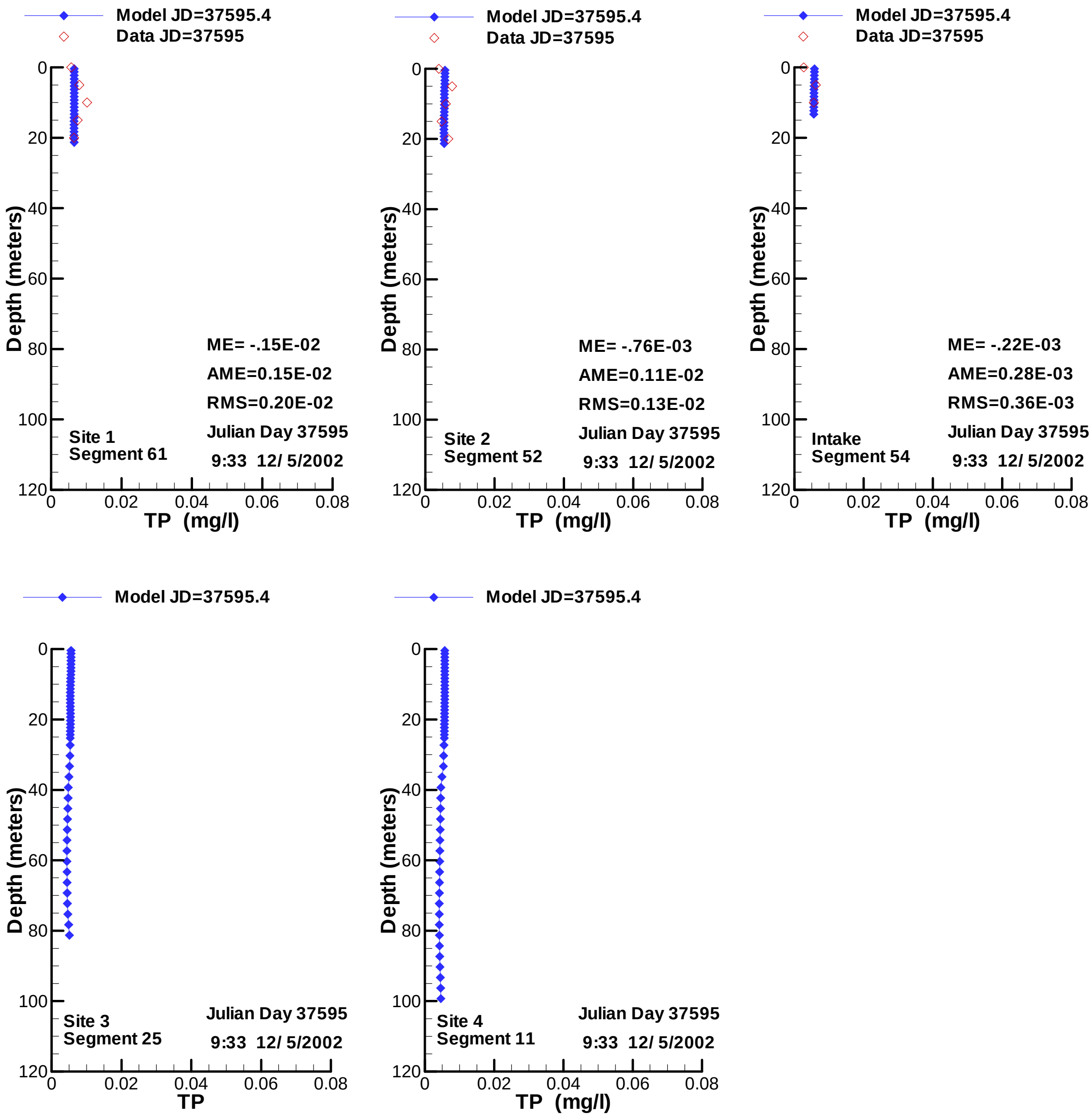

Figure 352. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 12/ 5/2002.

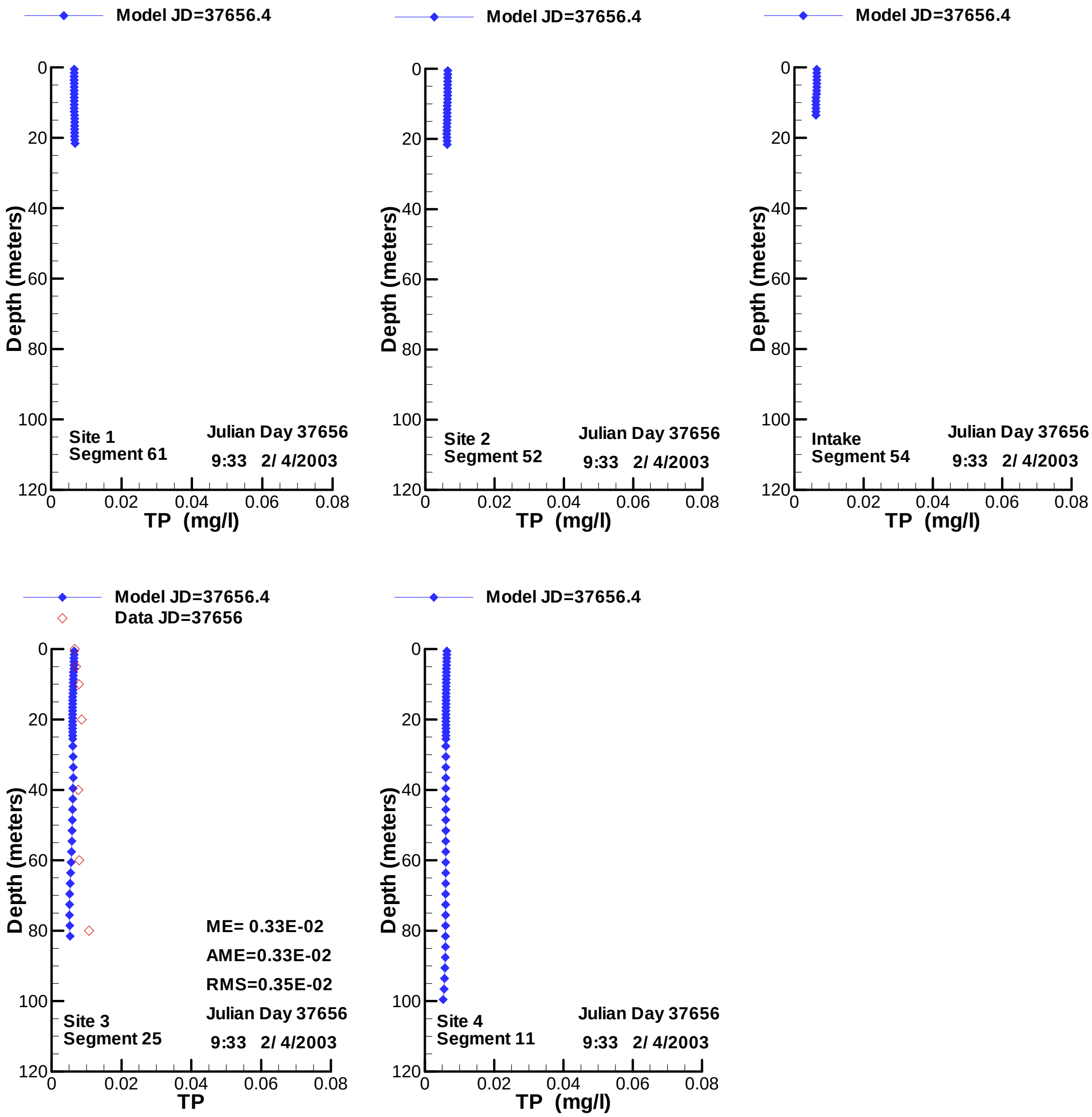

Figure 353. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 2/ 4/2003.

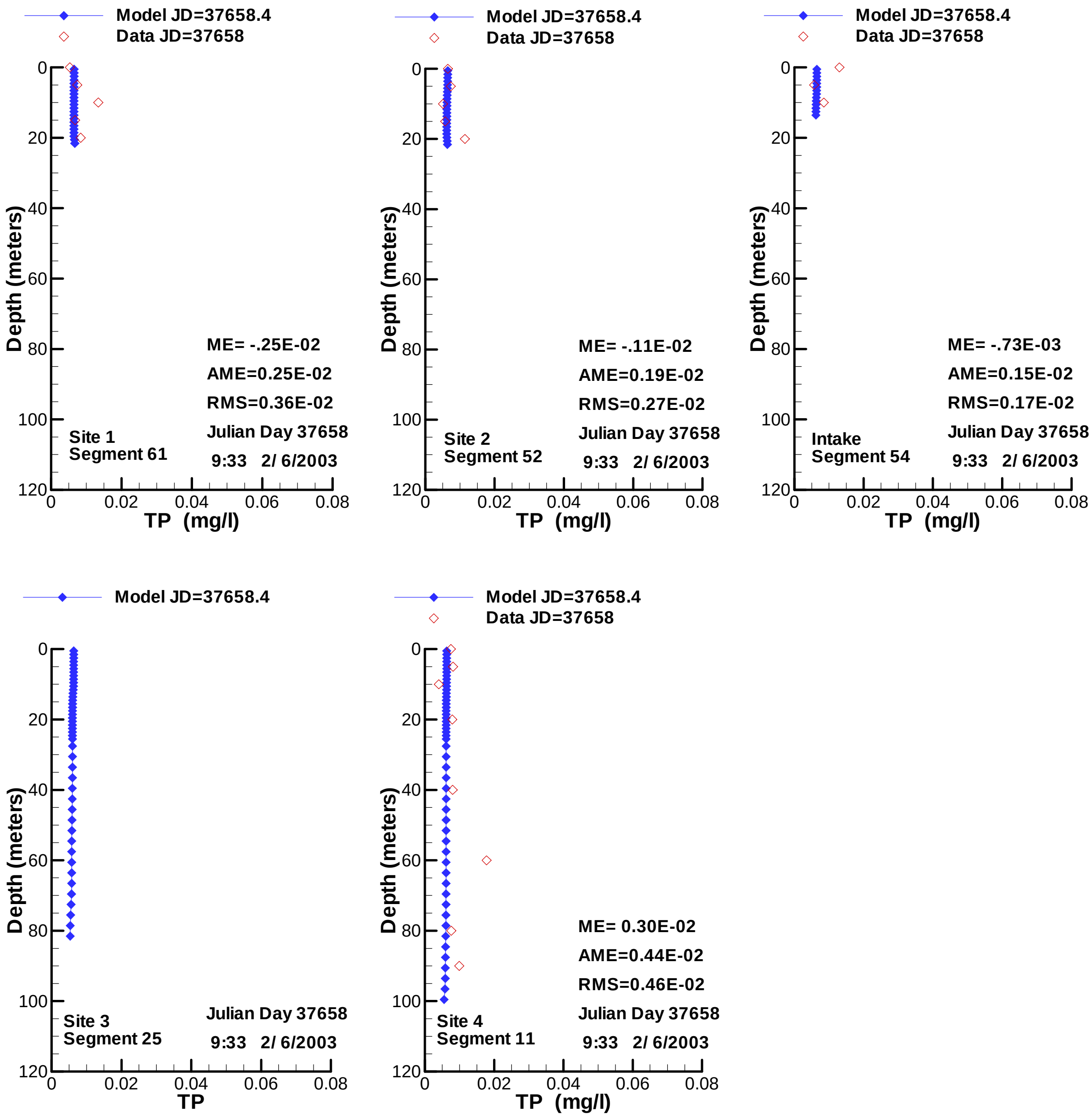

Figure 354. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 2/ 6/2003.

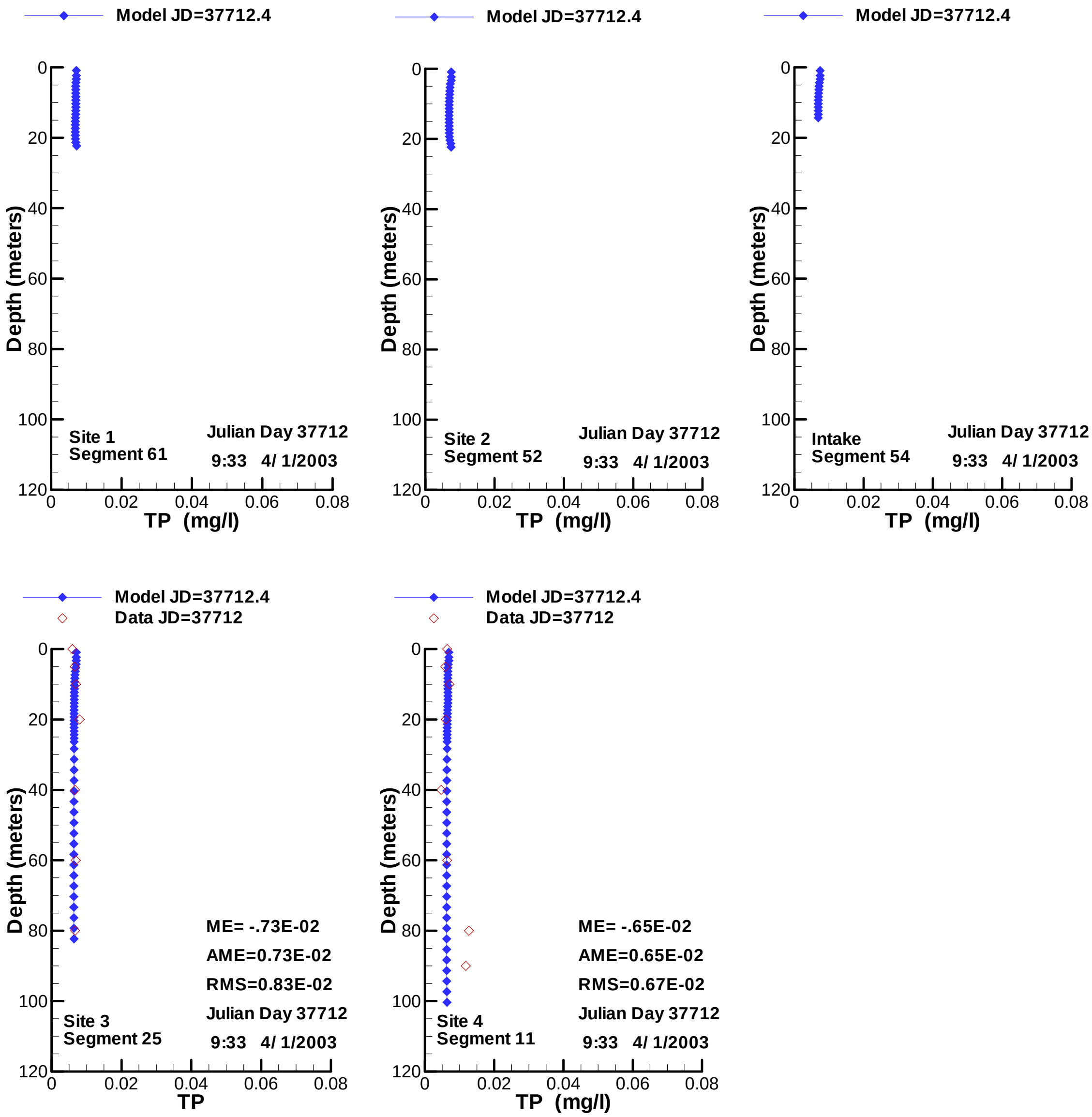

Figure 355. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 4/ 1/2003.

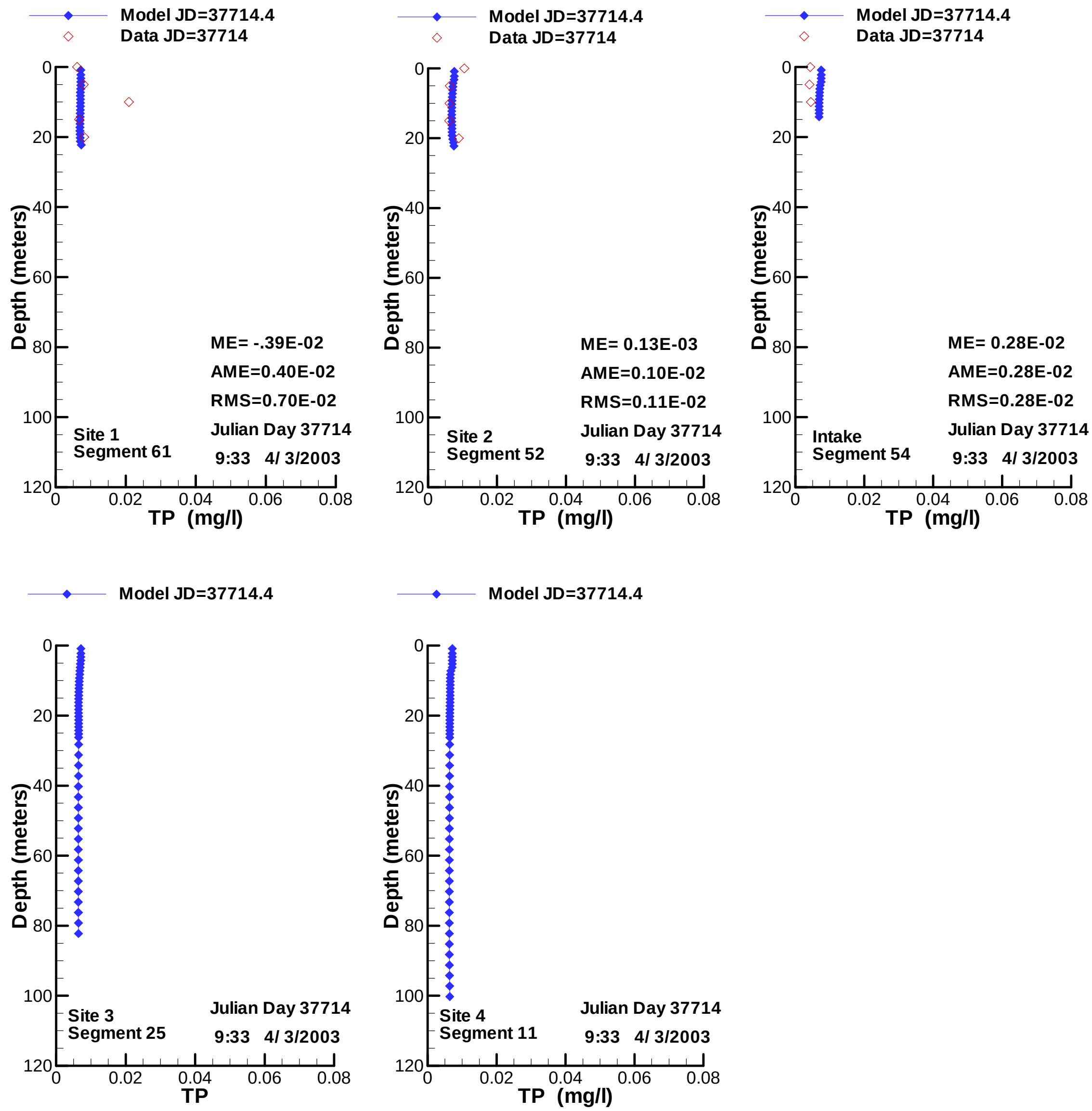

Figure 356. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 4/ 3/2003.

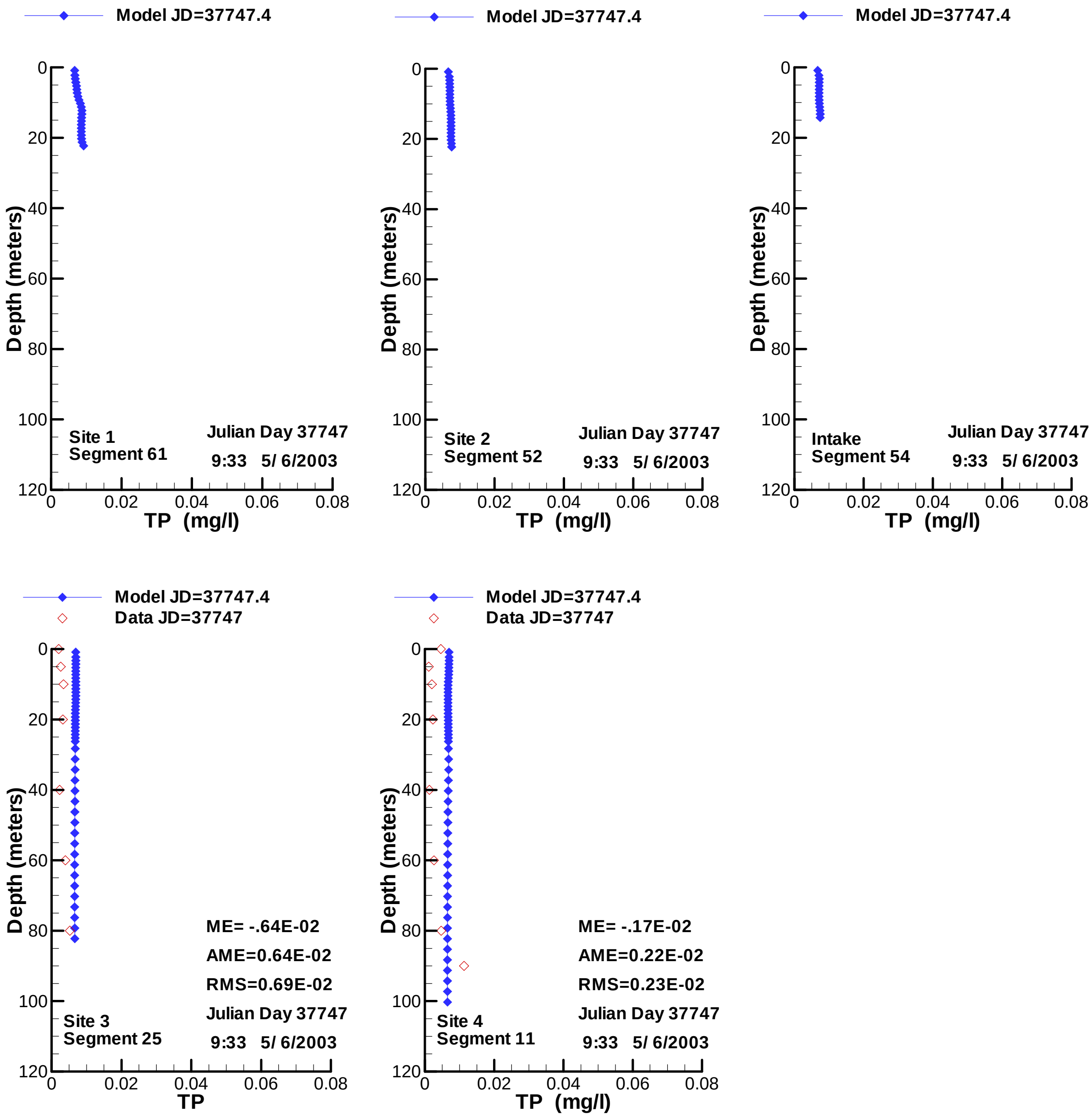

Figure 357. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 5/ 6/2003.

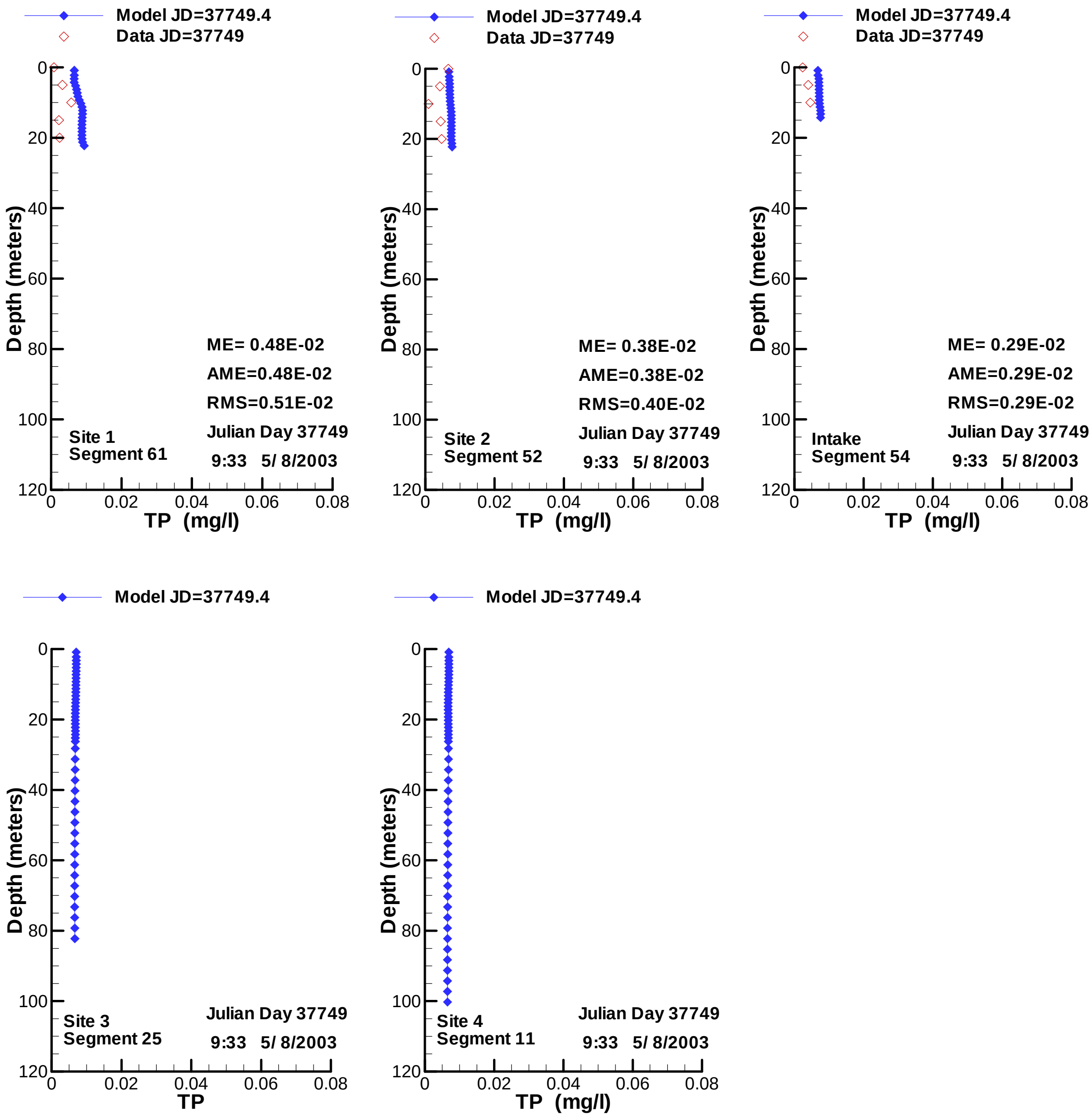

Figure 358. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 5/ 8/2003.

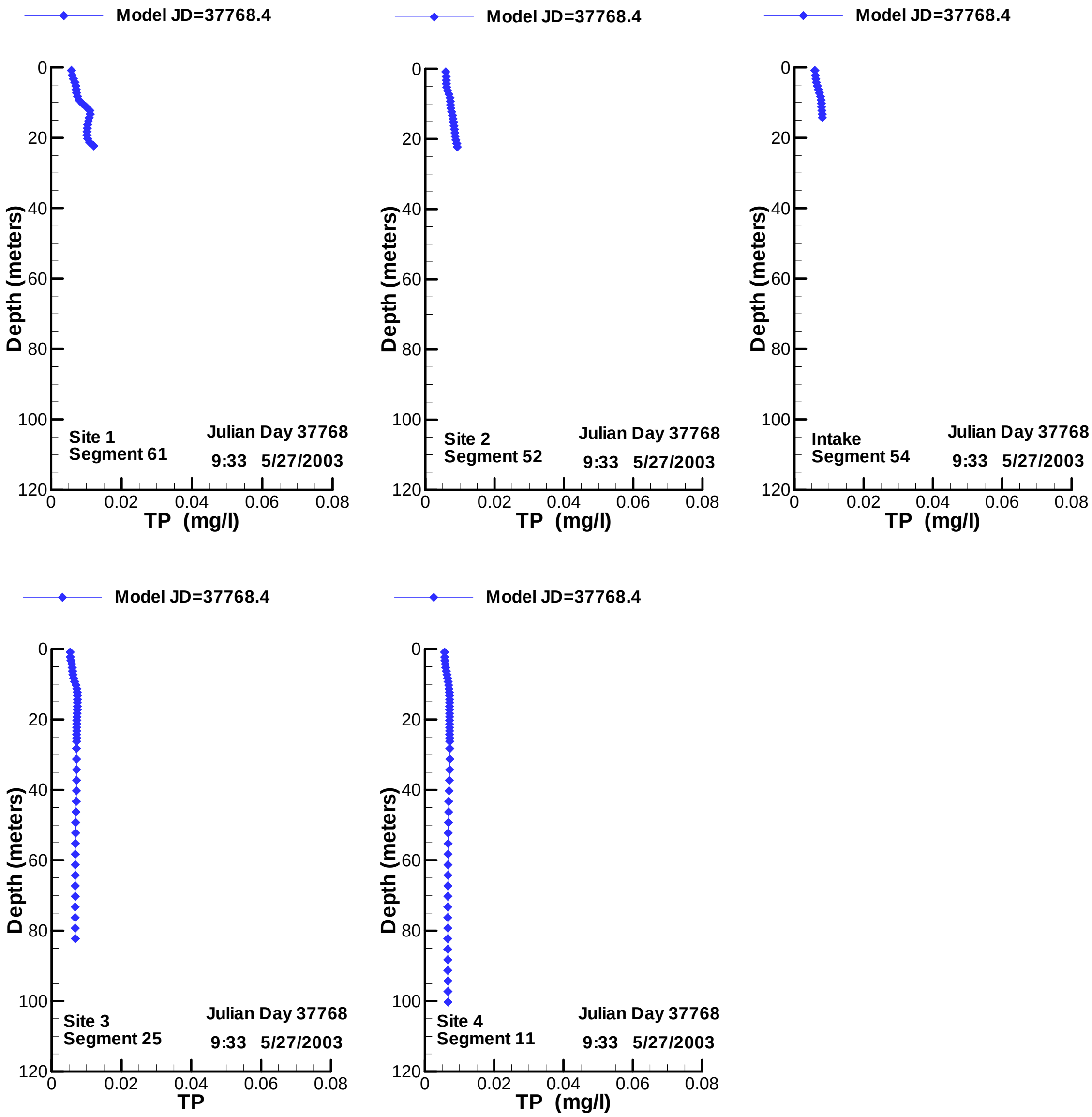

Figure 359. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 5/27/2003.

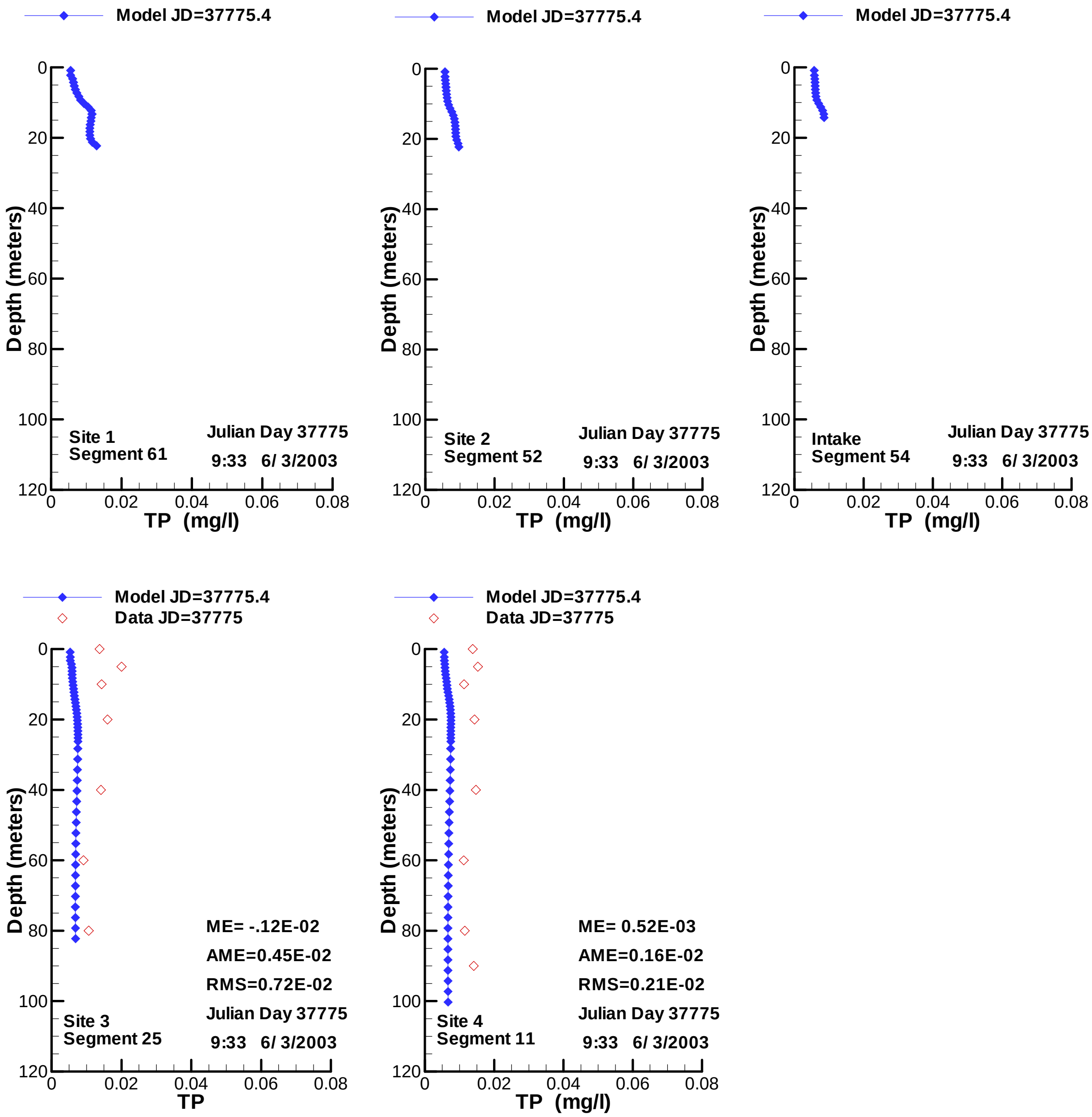

Figure 360. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 6/ 3/2003.

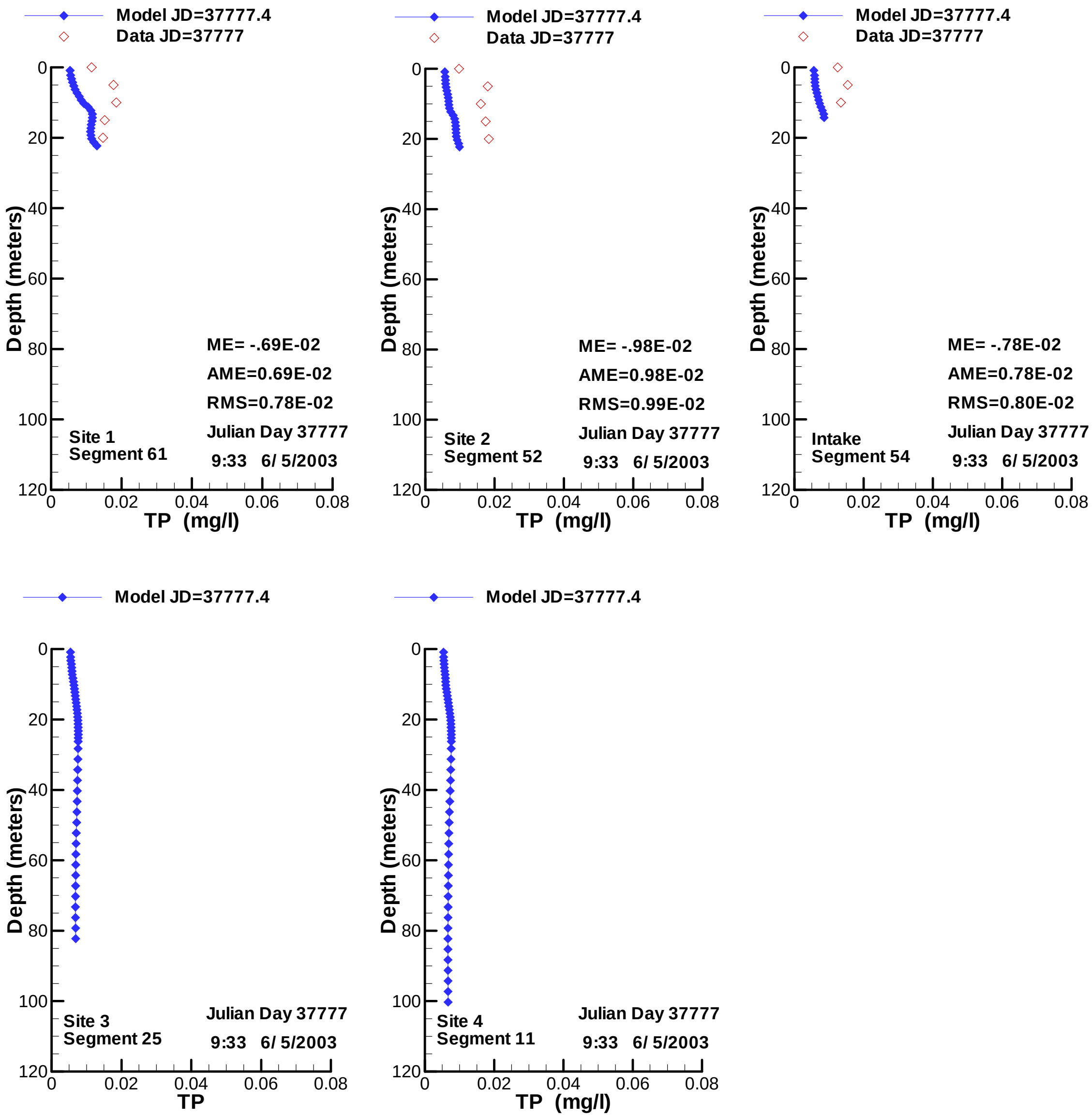

Figure 361. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 6/ 5/2003.

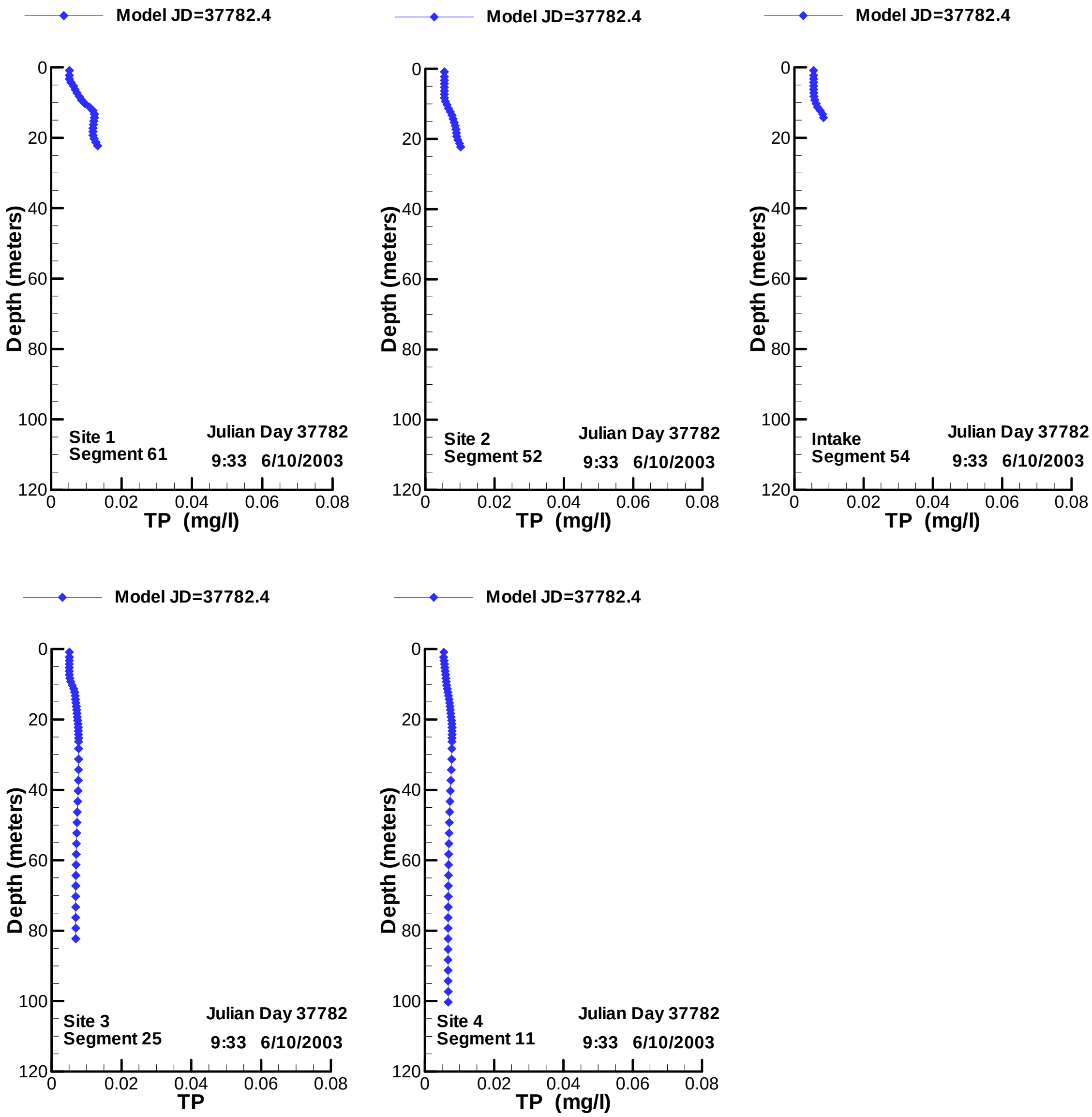

Figure 362. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 6/10/2003.

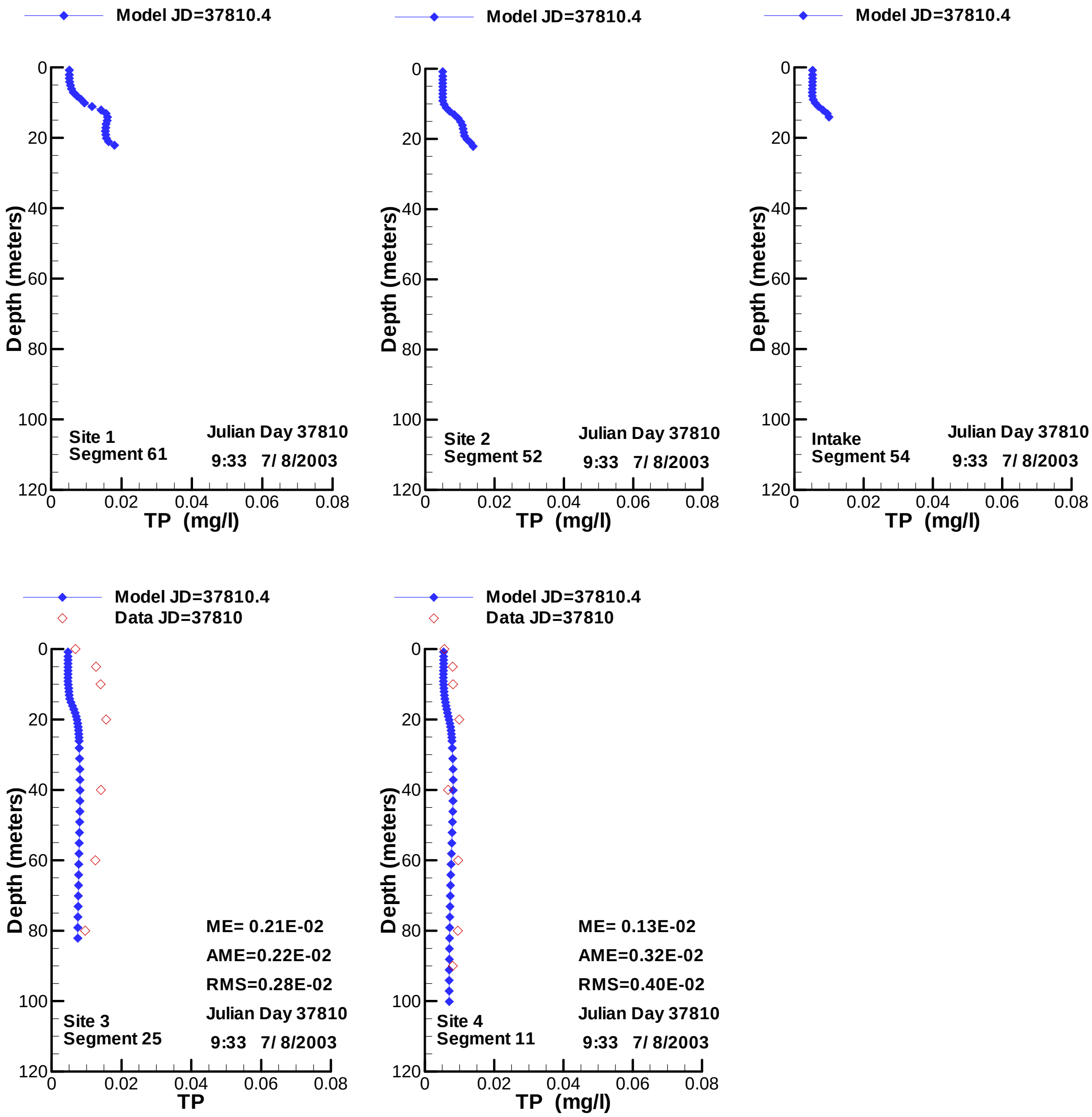

Figure 363. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/ 8/2003.

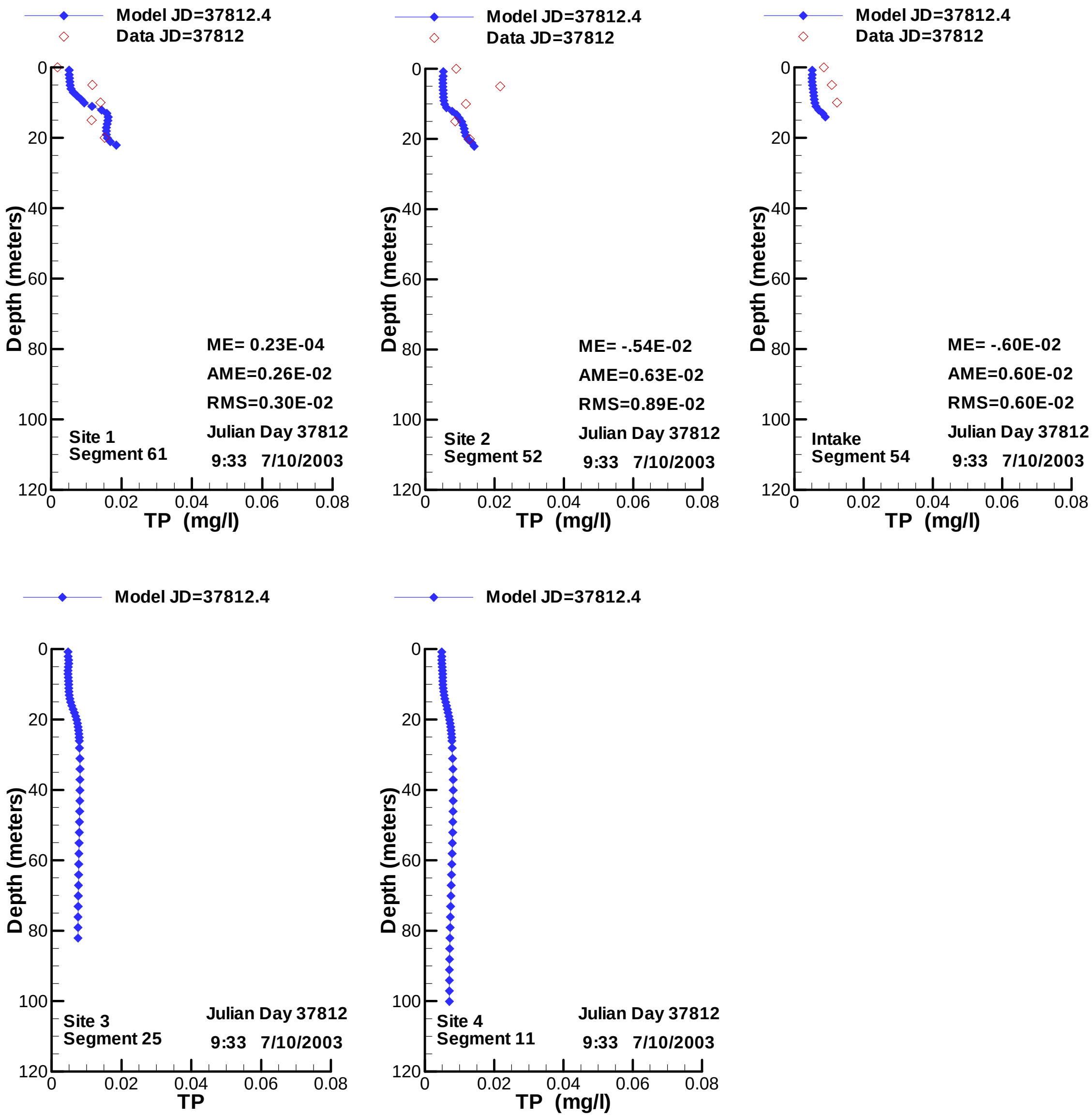

Figure 364. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/10/2003.

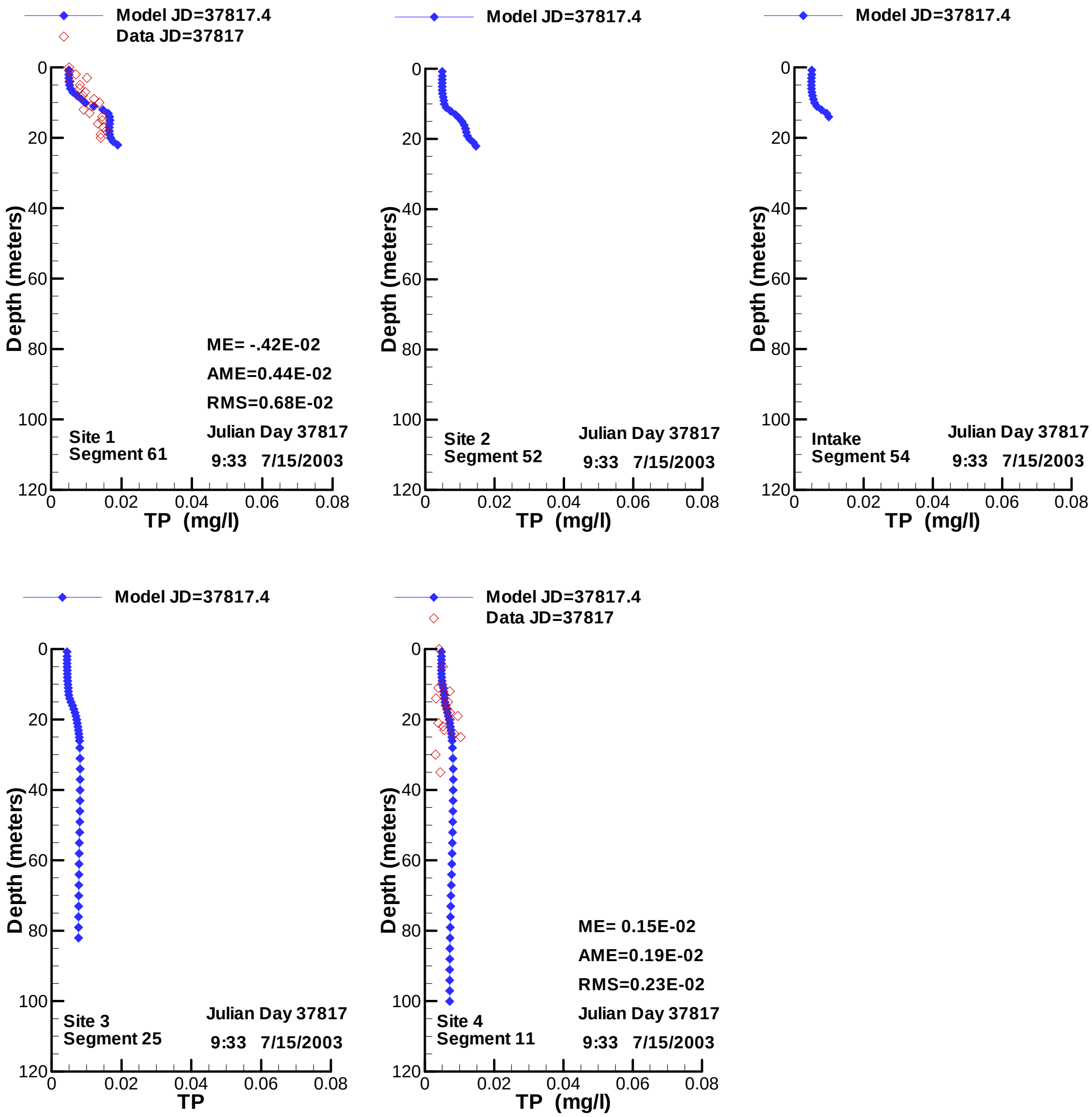

Figure 365. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/15/2003.

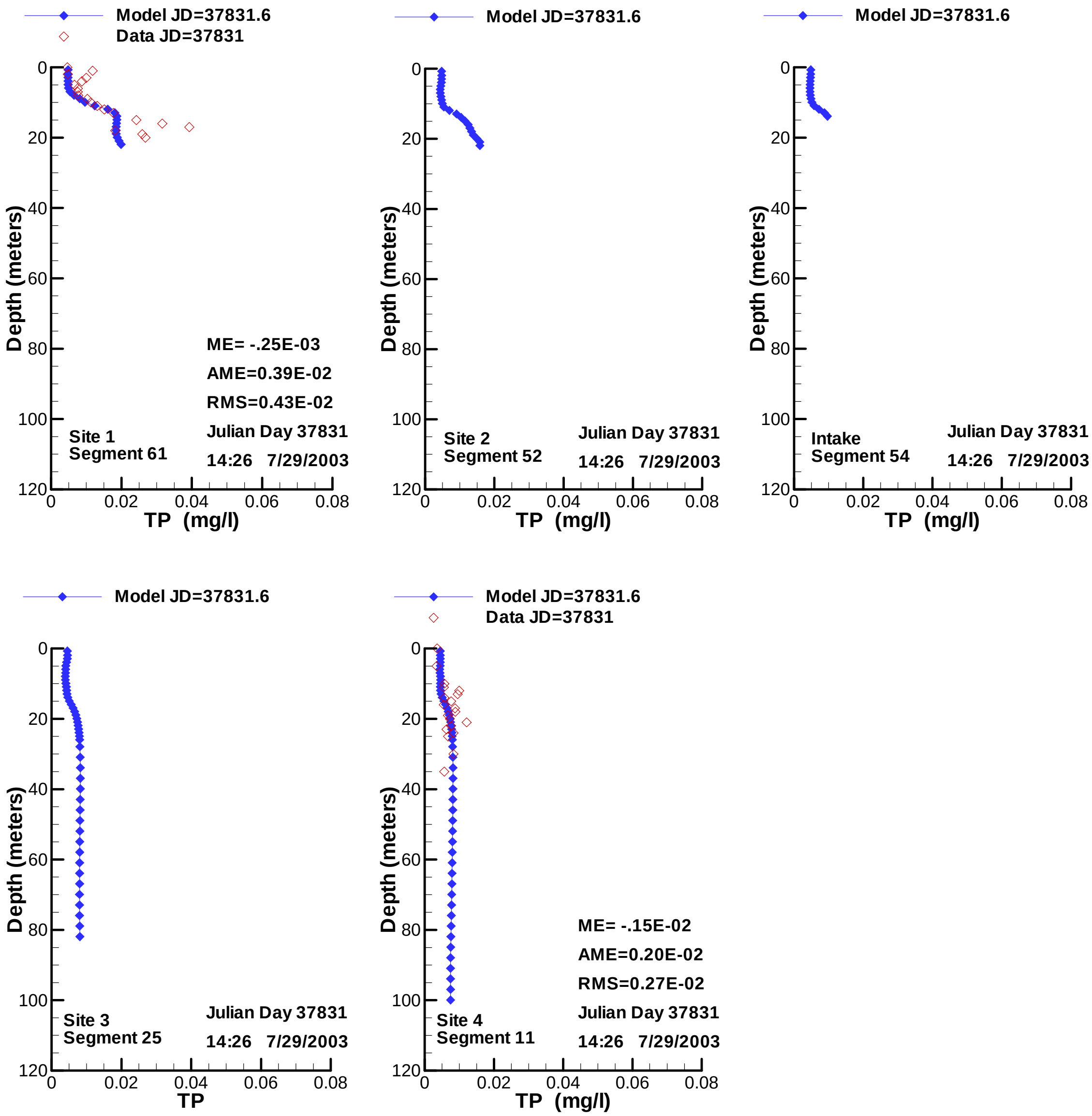

Figure 366. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 7/29/2003.

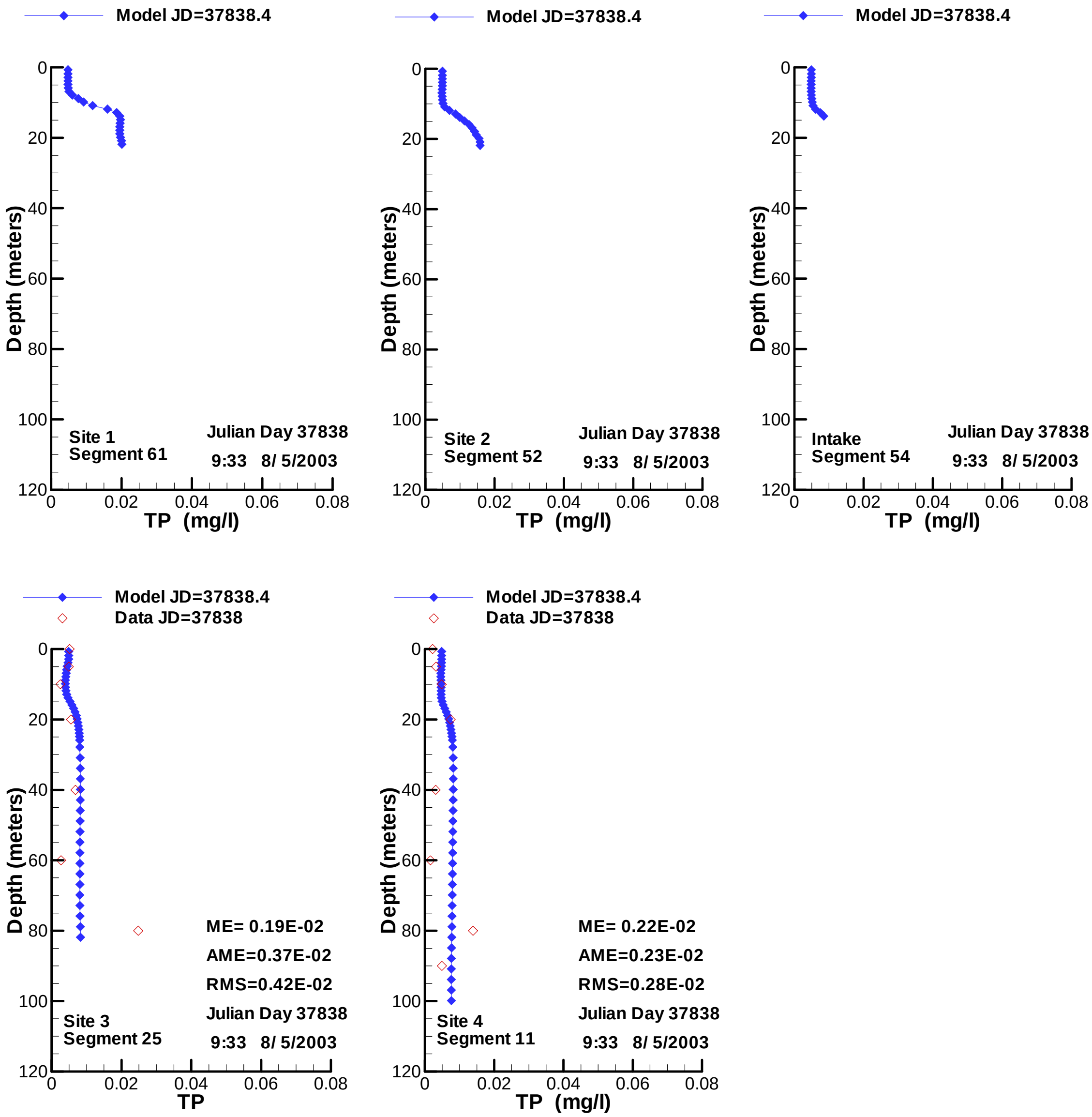

Figure 367. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/ 5/2003.

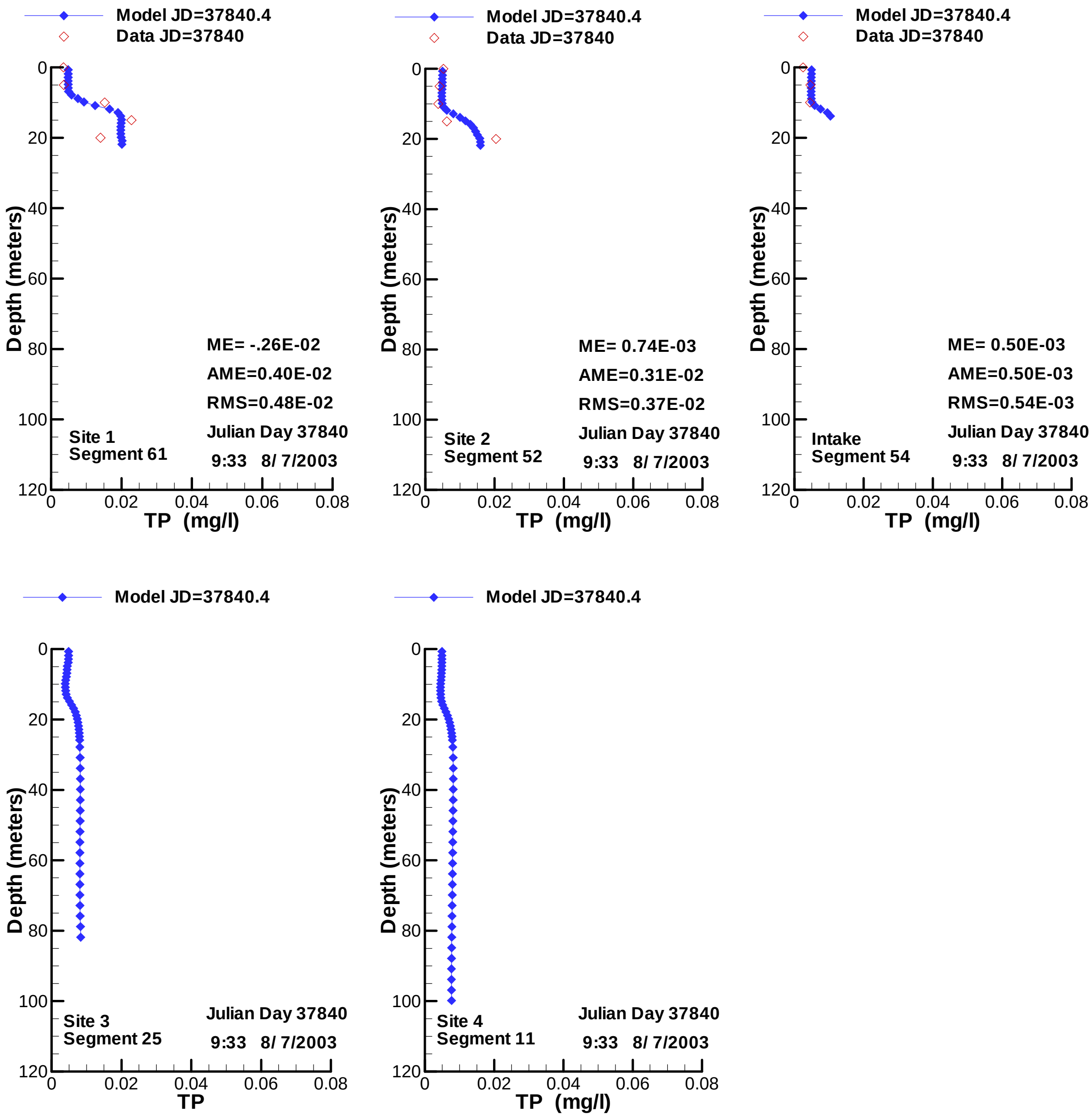

Figure 368. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/ 7/2003.

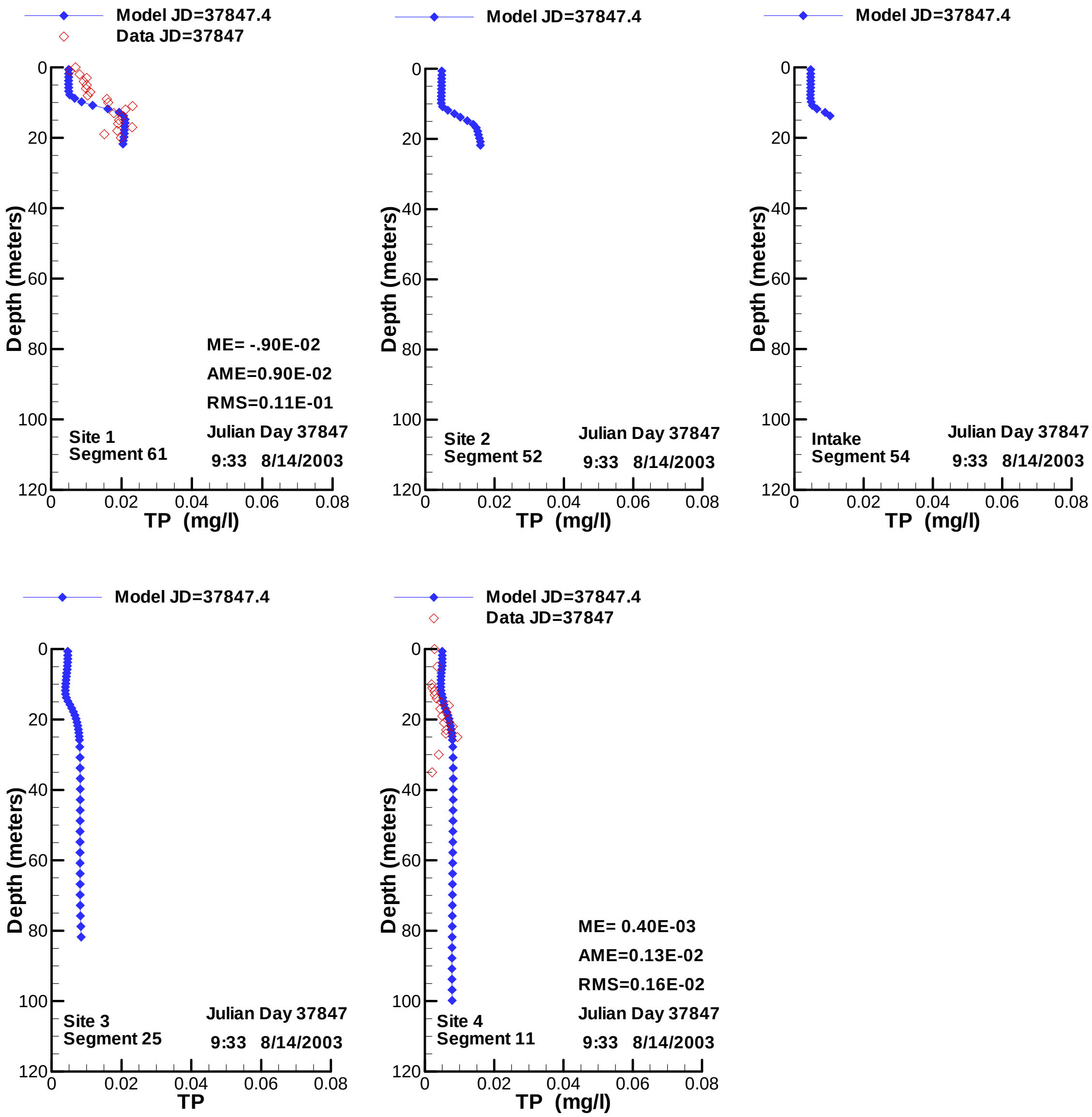

Figure 369. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/14/2003.

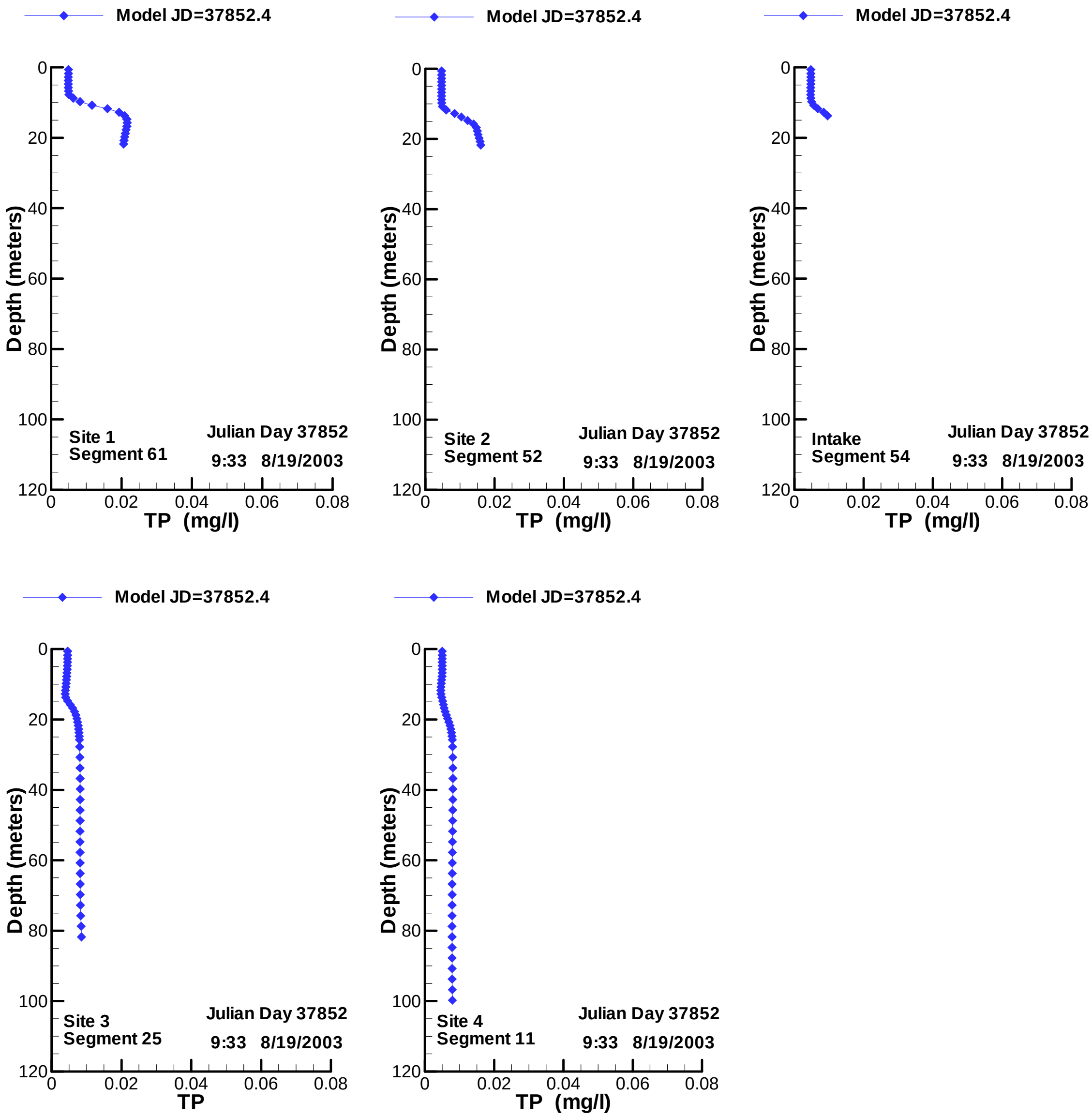

Figure 370. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/19/2003.

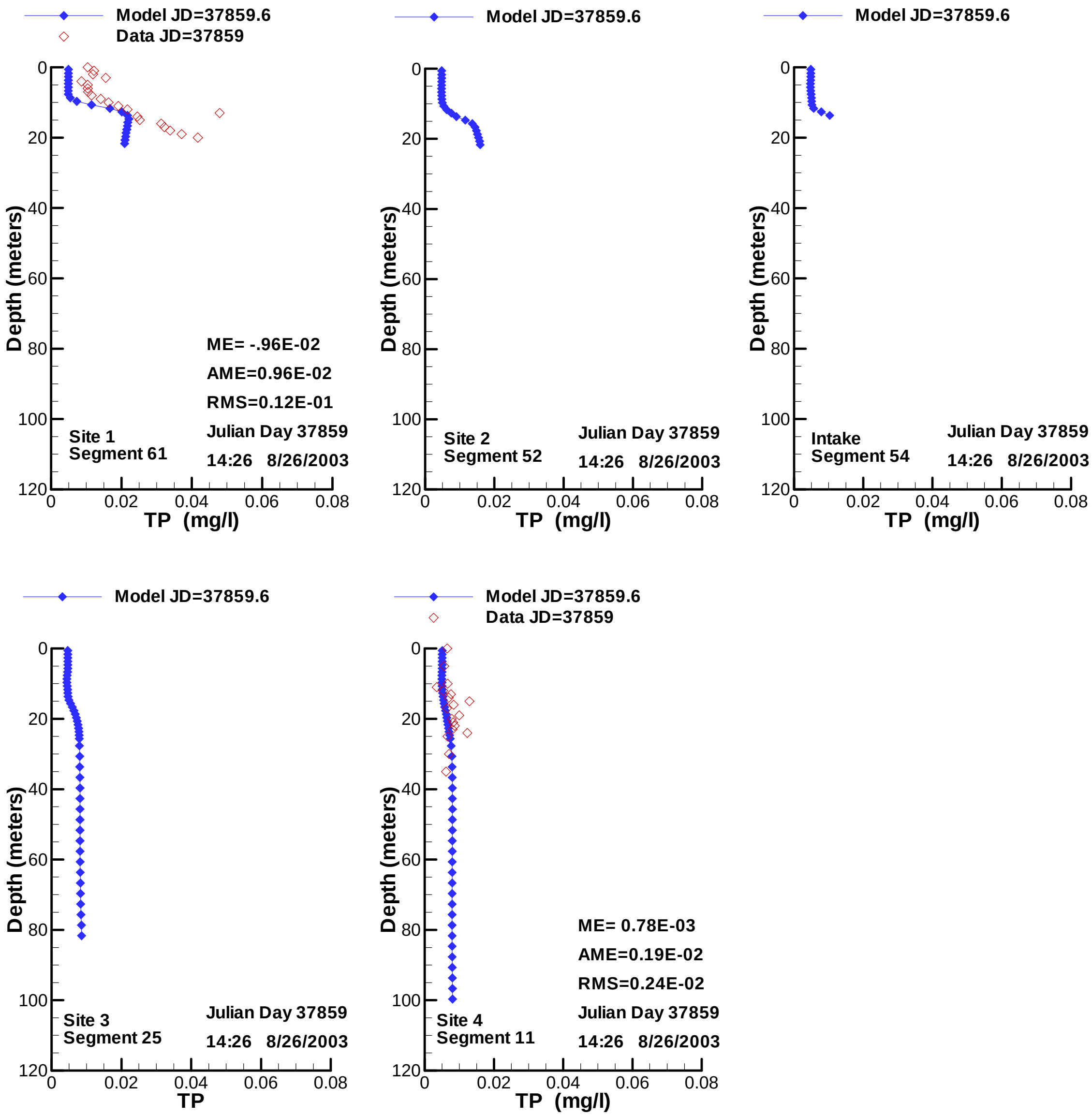

Figure 371. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 8/26/2003.

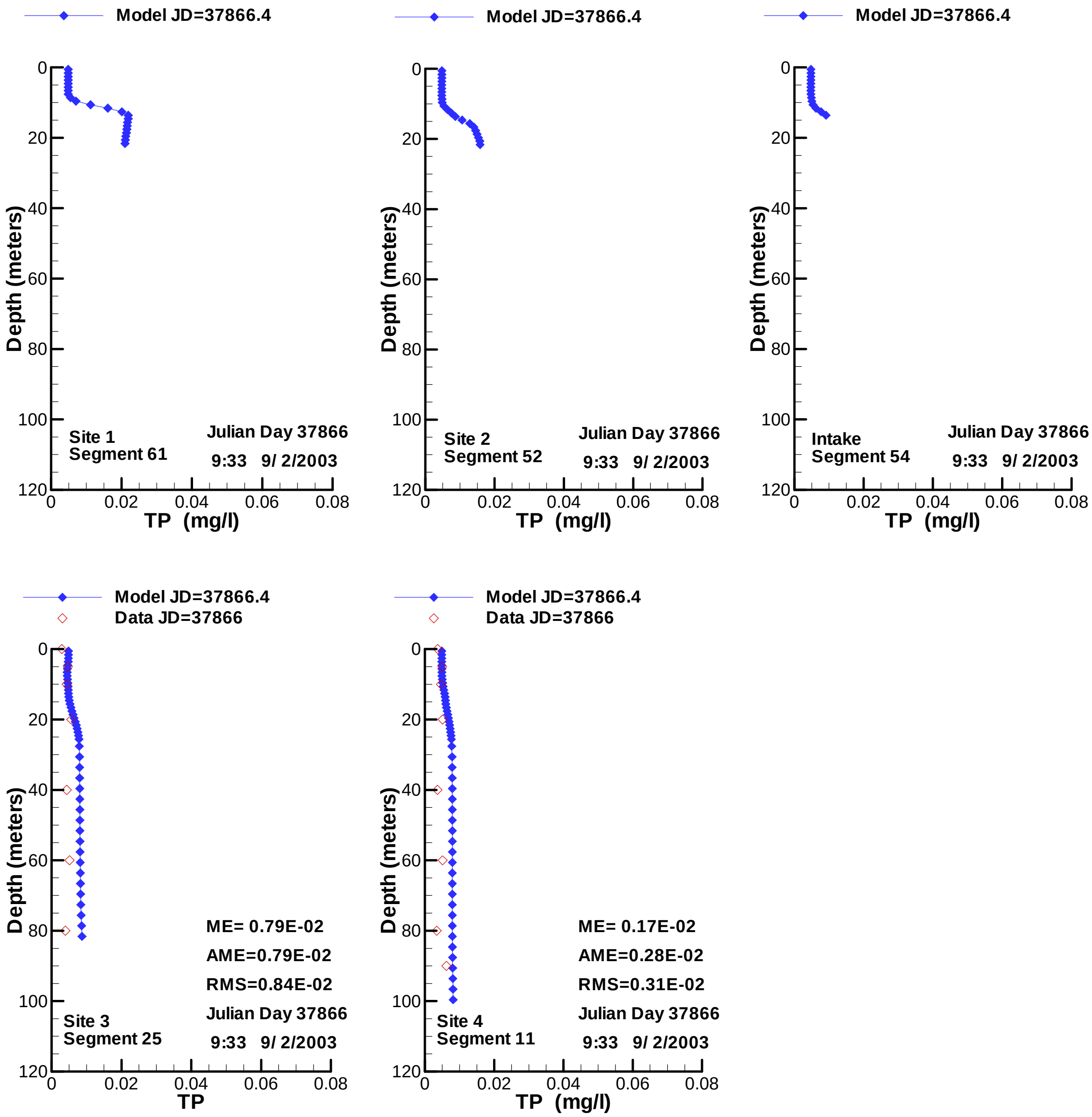

Figure 372. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/ 2/2003.

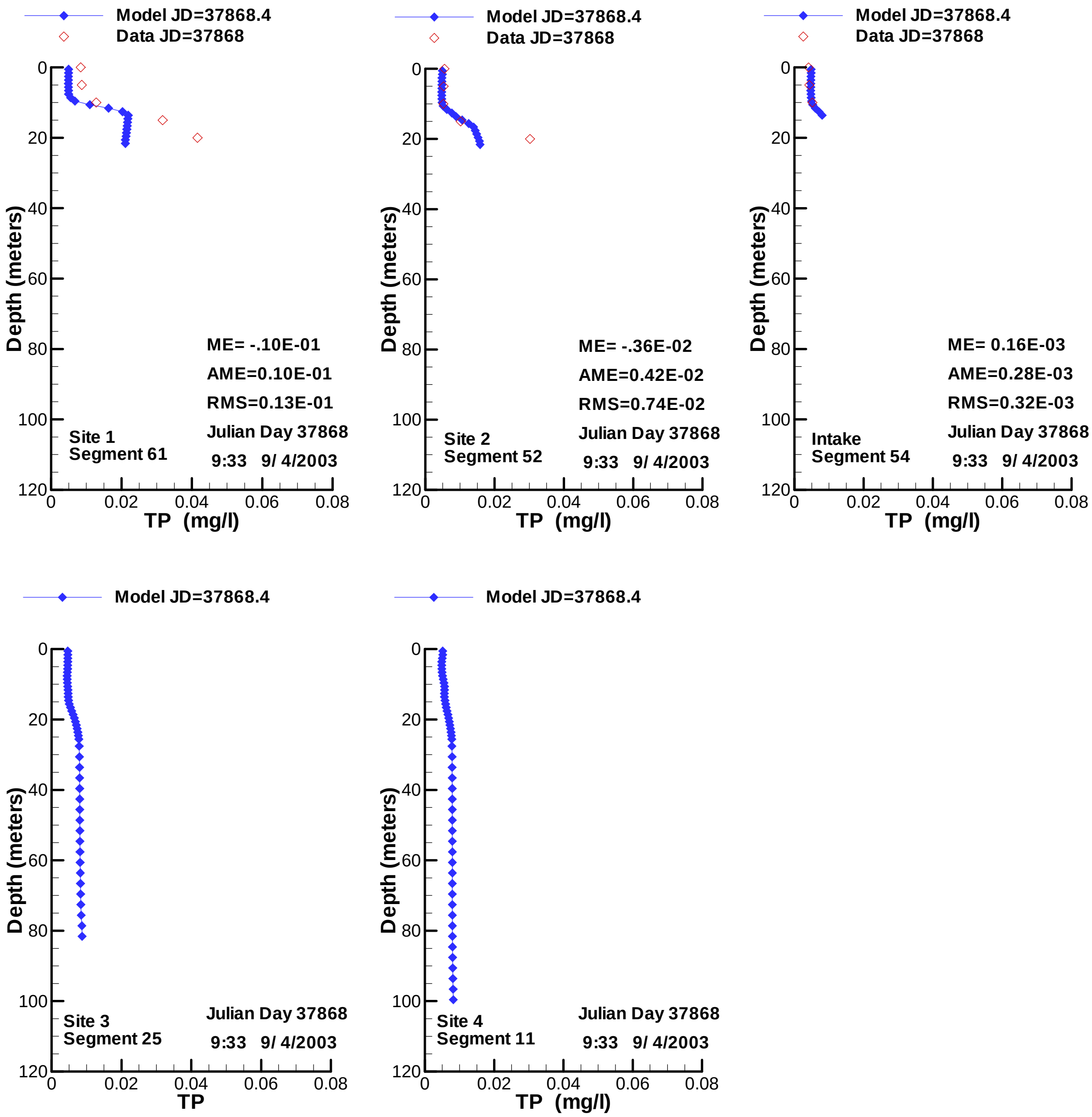

Figure 373. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/ 4/2003.

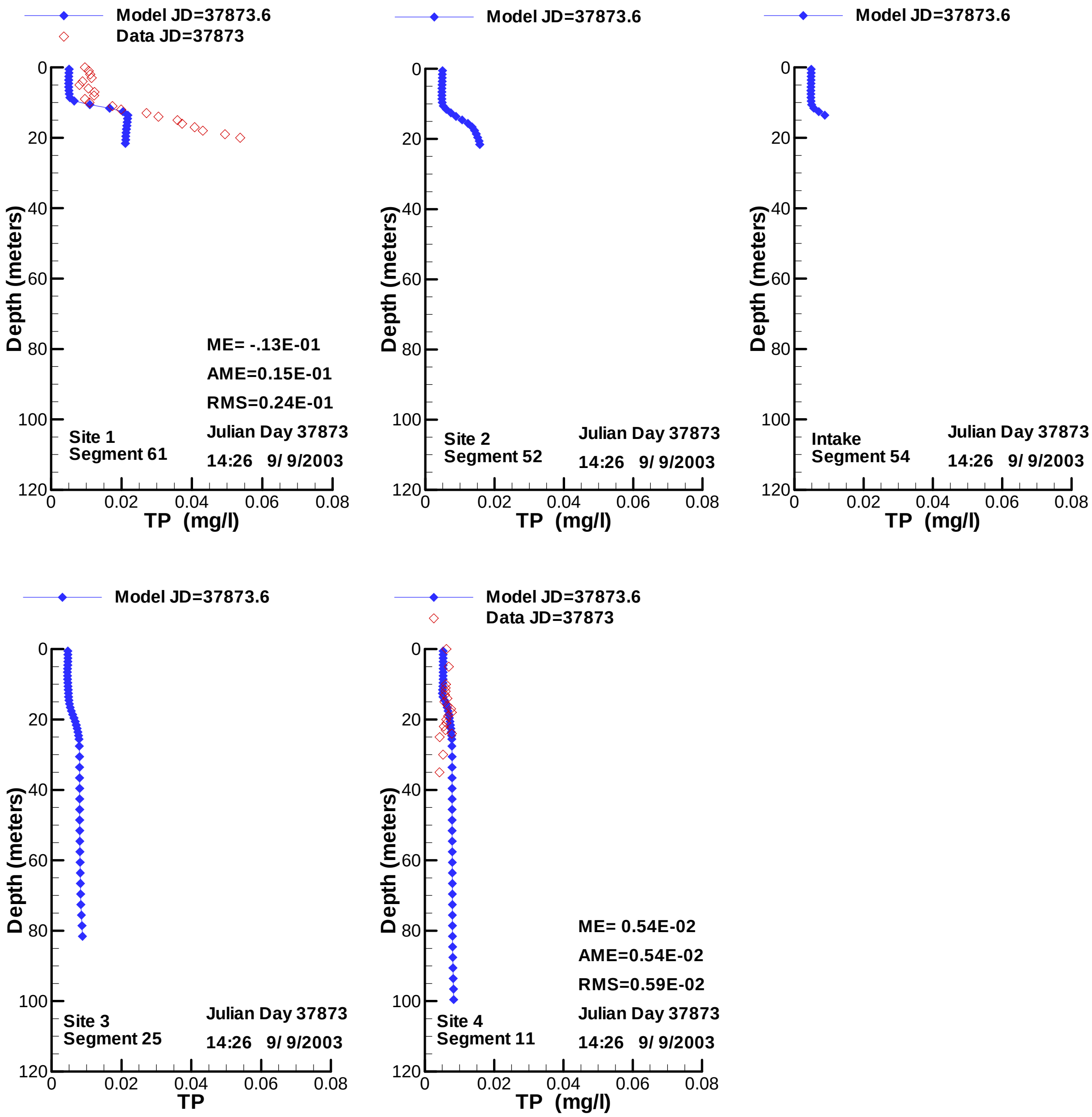

Figure 374. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/ 9/2003.

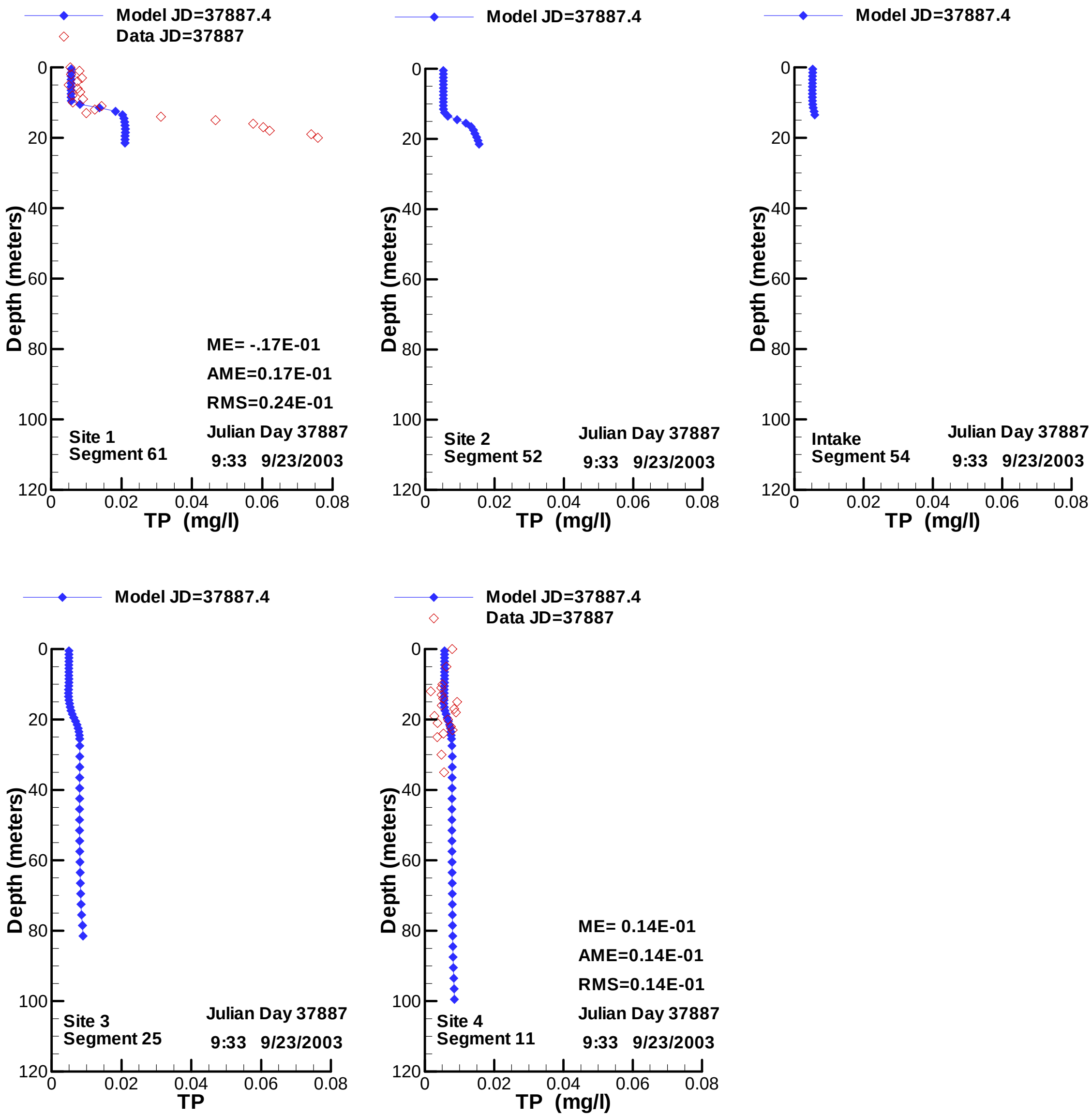

Figure 375. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 9/23/2003.

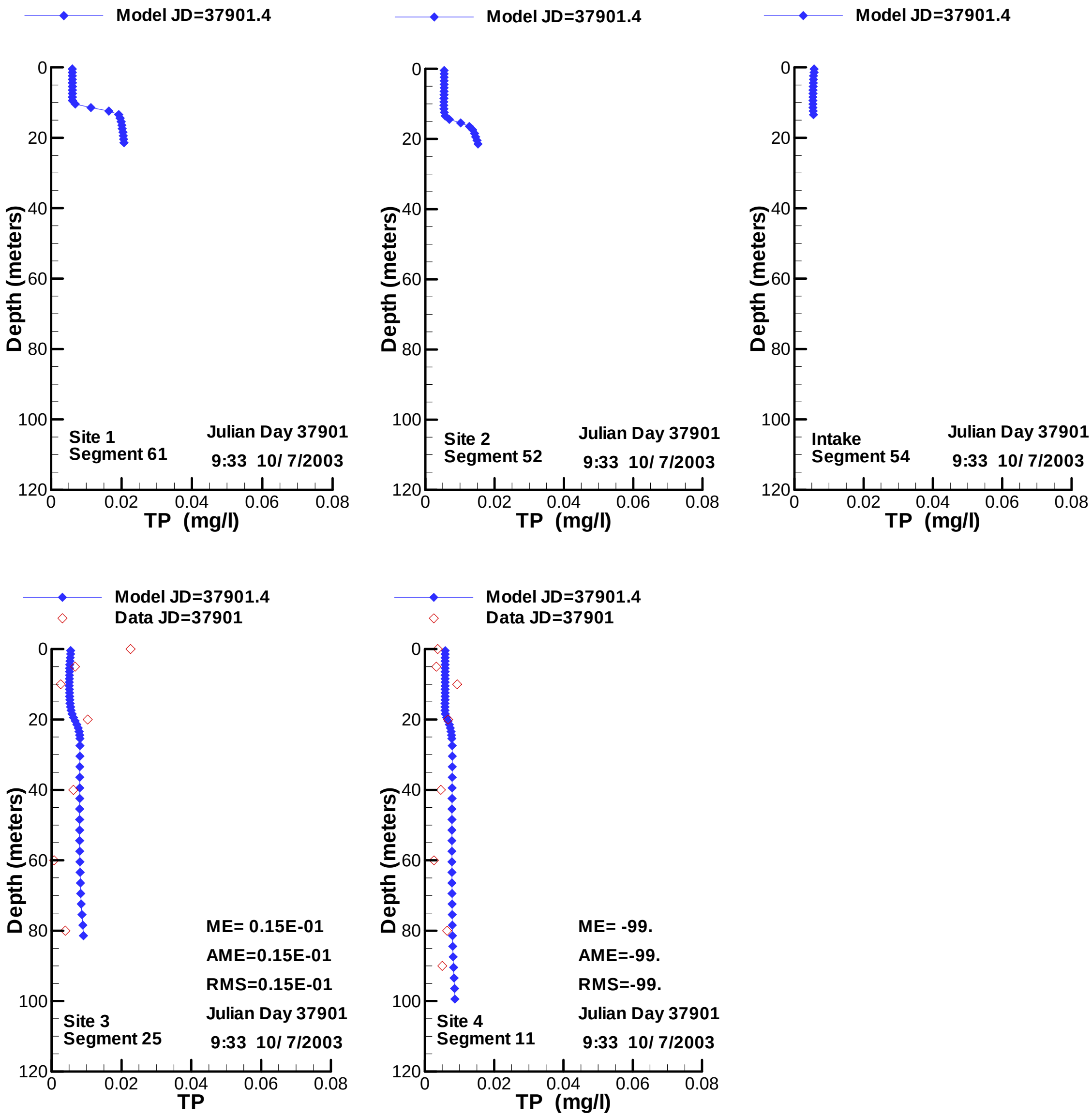

Figure 376. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 10/ 7/2003.

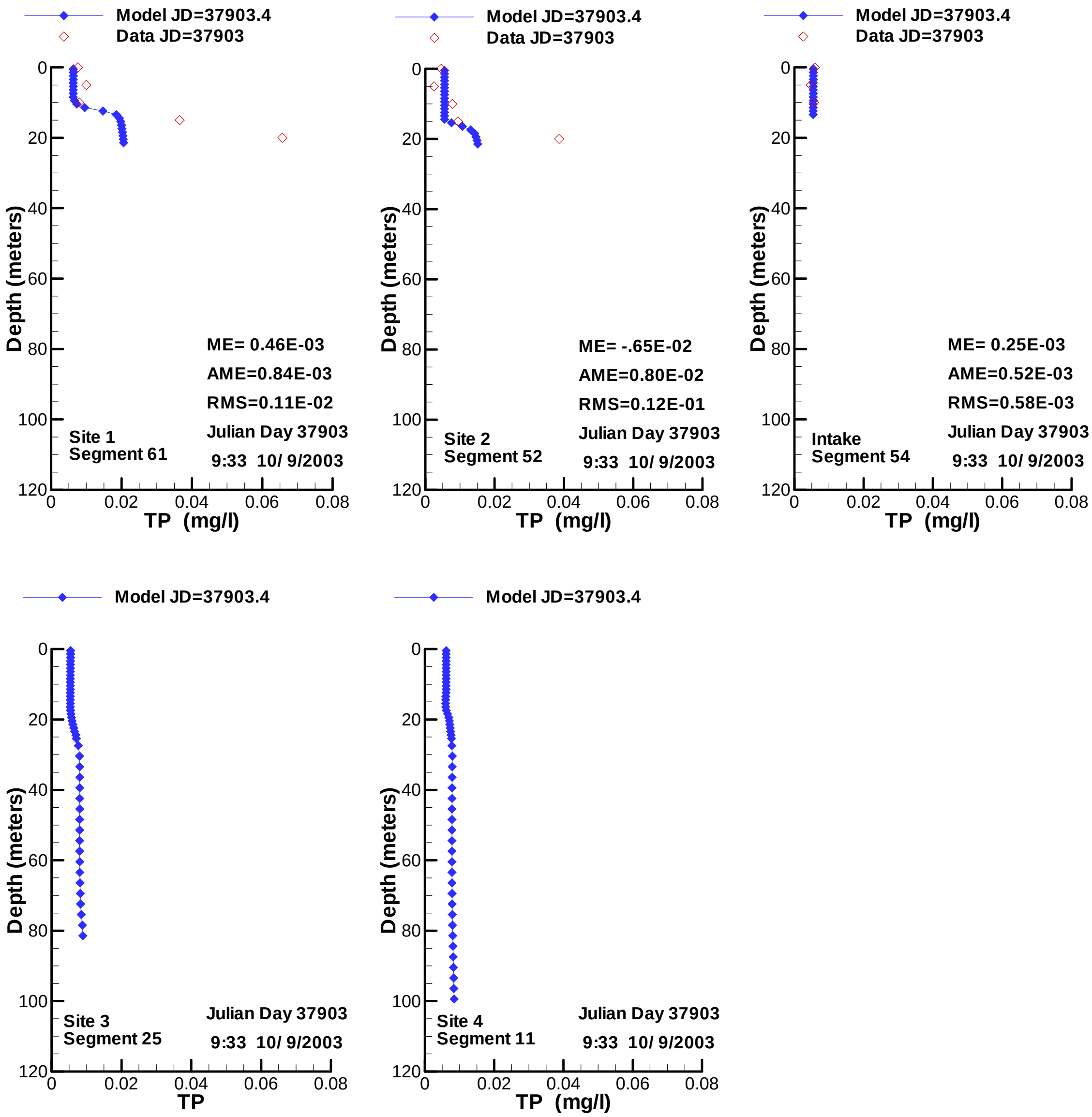

Figure 377. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 10/ 9/2003.

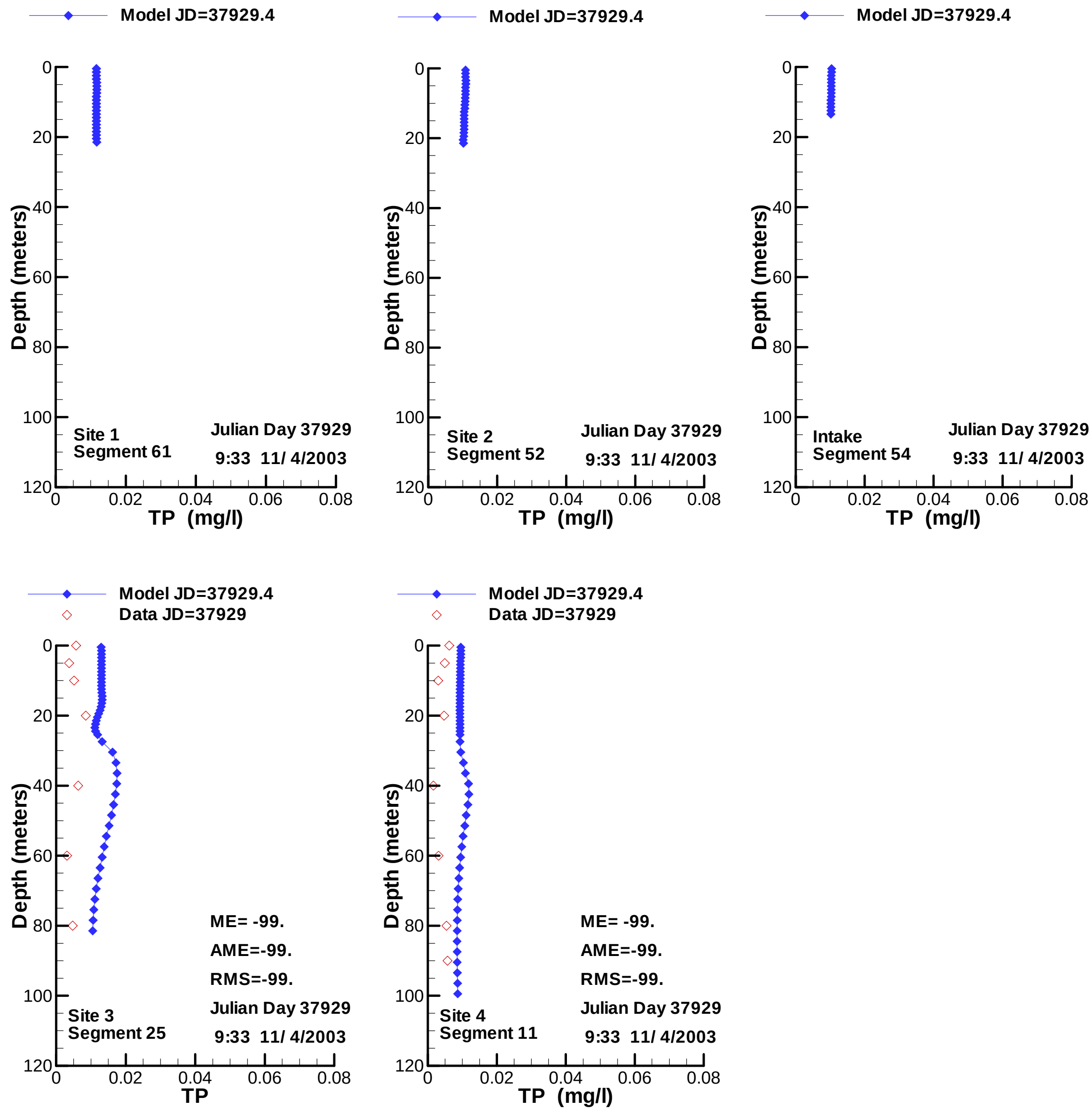

Figure 378. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 11/ 4/2003.

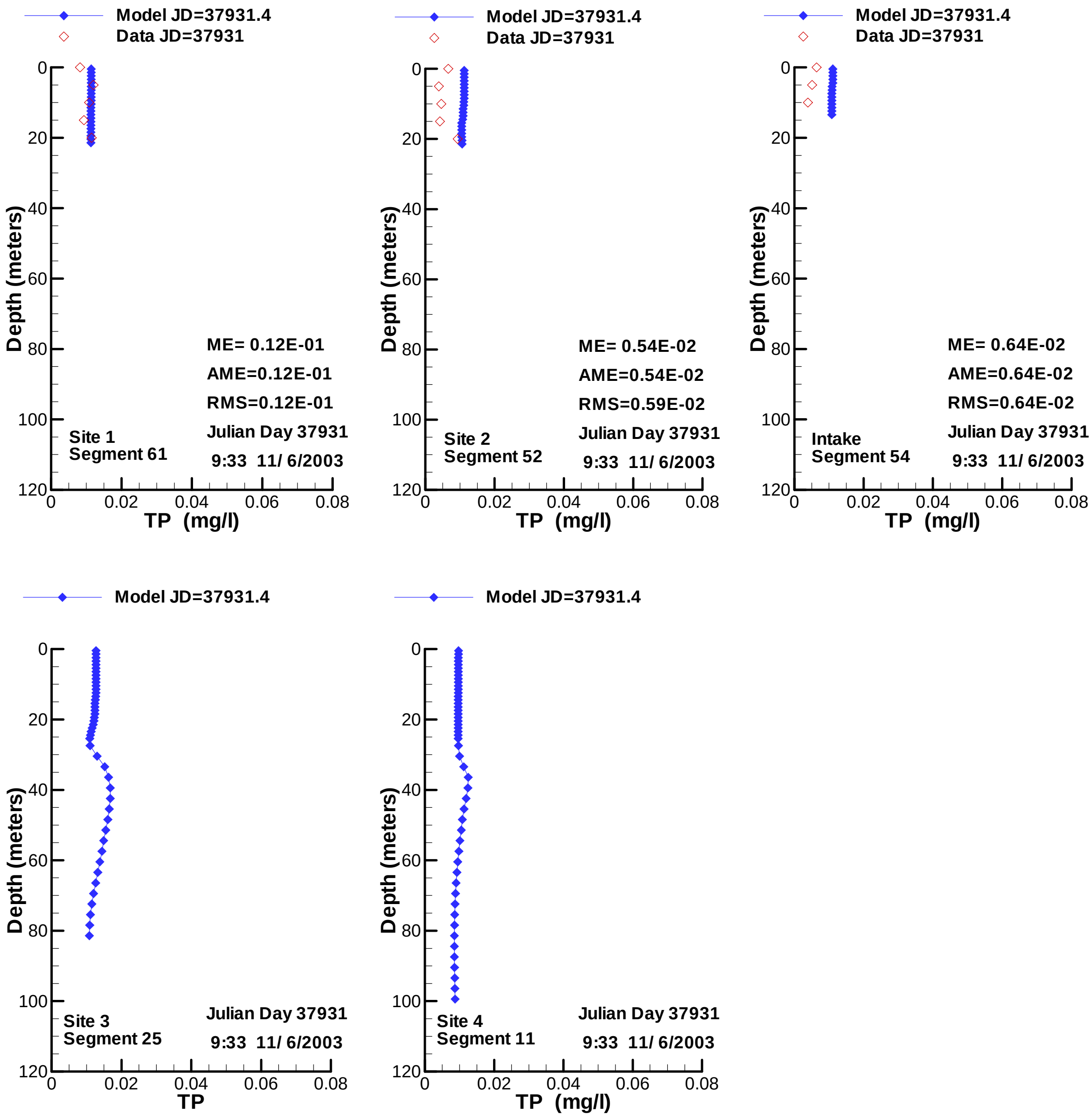

Figure 379. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 11/ 6/2003.

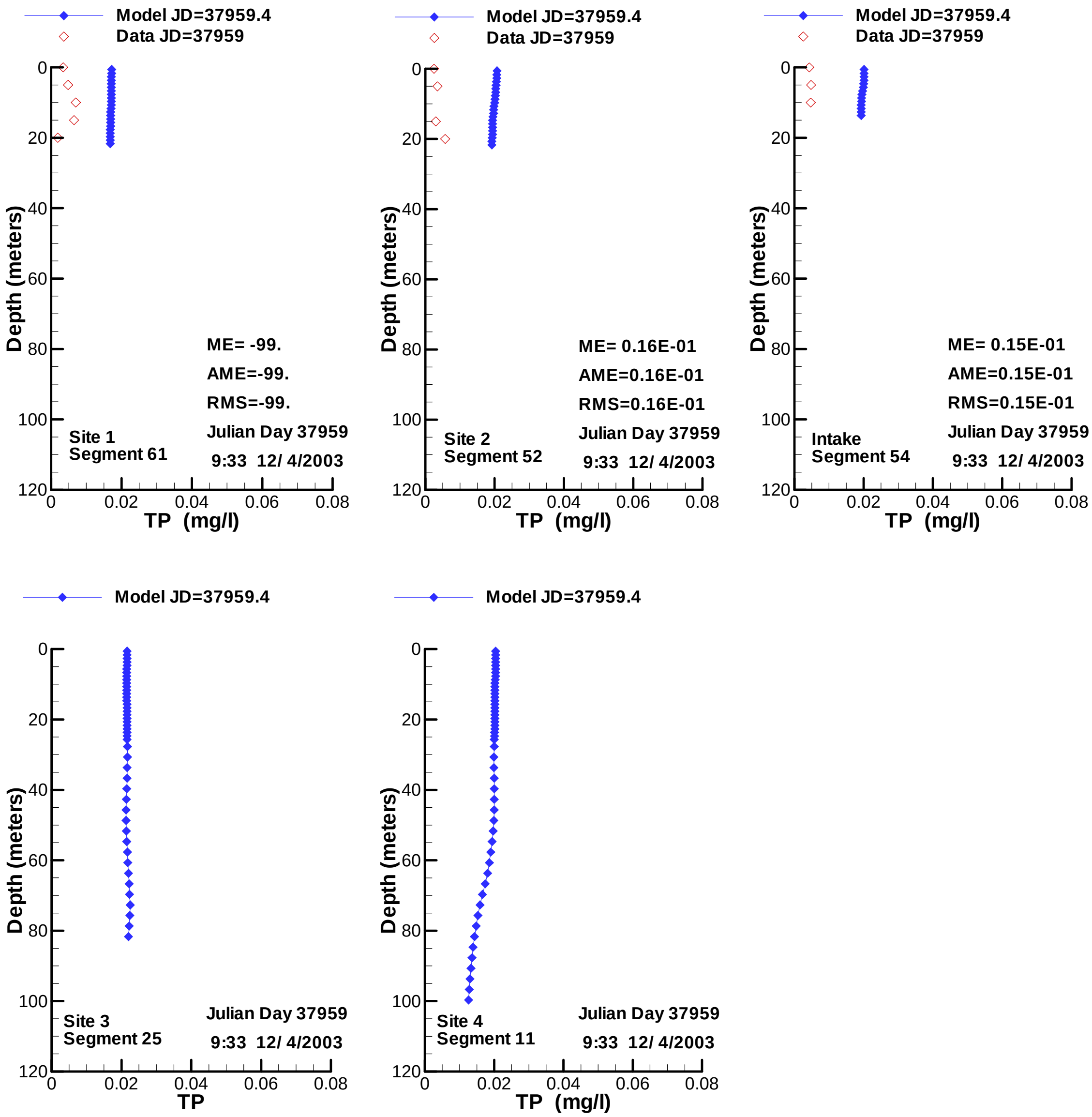

Figure 380. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 12/ 4/2003.

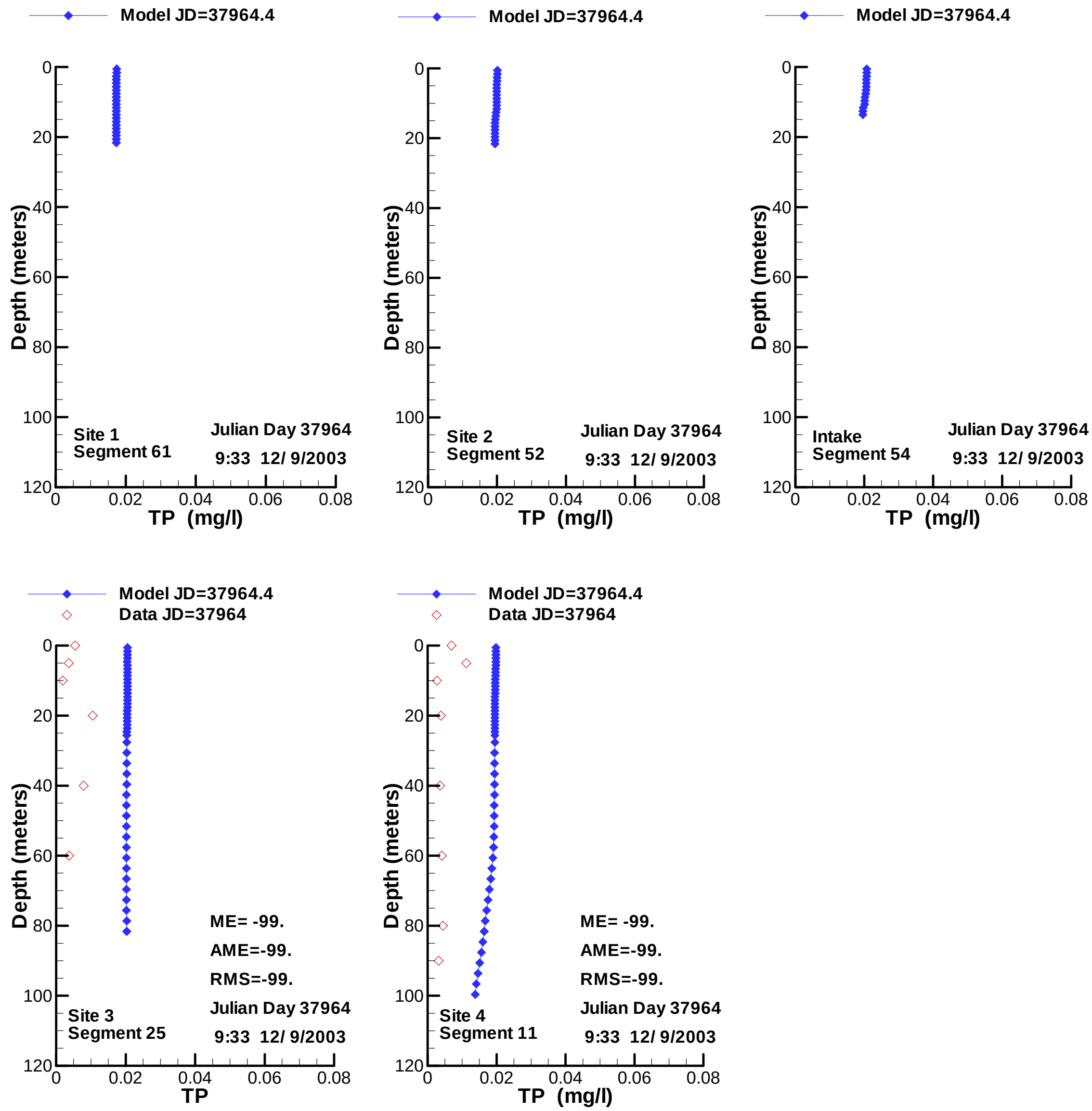

Figure 381. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 12/ 9/2003.

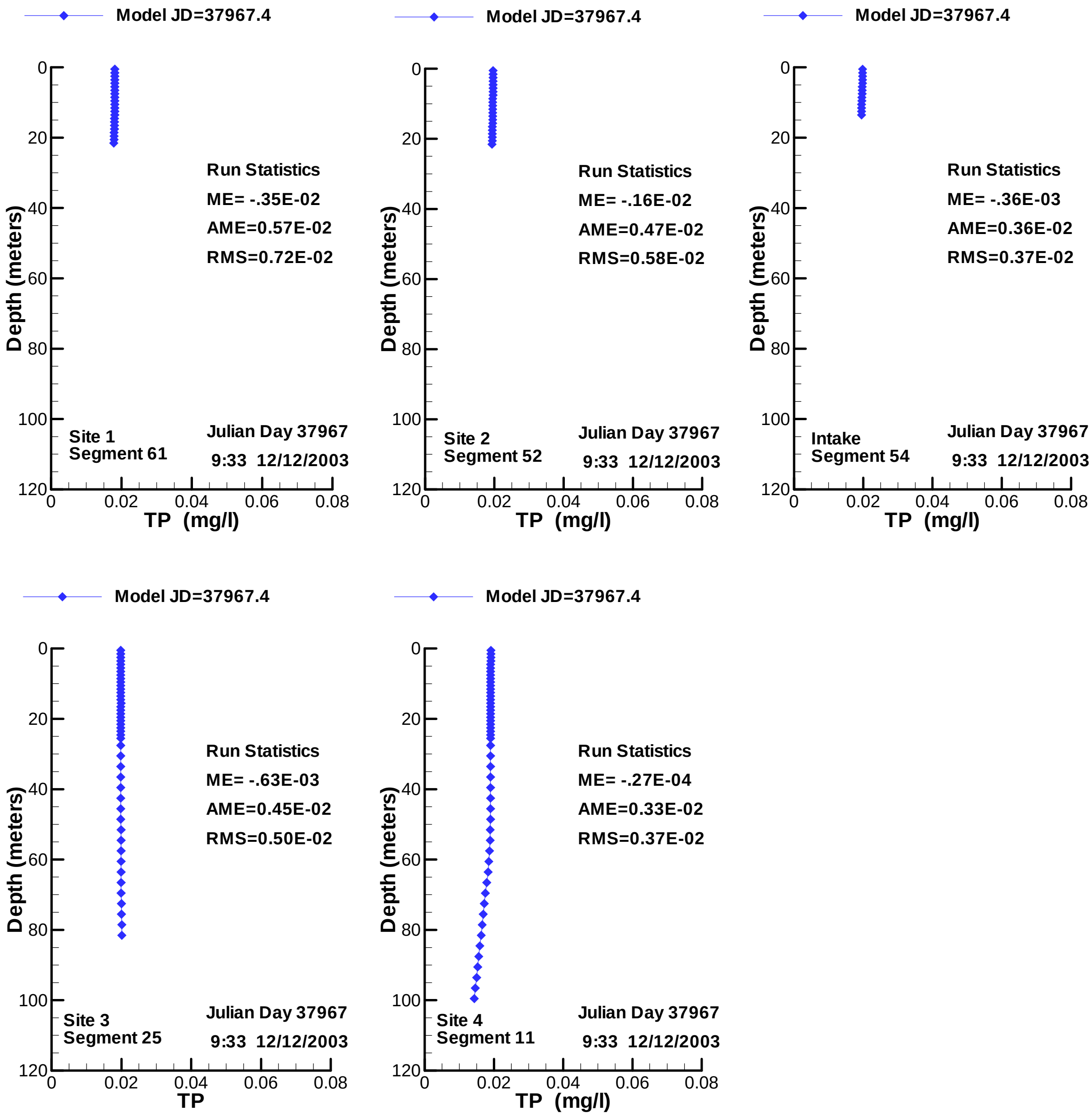

Figure 382. Vertical profiles of TOTAL PHOSPHORUS_ compared with data for 12/12/2003.

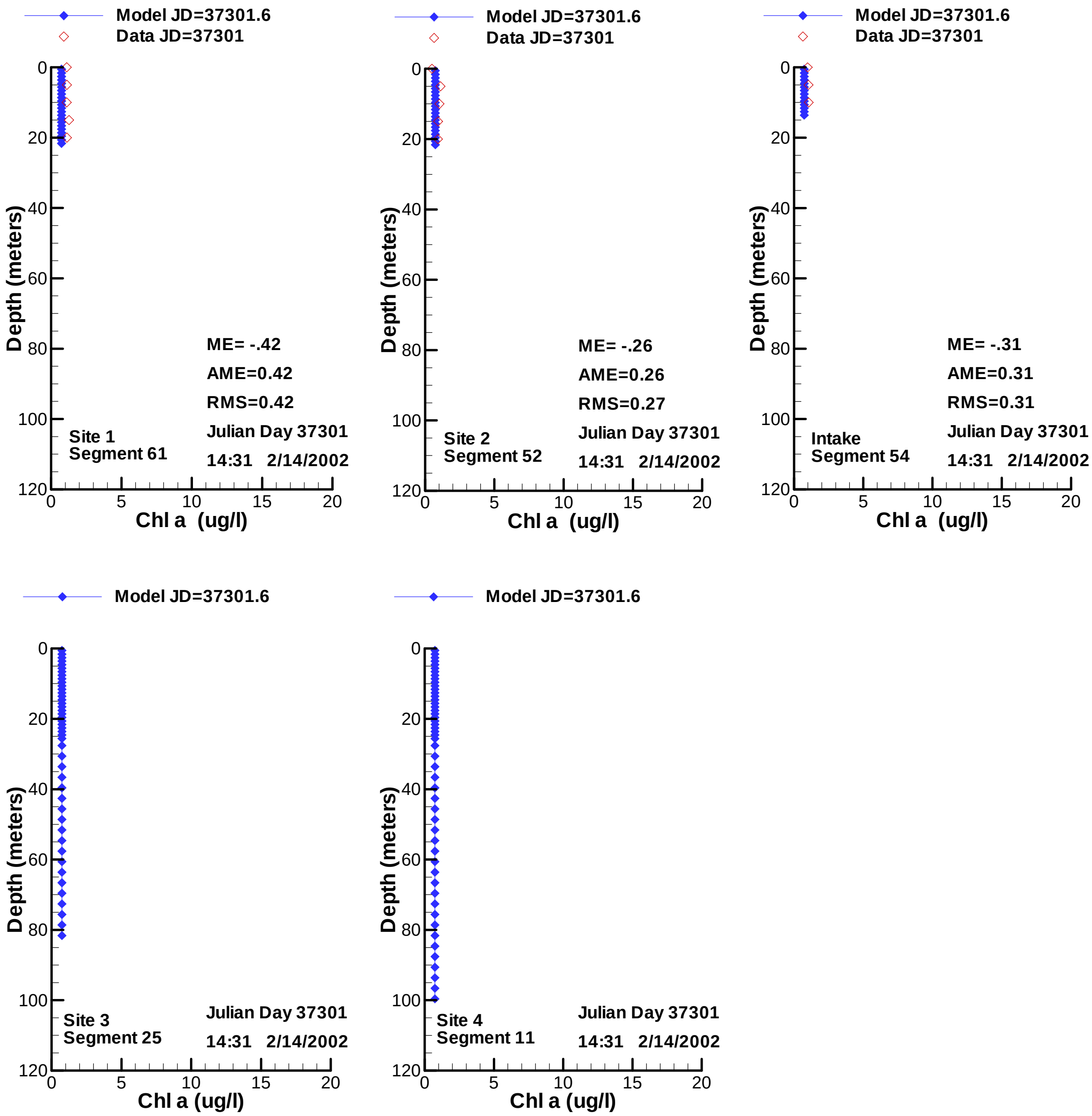

Figure 383. Vertical profiles of Chlorophyll a compared with data for 2/14/2002.

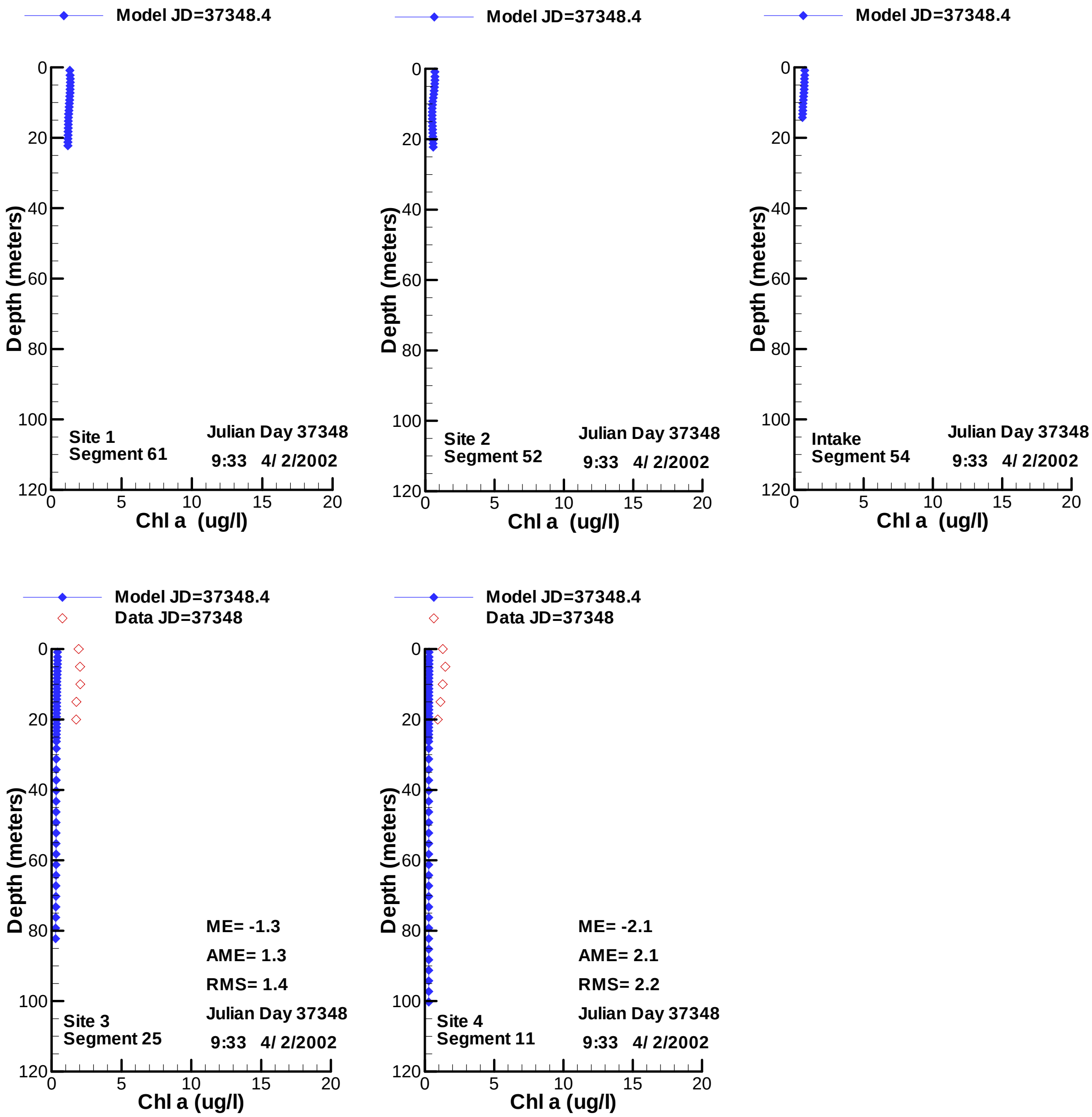

Figure 384. Vertical profiles of Chlorophyll a compared with data for 4/ 2/2002.

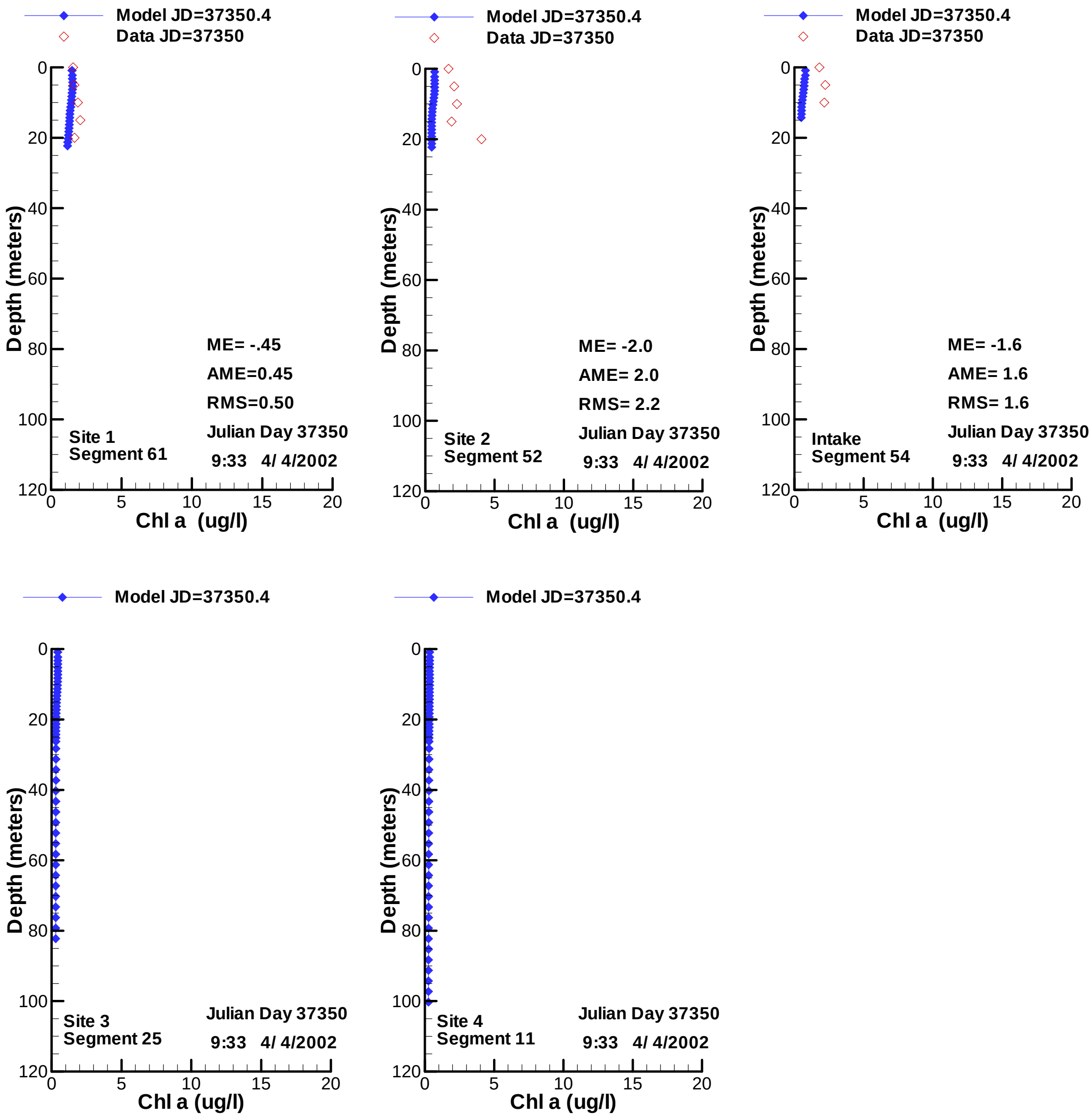

Figure 385. Vertical profiles of Chlorophyll a compared with data for 4/ 4/2002.

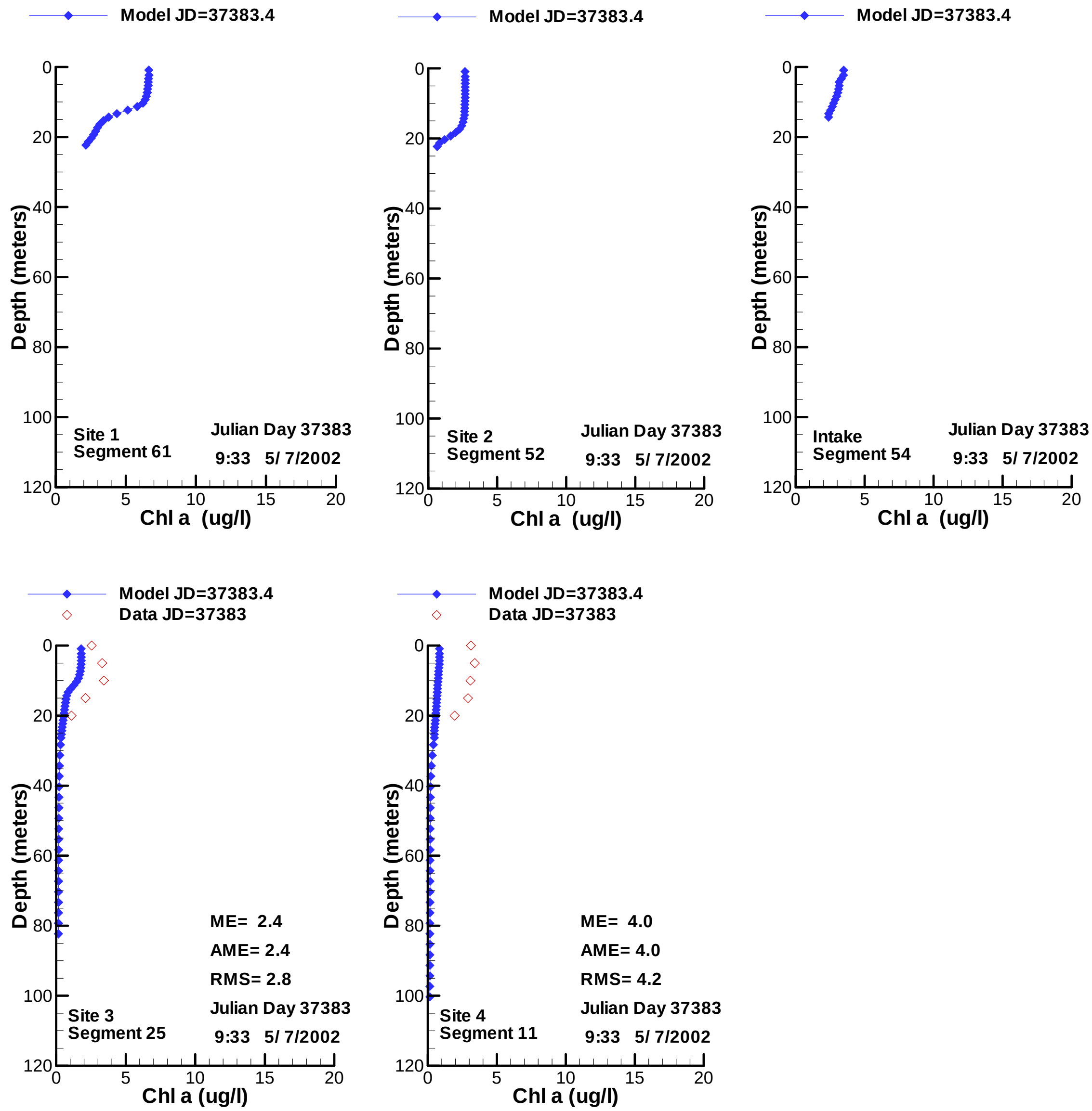

Figure 386. Vertical profiles of Chlorophyll a compared with data for 5/ 7/2002.

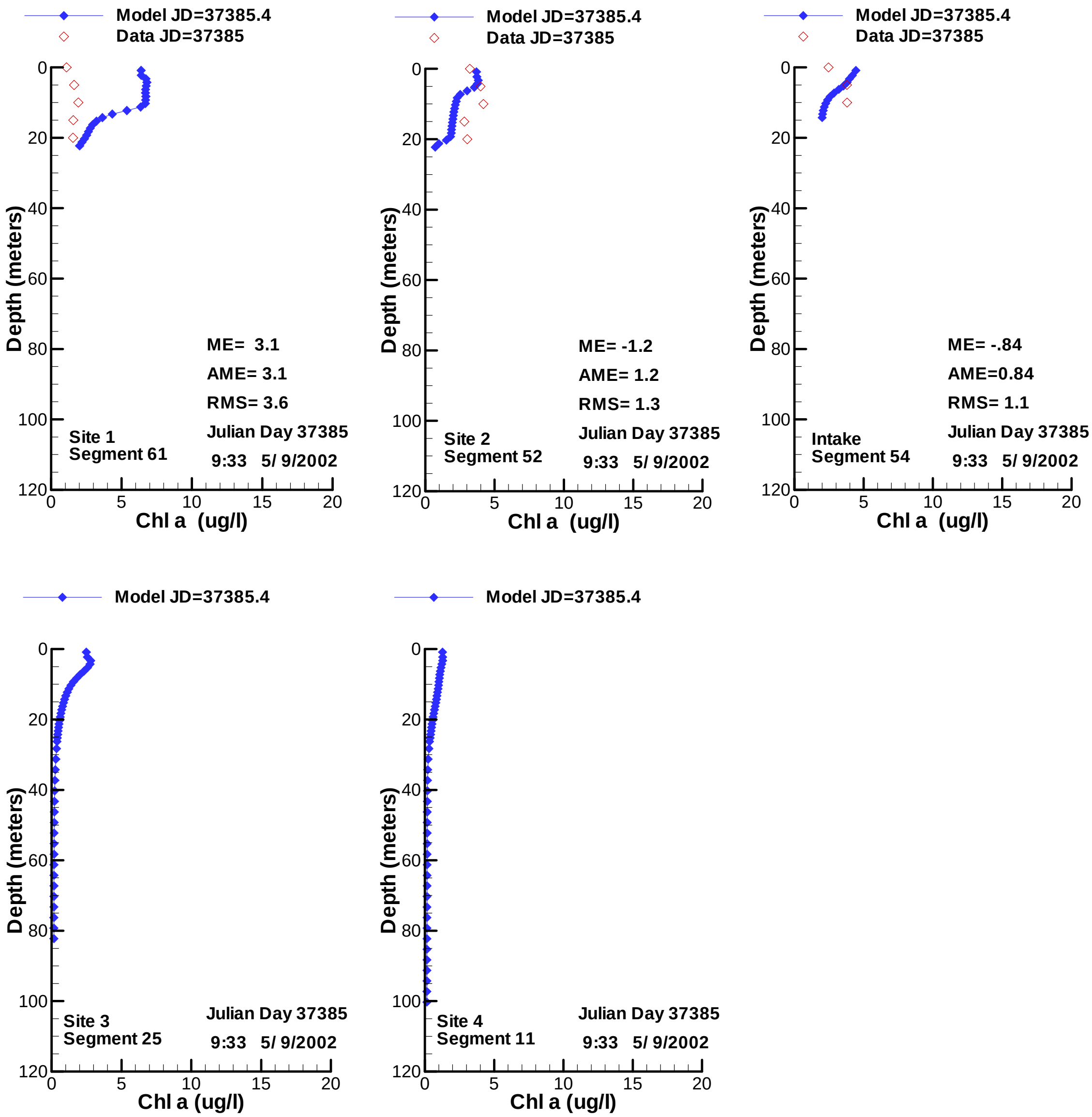

Figure 387. Vertical profiles of Chlorophyll a compared with data for 5/ 9/2002.

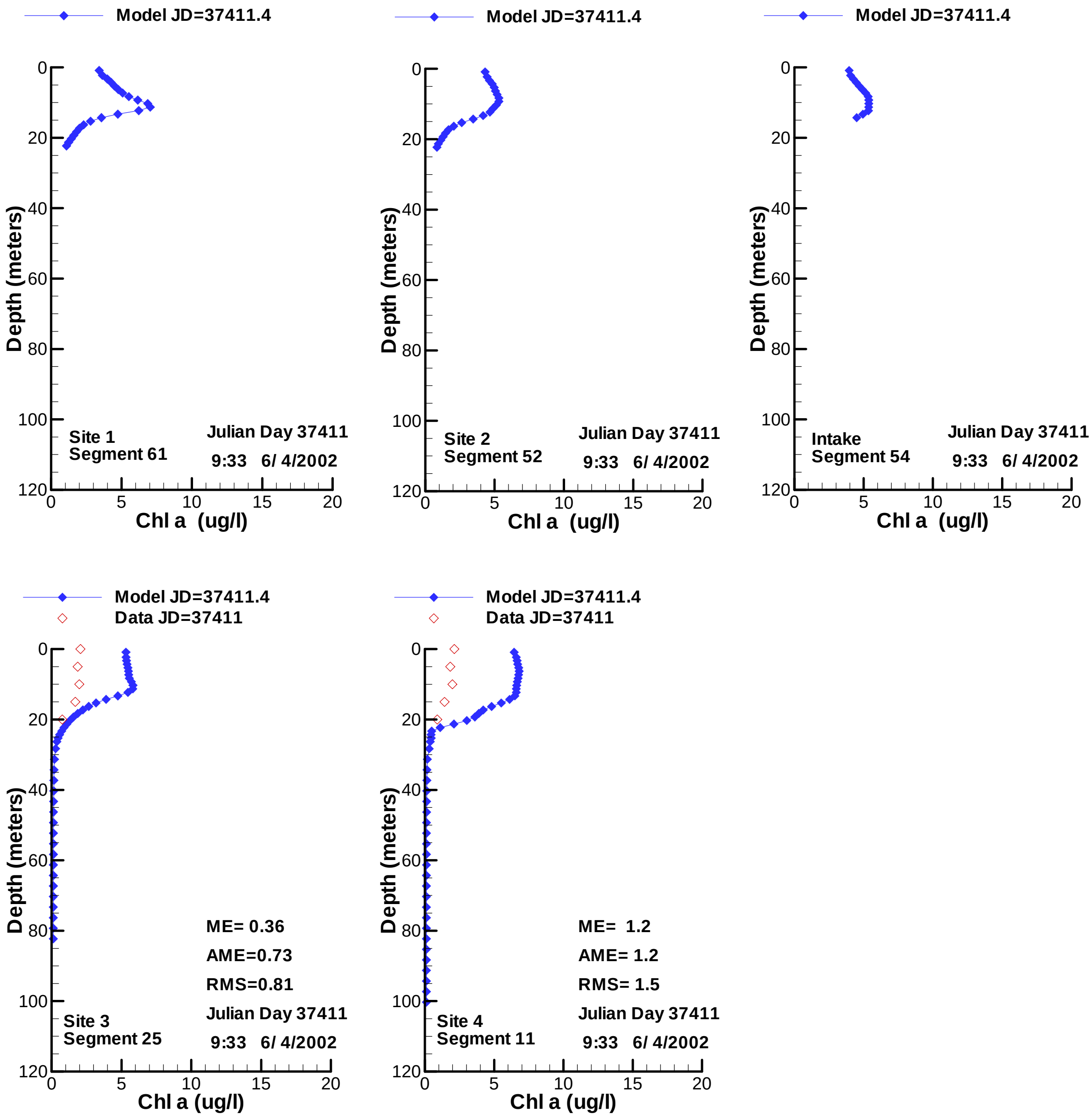

Figure 388. Vertical profiles of Chlorophyll a compared with data for 6/ 4/2002.

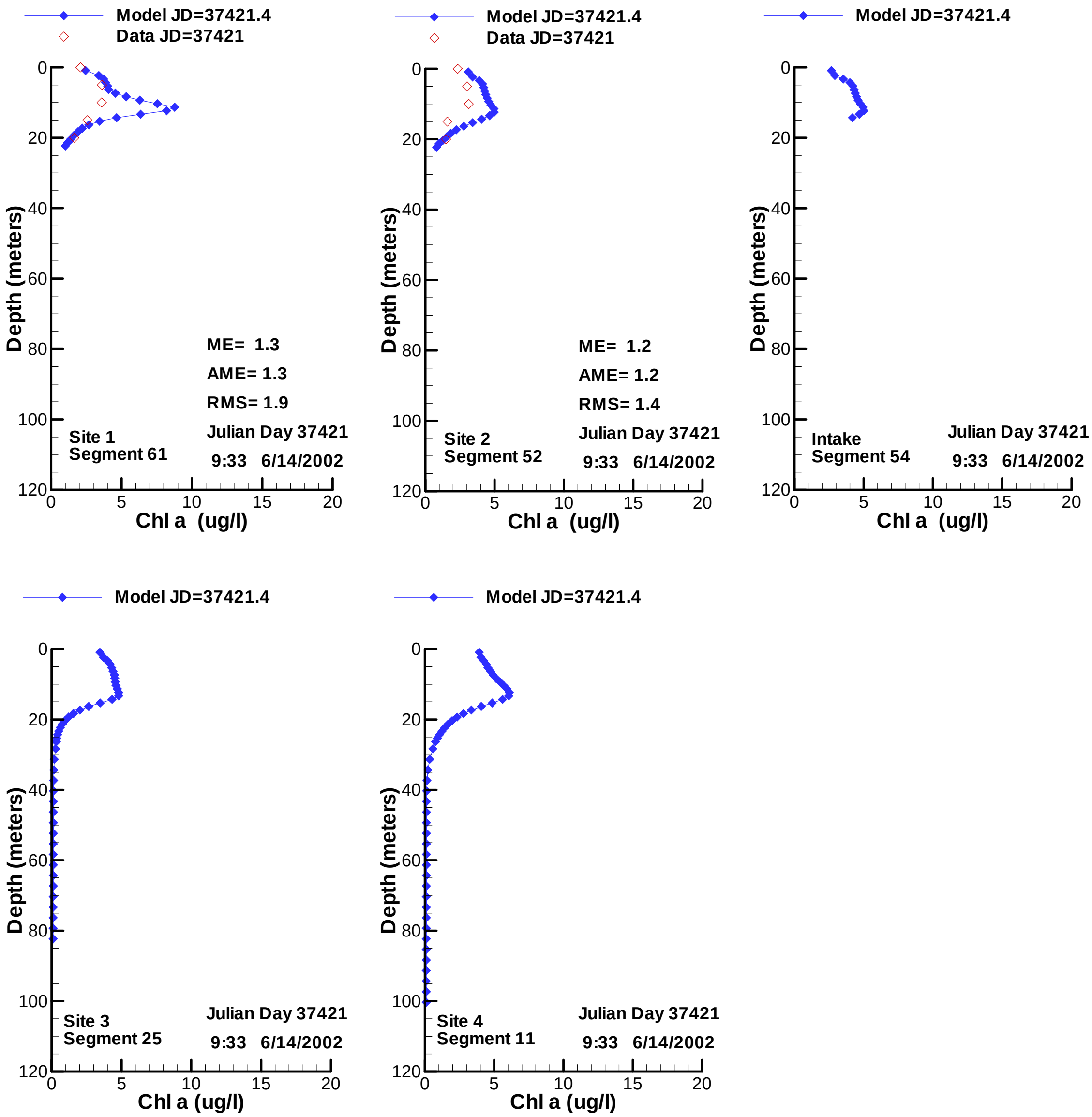

Figure 389. Vertical profiles of Chlorophyll a compared with data for 6/14/2002.

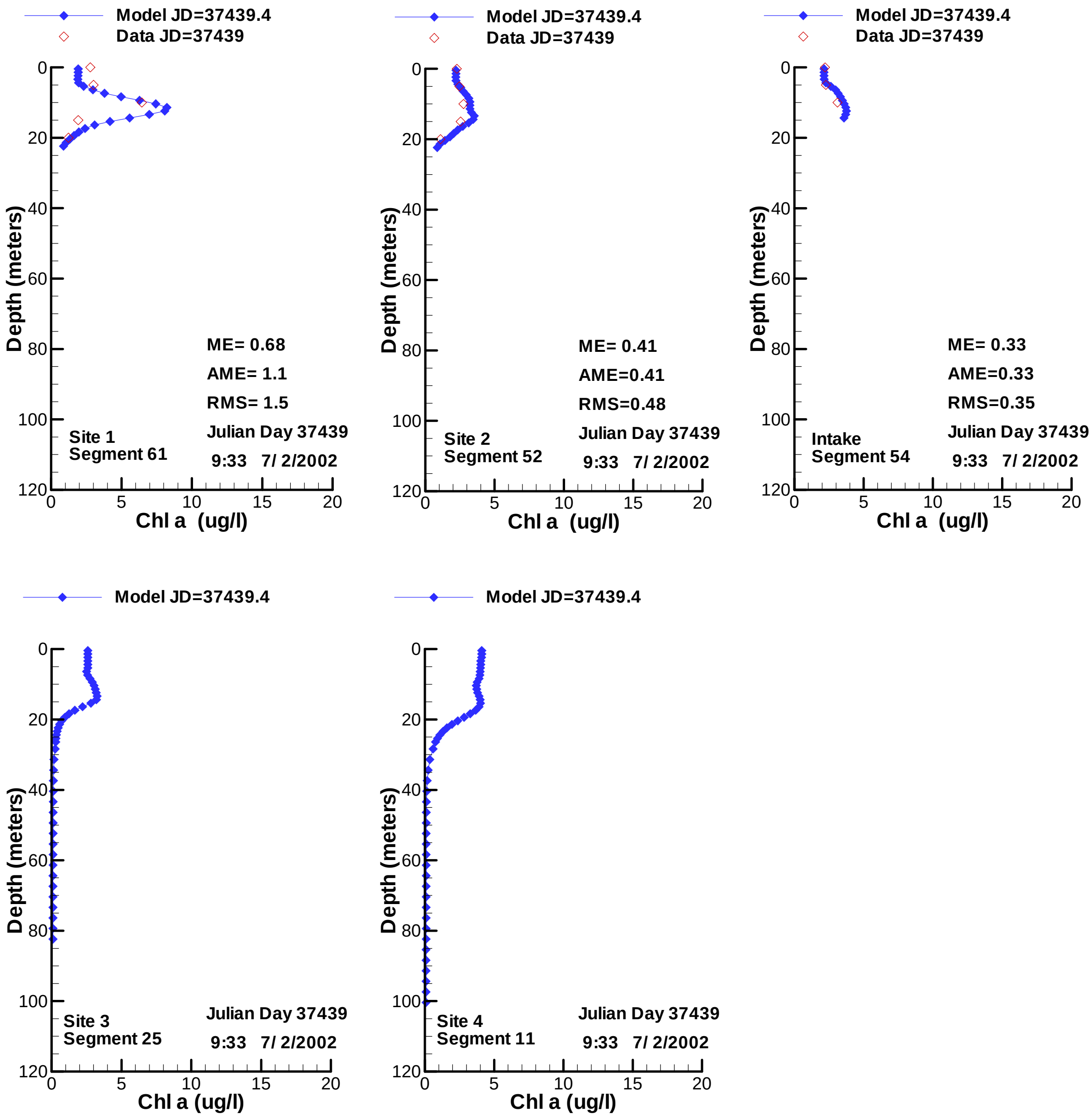

Figure 390. Vertical profiles of Chlorophyll a compared with data for 7/ 2/2002.

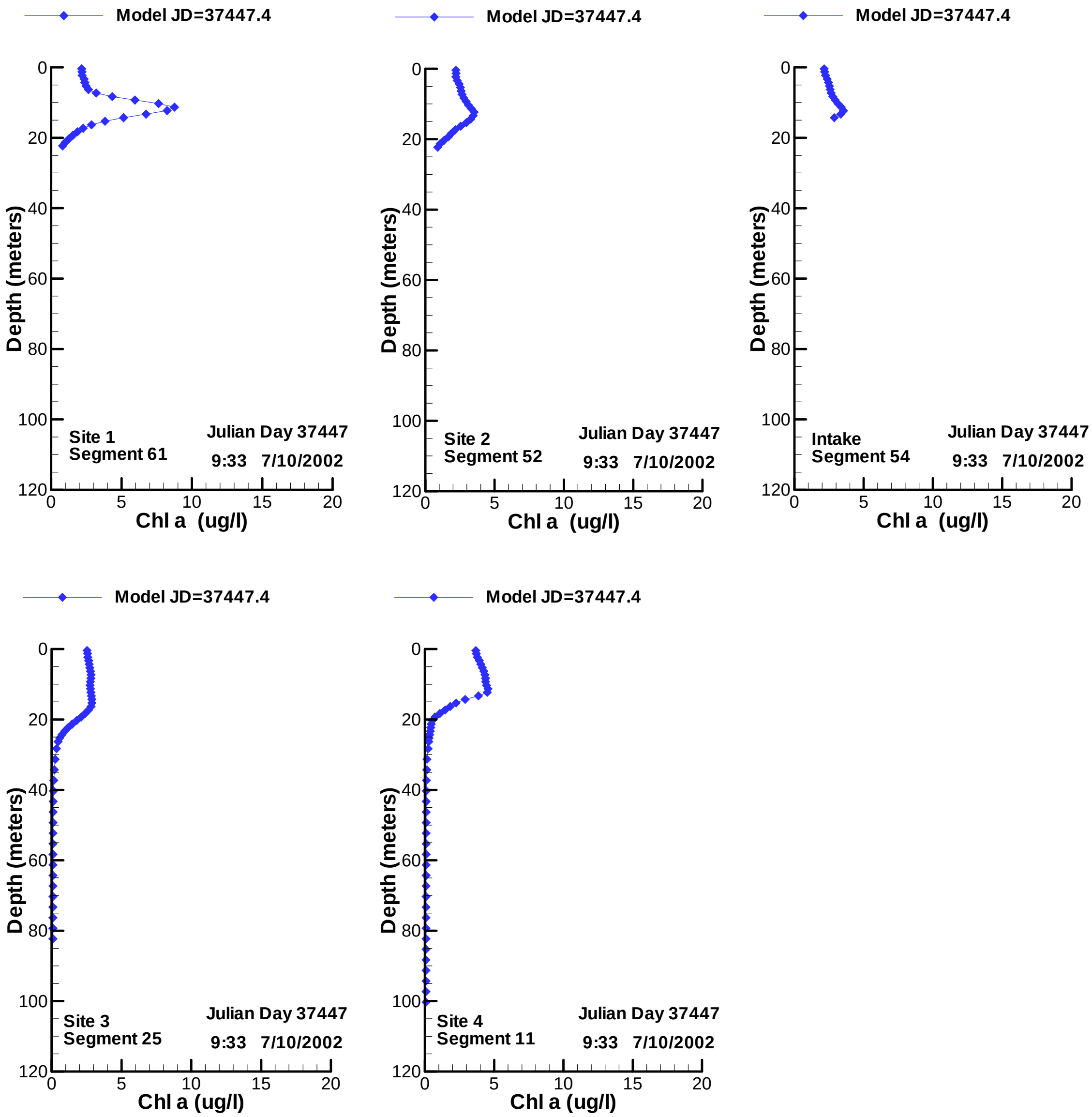

Figure 391. Vertical profiles of Chlorophyll a compared with data for 7/10/2002.

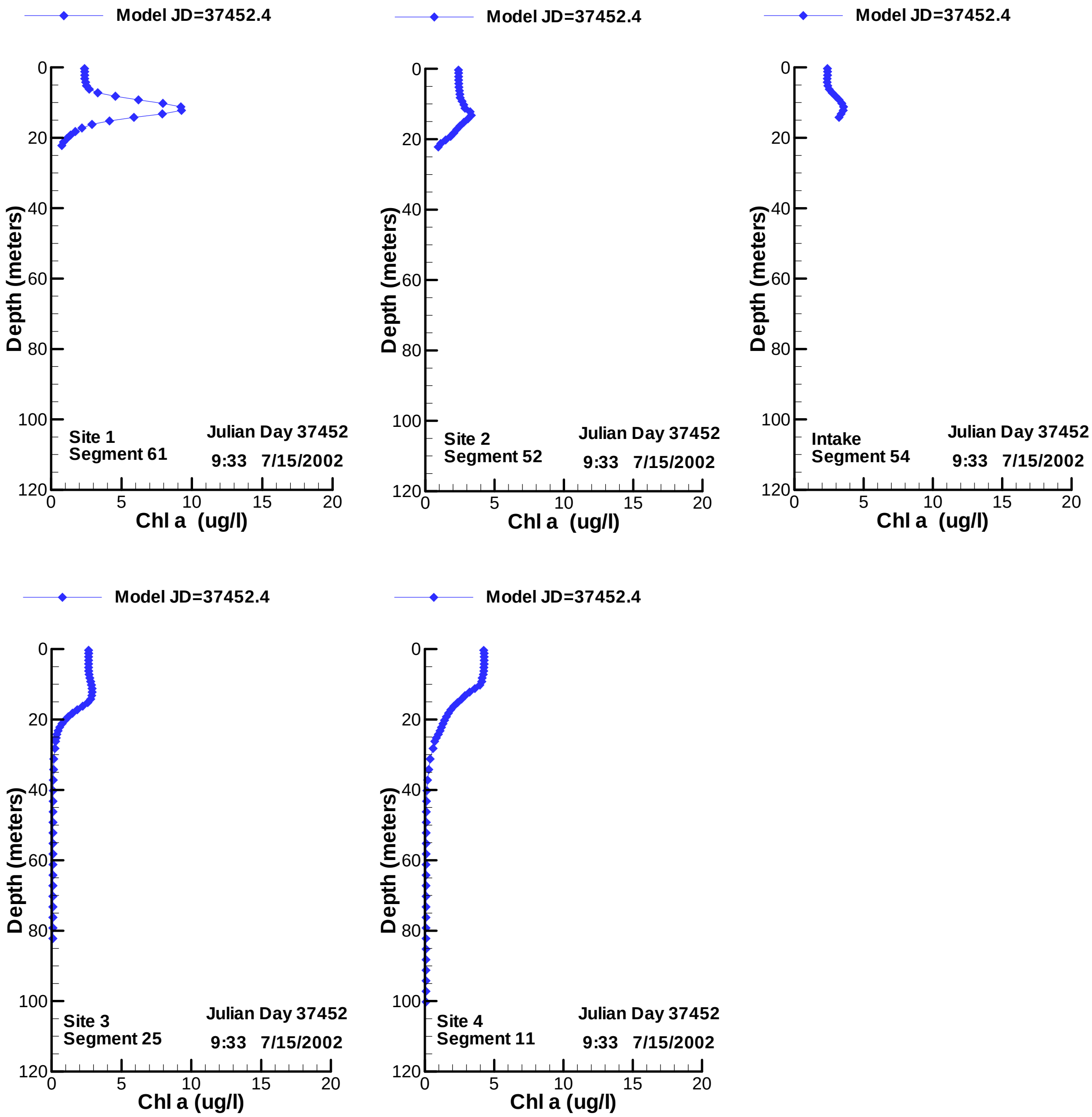

Figure 392. Vertical profiles of Chlorophyll a compared with data for 7/15/2002.

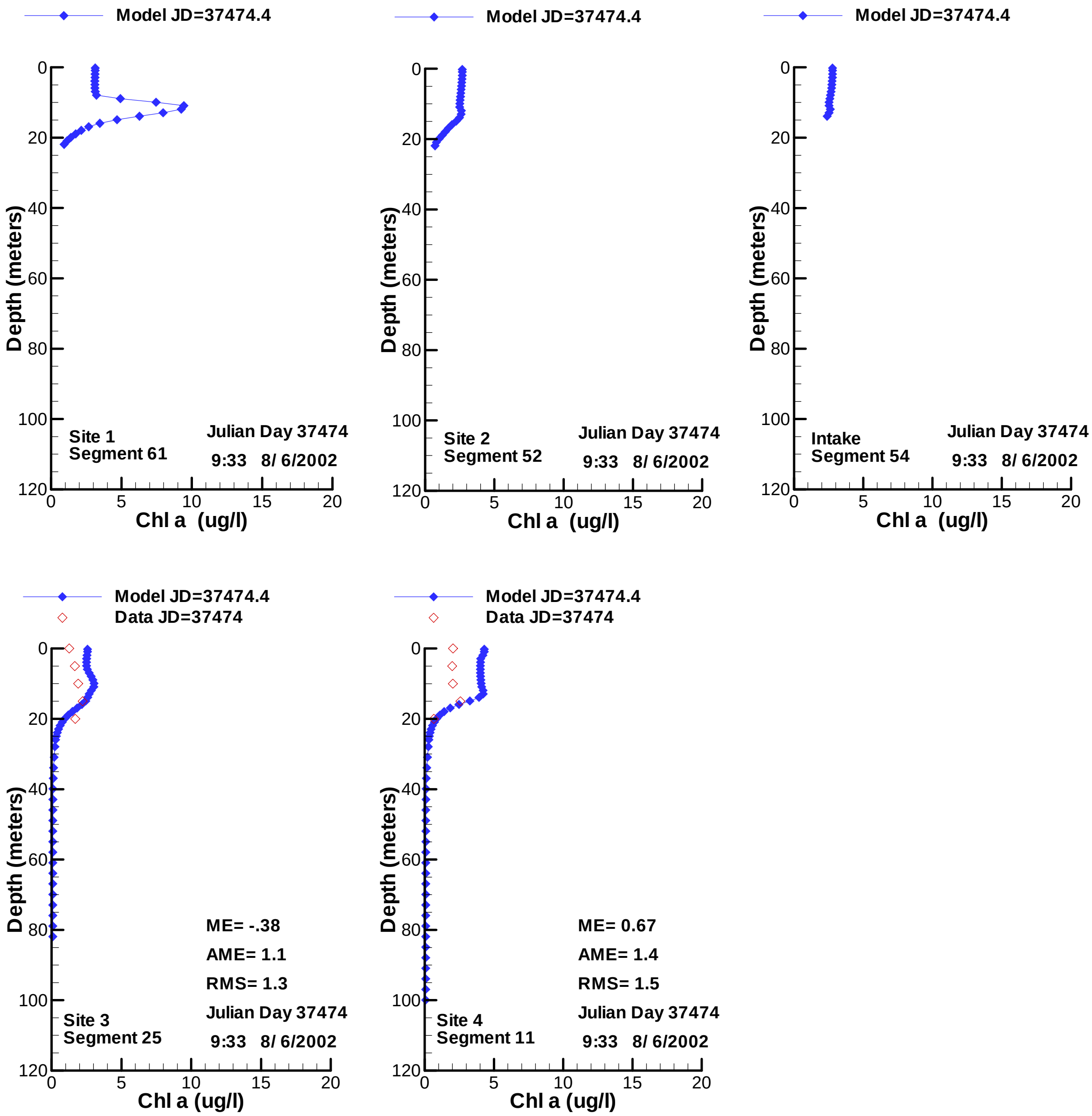

Figure 393. Vertical profiles of Chlorophyll a compared with data for 8/ 6/2002.

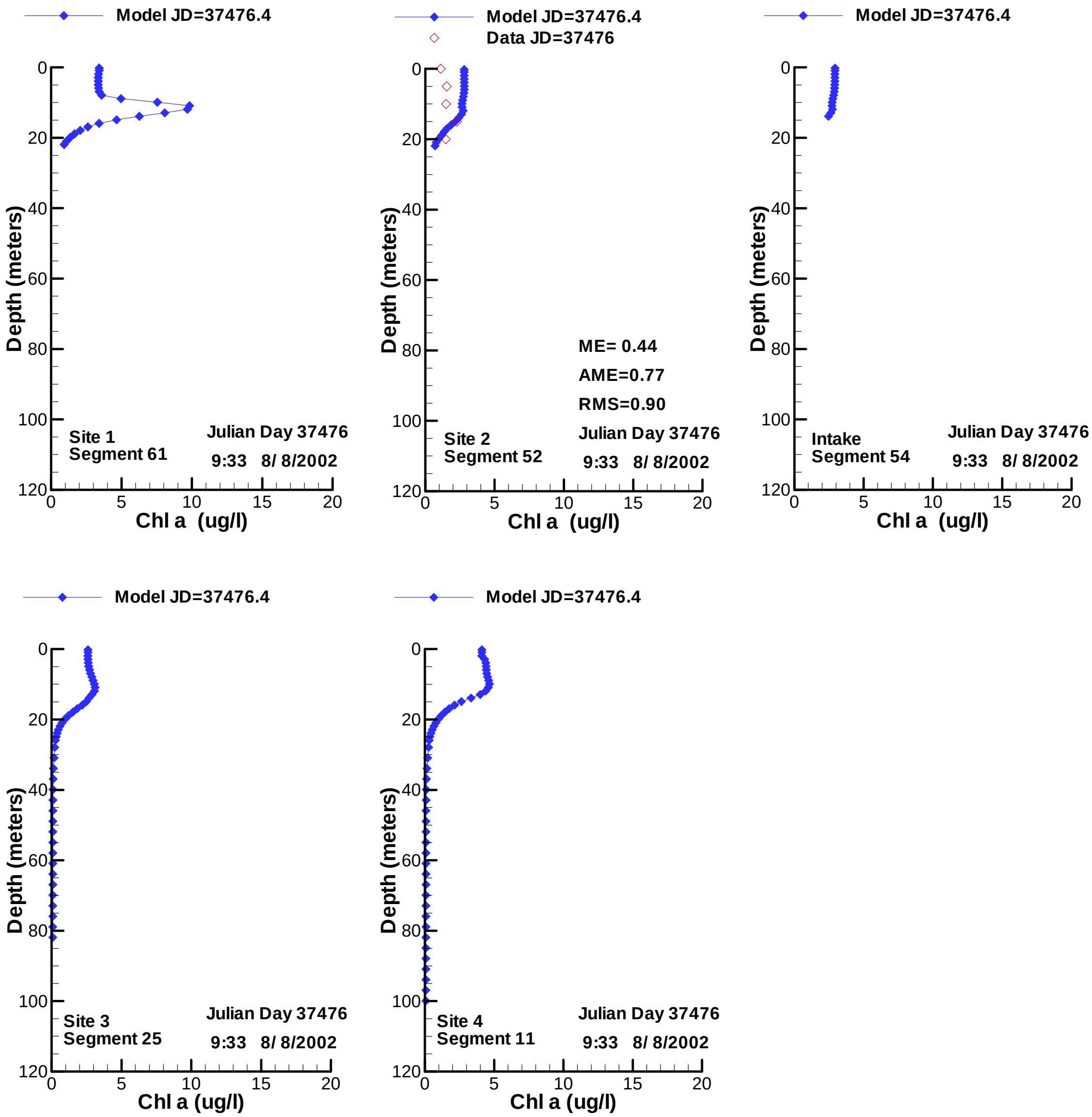

Figure 394. Vertical profiles of Chlorophyll a compared with data for 8/ 8/2002.

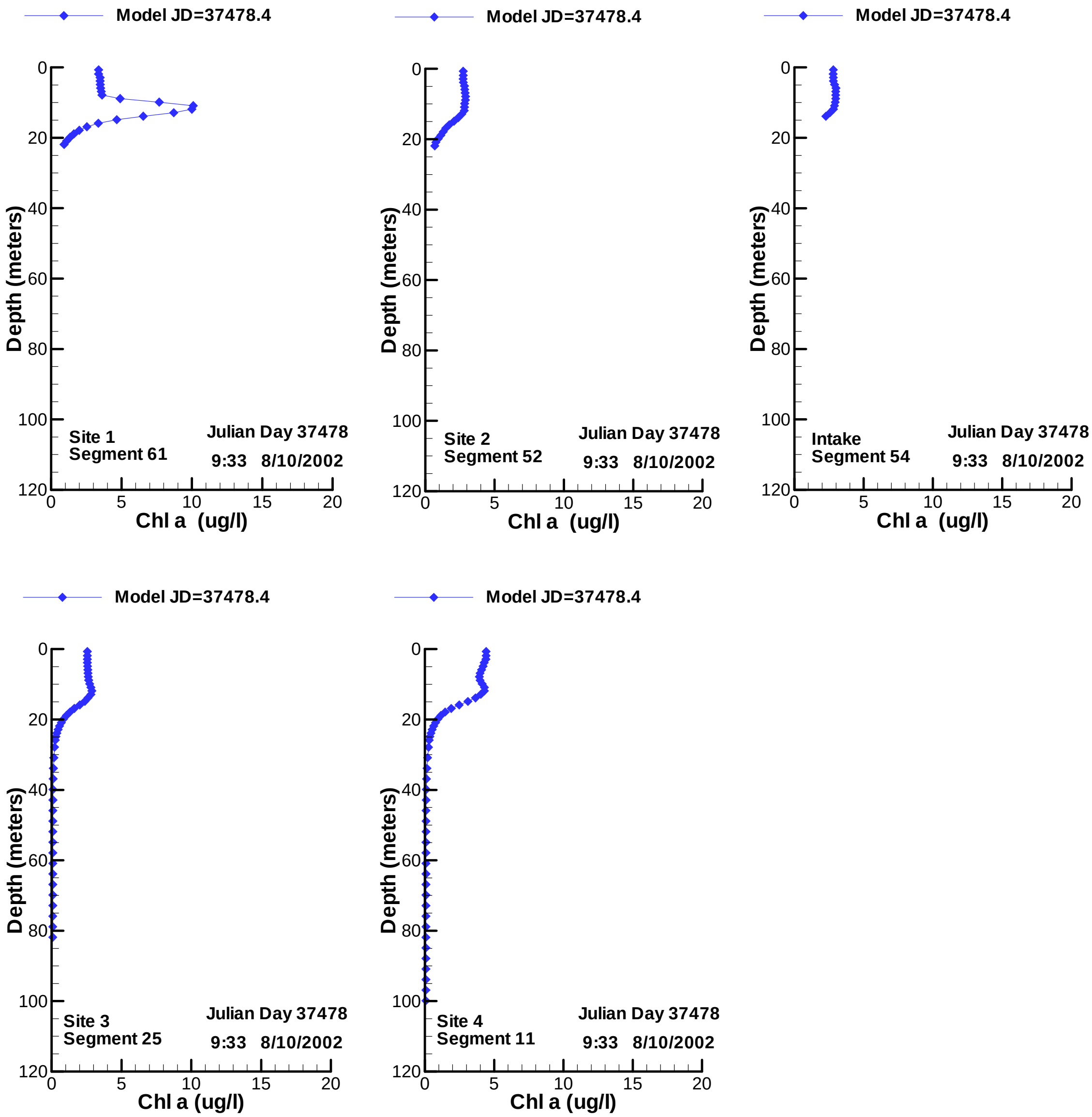

Figure 395. Vertical profiles of Chlorophyll a compared with data for 8/10/2002.

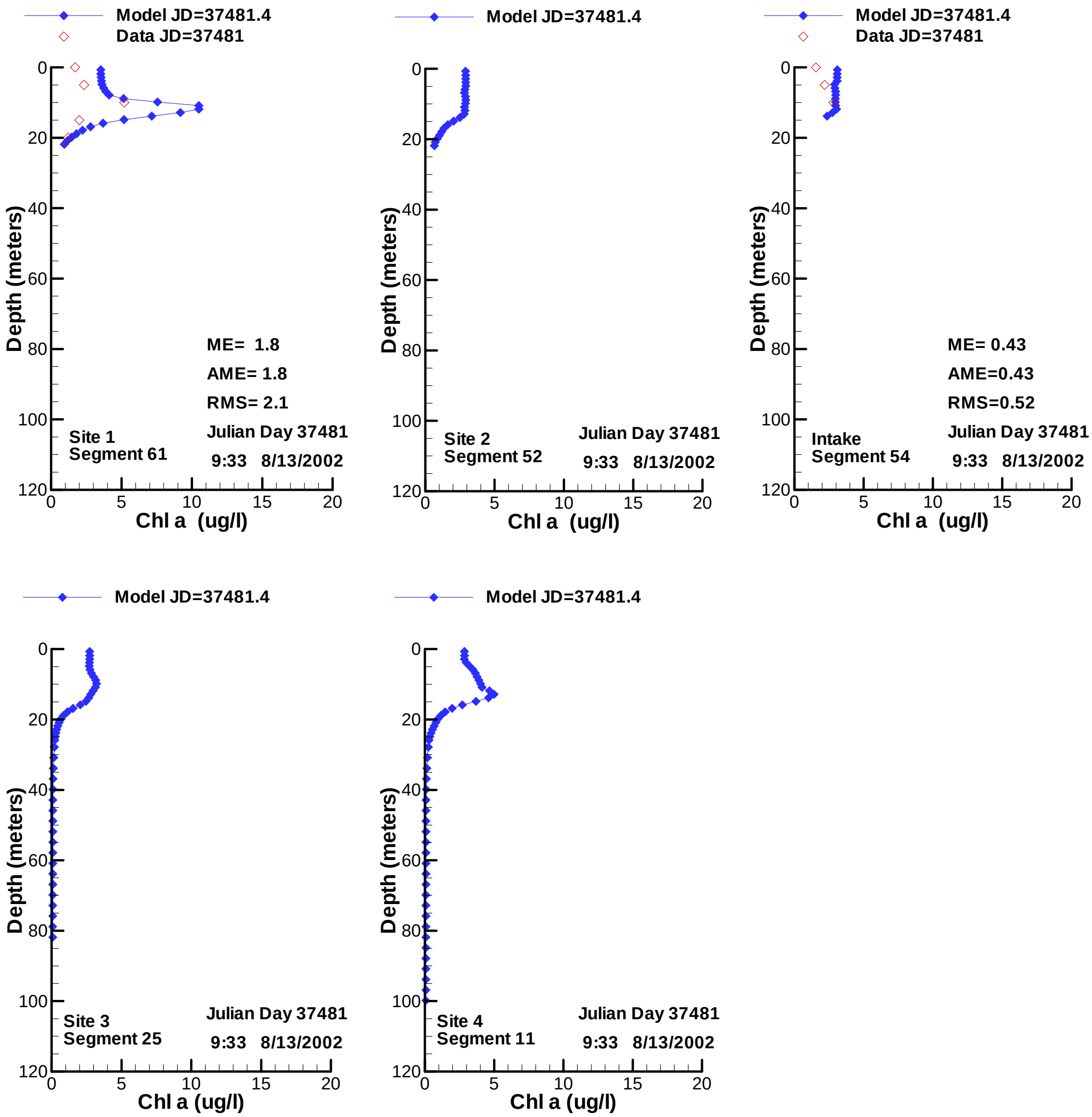

Figure 396. Vertical profiles of Chlorophyll a compared with data for 8/13/2002.

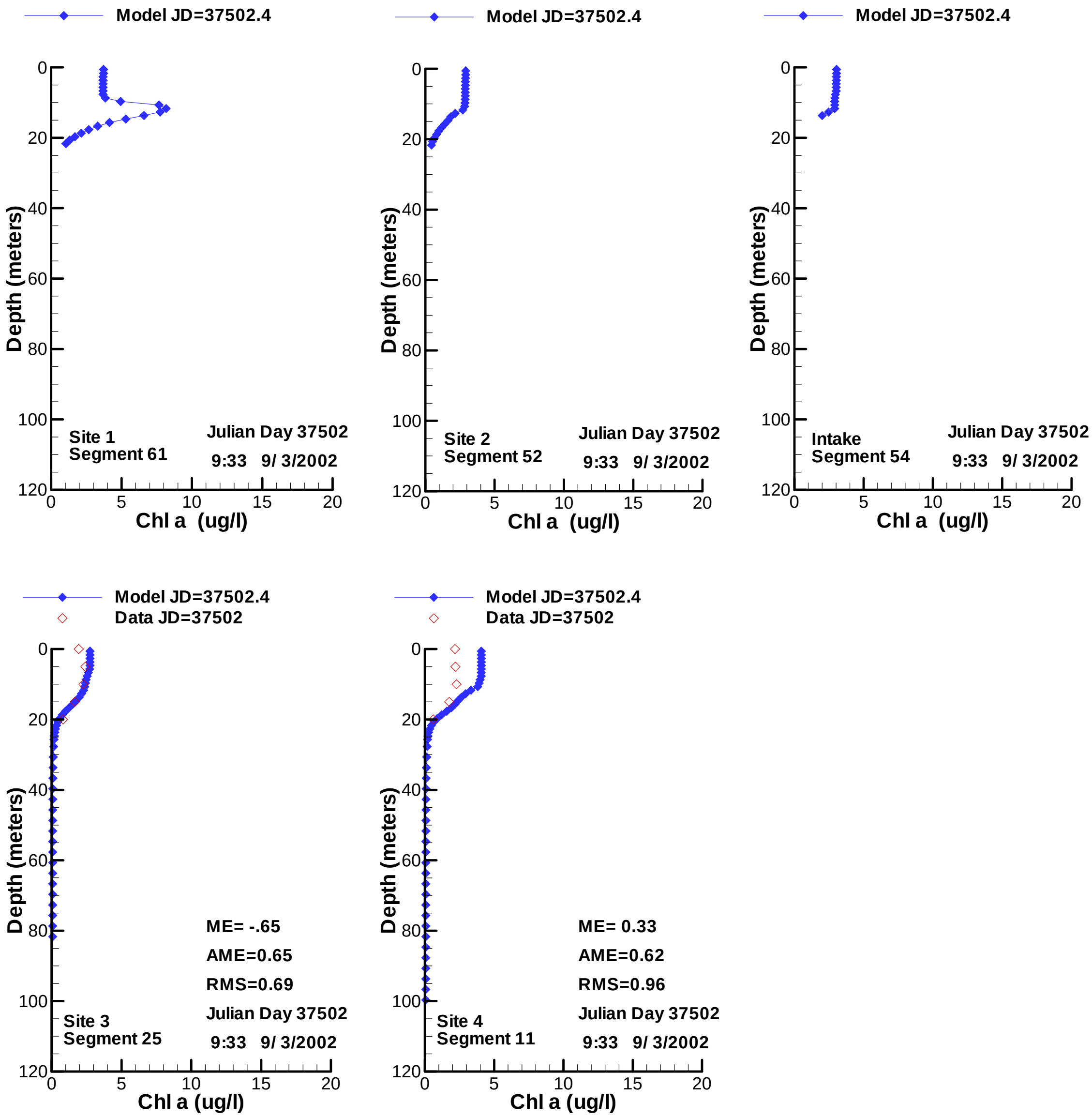

Figure 397. Vertical profiles of Chlorophyll a compared with data for 9/ 3/2002.

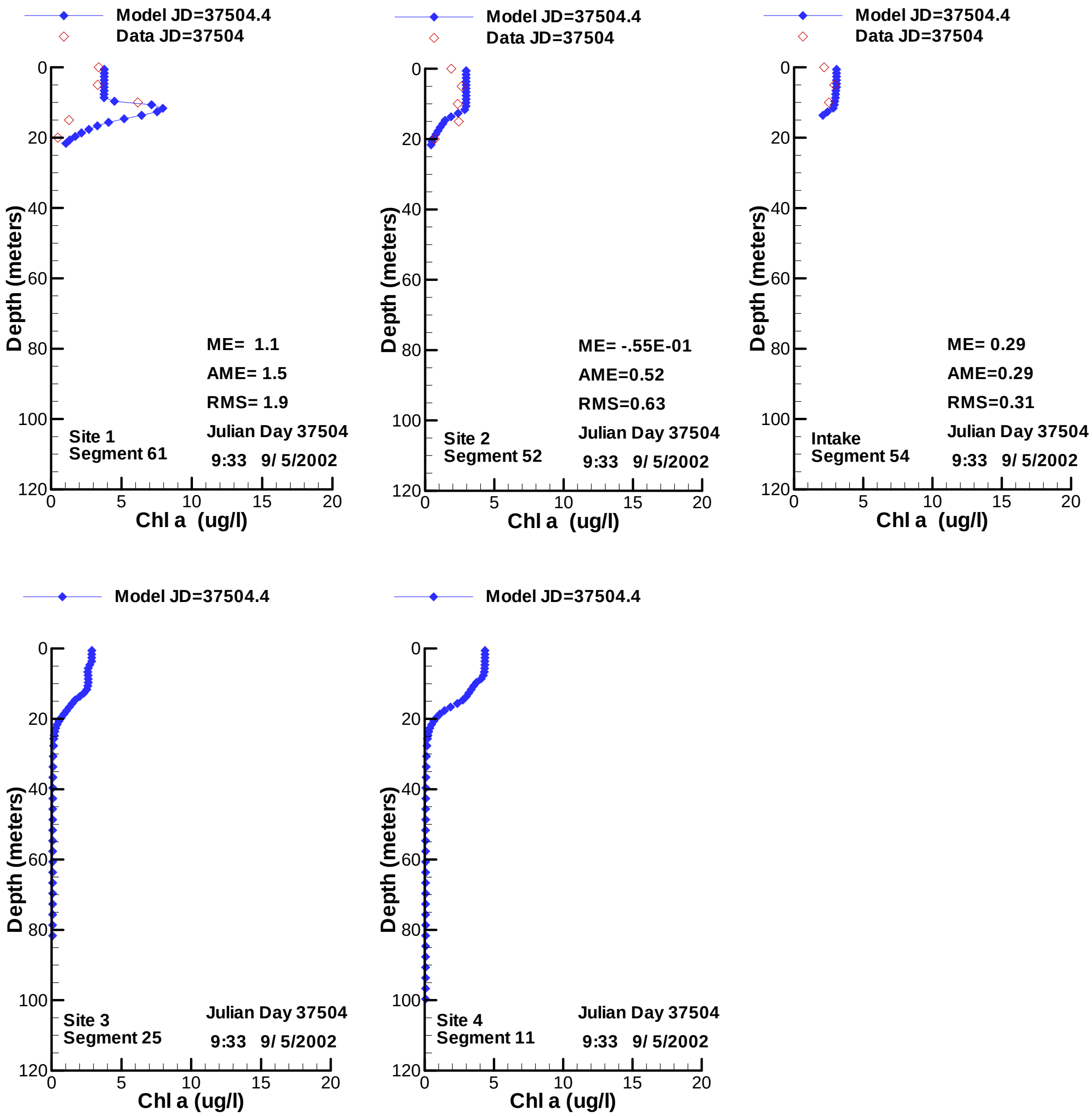

Figure 398. Vertical profiles of Chlorophyll a compared with data for 9/ 5/2002.

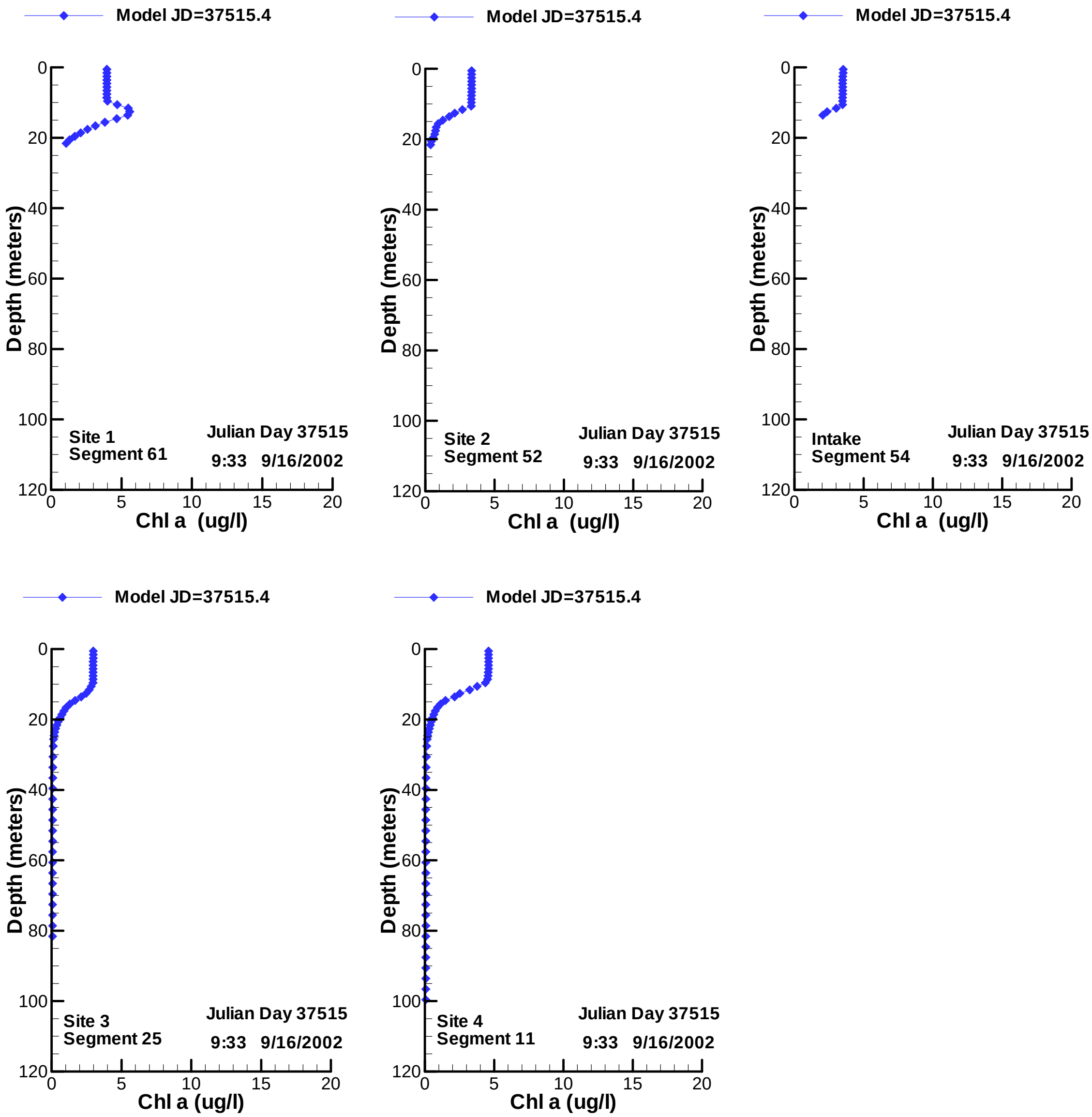

Figure 399. Vertical profiles of Chlorophyll a compared with data for 9/16/2002.

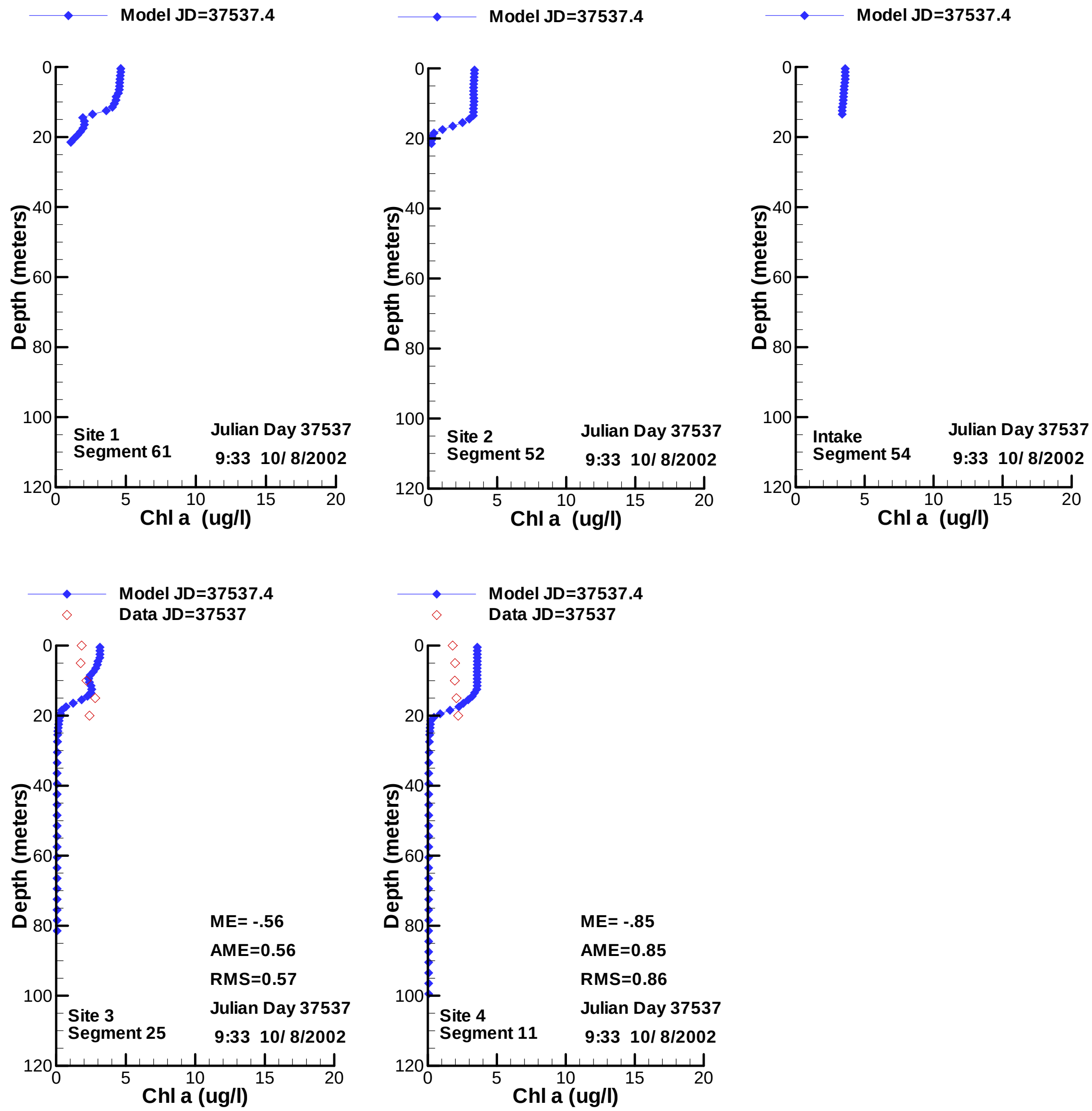

Figure 400. Vertical profiles of Chlorophyll a compared with data for 10/ 8/2002.

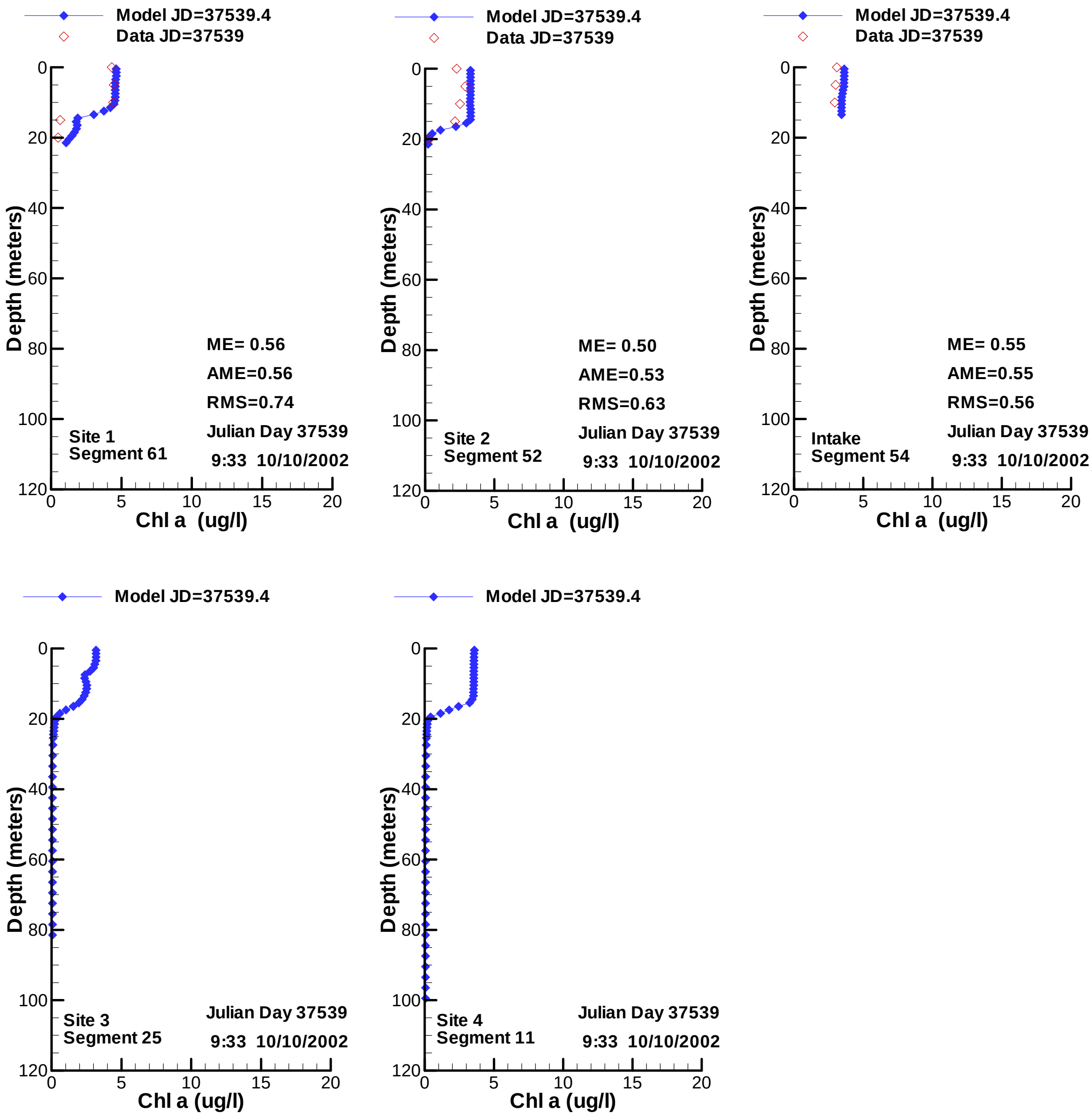

Figure 401. Vertical profiles of Chlorophyll a compared with data for 10/10/2002.

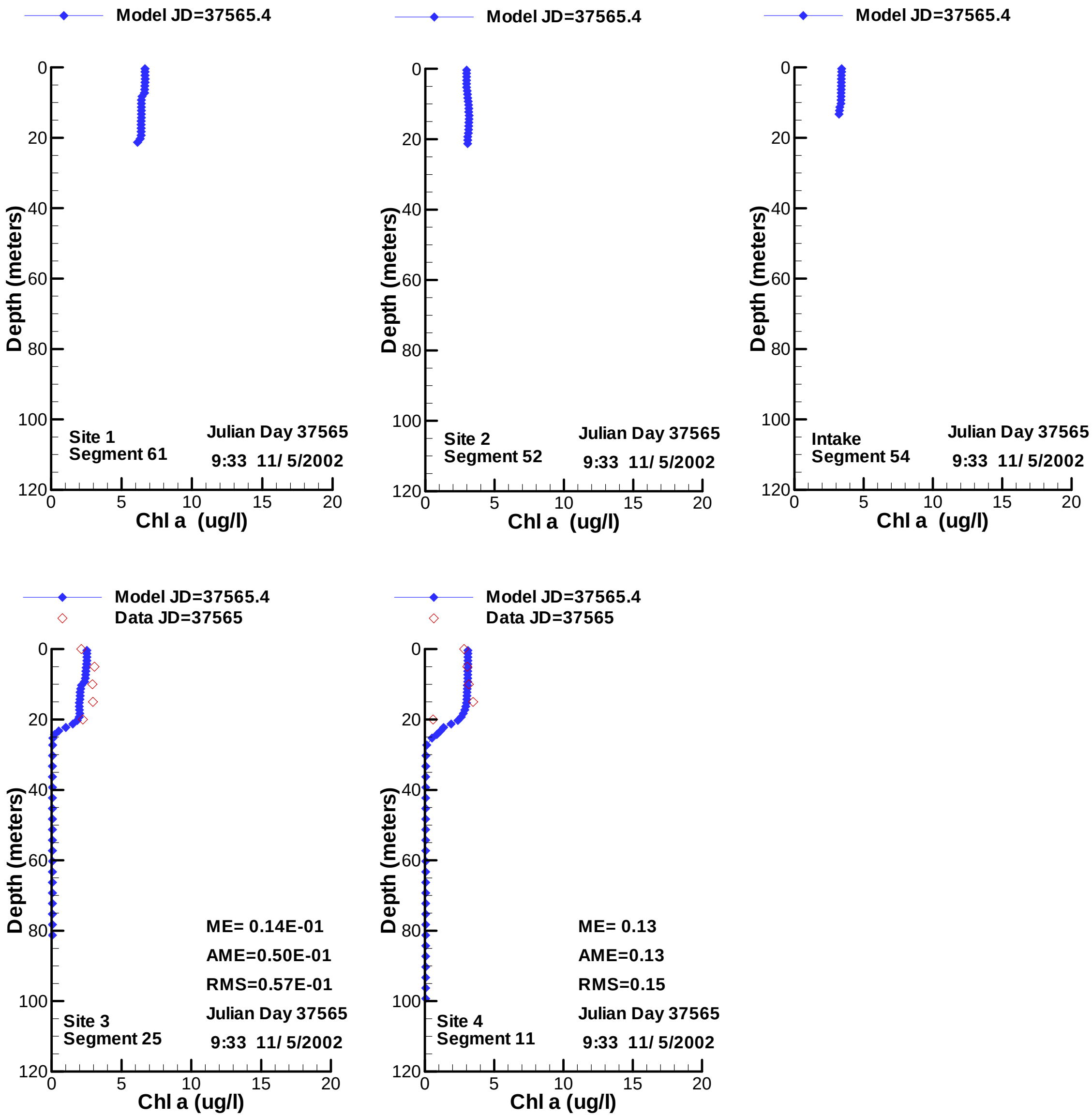

Figure 402. Vertical profiles of Chlorophyll a compared with data for 11/ 5/2002.

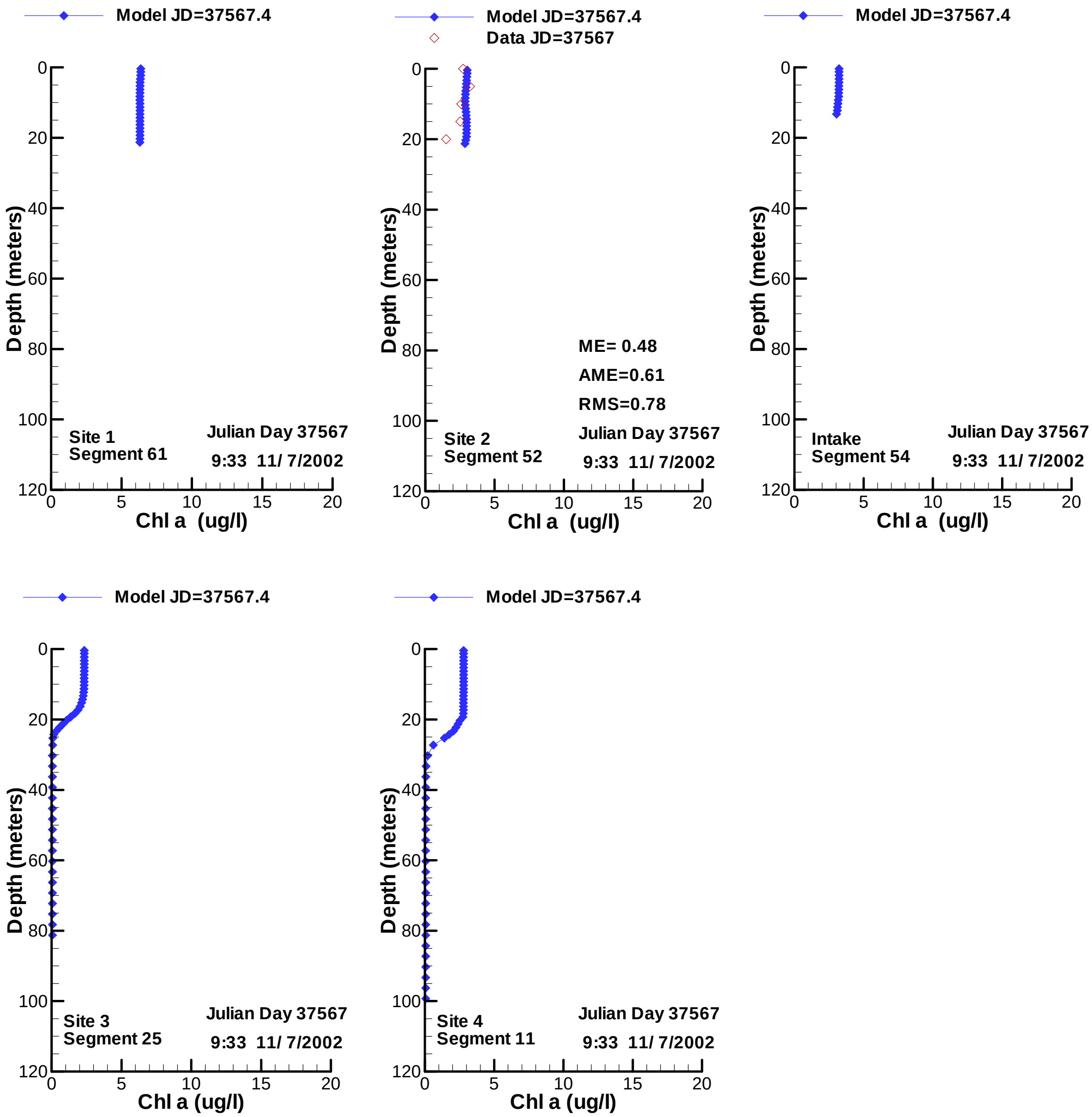

Figure 403. Vertical profiles of Chlorophyll a compared with data for 11/ 7/2002.

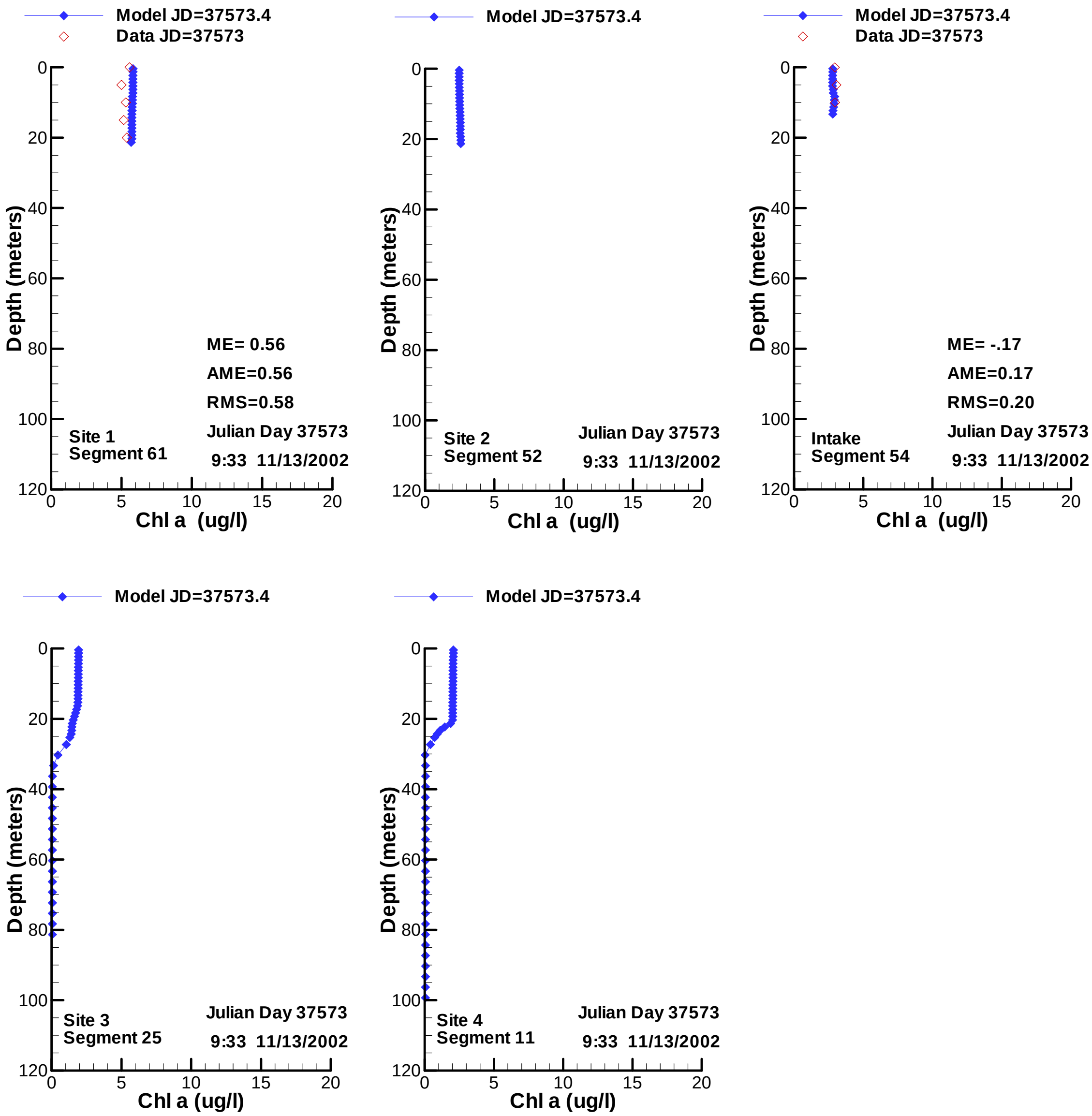

Figure 404. Vertical profiles of Chlorophyll a compared with data for 11/13/2002.

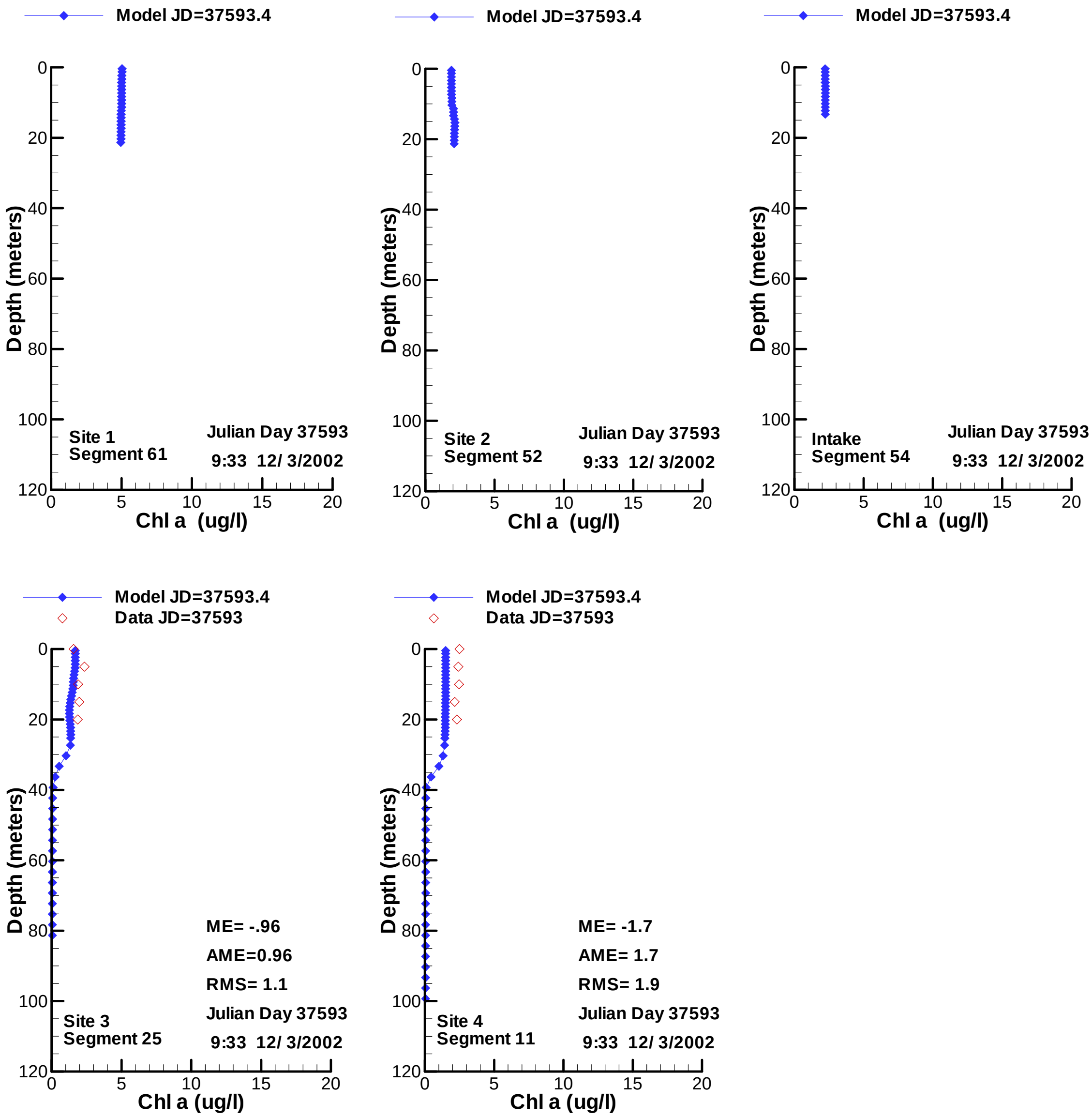

Figure 405. Vertical profiles of Chlorophyll a compared with data for 12/ 3/2002.

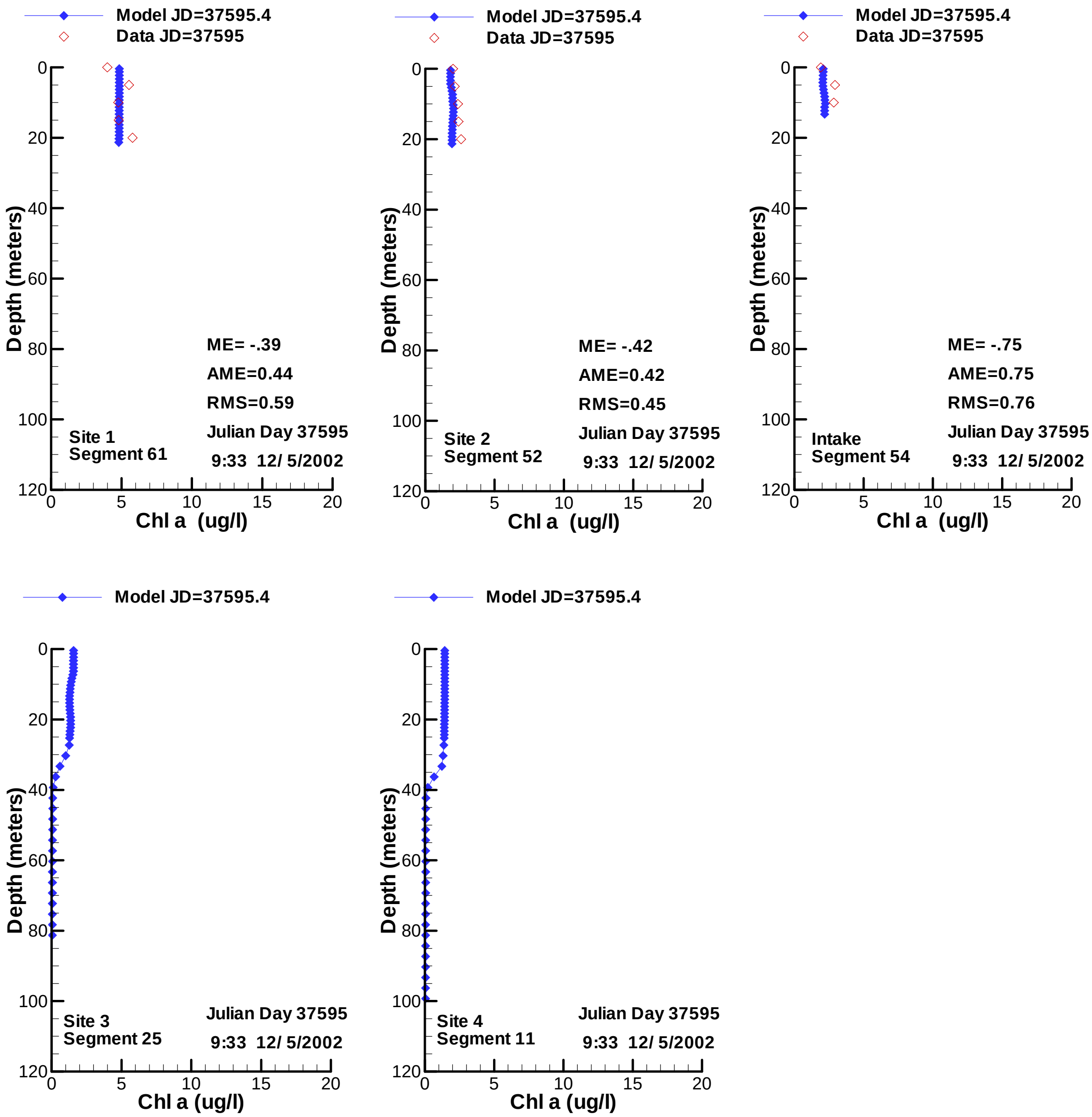

Figure 406. Vertical profiles of Chlorophyll a compared with data for 12/ 5/2002.

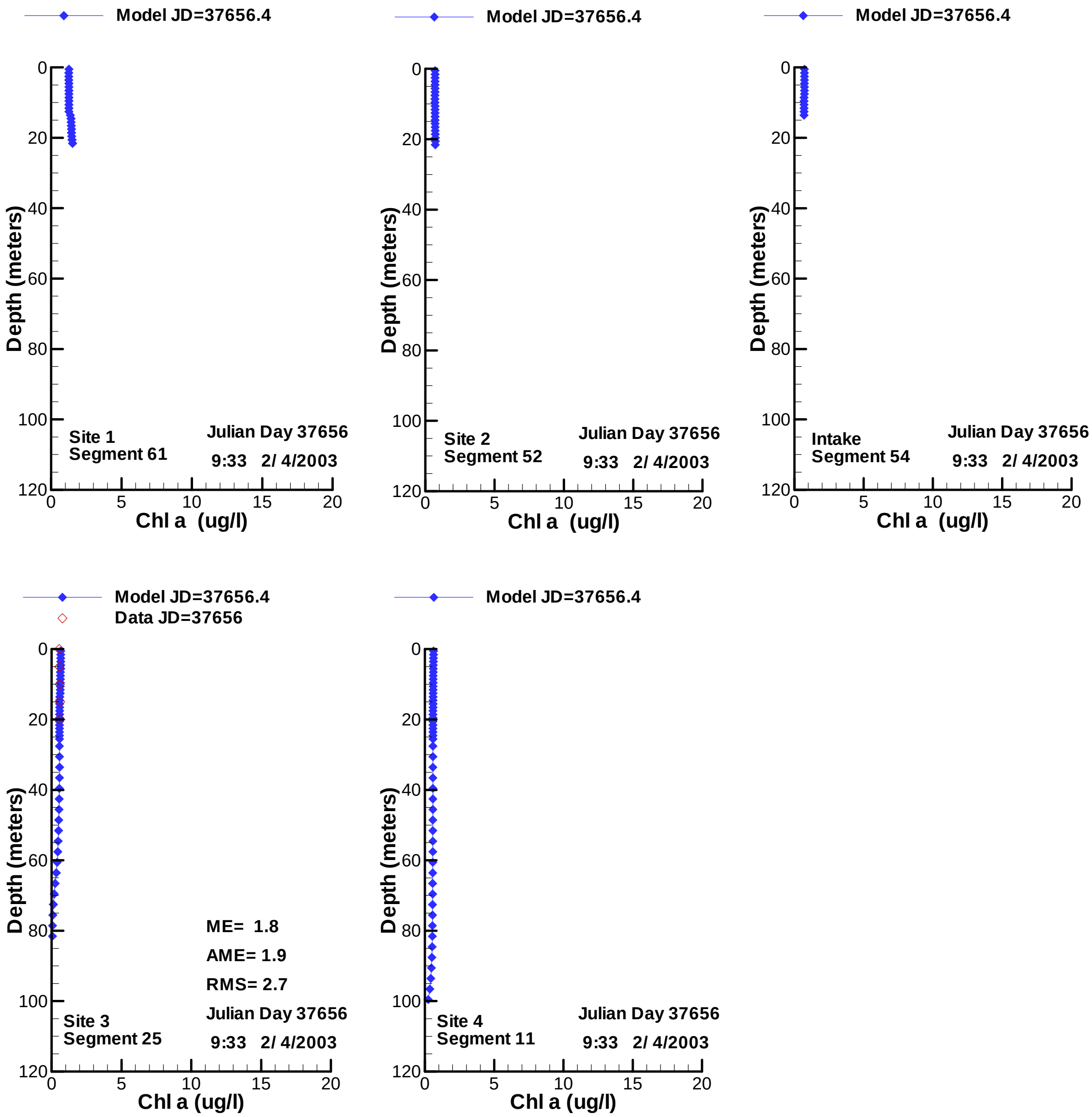

Figure 407. Vertical profiles of Chlorophyll a compared with data for 2/ 4/2003.

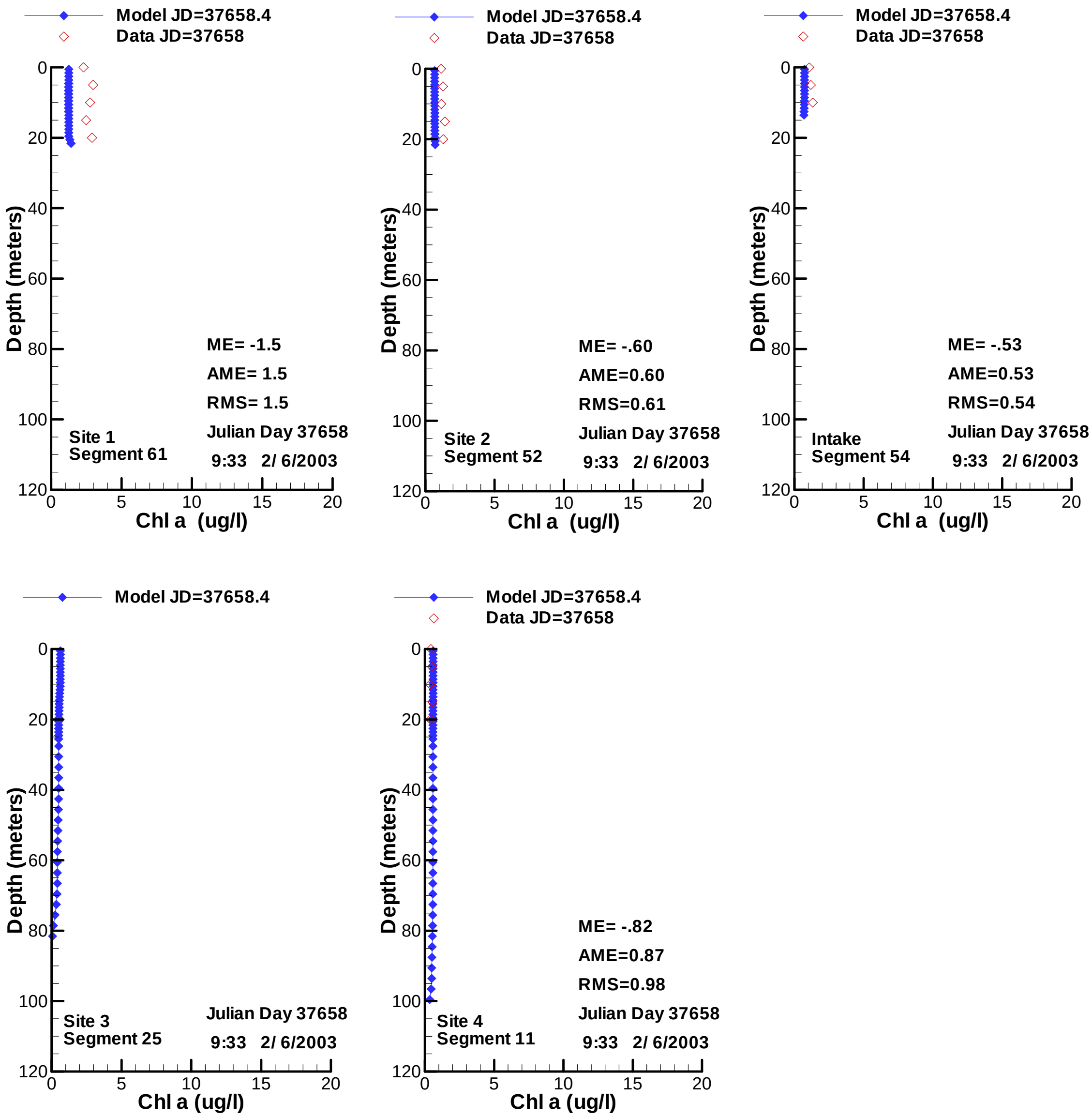

Figure 408. Vertical profiles of Chlorophyll a compared with data for 2/ 6/2003.

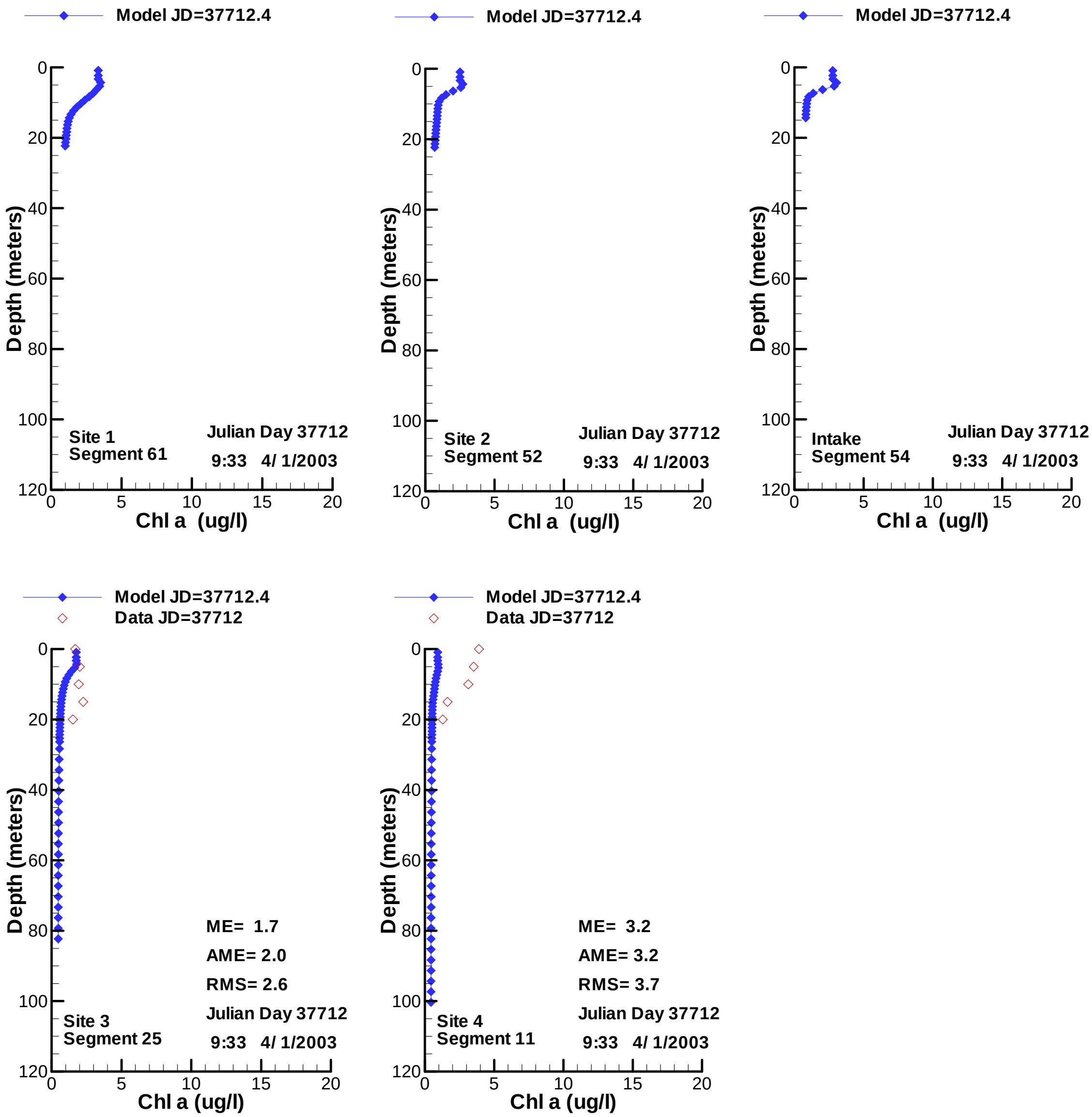

Figure 409. Vertical profiles of Chlorophyll a compared with data for 4/ 1/2003.

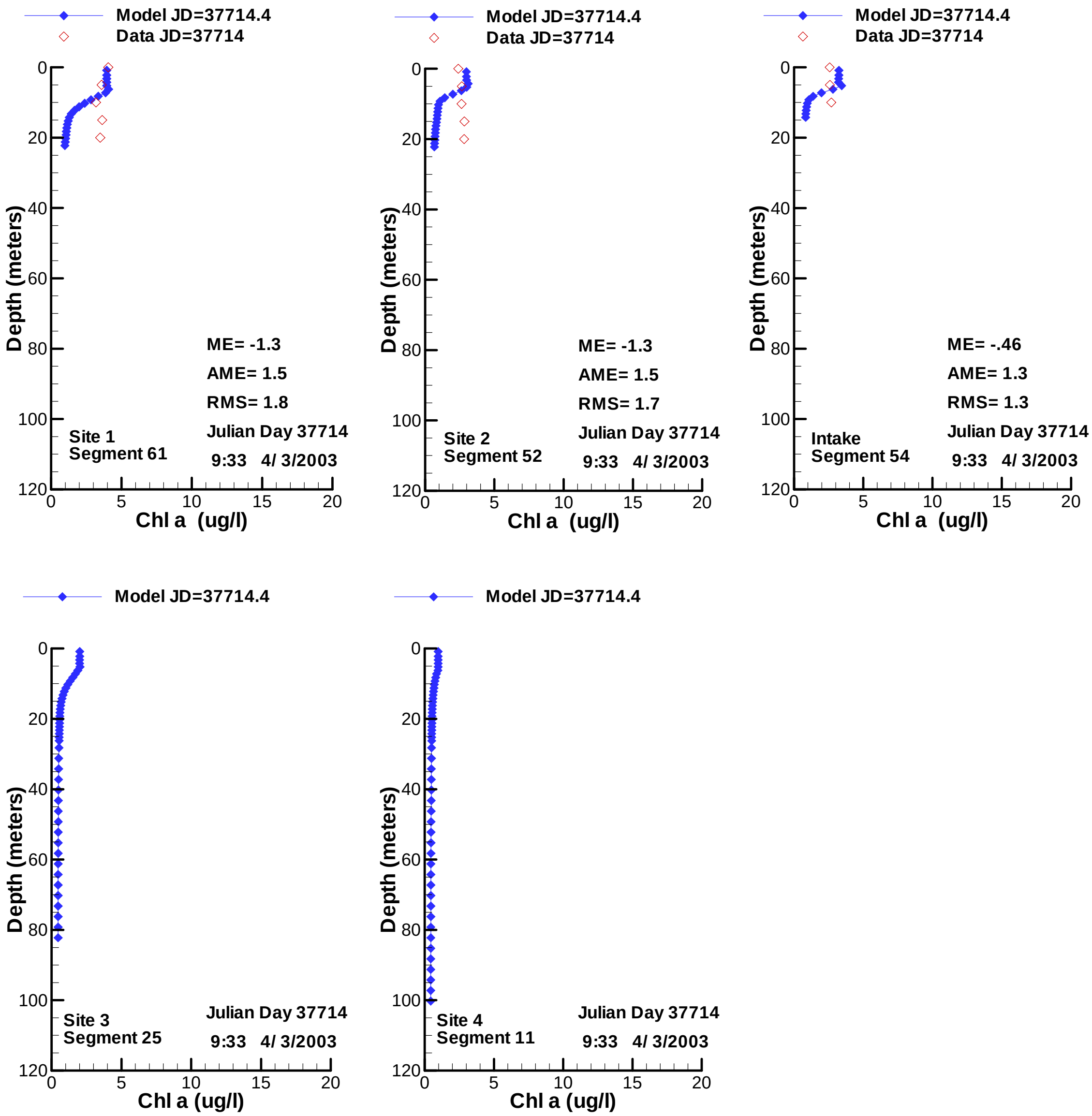

Figure 410. Vertical profiles of Chlorophyll a compared with data for 4/ 3/2003.

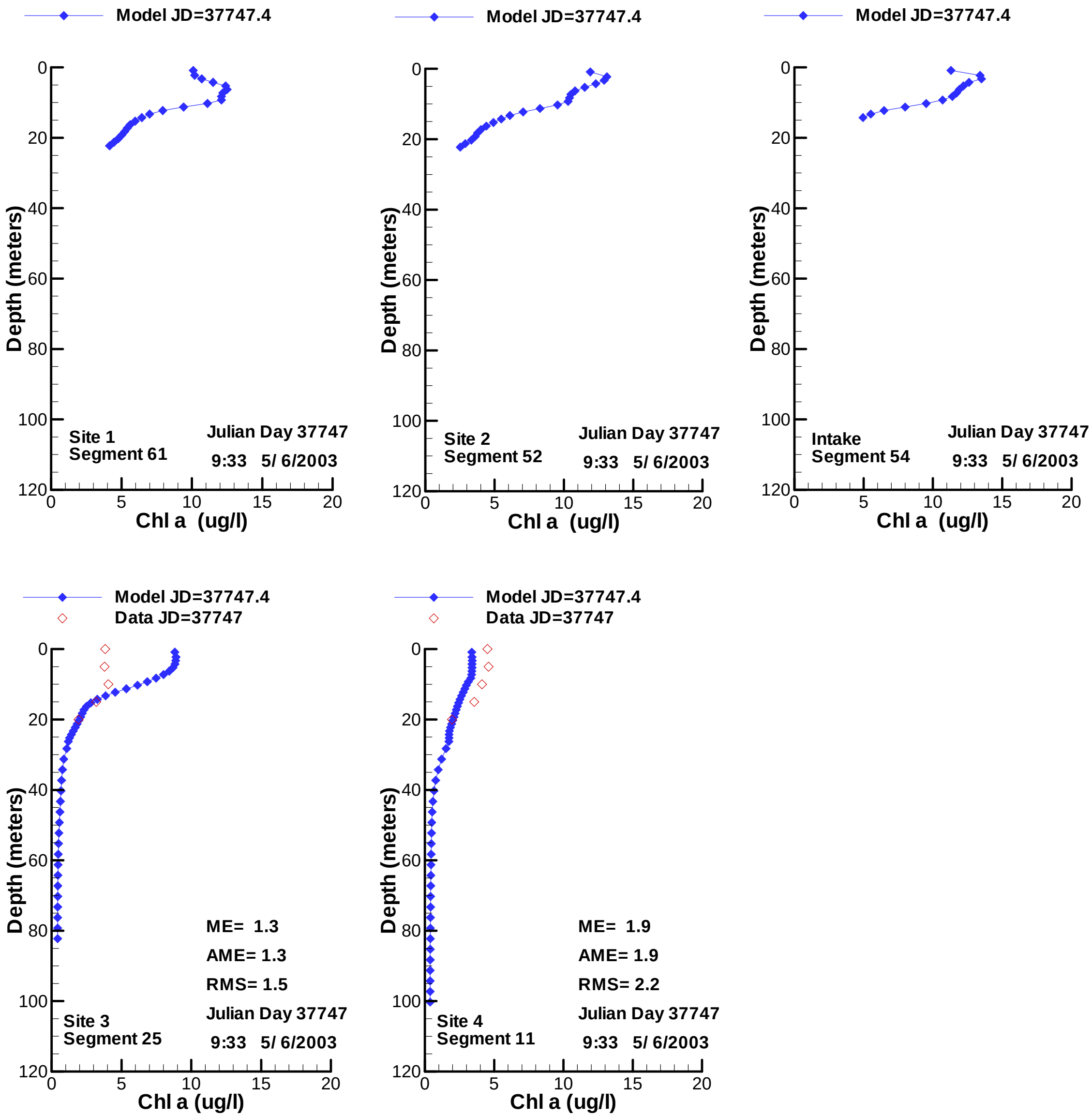

Figure 411. Vertical profiles of Chlorophyll a compared with data for 5/ 6/2003.

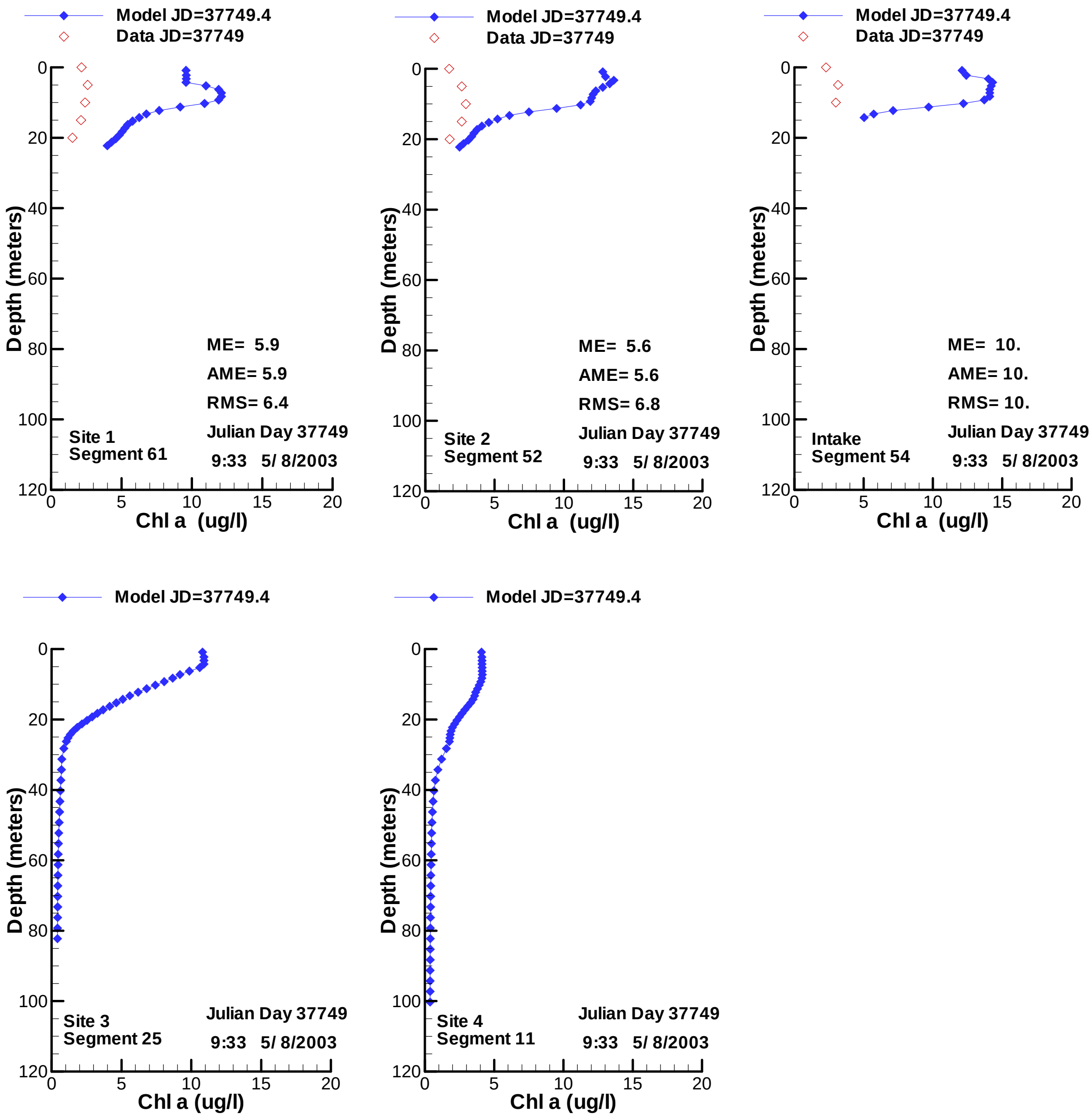

Figure 412. Vertical profiles of Chlorophyll a compared with data for 5/ 8/2003.

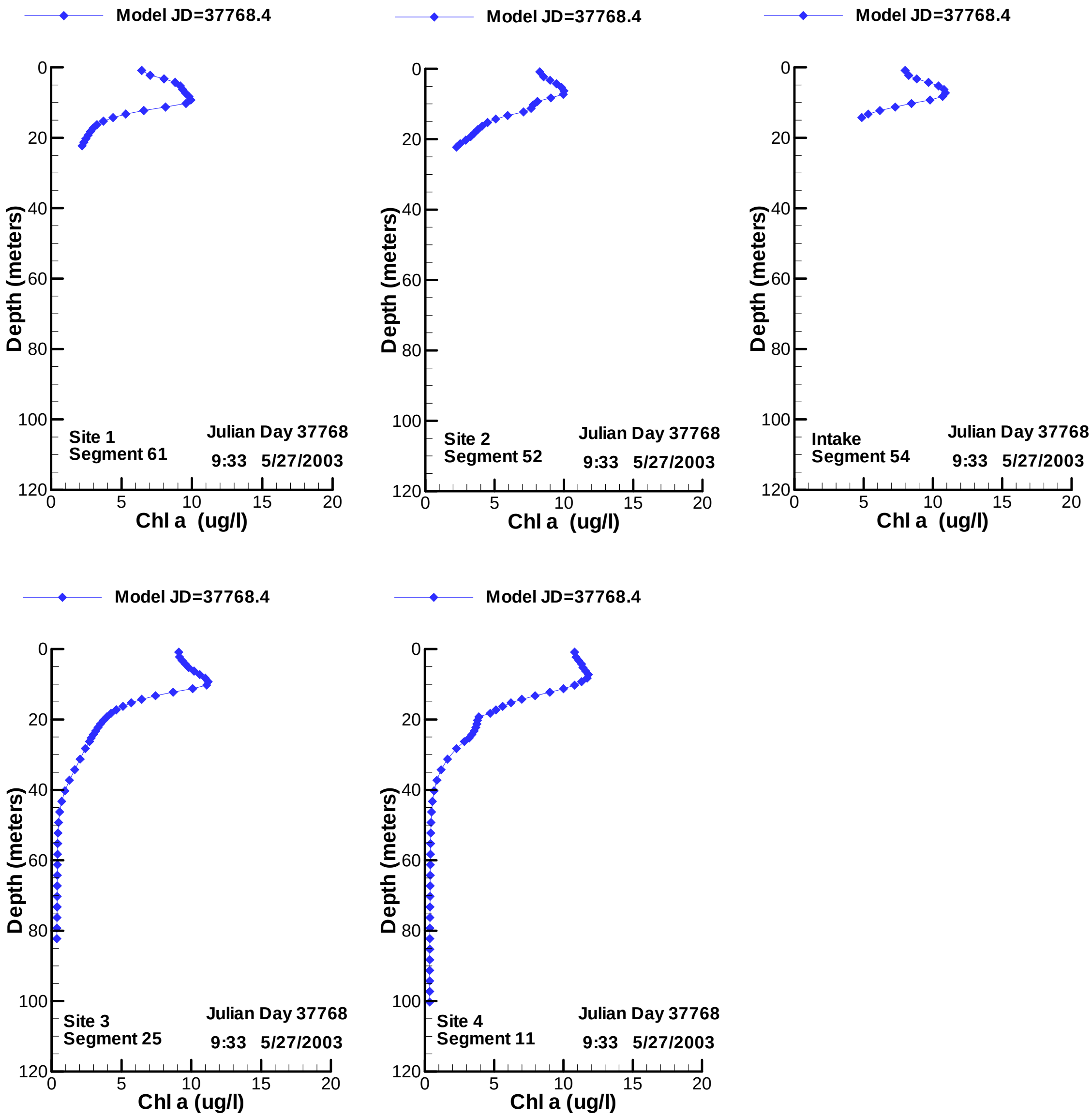

Figure 413. Vertical profiles of Chlorophyll a compared with data for 5/27/2003.

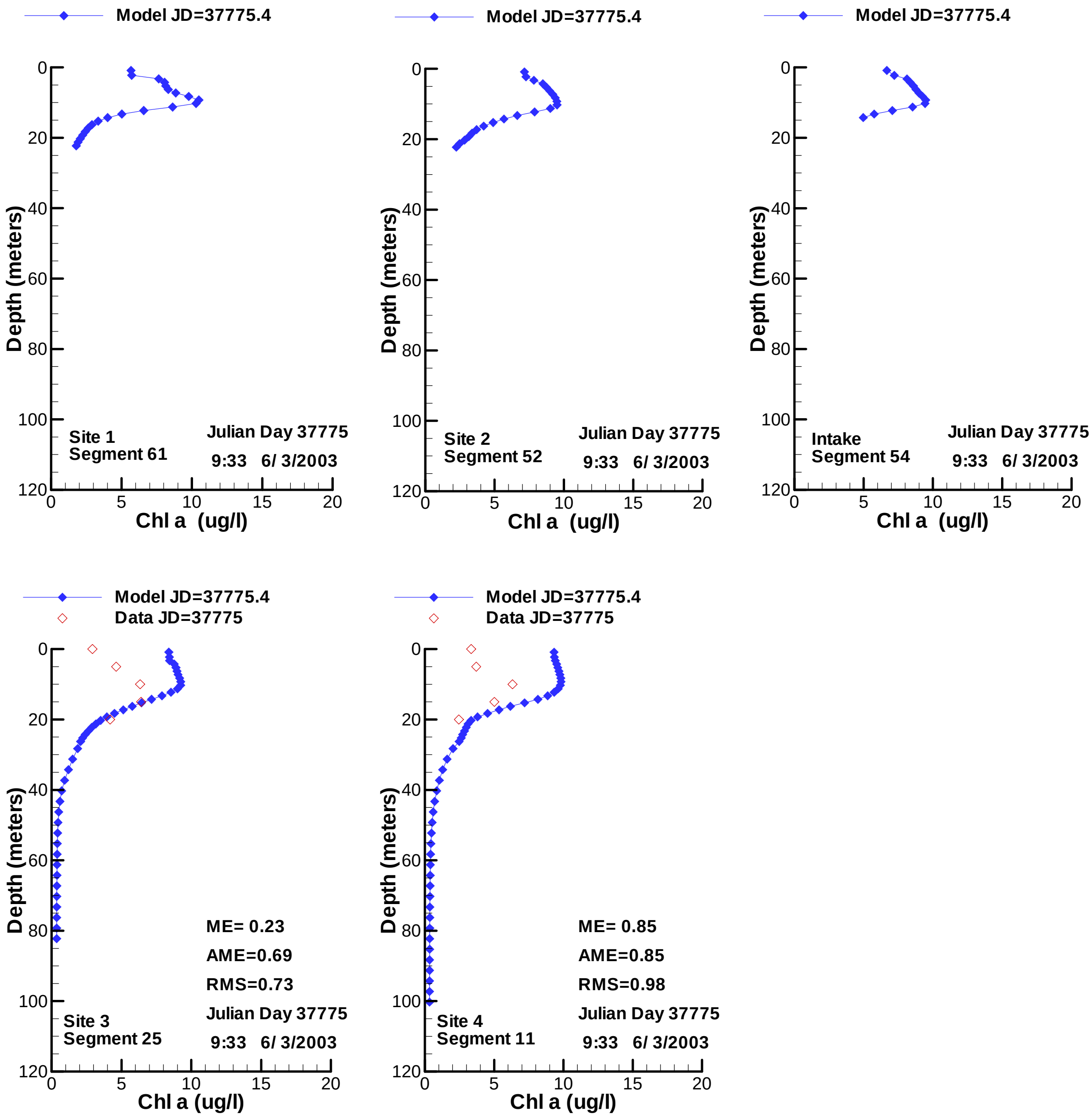

Figure 414. Vertical profiles of Chlorophyll a compared with data for 6/ 3/2003.

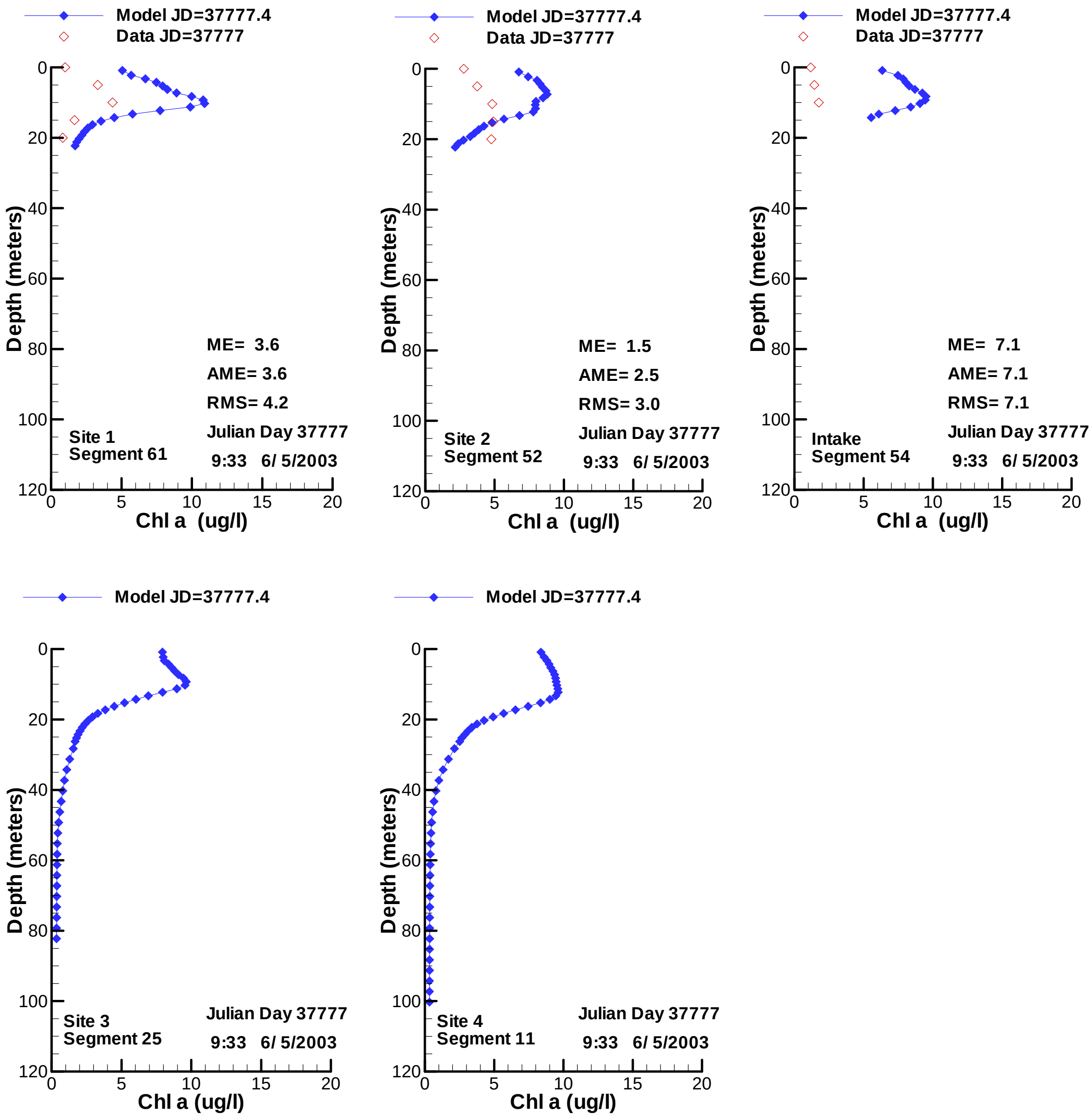

Figure 415. Vertical profiles of Chlorophyll a compared with data for 6/ 5/2003.

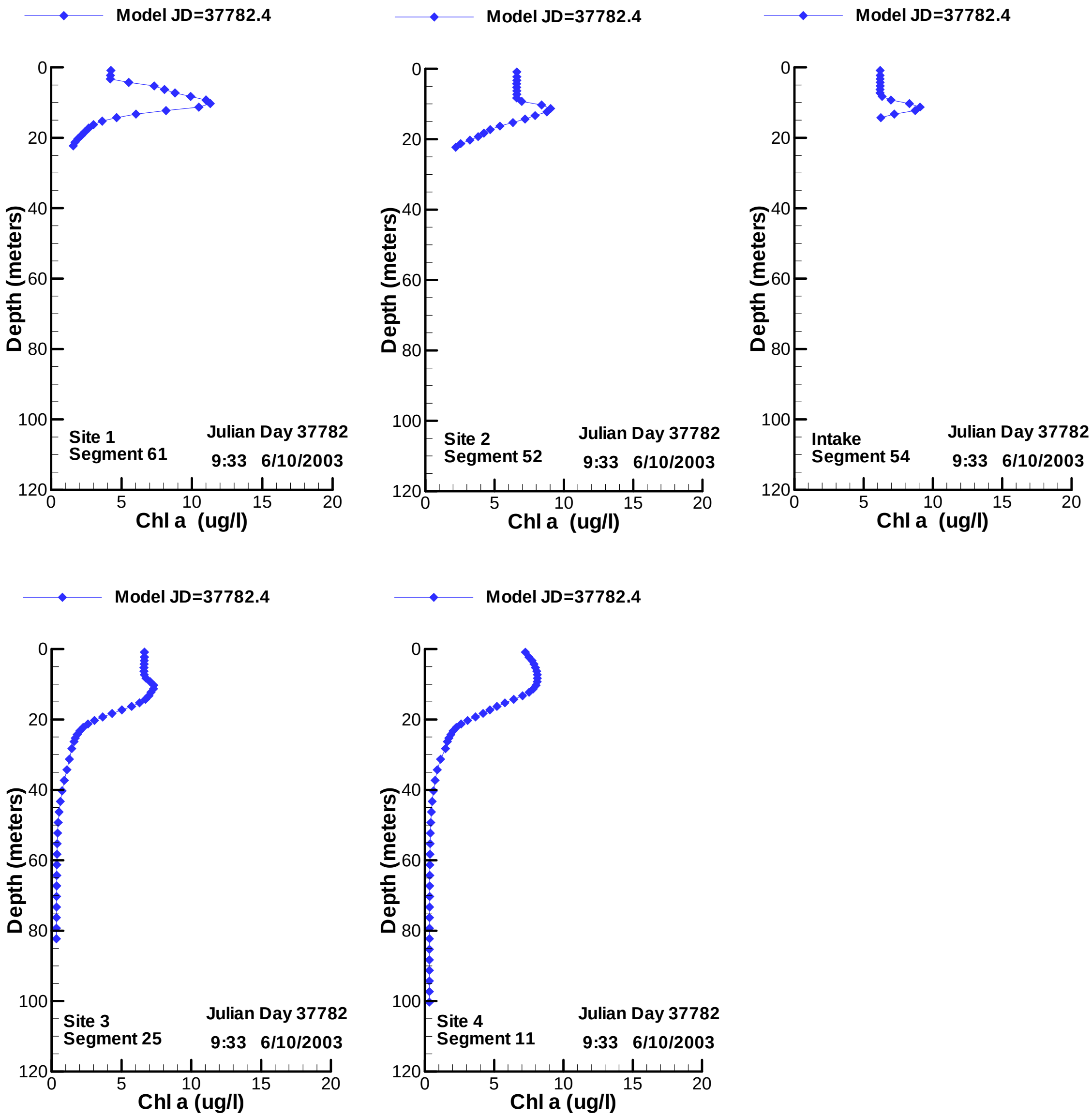

Figure 416. Vertical profiles of Chlorophyll a compared with data for 6/10/2003.

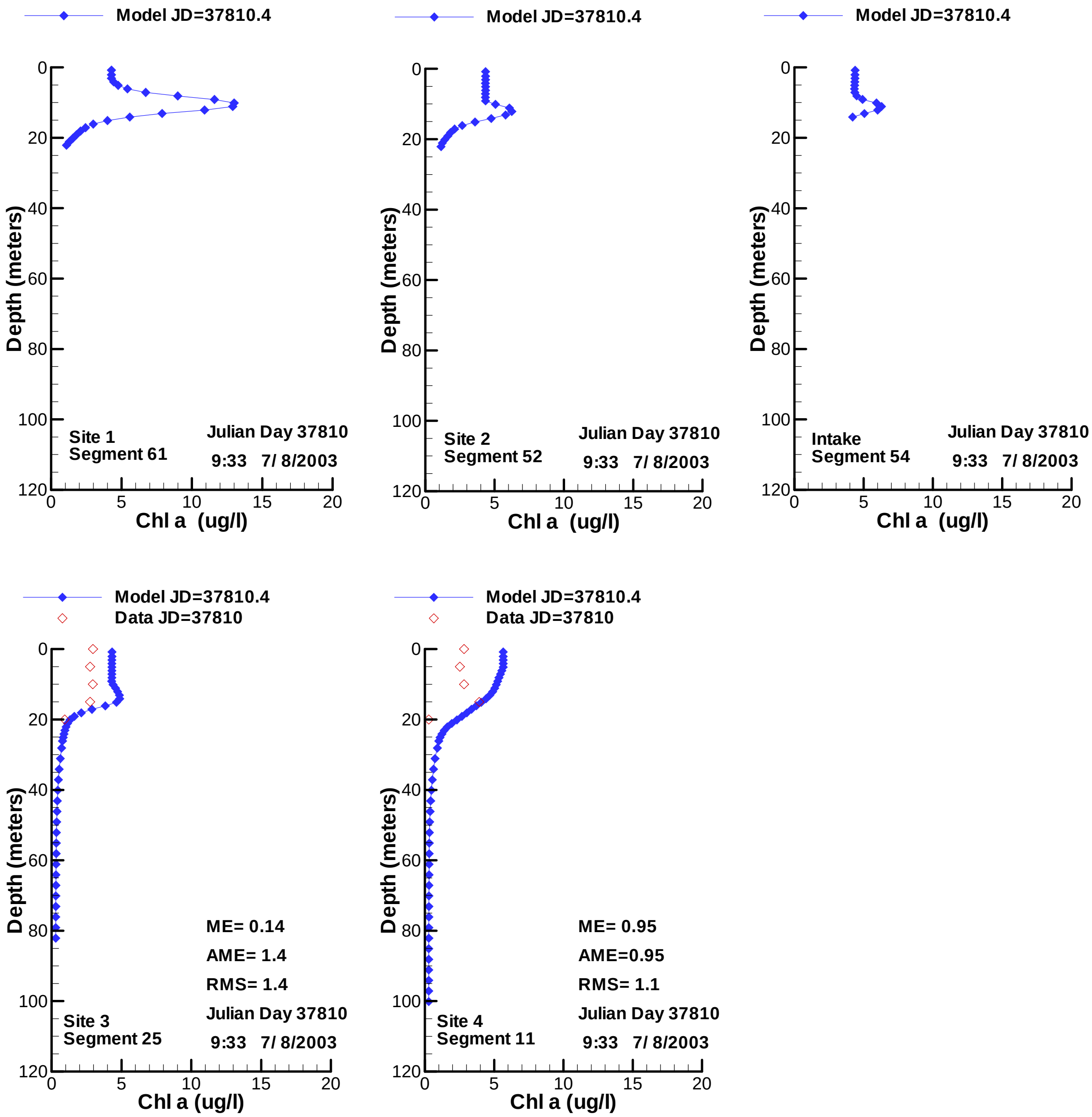

Figure 417. Vertical profiles of Chlorophyll a compared with data for 7/ 8/2003.

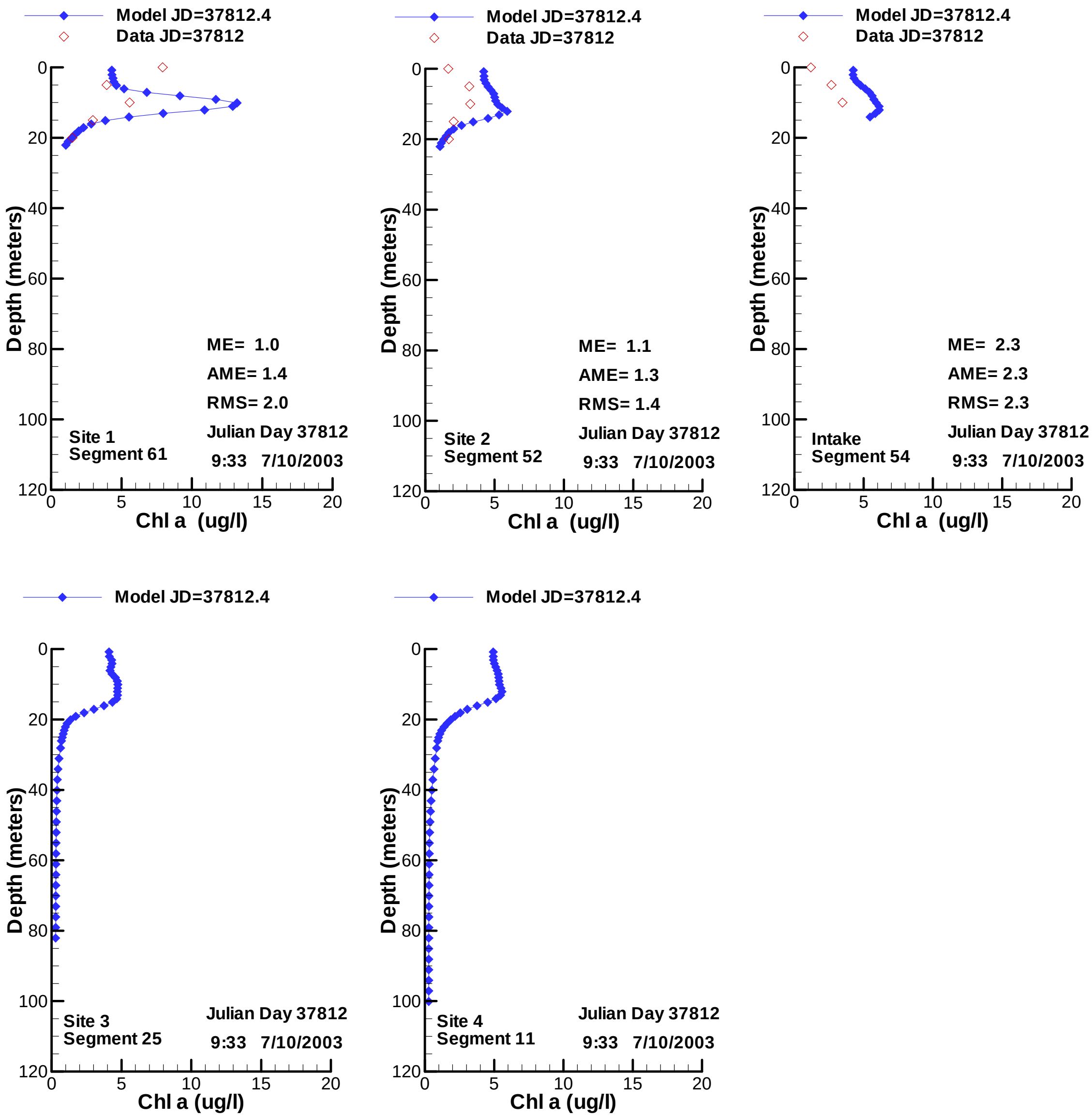

Figure 418. Vertical profiles of Chlorophyll a compared with data for 7/10/2003.

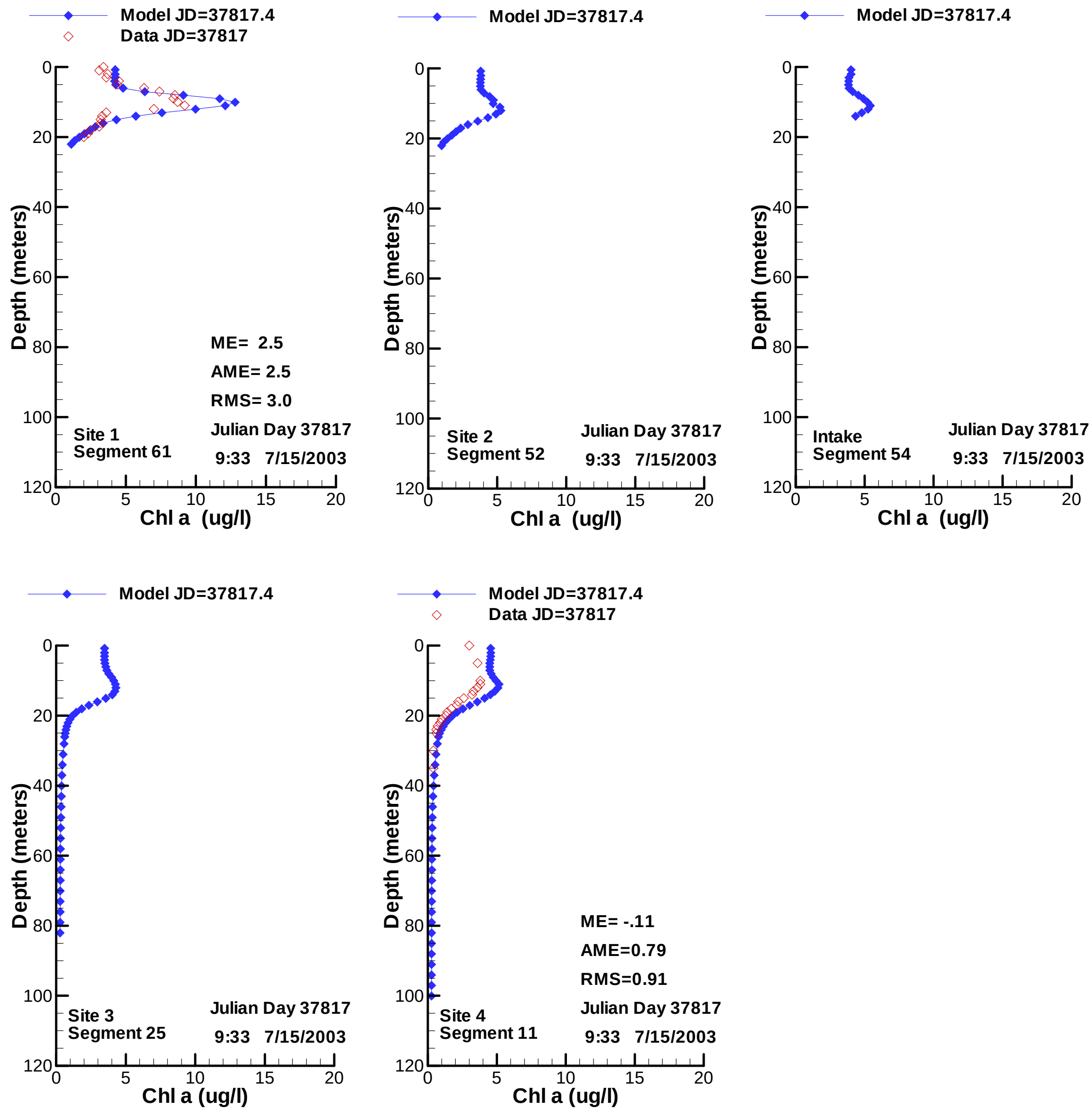

Figure 419. Vertical profiles of Chlorophyll a compared with data for 7/15/2003.

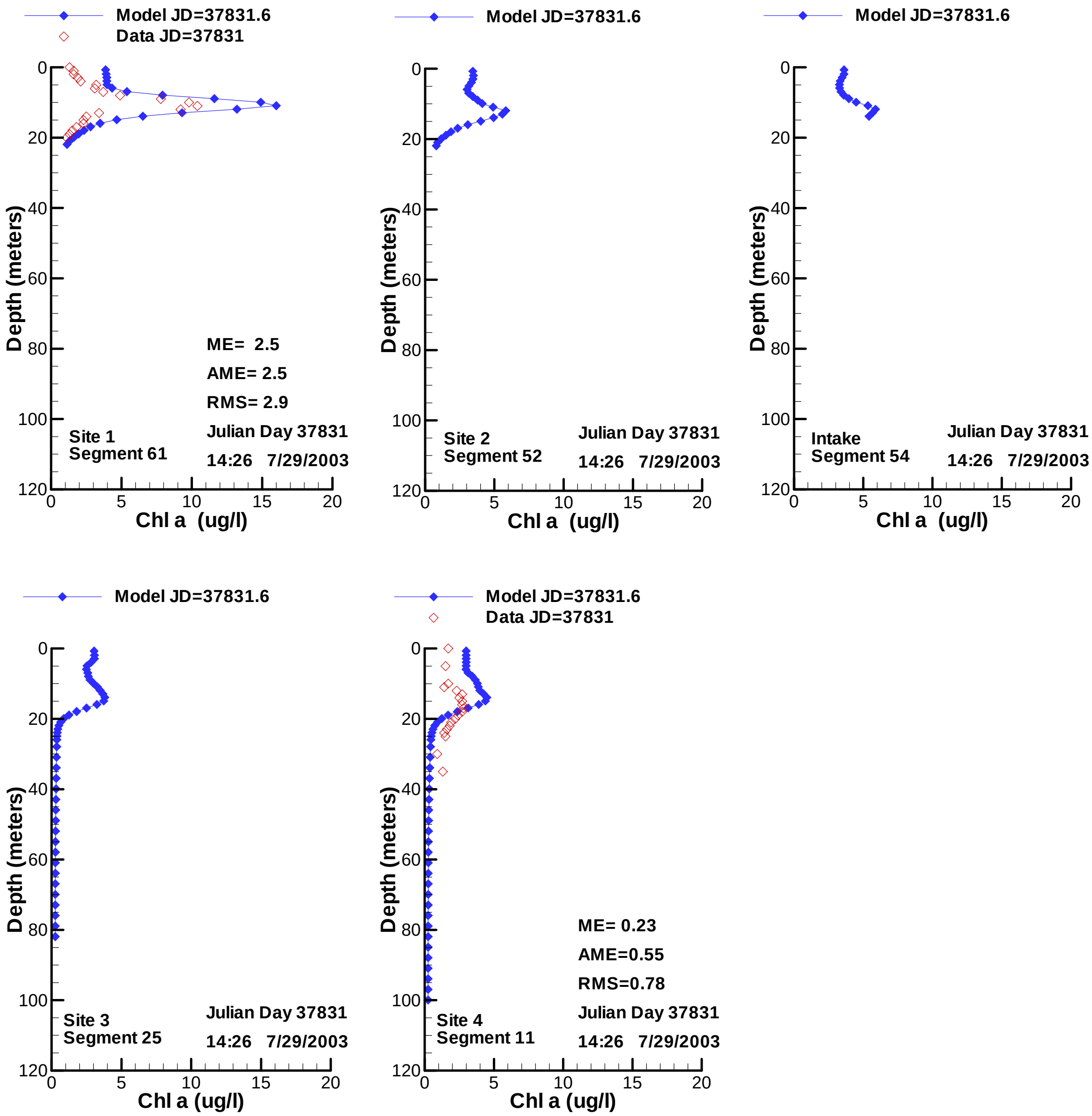

Figure 420. Vertical profiles of Chlorophyll a compared with data for 7/29/2003.

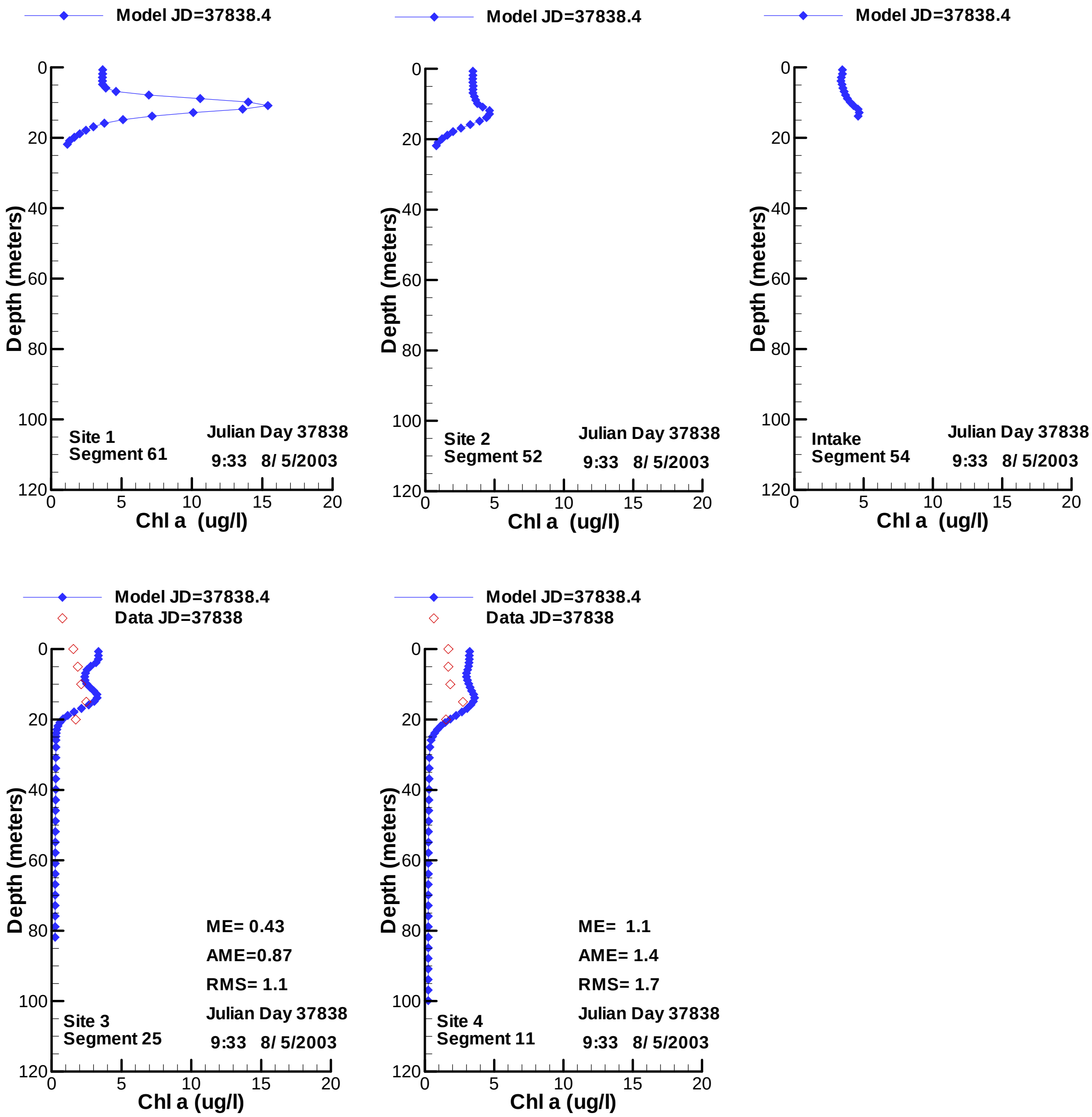

Figure 421. Vertical profiles of Chlorophyll a compared with data for 8/ 5/2003.

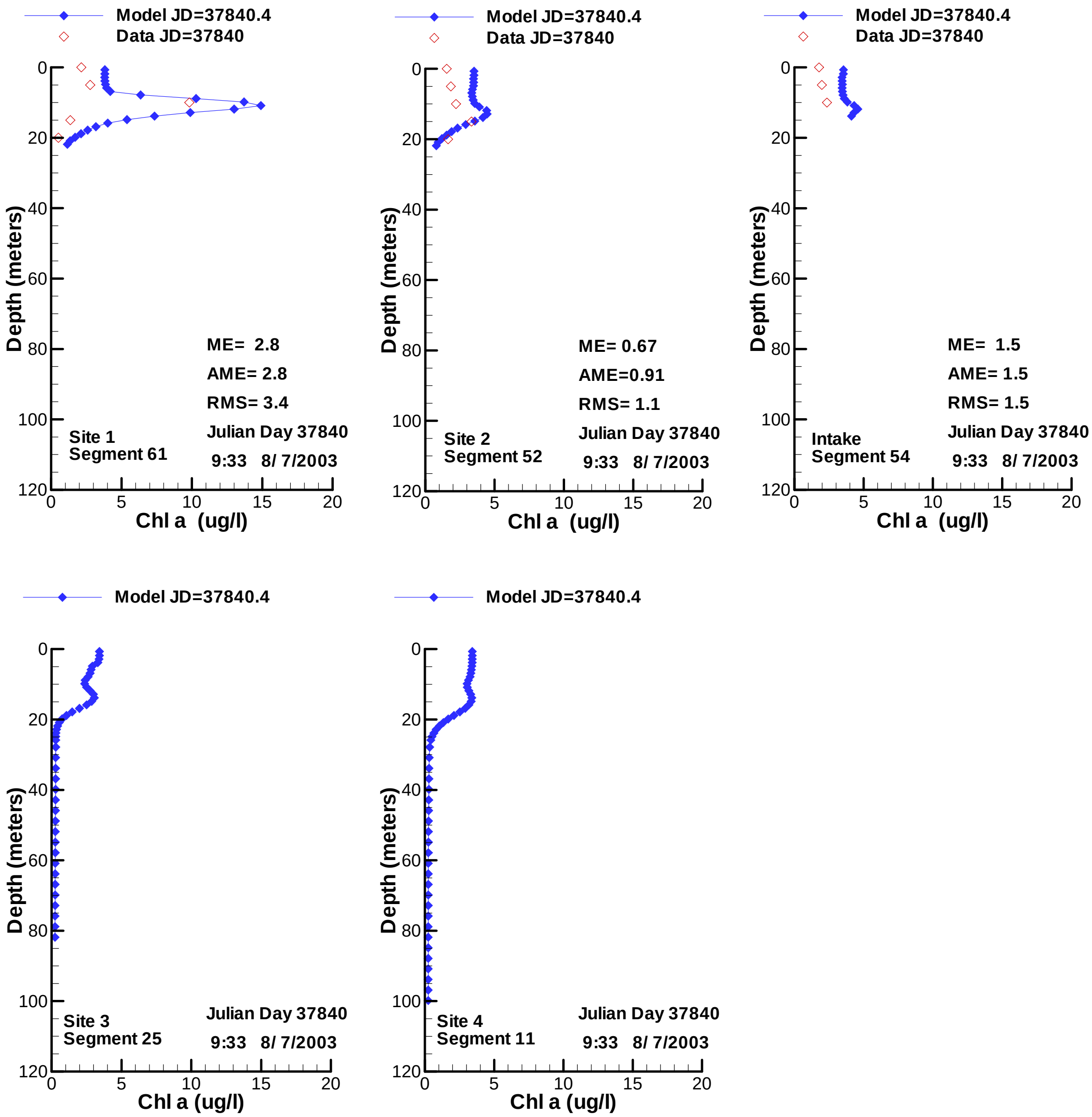

Figure 422. Vertical profiles of Chlorophyll a compared with data for 8/ 7/2003.

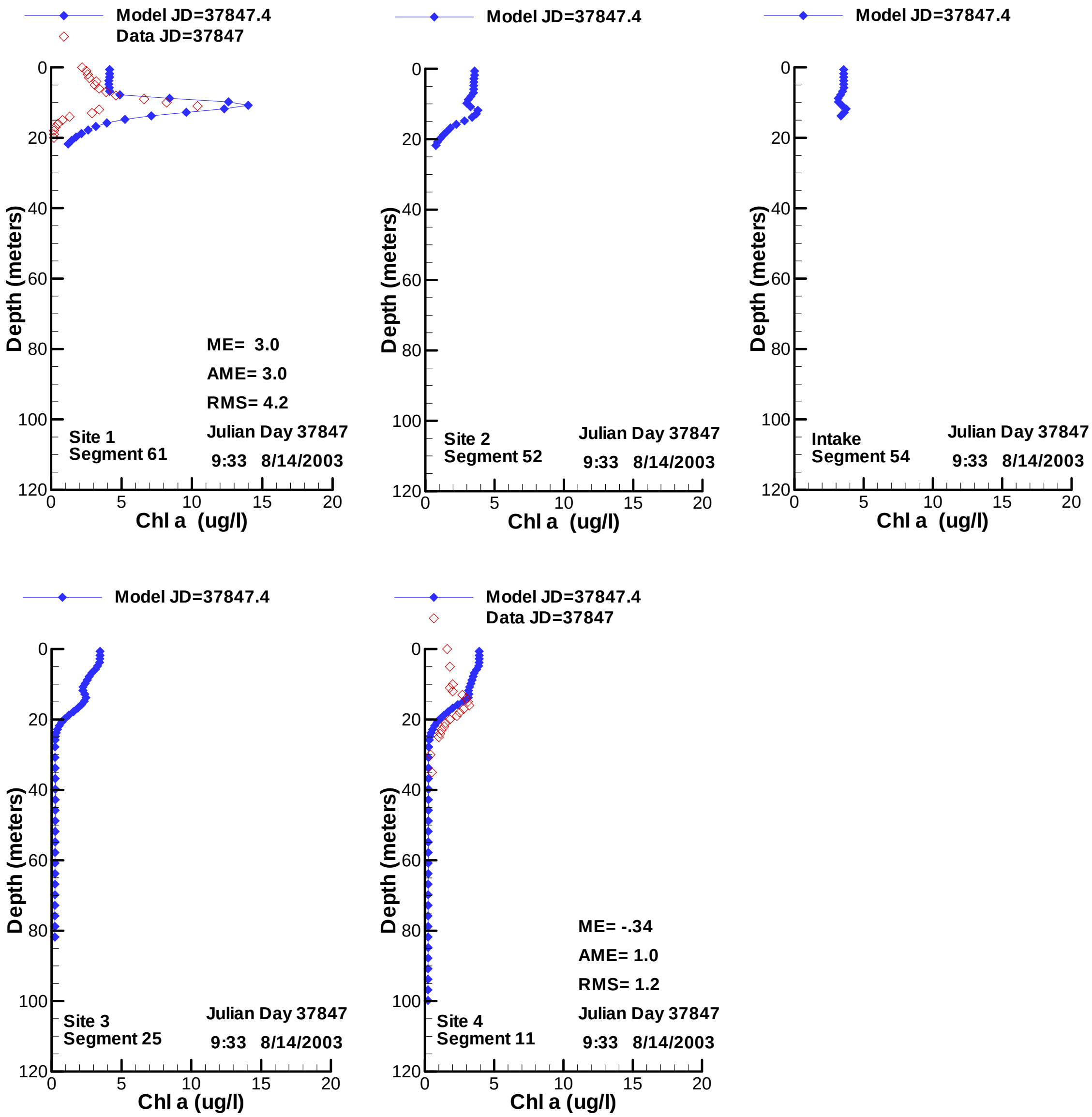

Figure 423. Vertical profiles of Chlorophyll a compared with data for 8/14/2003.

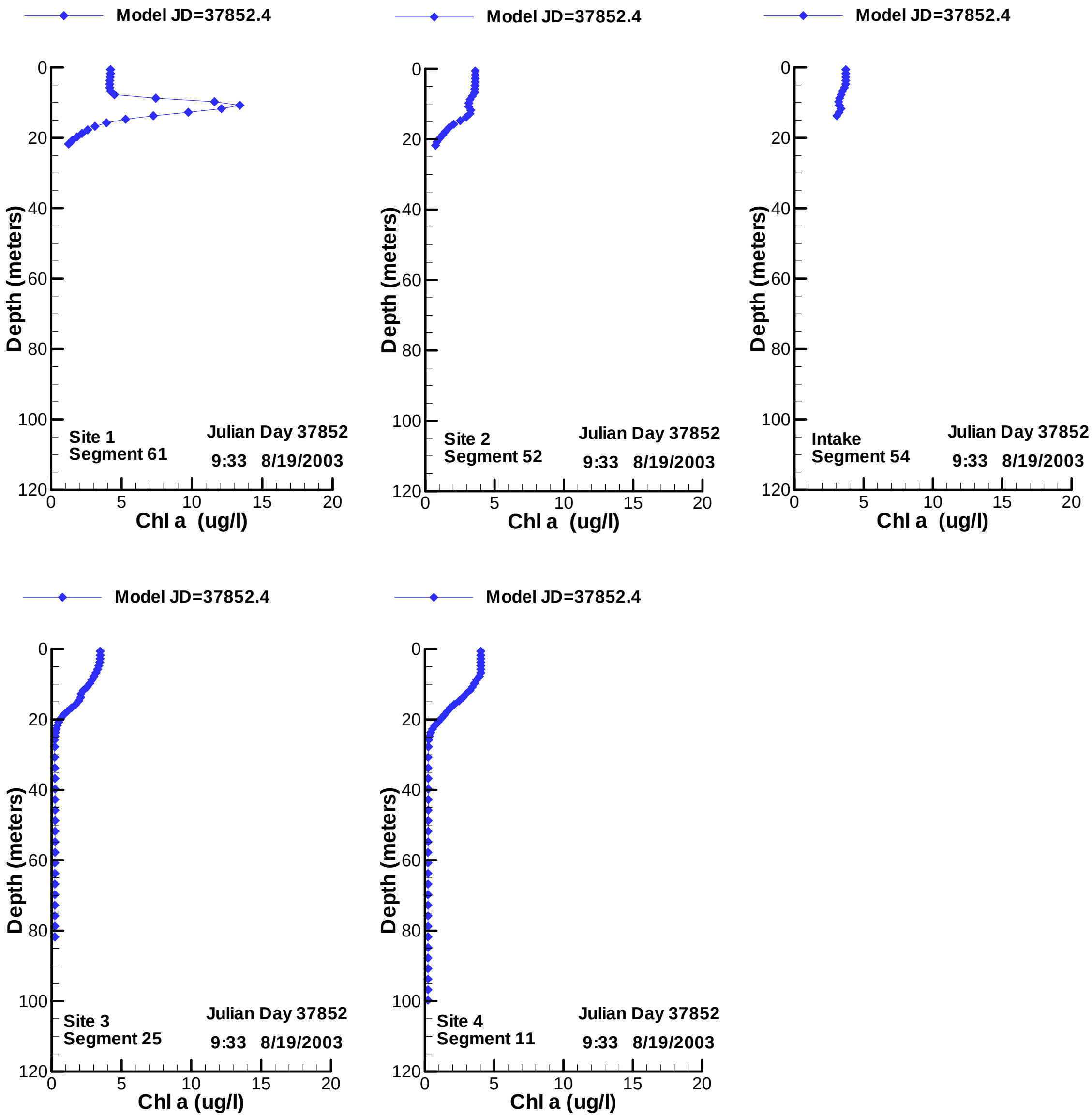

Figure 424. Vertical profiles of Chlorophyll a compared with data for 8/19/2003.

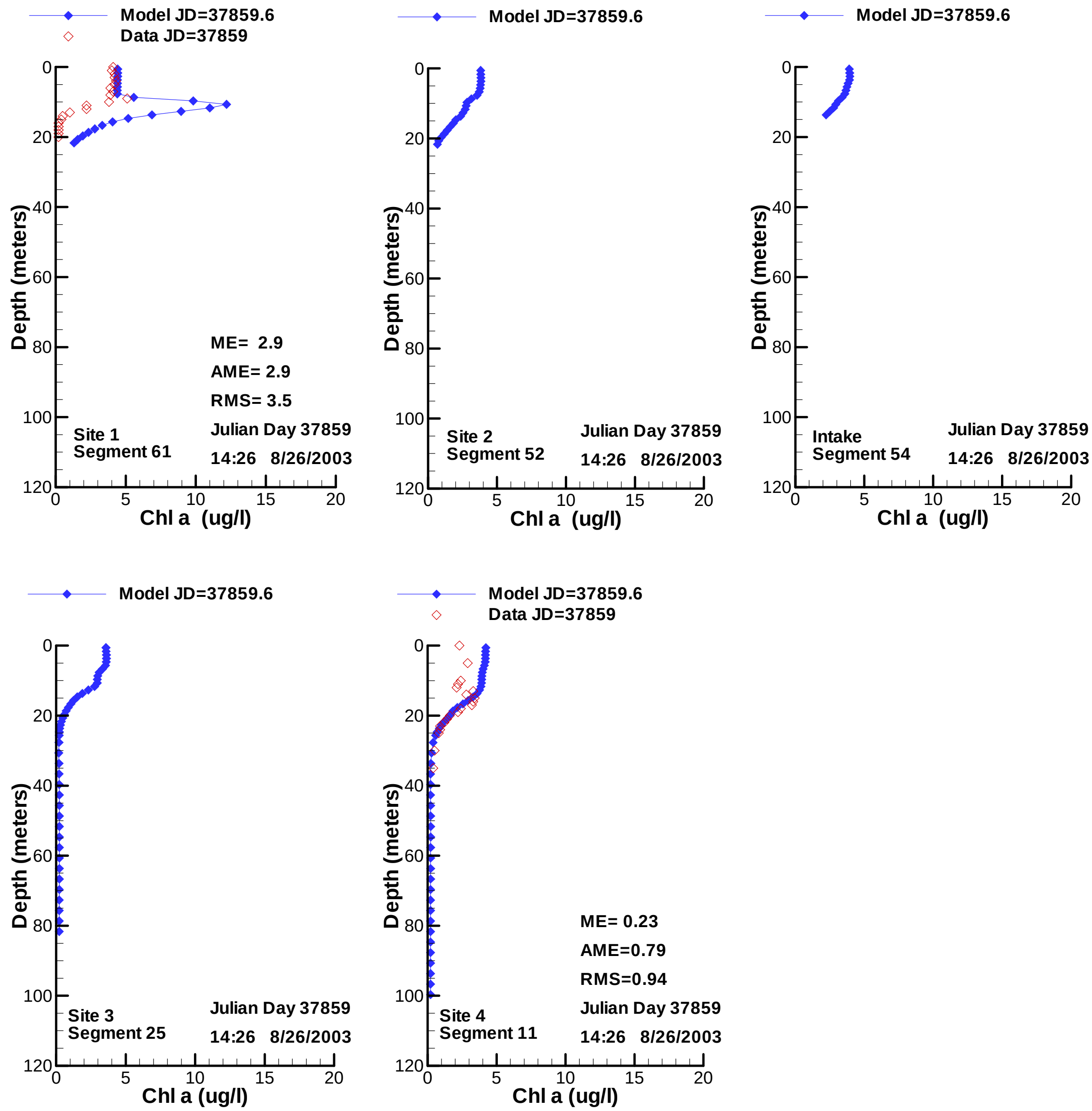

Figure 425. Vertical profiles of Chlorophyll a compared with data for 8/26/2003.

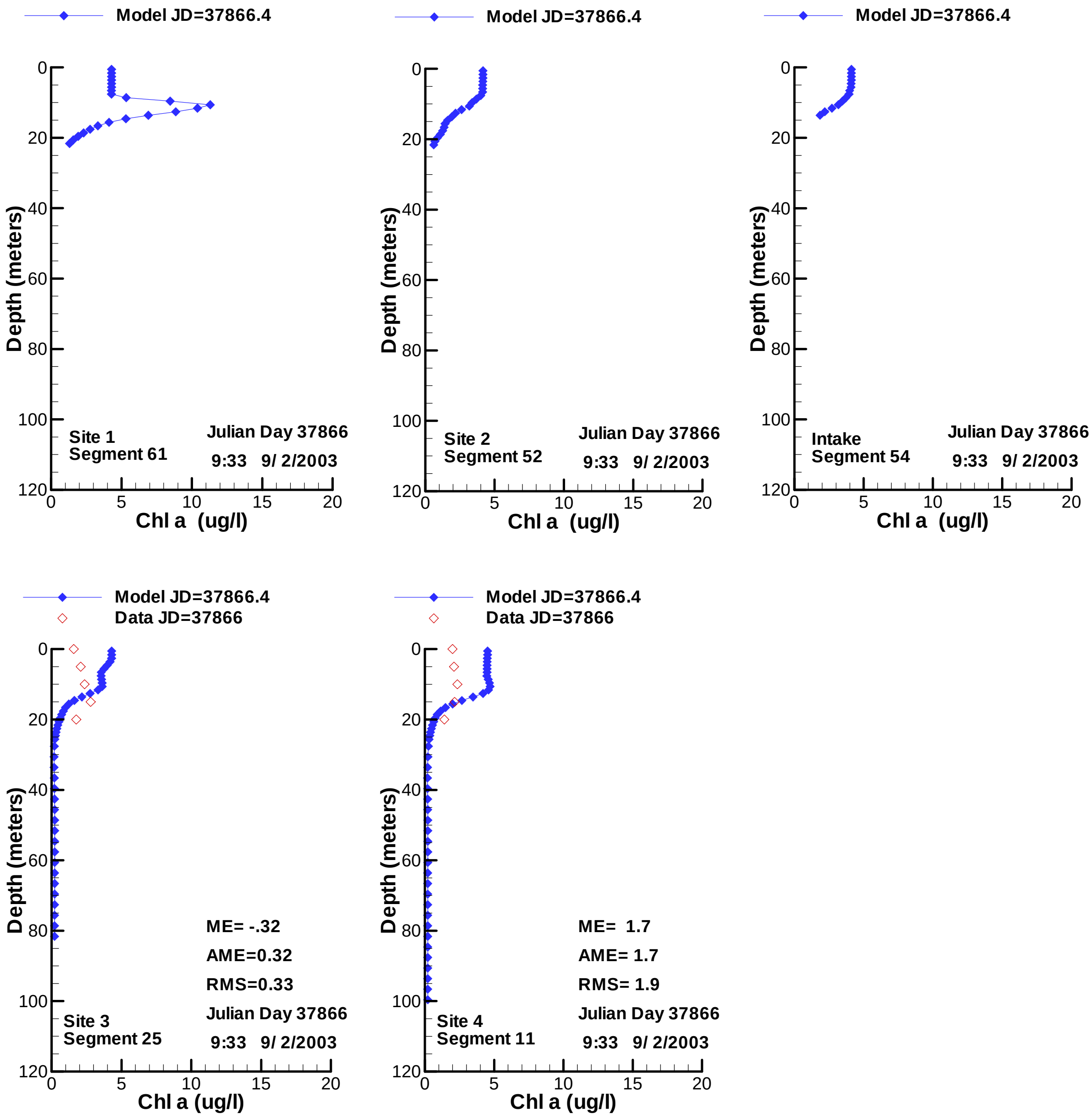

Figure 426. Vertical profiles of Chlorophyll a compared with data for 9/ 2/2003.

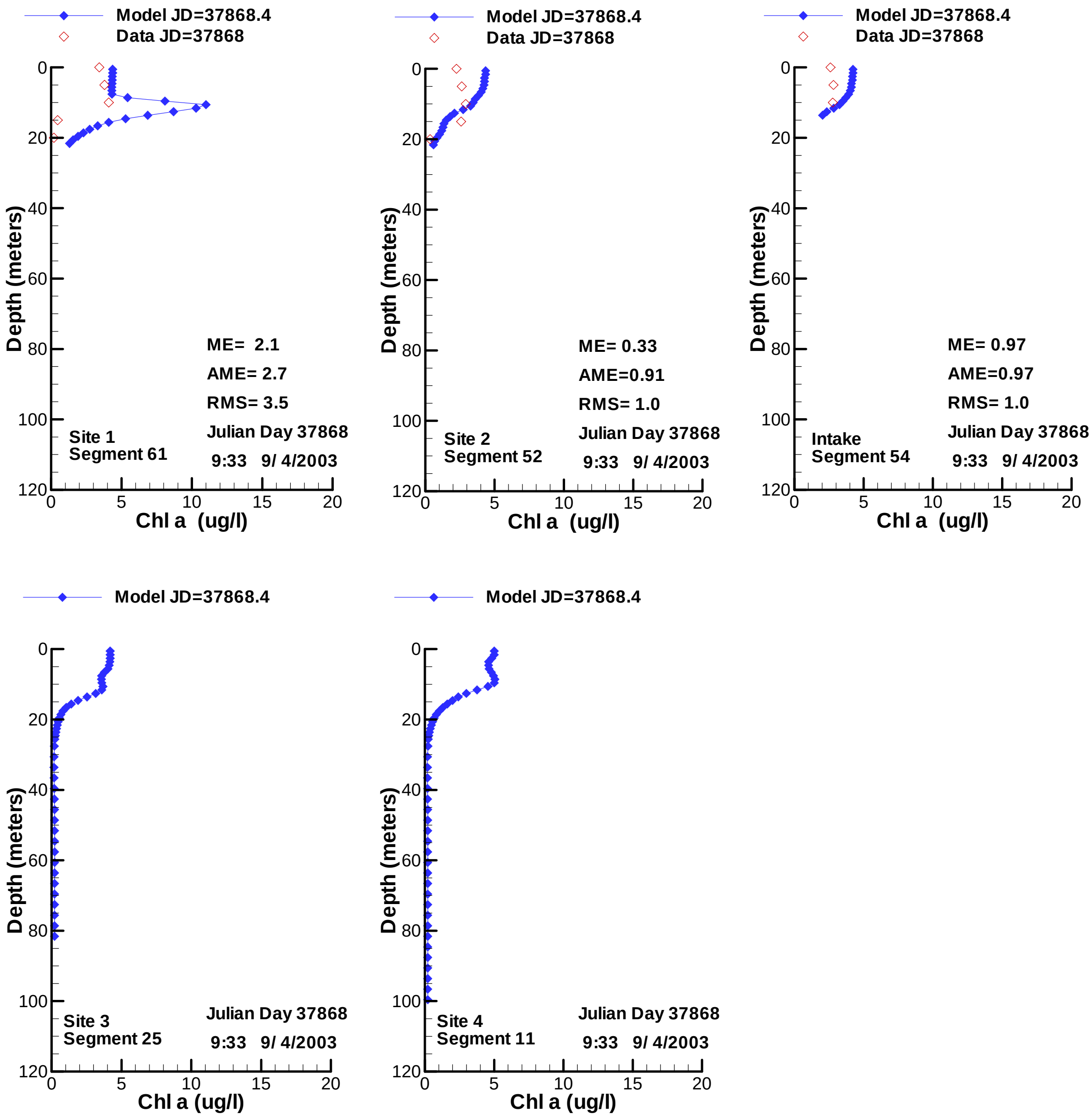

Figure 427. Vertical profiles of Chlorophyll a compared with data for 9/ 4/2003.

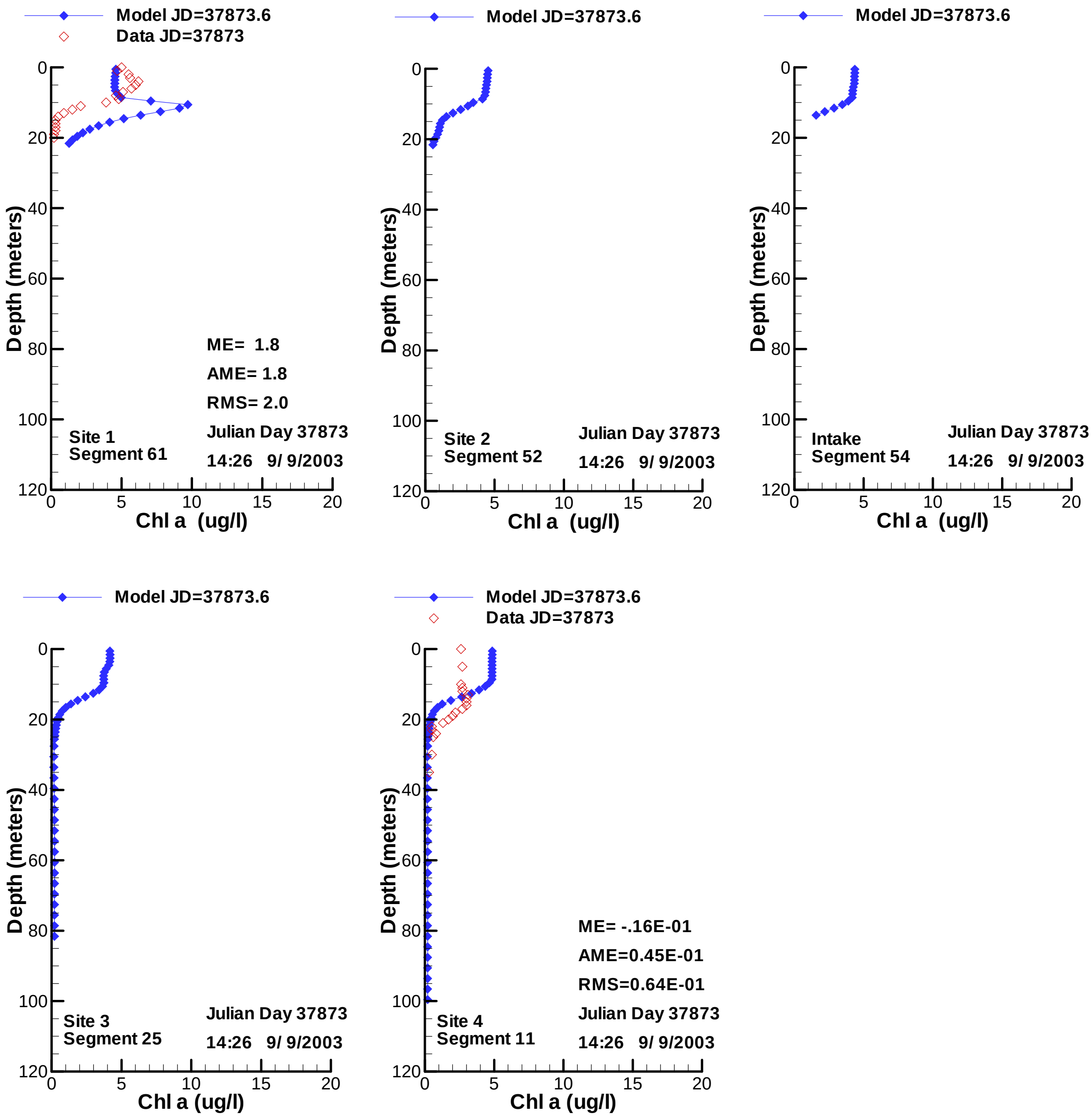

Figure 428. Vertical profiles of Chlorophyll a compared with data for 9/ 9/2003.

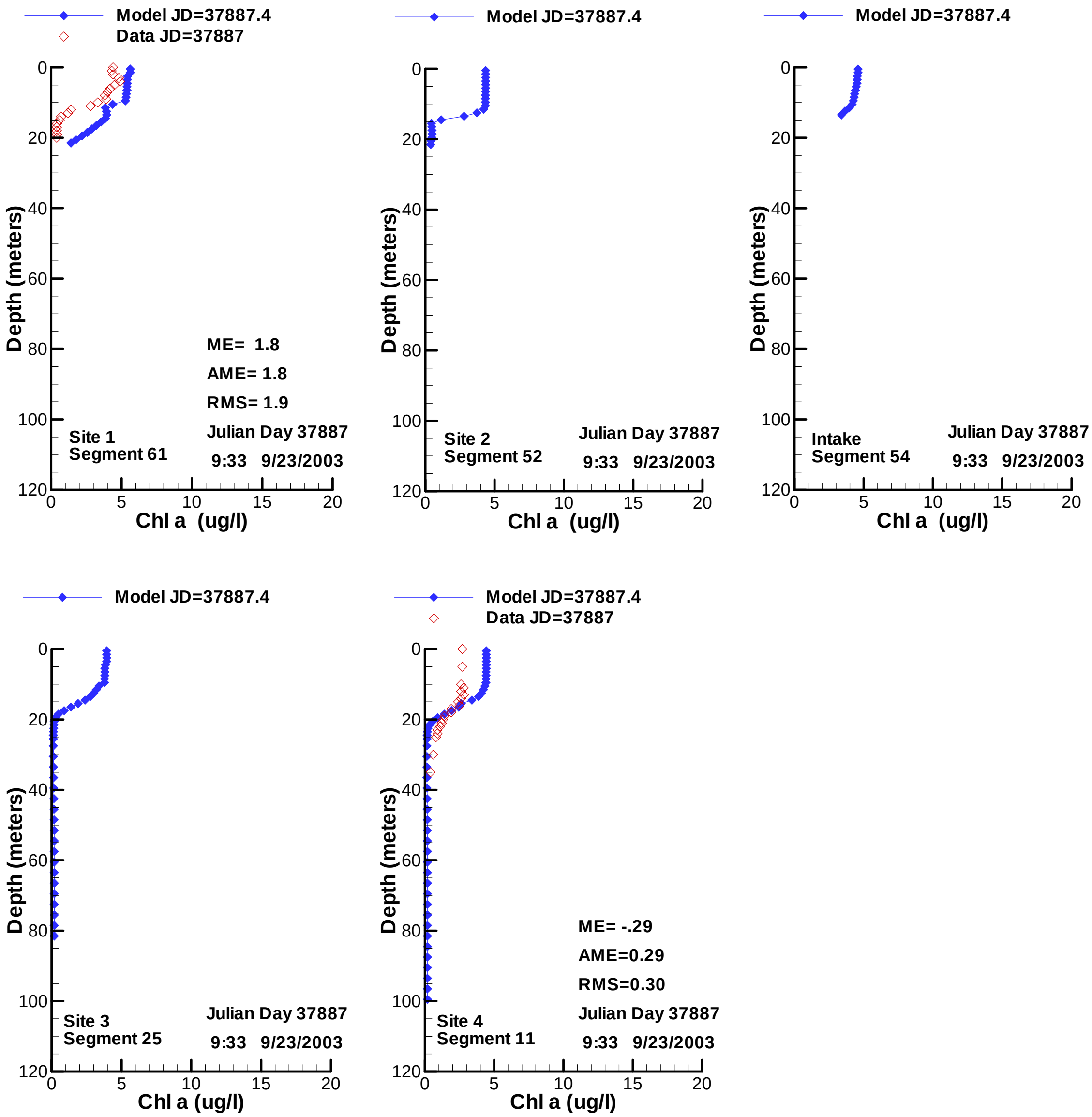

Figure 429. Vertical profiles of Chlorophyll a compared with data for 9/23/2003.

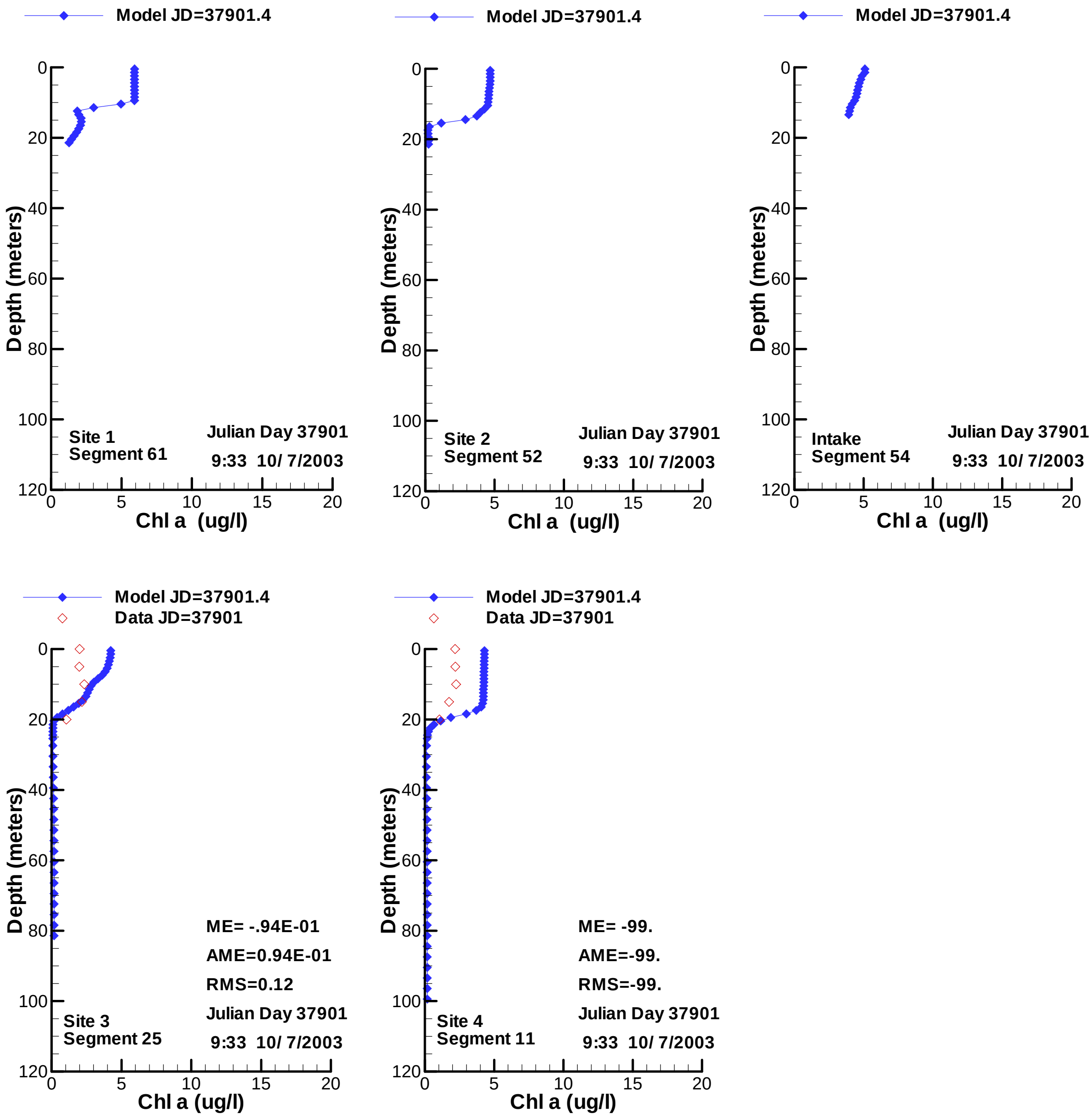

Figure 430. Vertical profiles of Chlorophyll a compared with data for 10/ 7/2003.

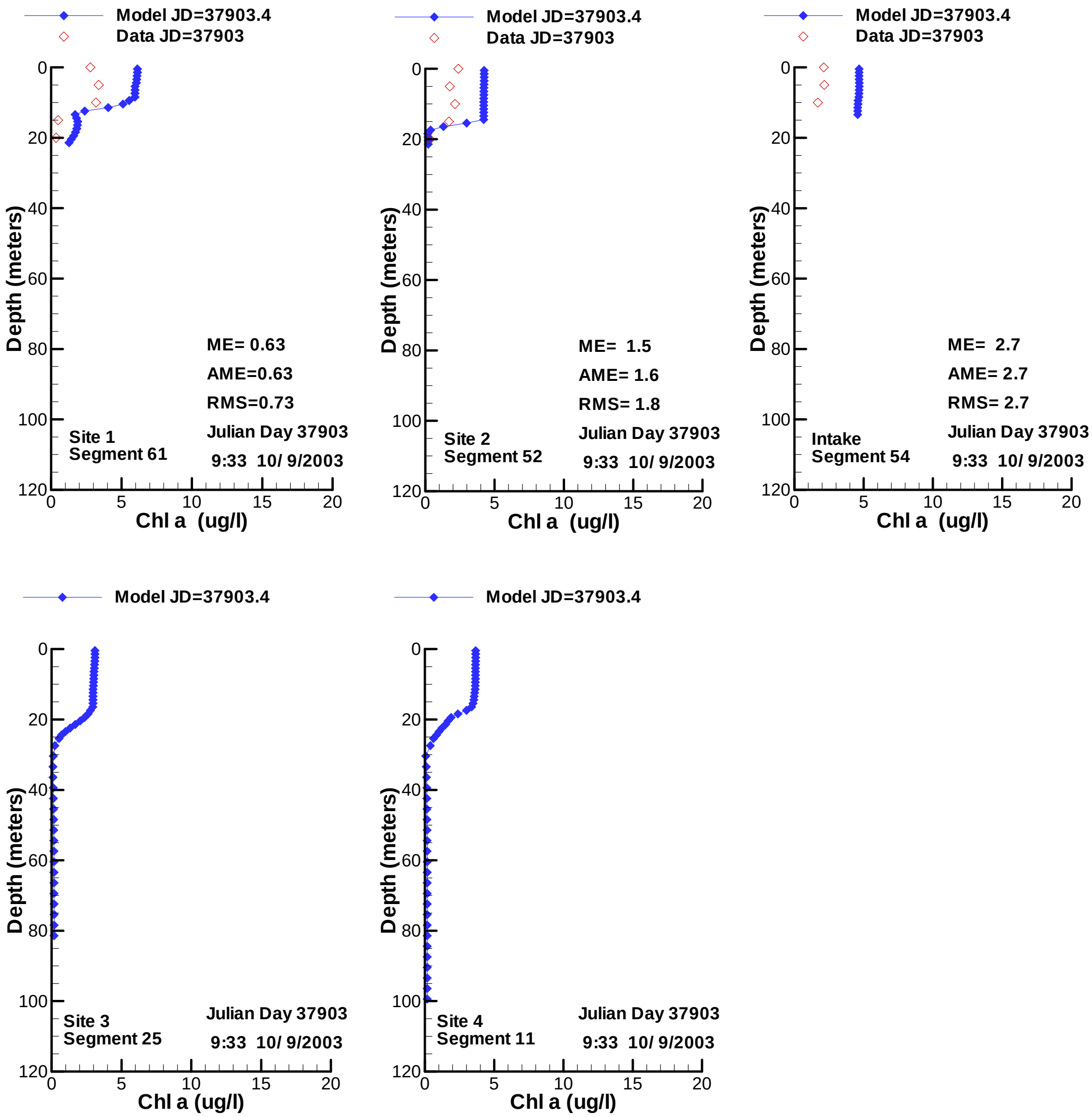

Figure 431. Vertical profiles of Chlorophyll a compared with data for 10/ 9/2003.

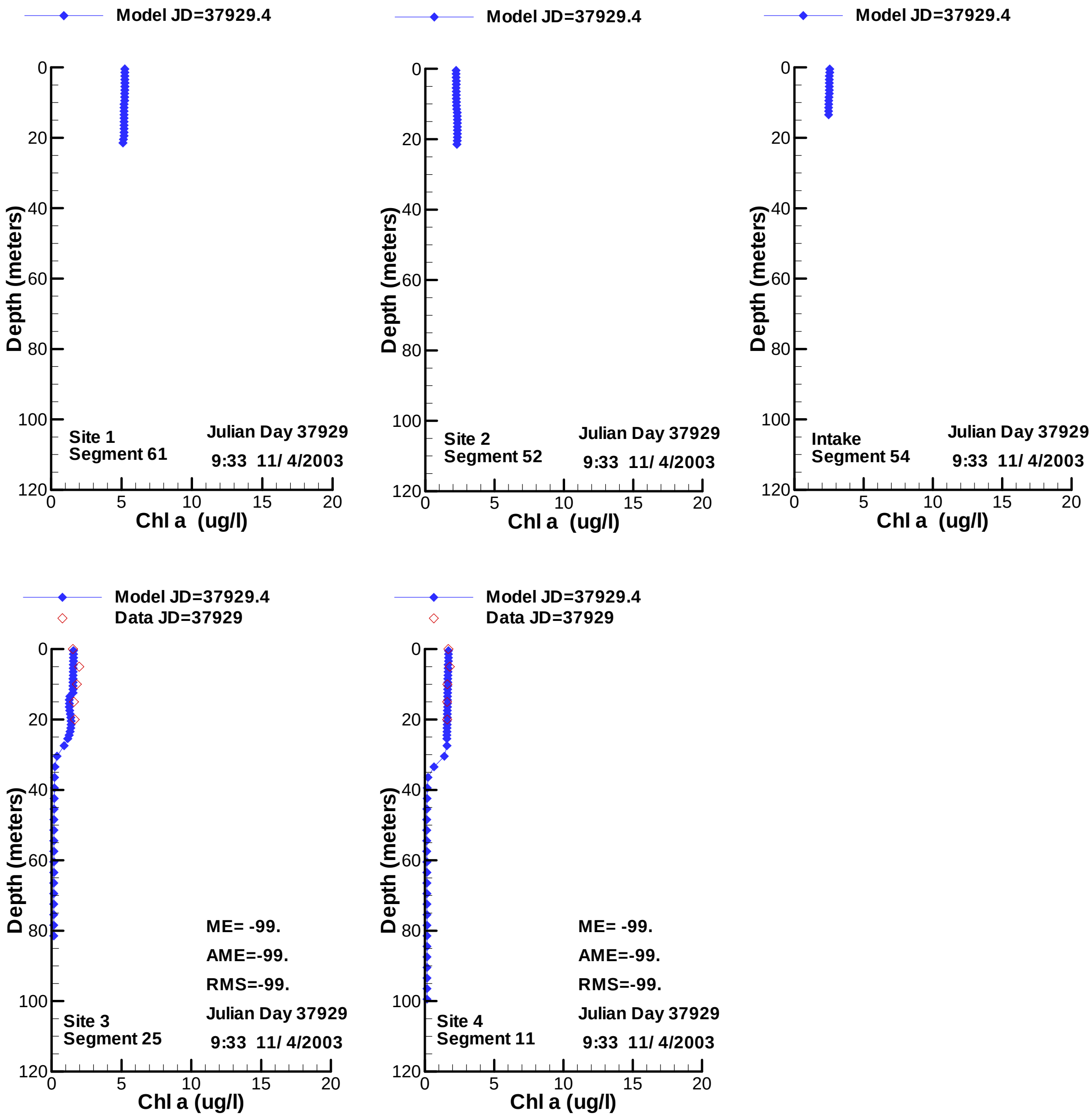

Figure 432. Vertical profiles of Chlorophyll a compared with data for 11/ 4/2003.

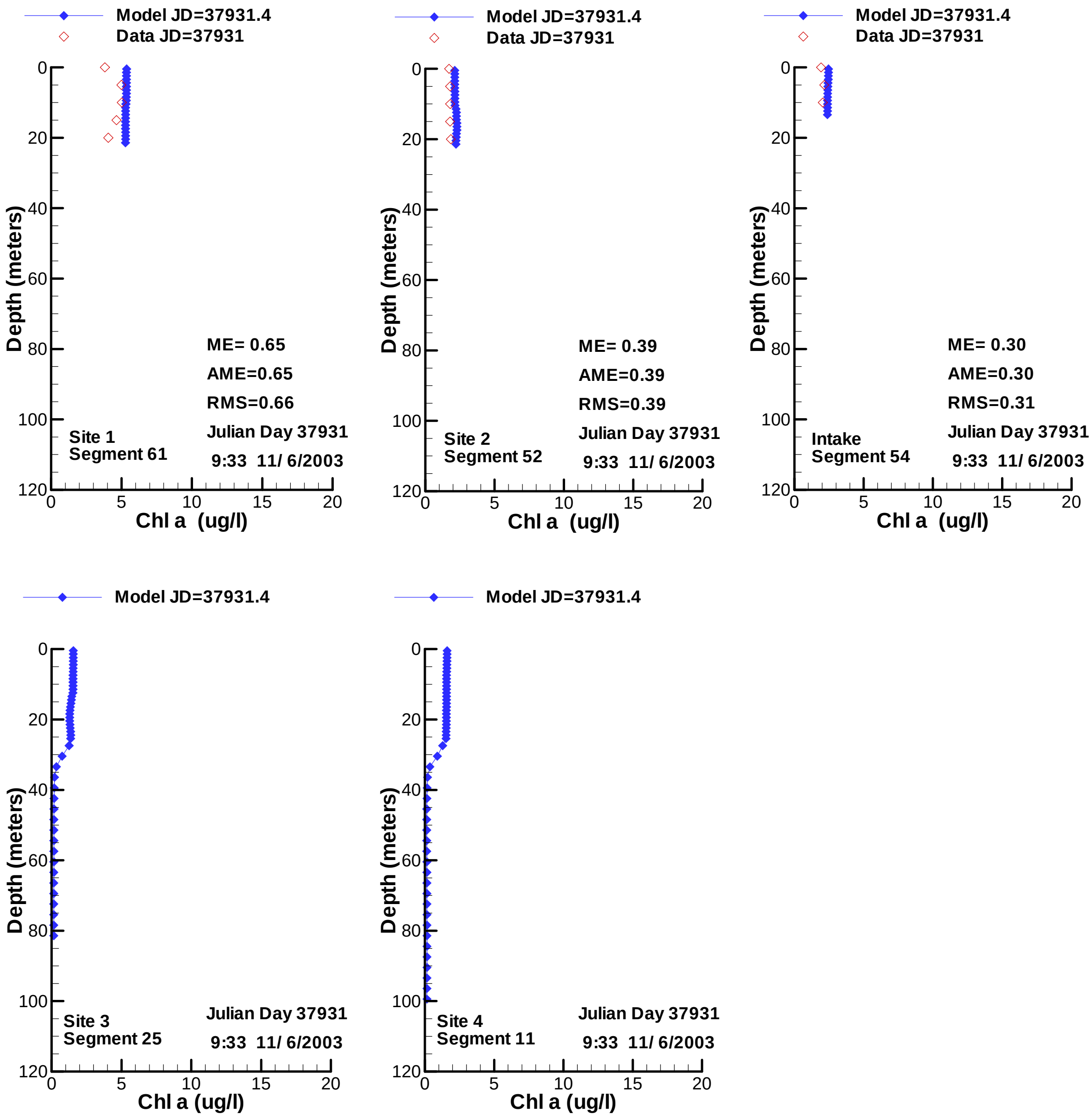

Figure 433. Vertical profiles of Chlorophyll a compared with data for 11/ 6/2003.

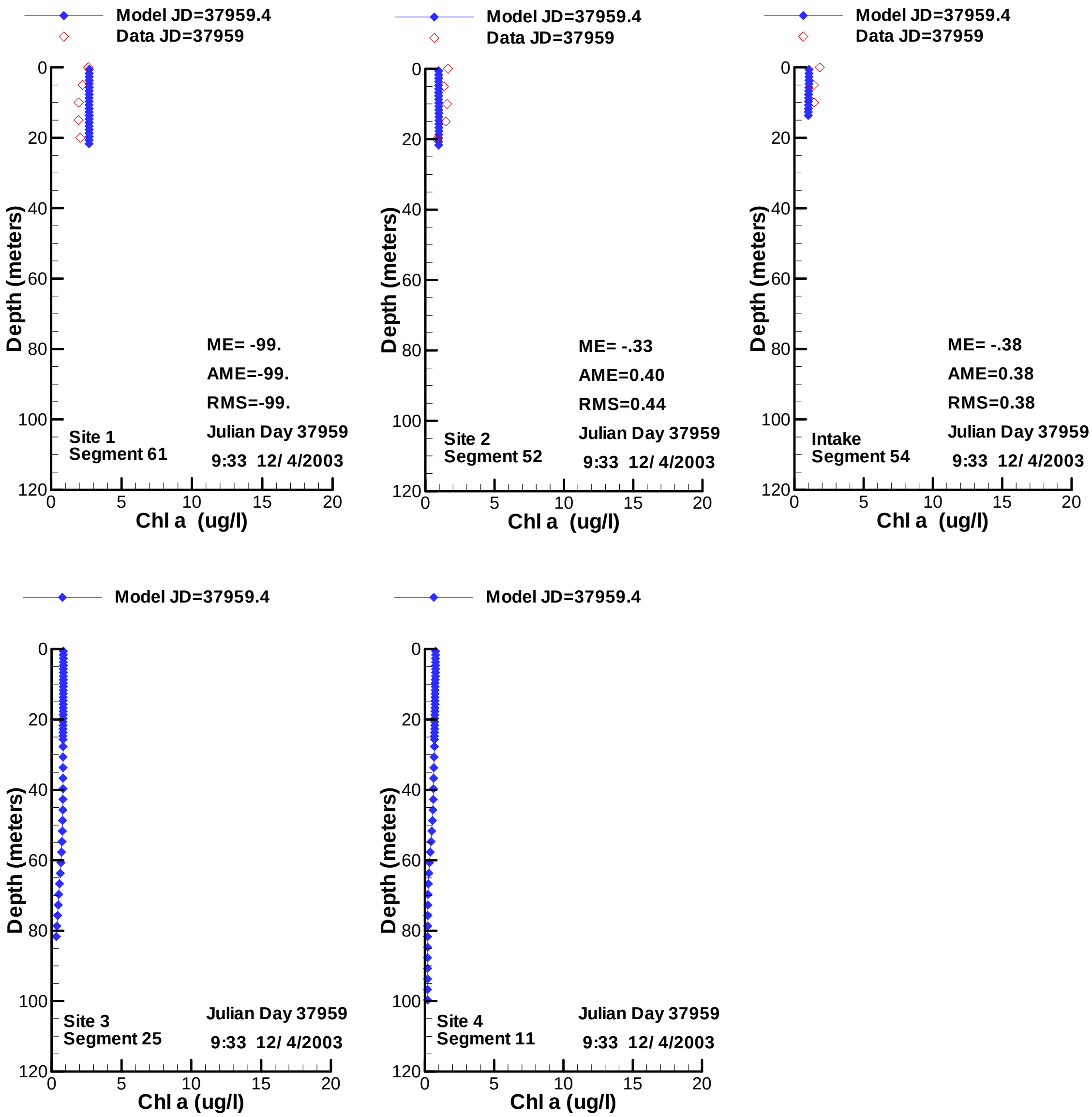

Figure 434. Vertical profiles of Chlorophyll a compared with data for 12/ 4/2003.

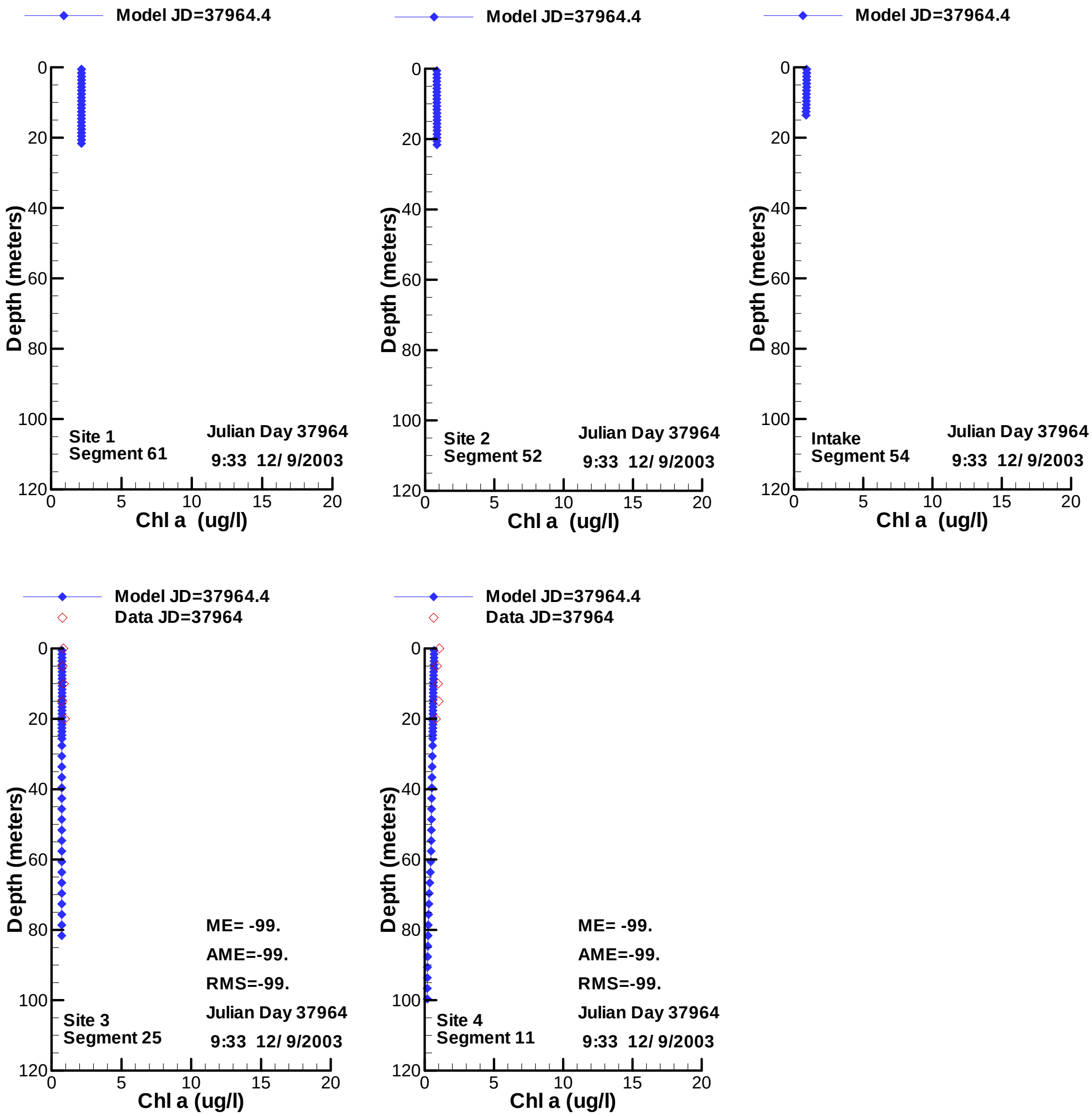

Figure 435. Vertical profiles of Chlorophyll a compared with data for 12/ 9/2003.

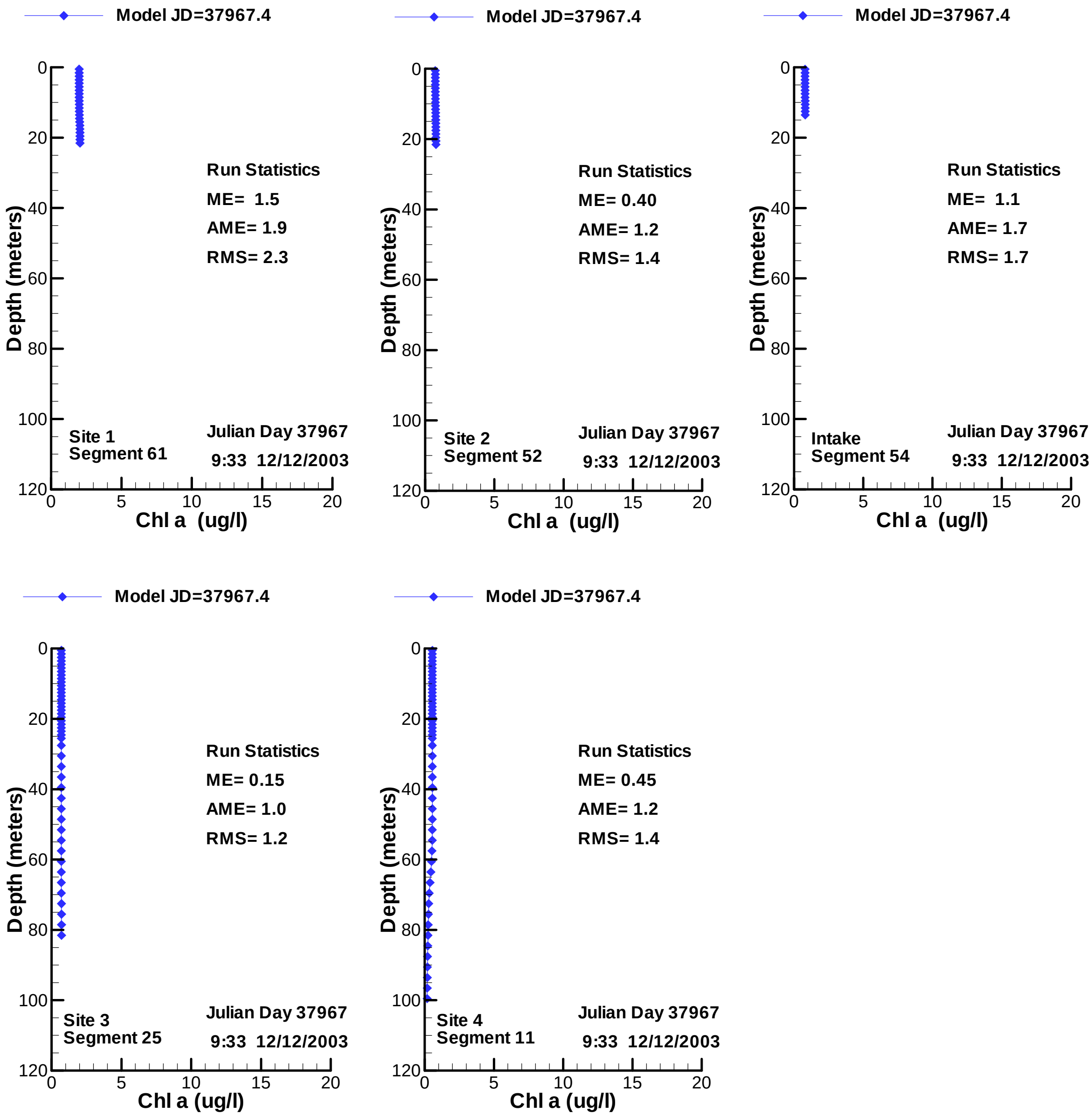

Figure 436. Vertical profiles of Chlorophyll a compared with data for 12/12/2003.

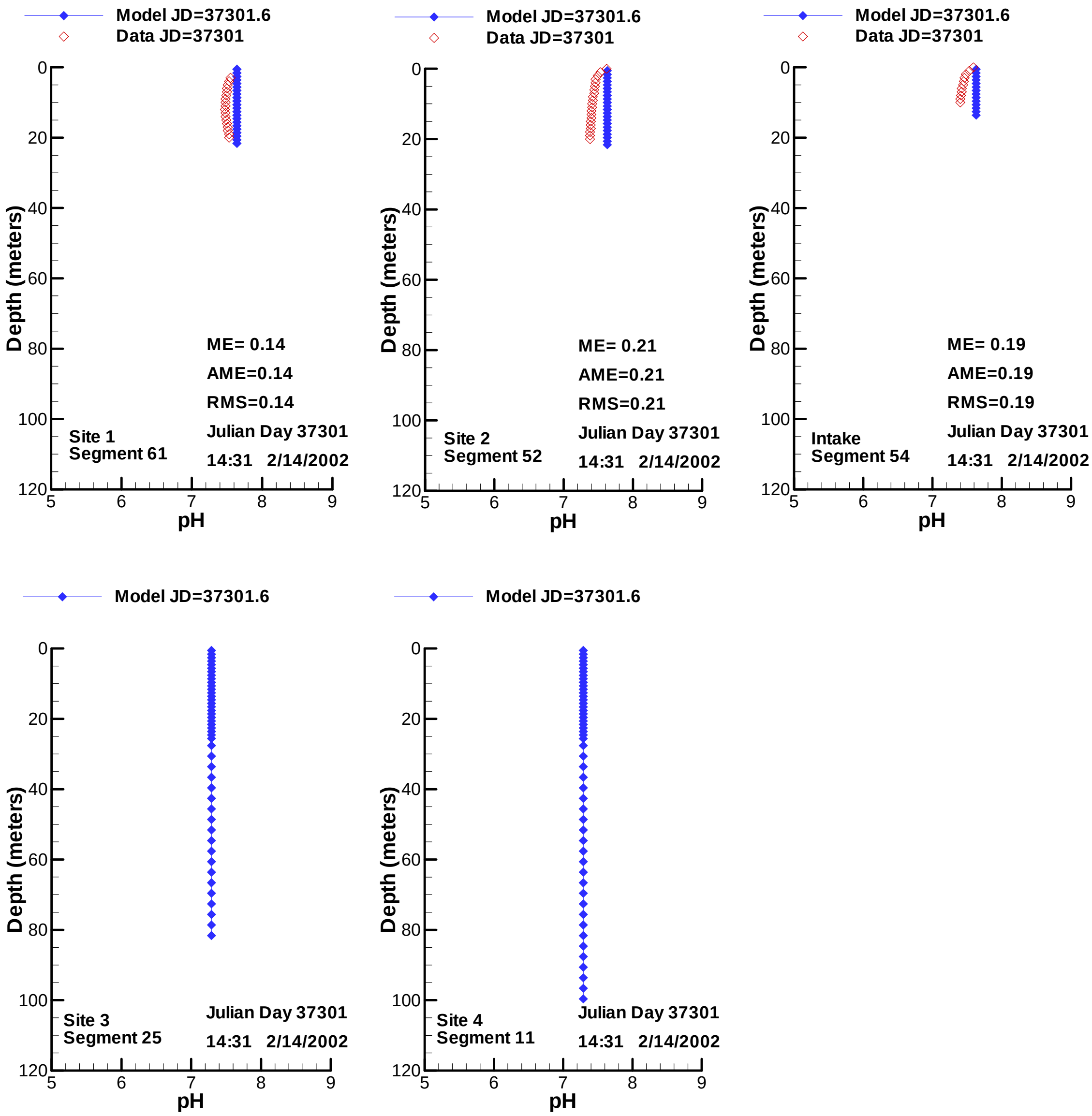

Figure 437. Vertical profiles of pH compared with data for 2/14/2002.

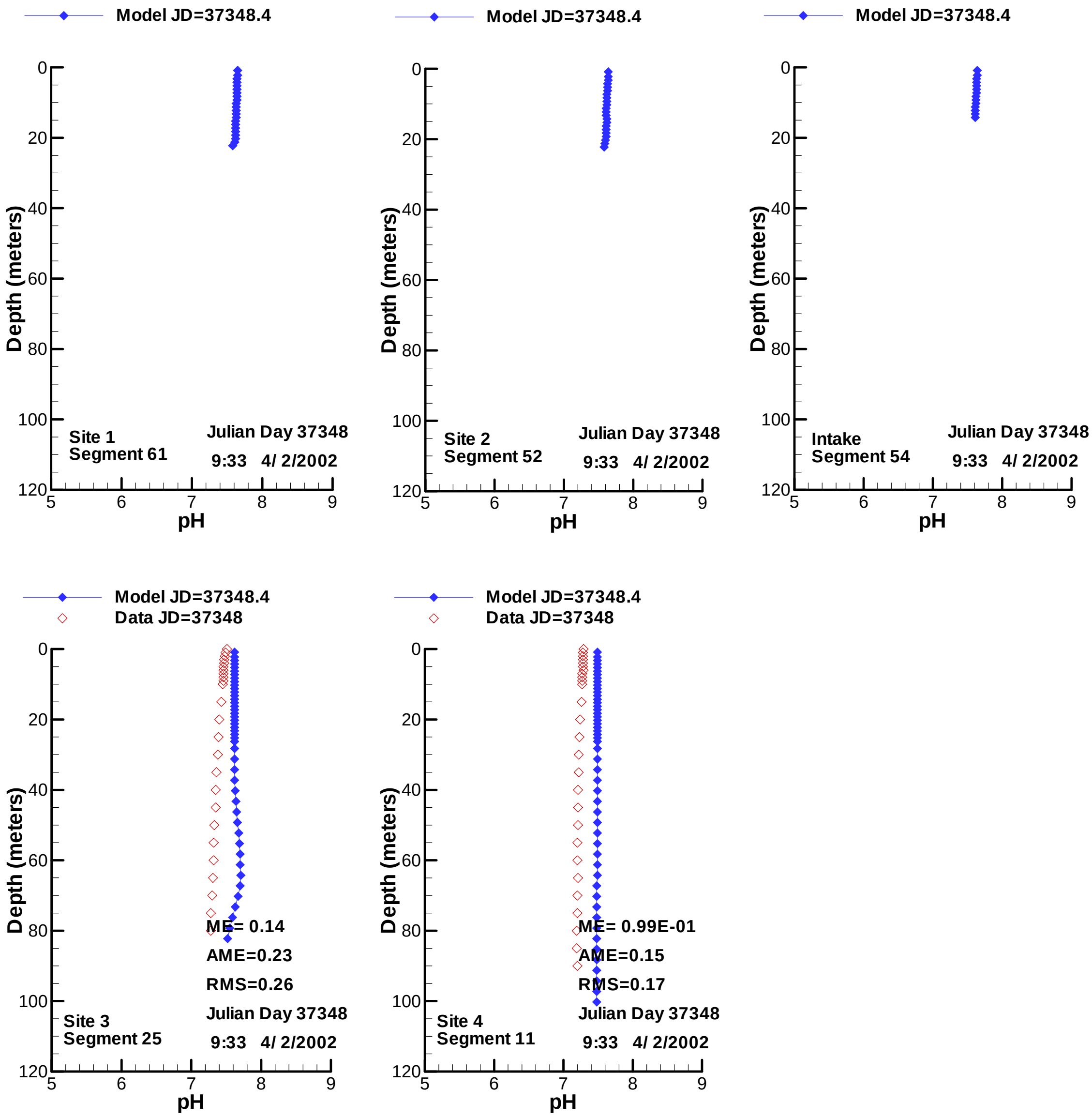

Figure 438. Vertical profiles of pH compared with data for 4/ 2/2002.

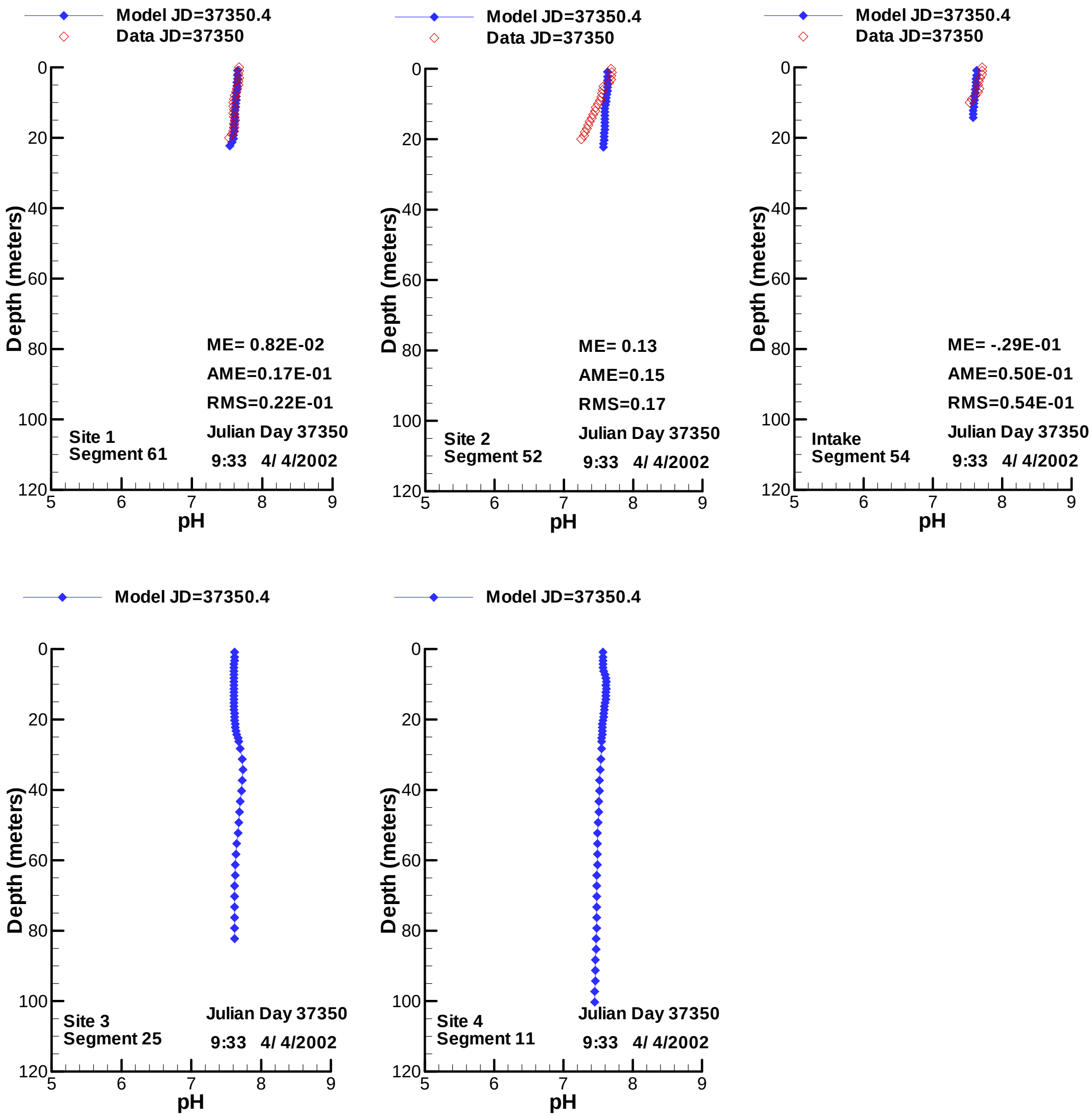

Figure 439. Vertical profiles of pH compared with data for 4/ 4/2002.

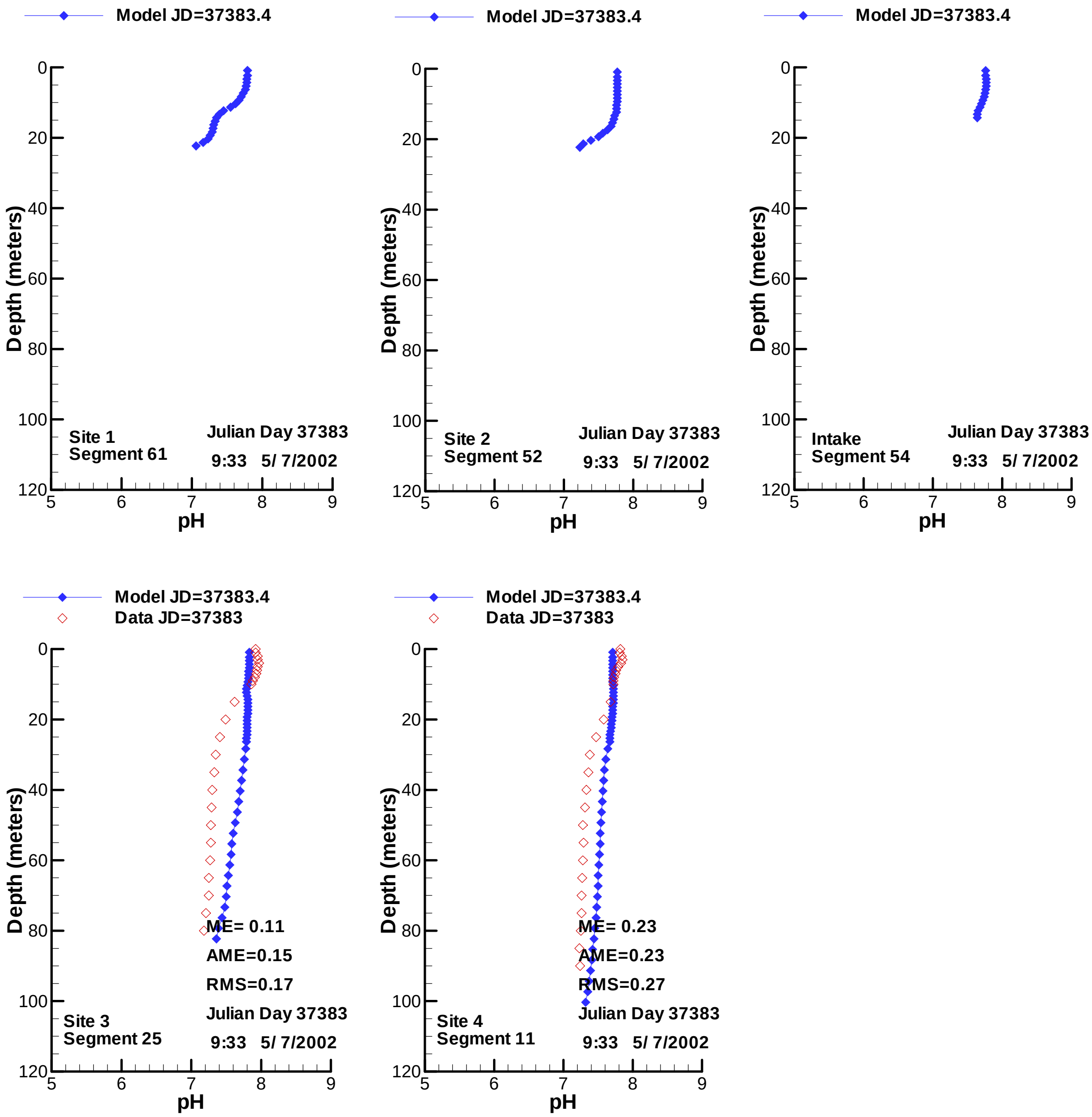

Figure 440. Vertical profiles of pH compared with data for 5/ 7/2002.

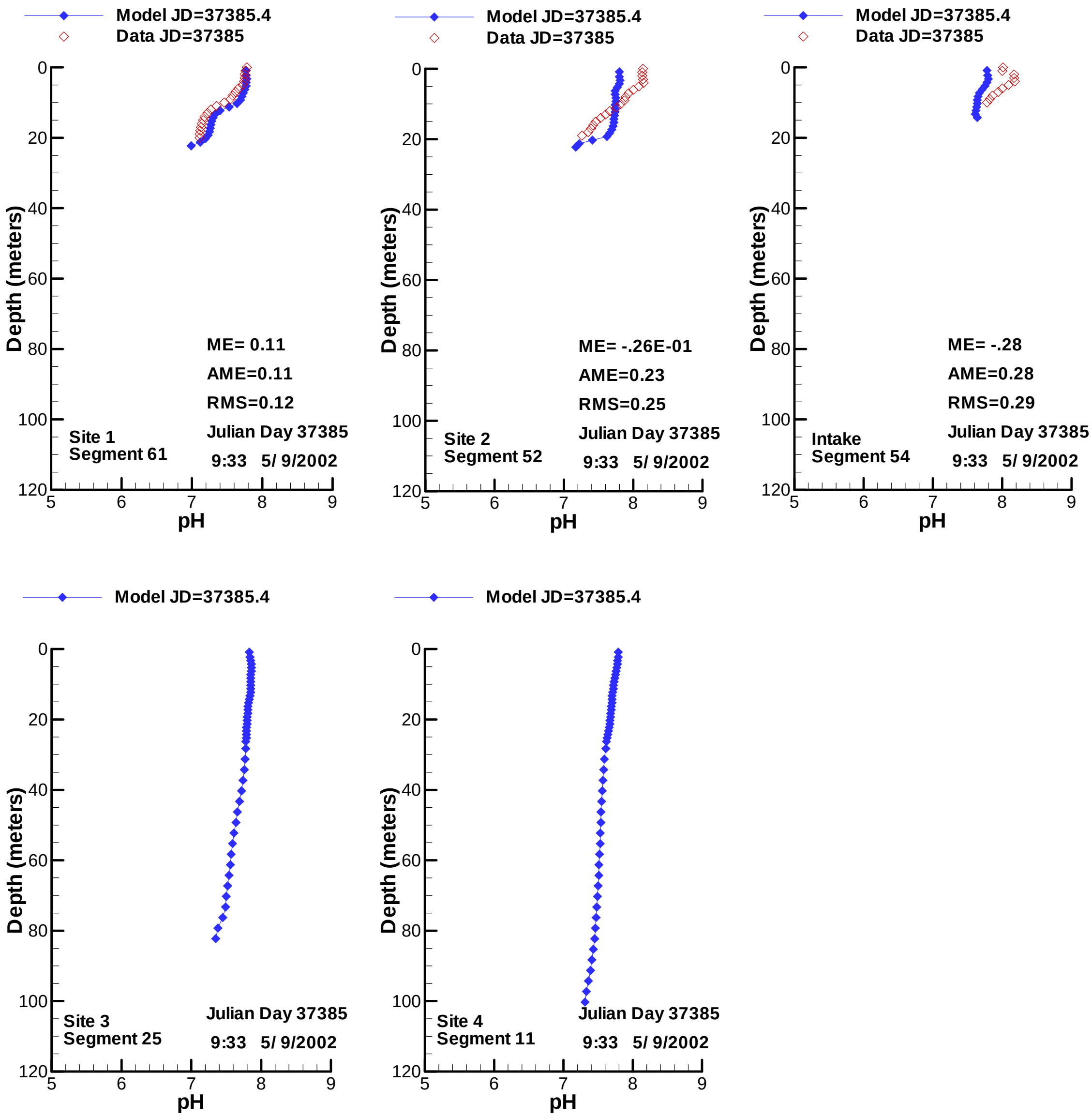

Figure 441. Vertical profiles of pH compared with data for 5/ 9/2002.

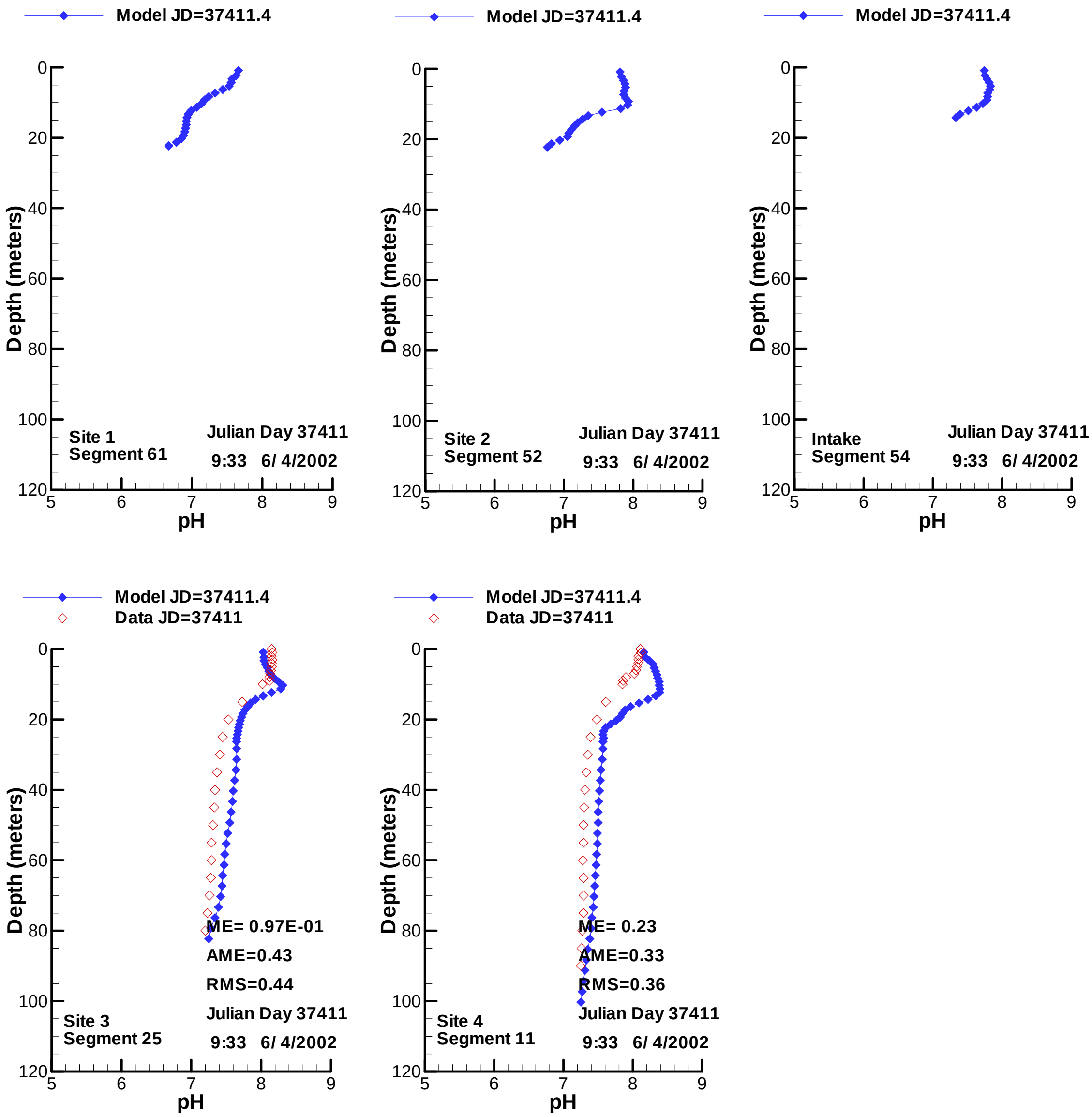

Figure 442. Vertical profiles of pH compared with data for 6/ 4/2002.

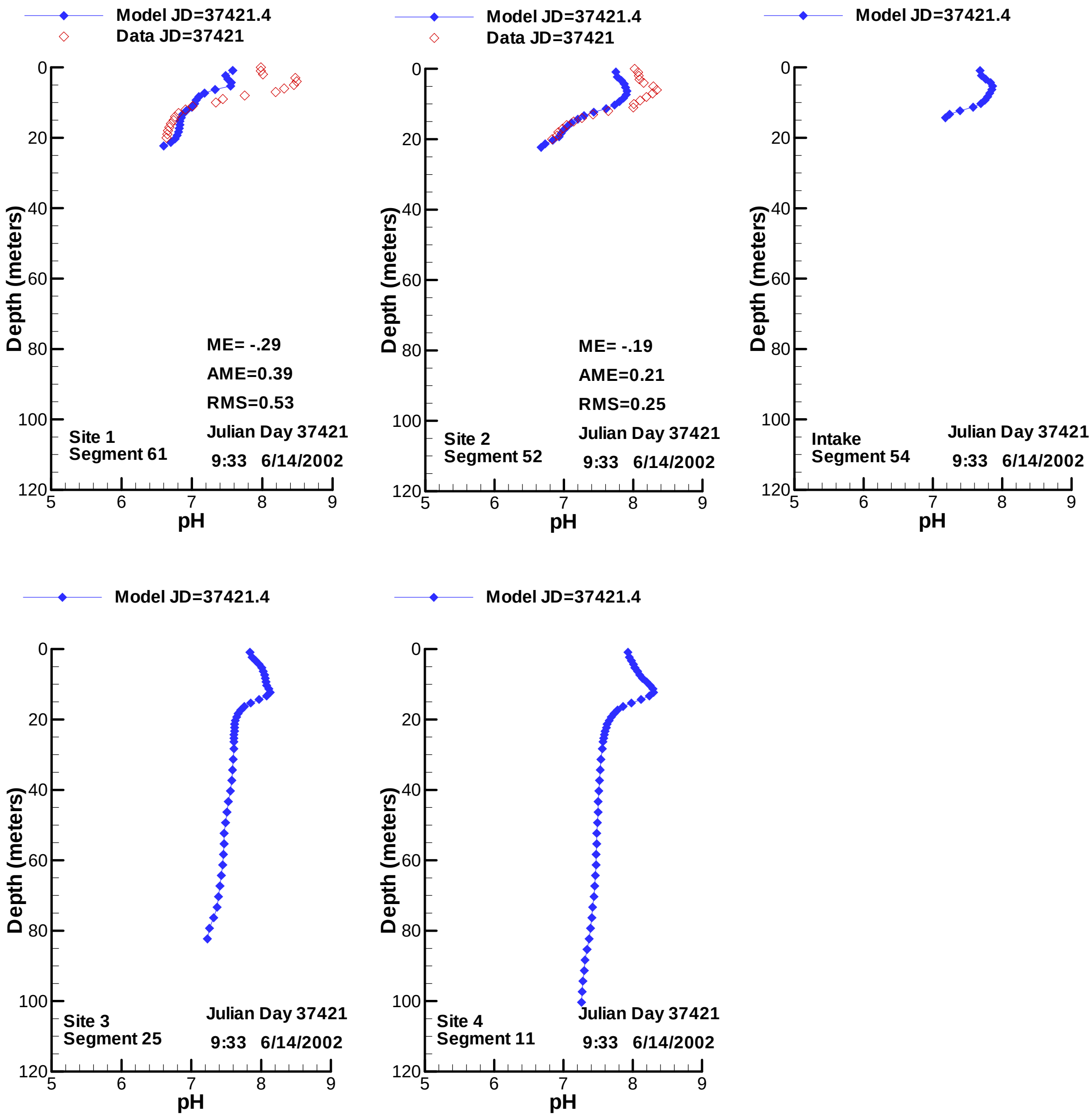

Figure 443. Vertical profiles of pH compared with data for 6/14/2002.

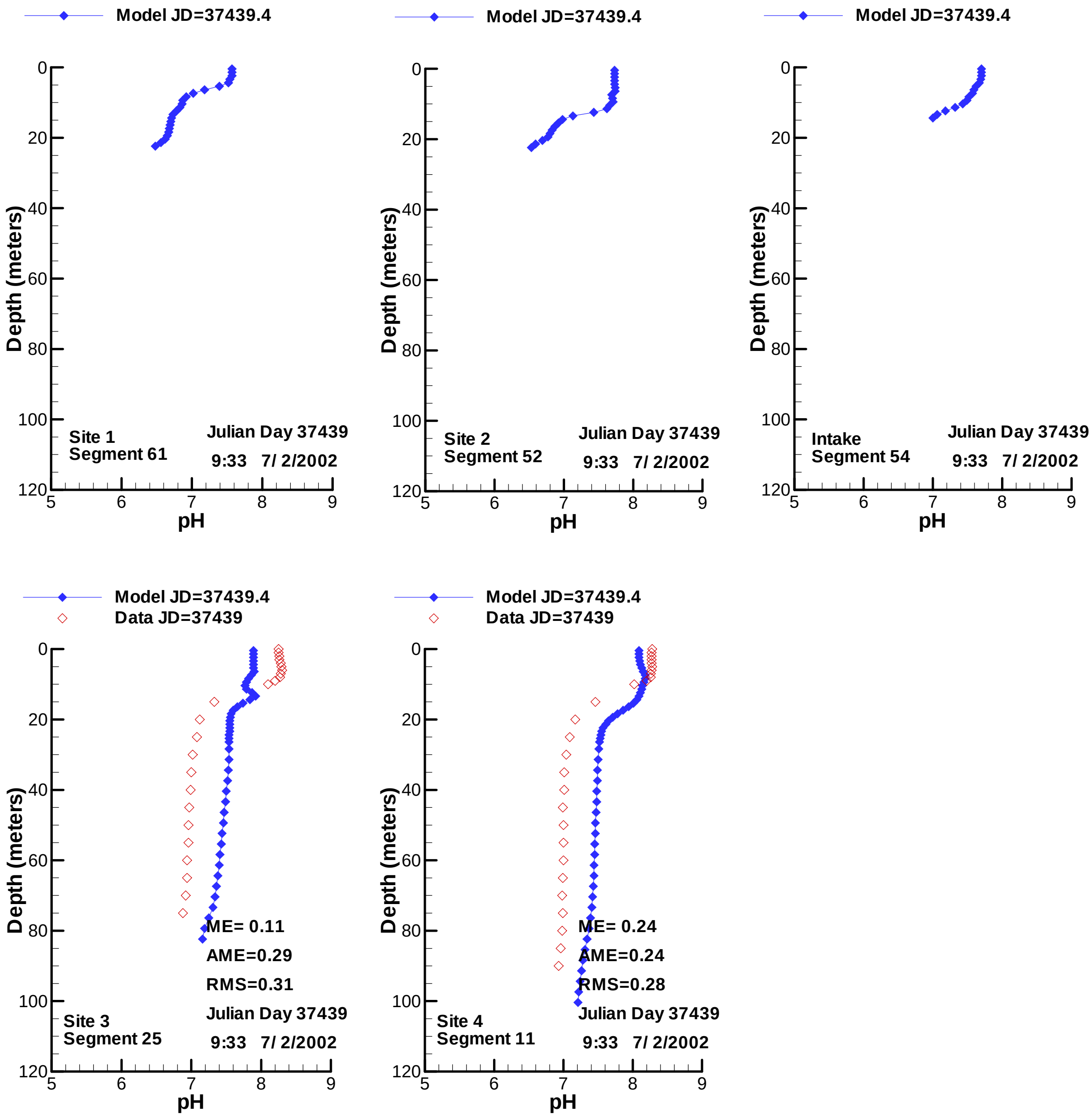

Figure 444. Vertical profiles of pH compared with data for 7/ 2/2002.

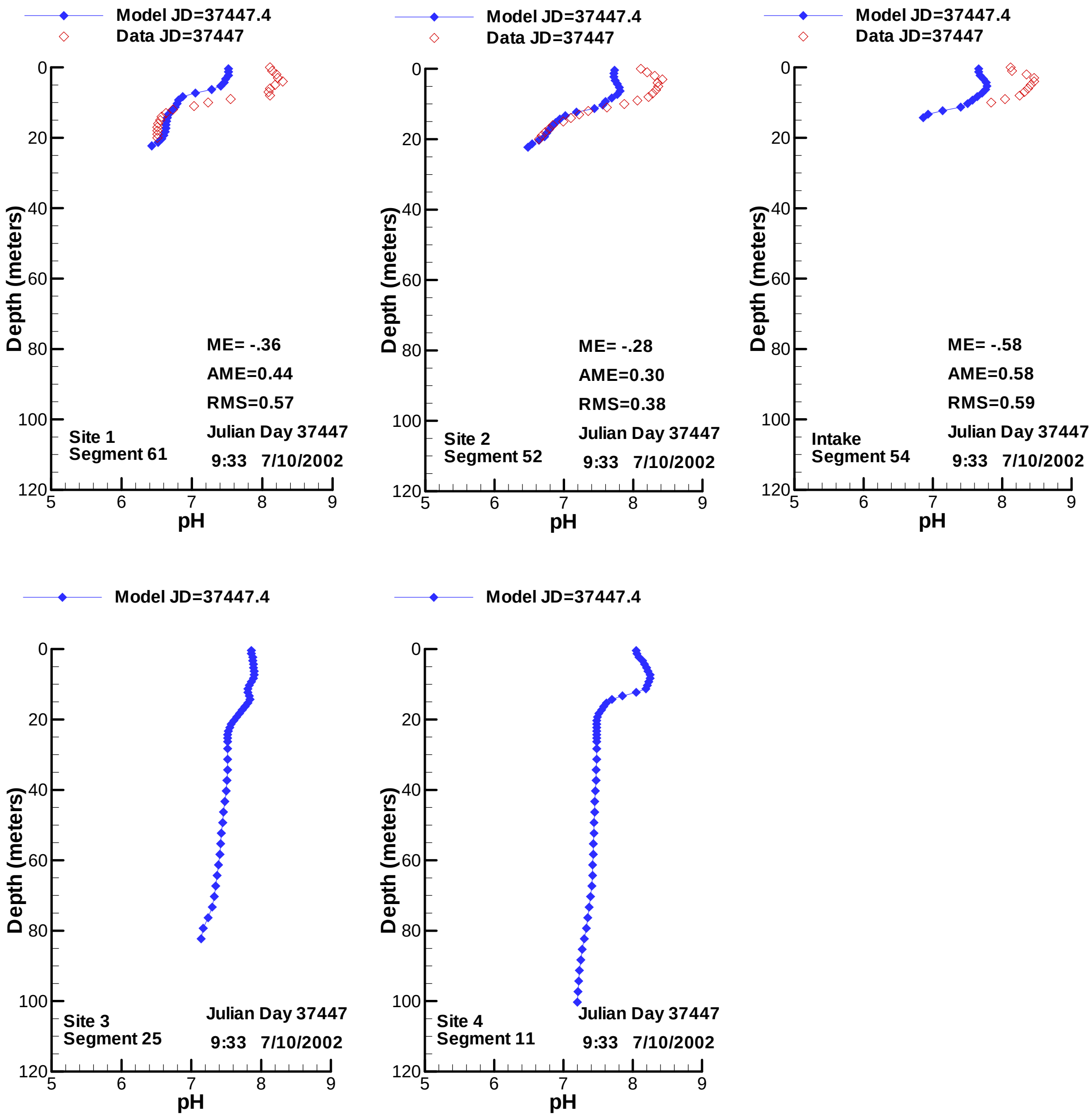

Figure 445. Vertical profiles of pH compared with data for 7/10/2002.

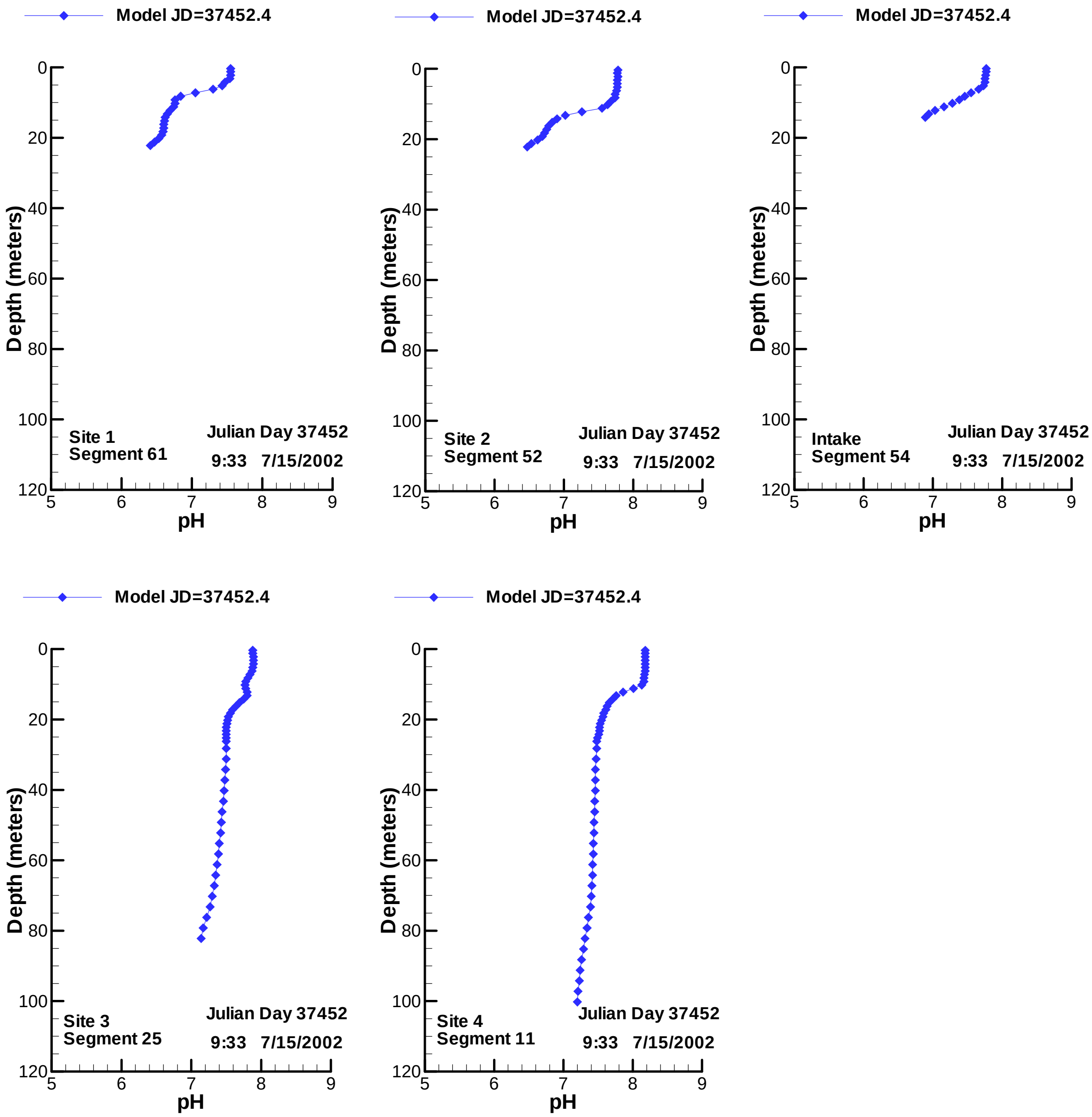

Figure 446. Vertical profiles of pH compared with data for 7/15/2002.

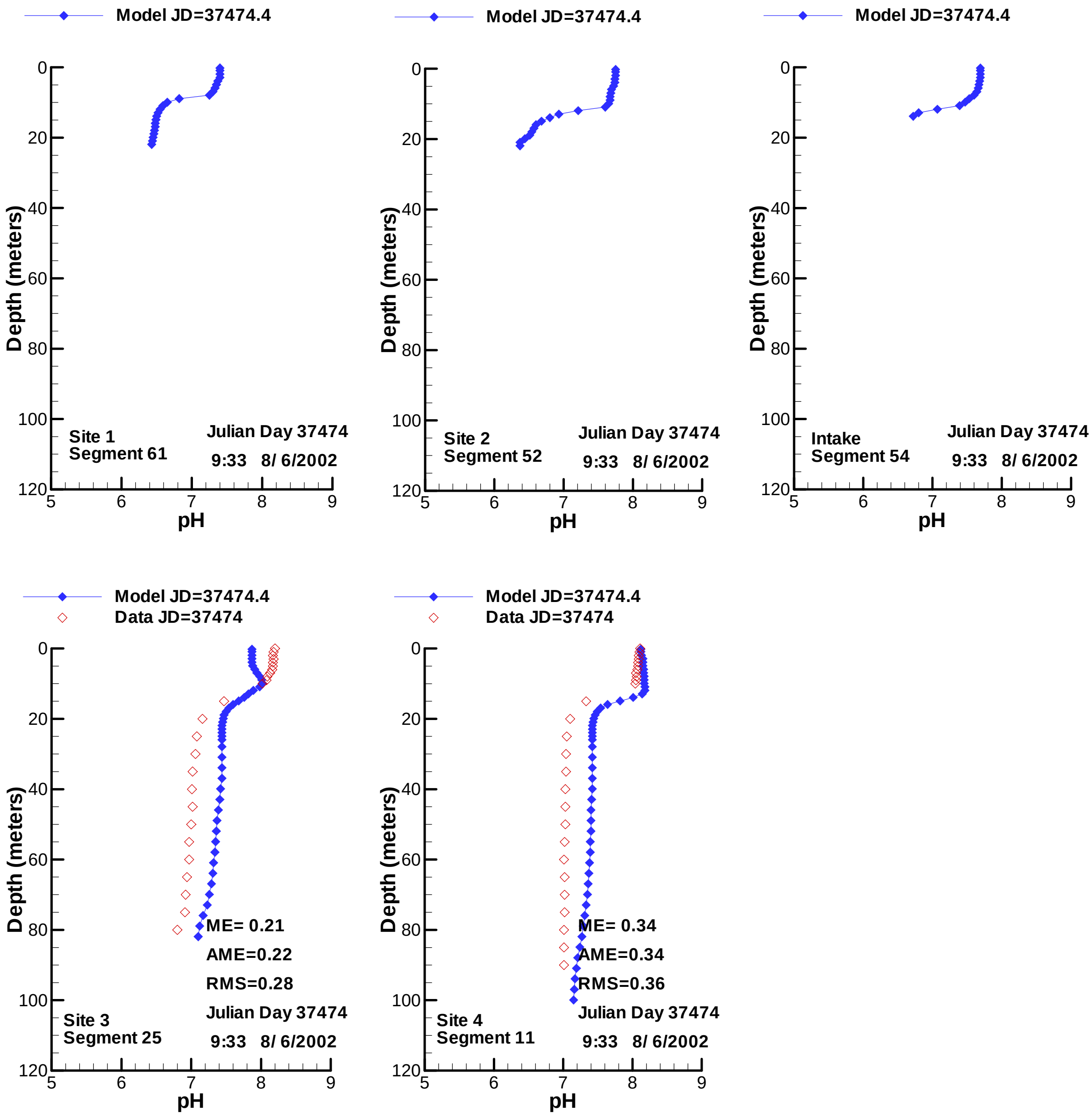

Figure 447. Vertical profiles of pH compared with data for 8/ 6/2002.

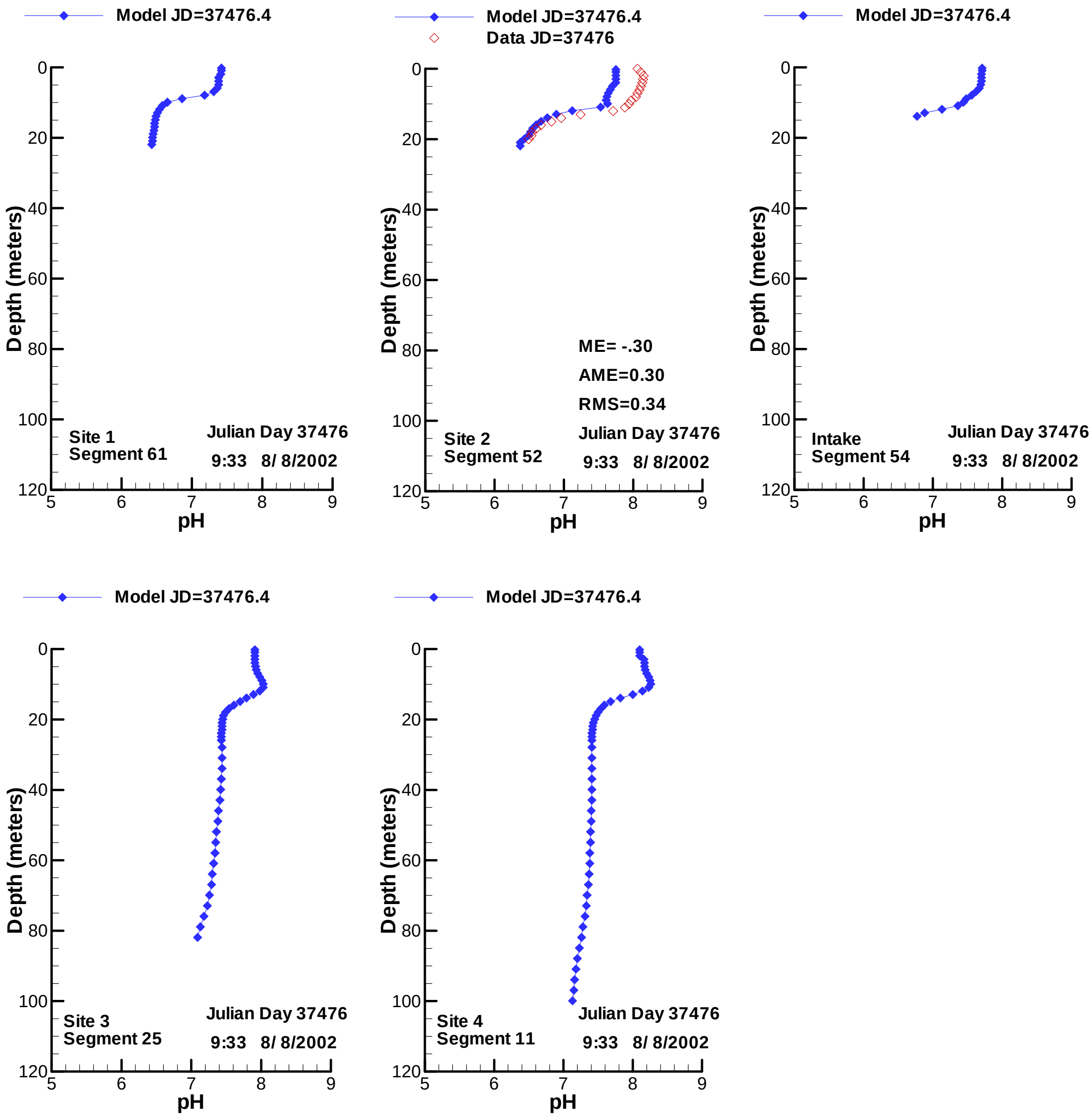

Figure 448. Vertical profiles of pH compared with data for 8/ 8/2002.

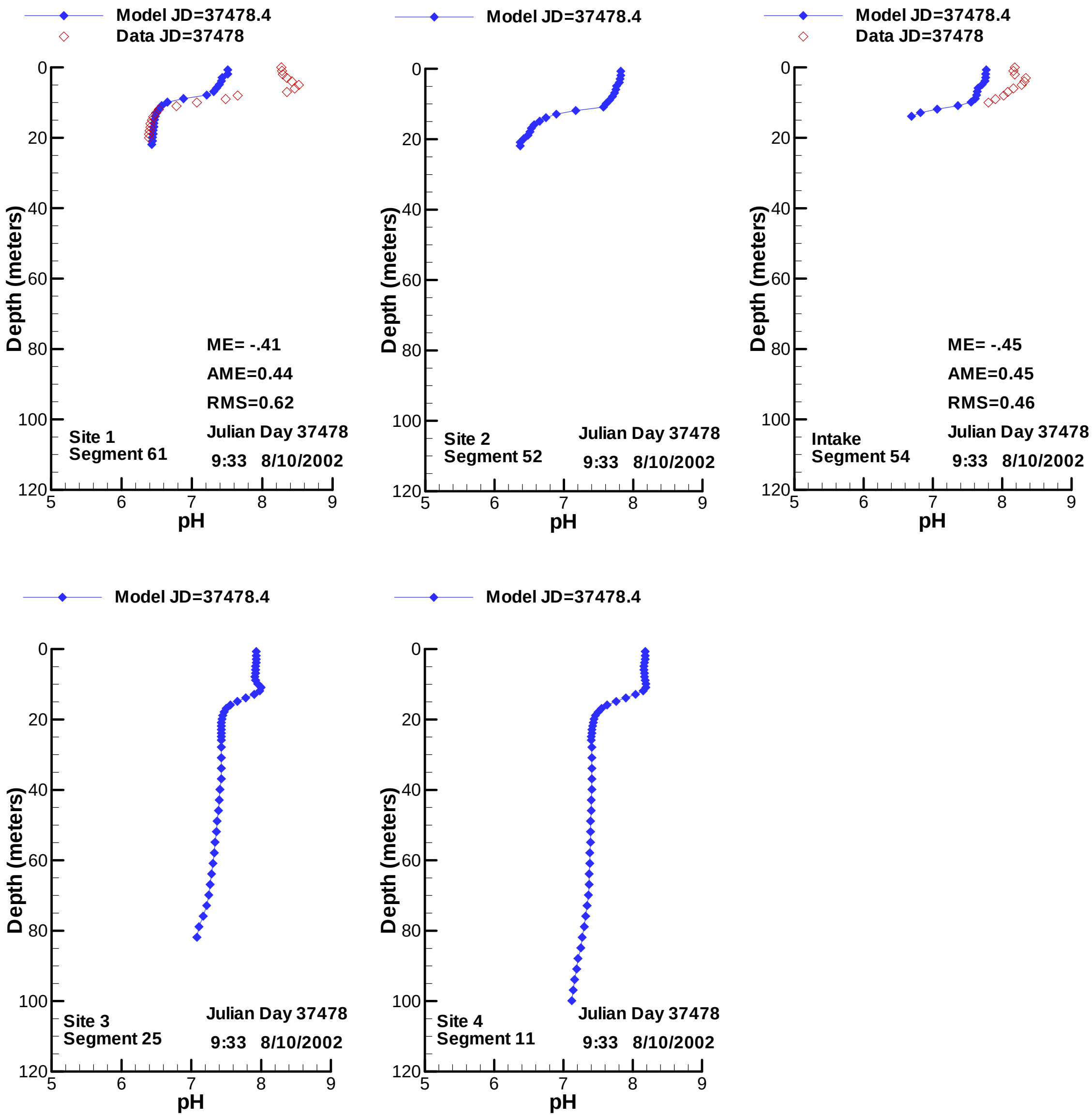

Figure 449. Vertical profiles of pH compared with data for 8/10/2002.

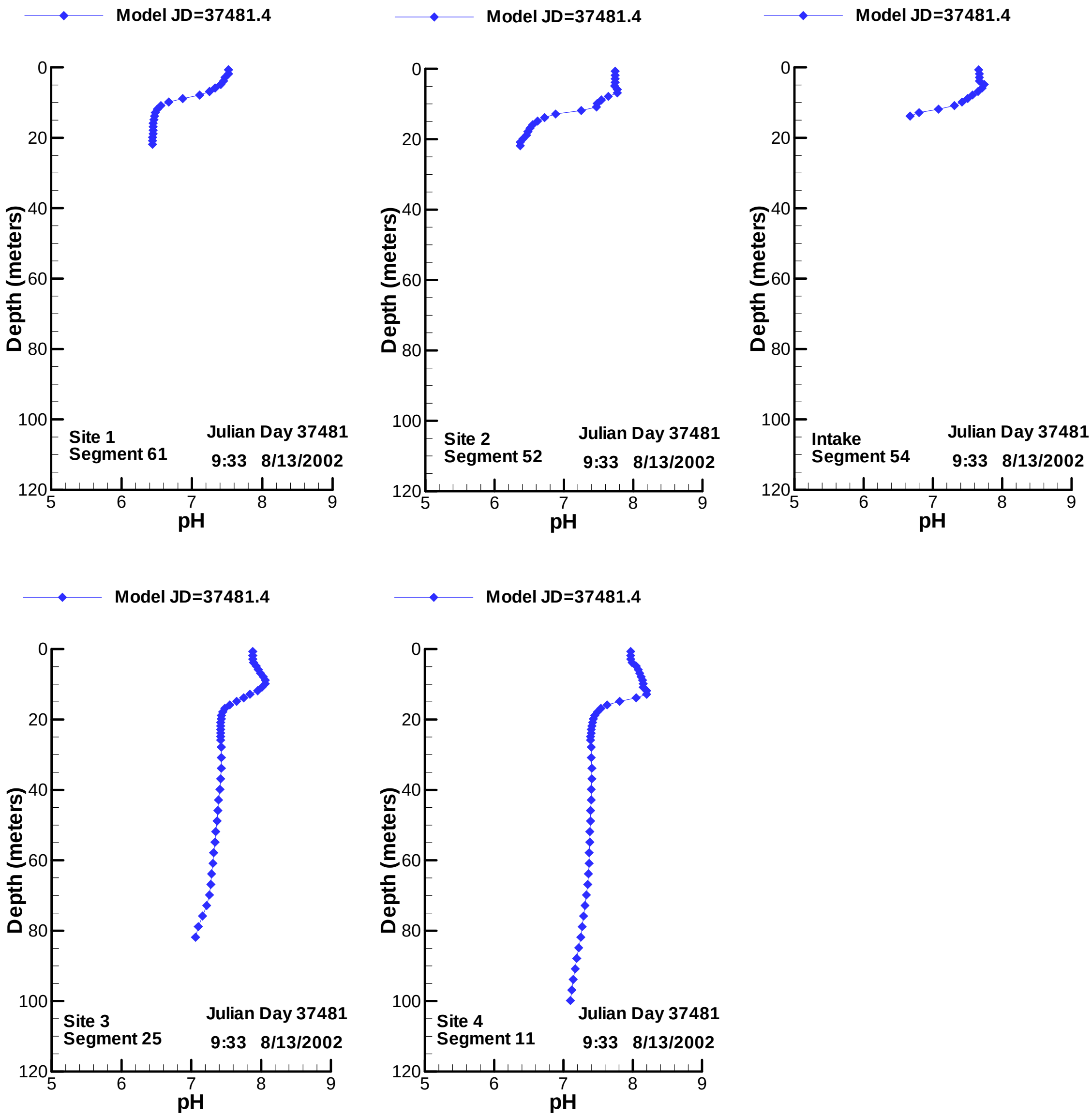

Figure 450. Vertical profiles of pH compared with data for 8/13/2002.

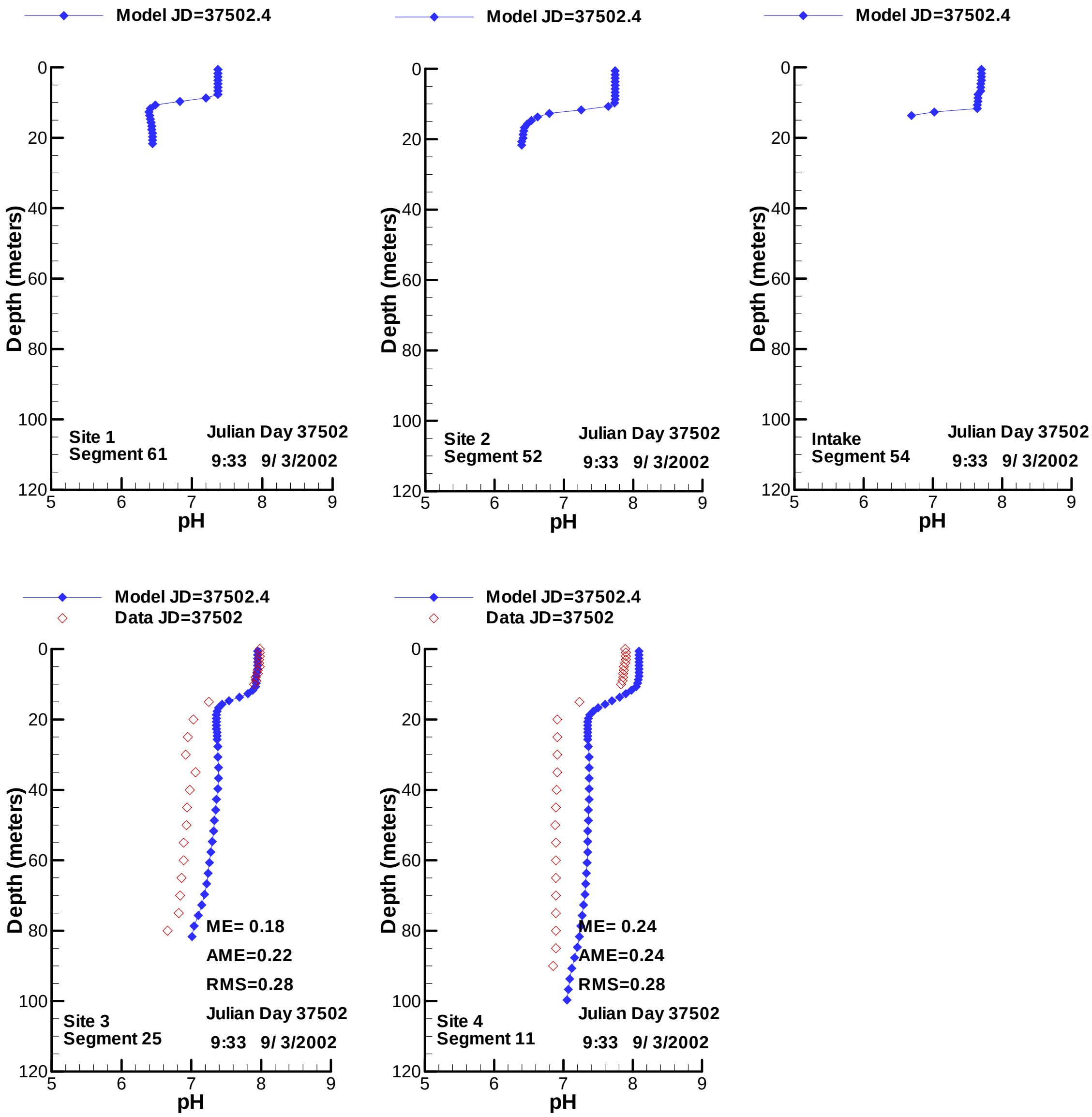

Figure 451. Vertical profiles of pH compared with data for 9/ 3/2002.

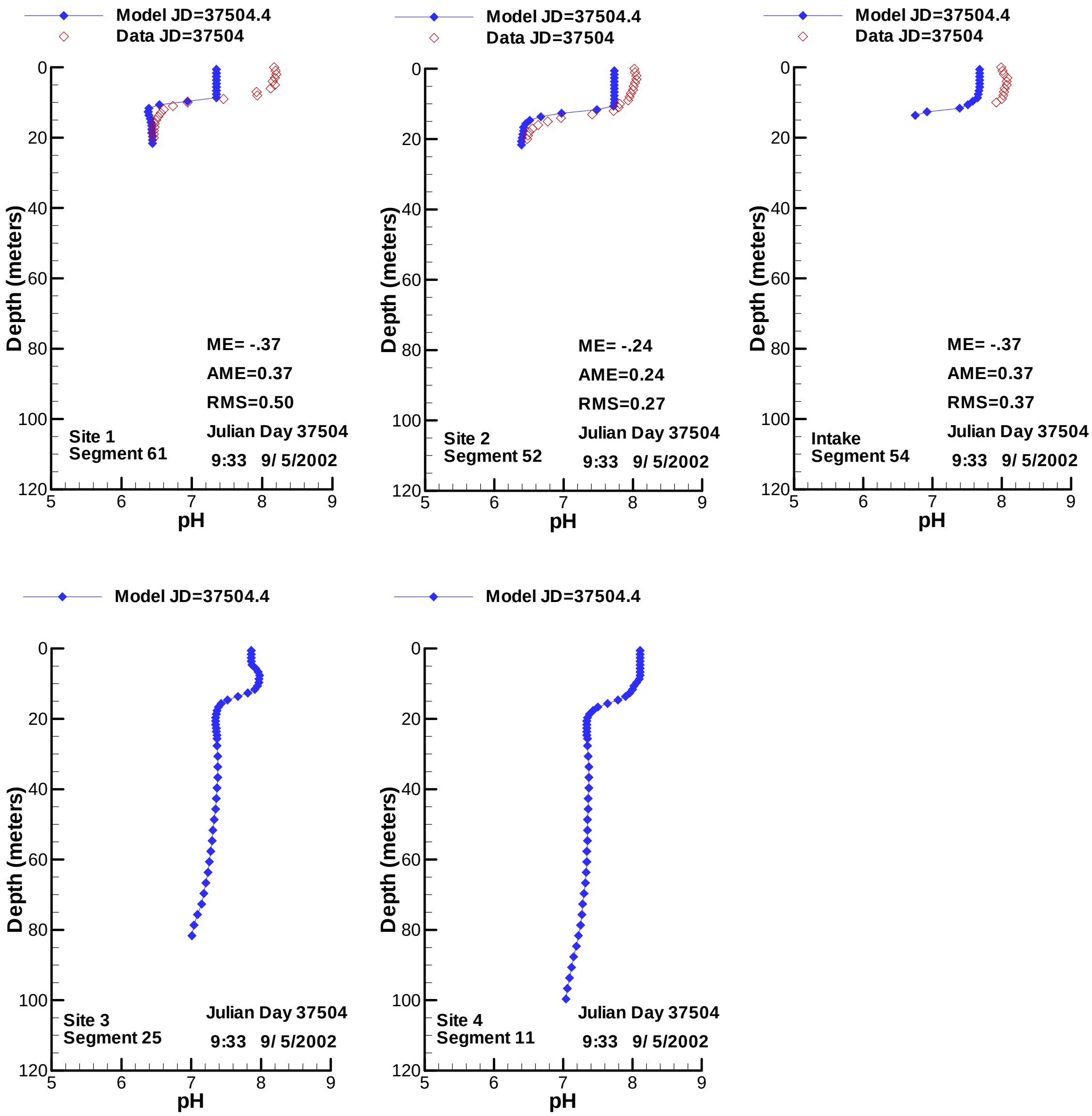

Figure 452. Vertical profiles of pH compared with data for 9/ 5/2002.

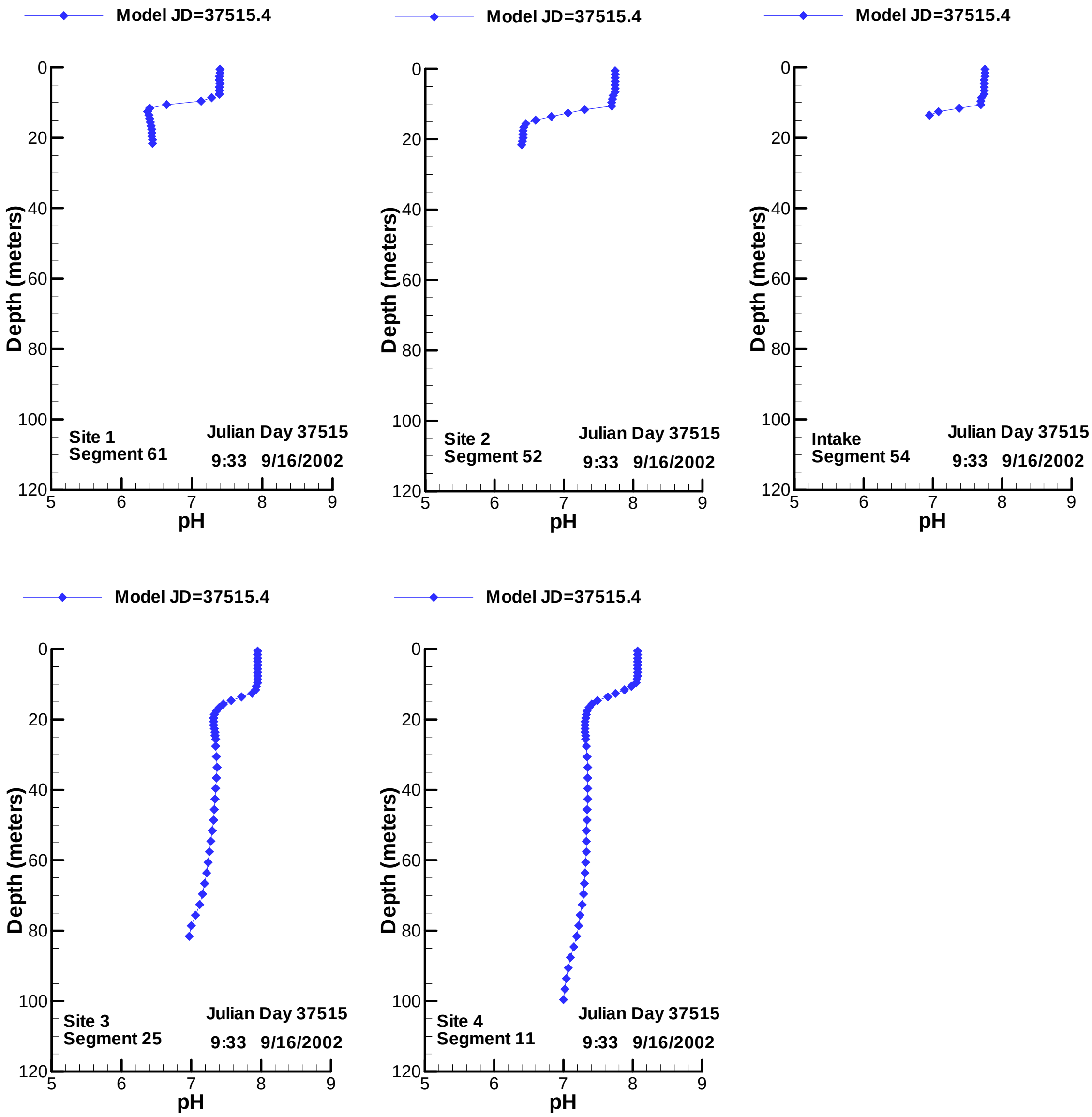

Figure 453. Vertical profiles of pH compared with data for 9/16/2002.

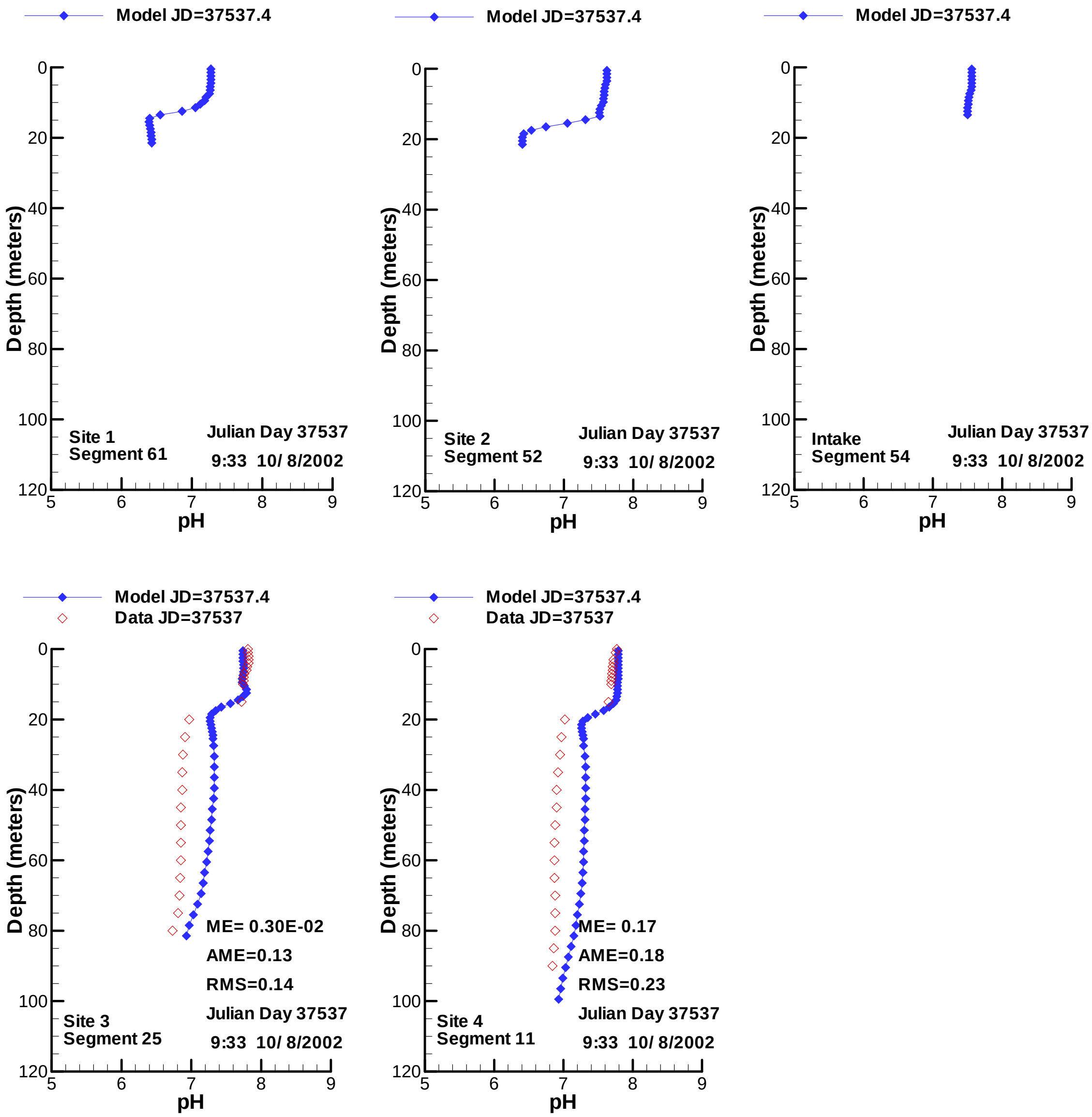

Figure 454. Vertical profiles of pH compared with data for 10/ 8/2002.

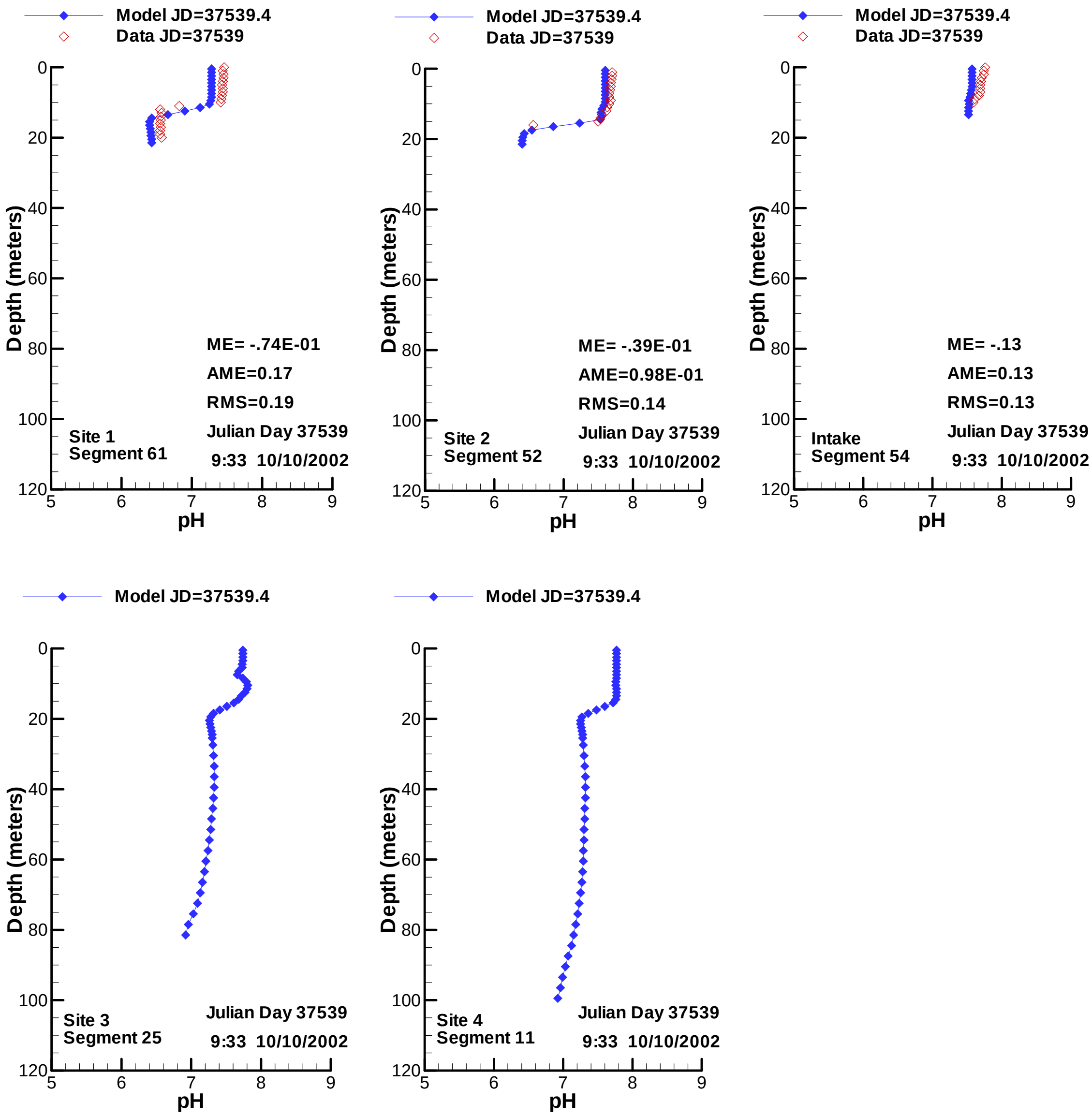

Figure 455. Vertical profiles of pH compared with data for 10/10/2002.

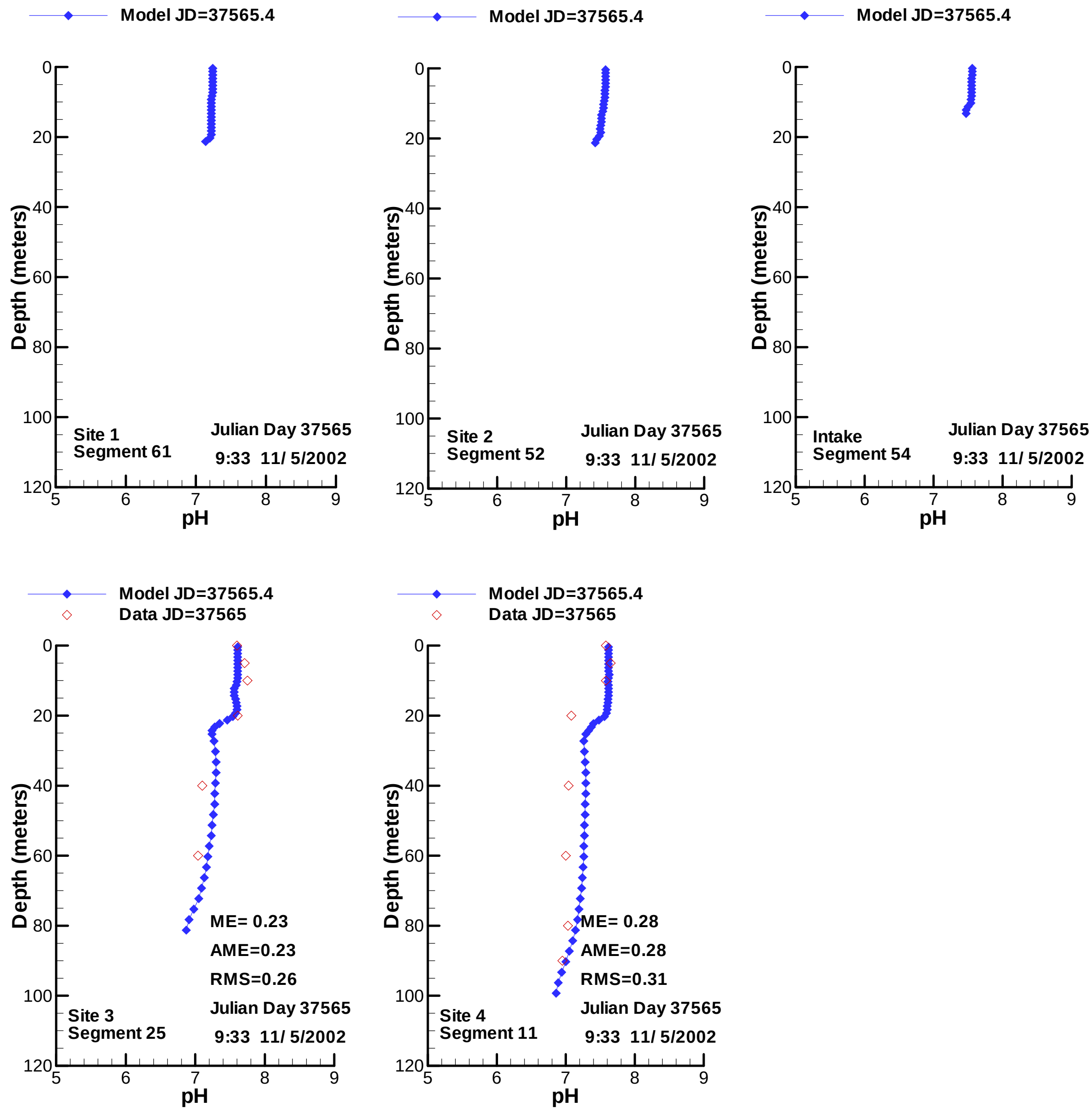

Figure 456. Vertical profiles of pH compared with data for 11/ 5/2002.

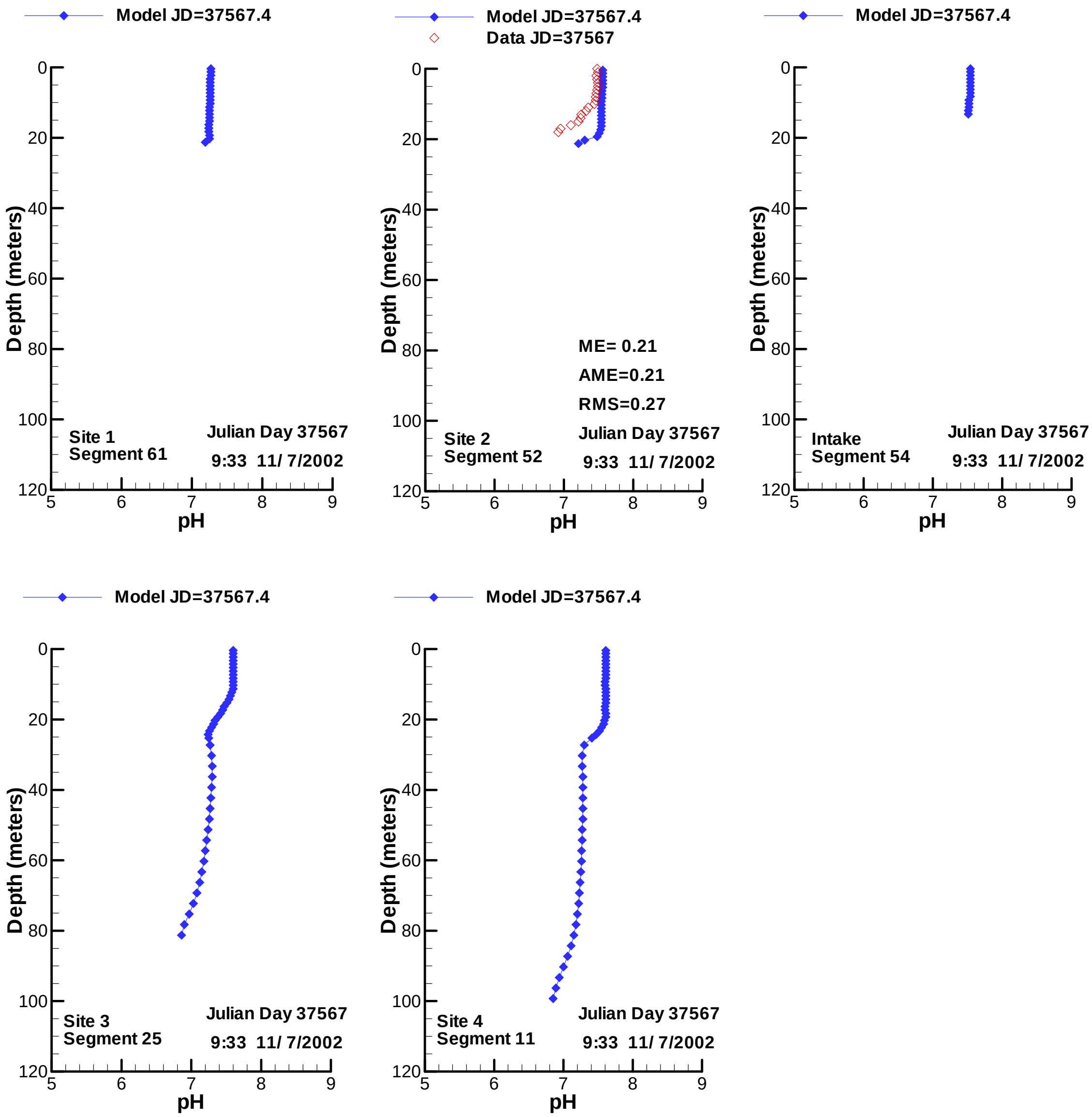

Figure 457. Vertical profiles of pH compared with data for 11/ 7/2002.

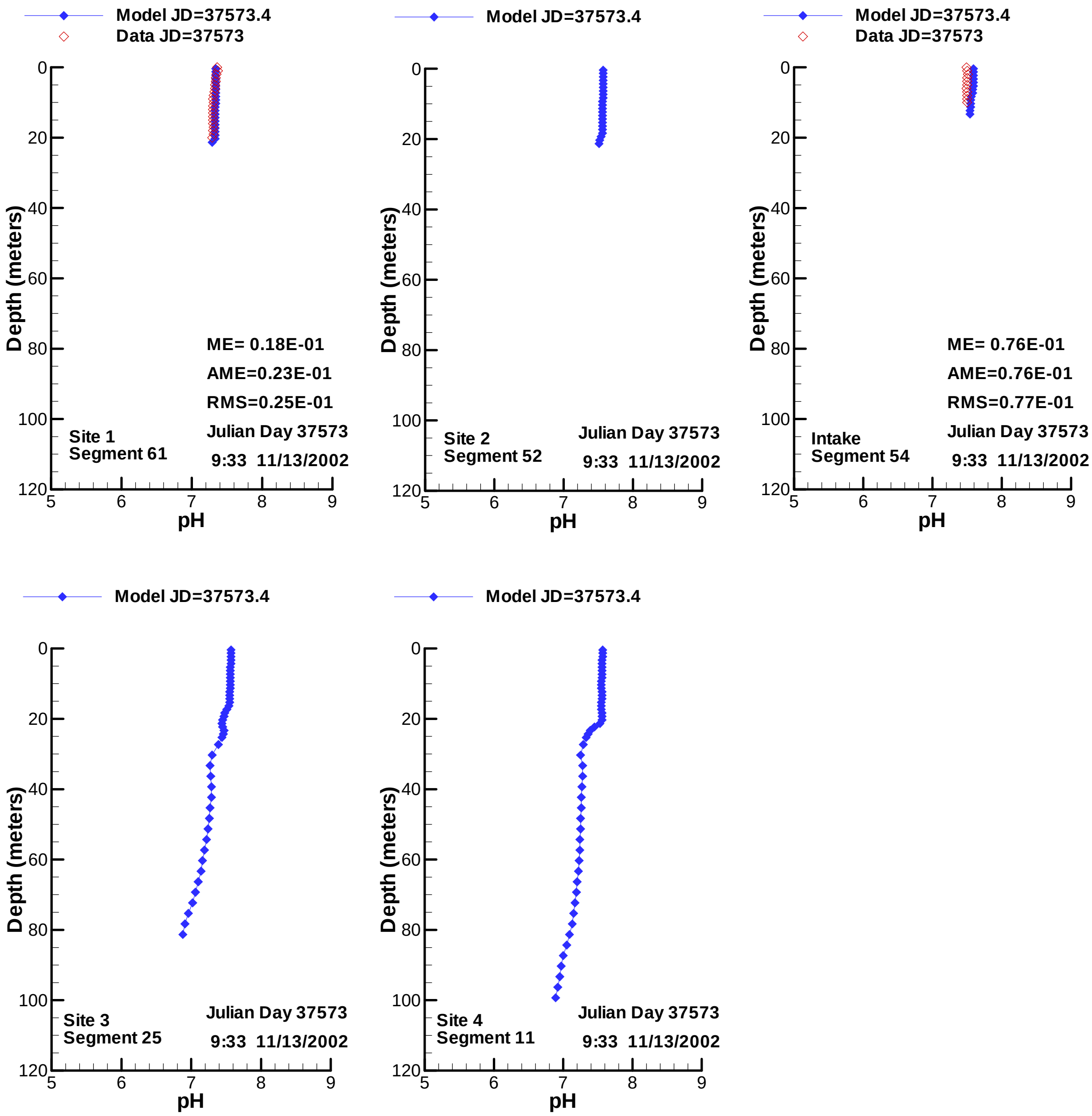

Figure 458. Vertical profiles of pH compared with data for 11/13/2002.

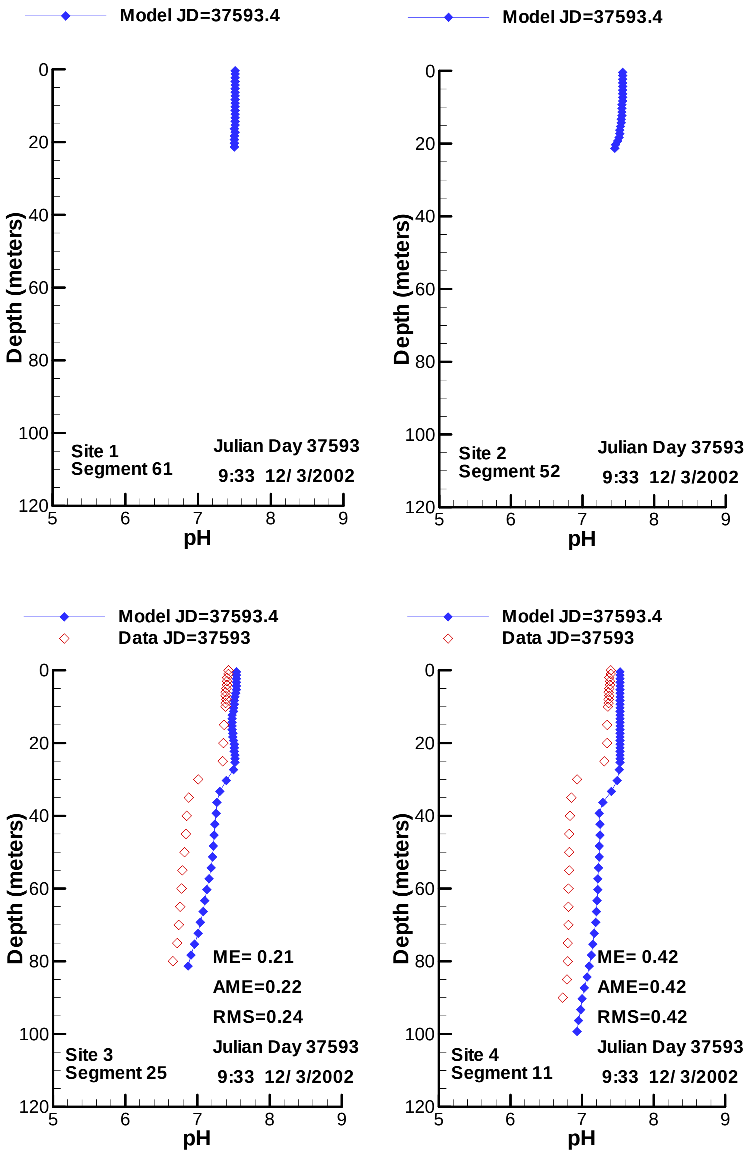

Figure 459. Vertical profiles of pH compared with data for 12/ 3/2002.

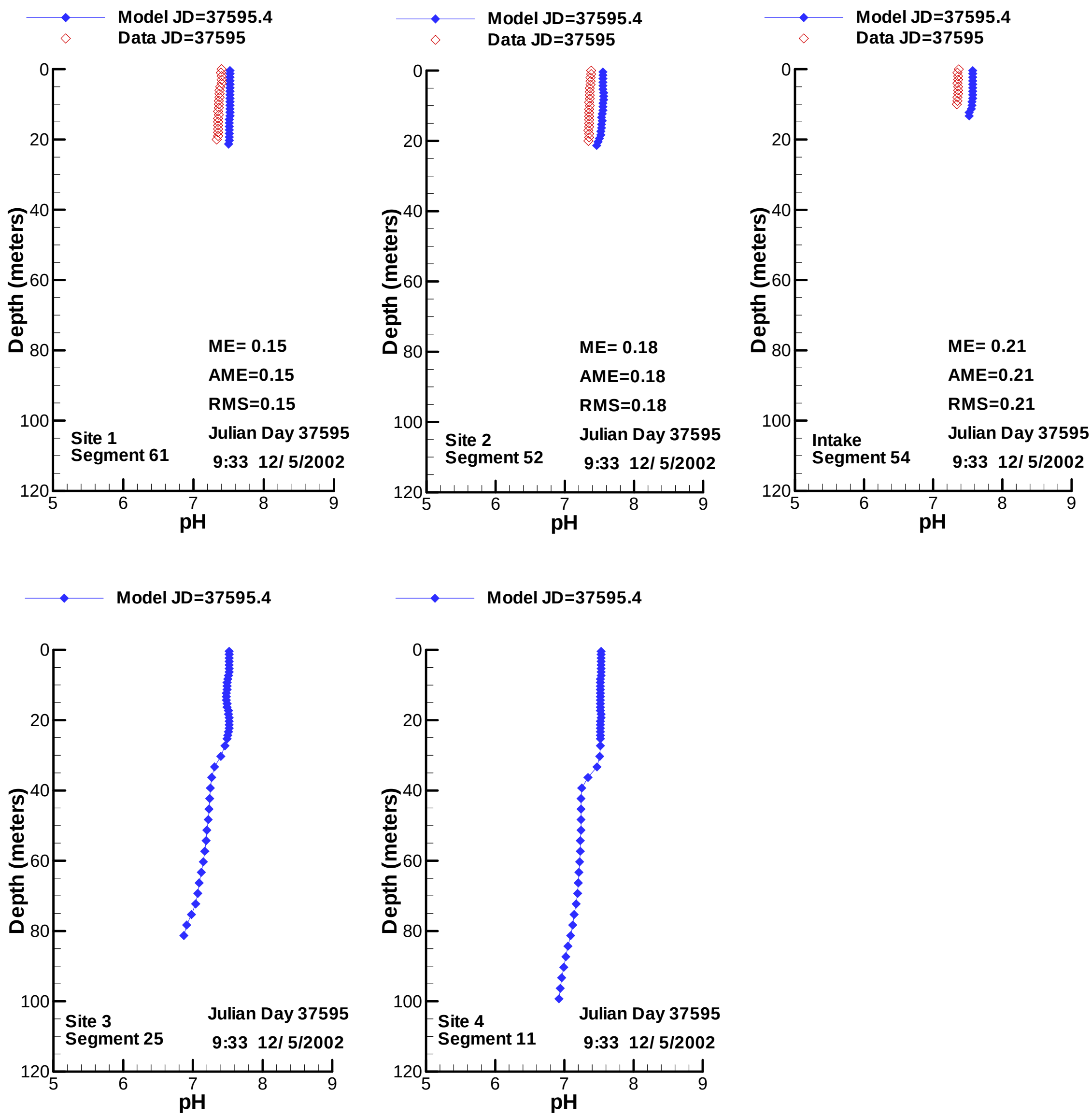

Figure 460. Vertical profiles of pH compared with data for 12/ 5/2002.

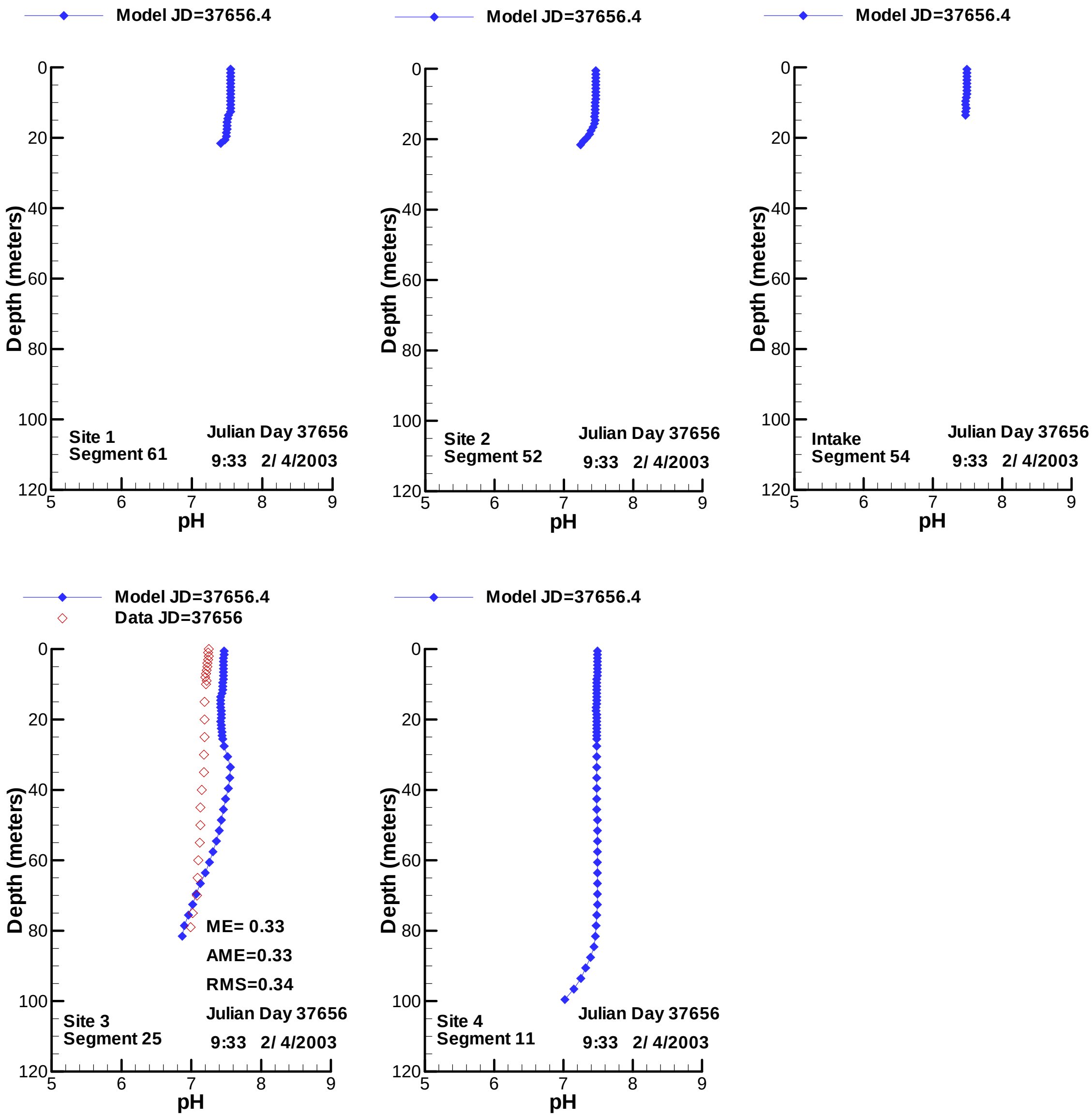

Figure 461. Vertical profiles of pH compared with data for 2/ 4/2003.

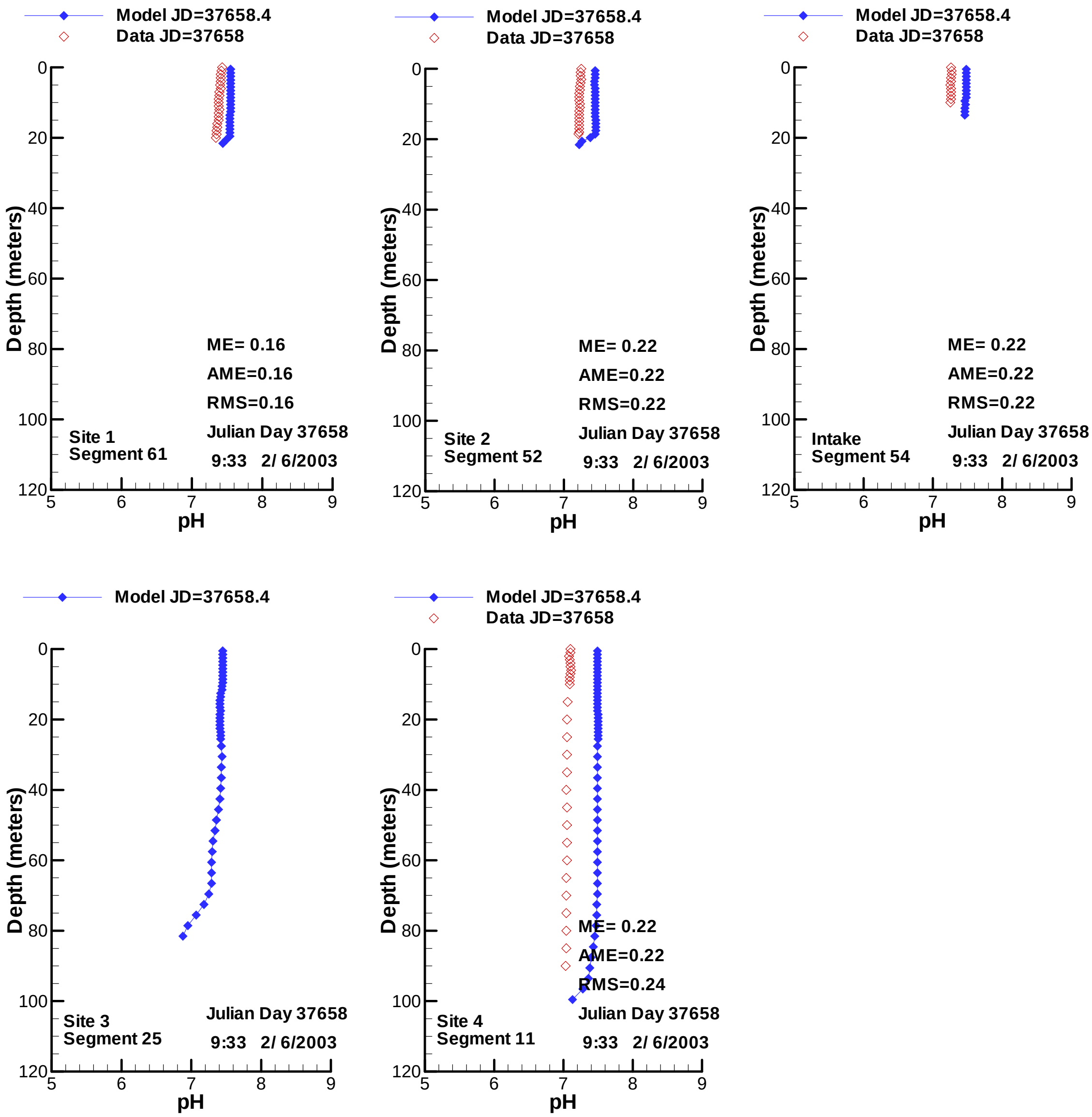

Figure 462. Vertical profiles of pH compared with data for 2/ 6/2003.

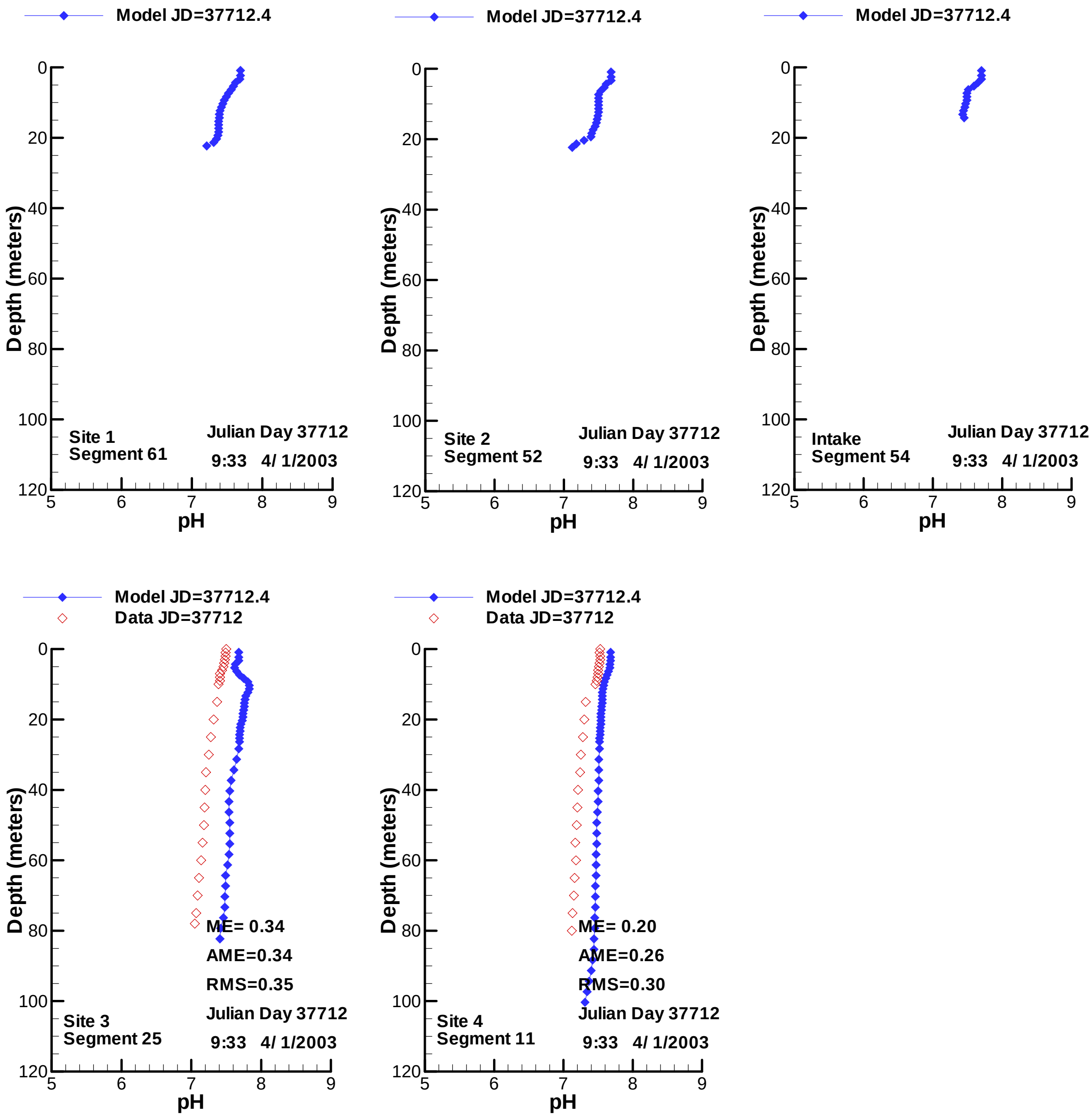

Figure 463. Vertical profiles of pH compared with data for 4/ 1/2003.

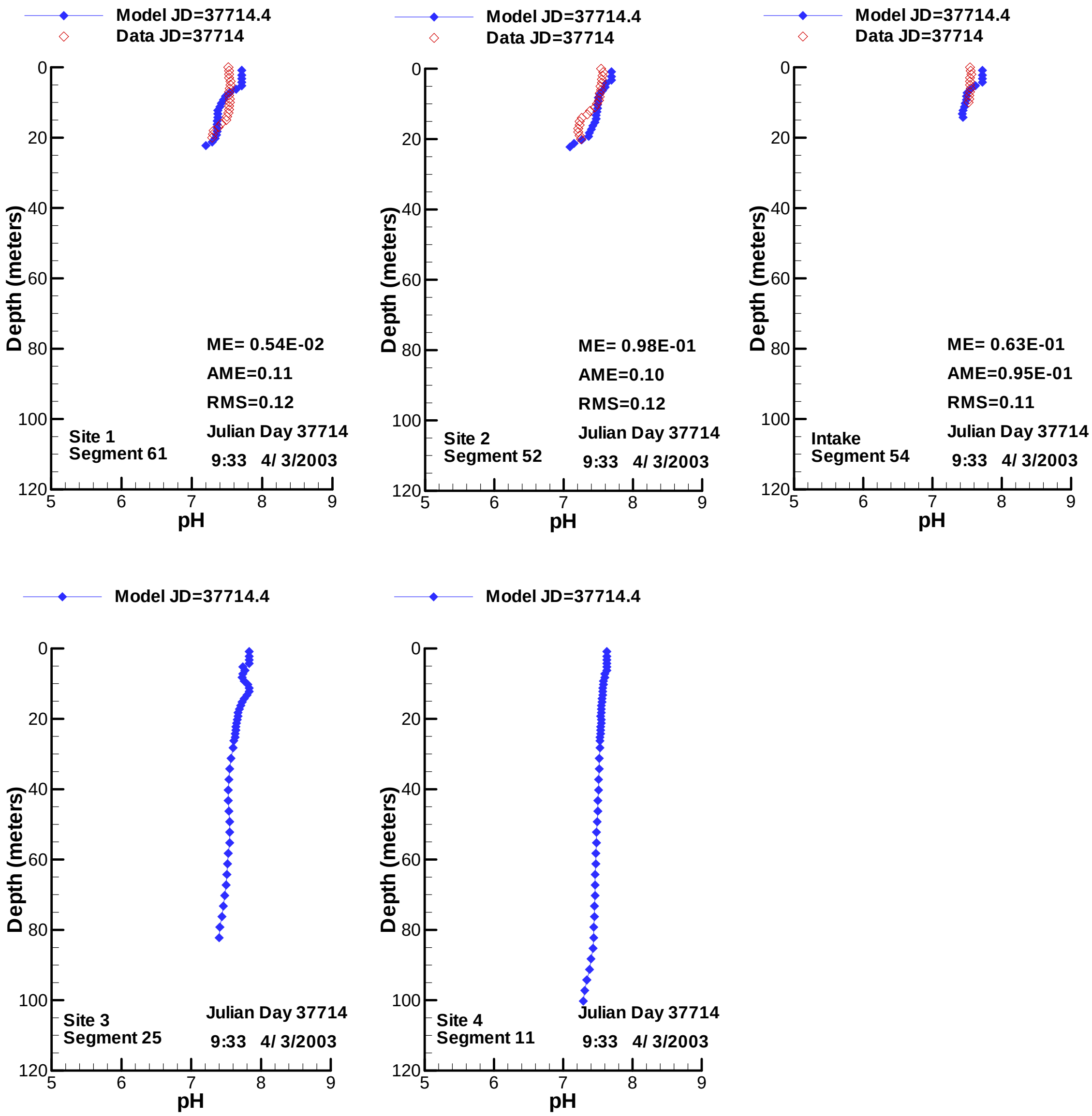

Figure 464. Vertical profiles of pH compared with data for 4/ 3/2003.

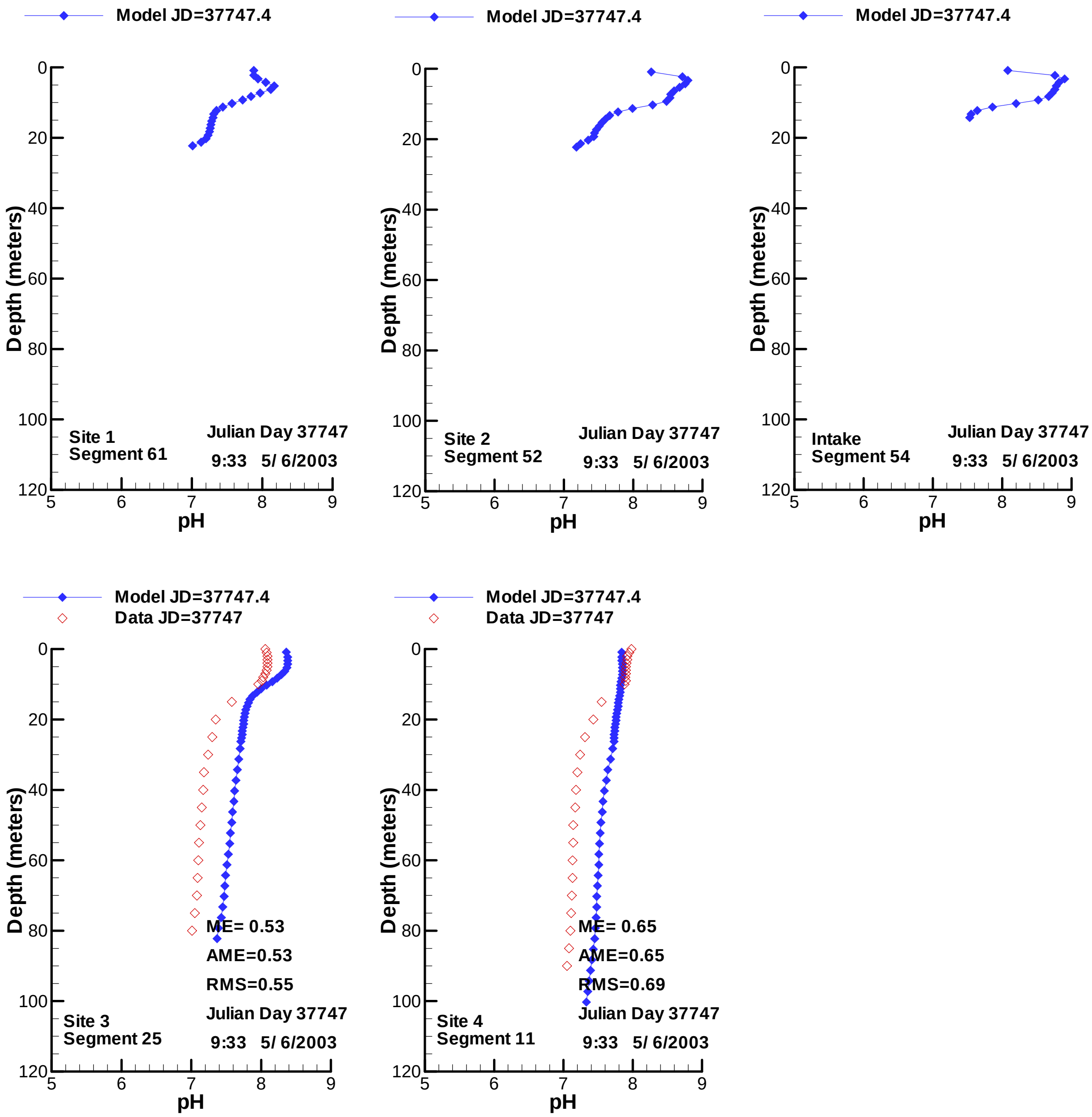

Figure 465. Vertical profiles of pH compared with data for 5/ 6/2003.

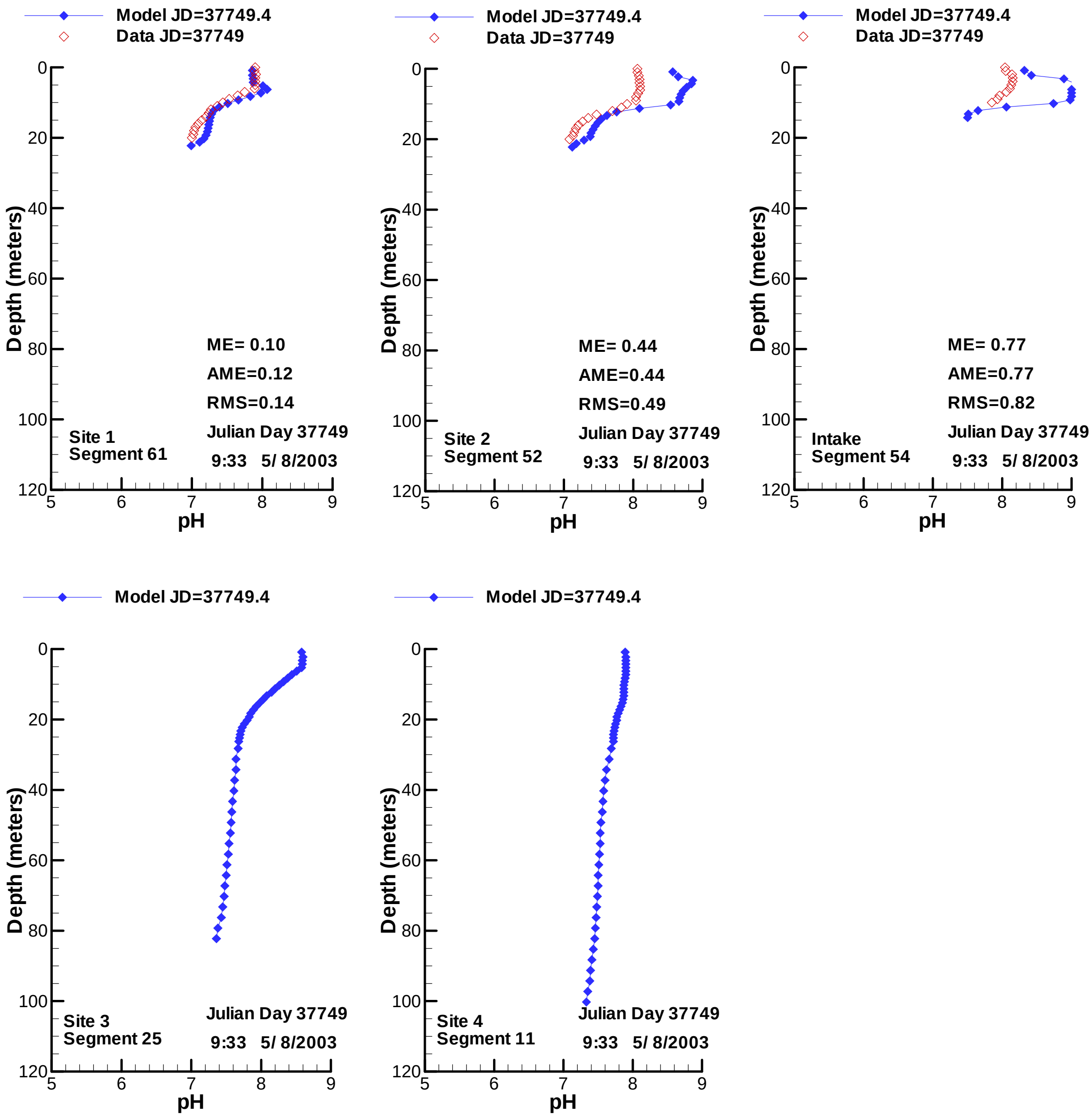

Figure 466. Vertical profiles of pH compared with data for 5/ 8/2003.

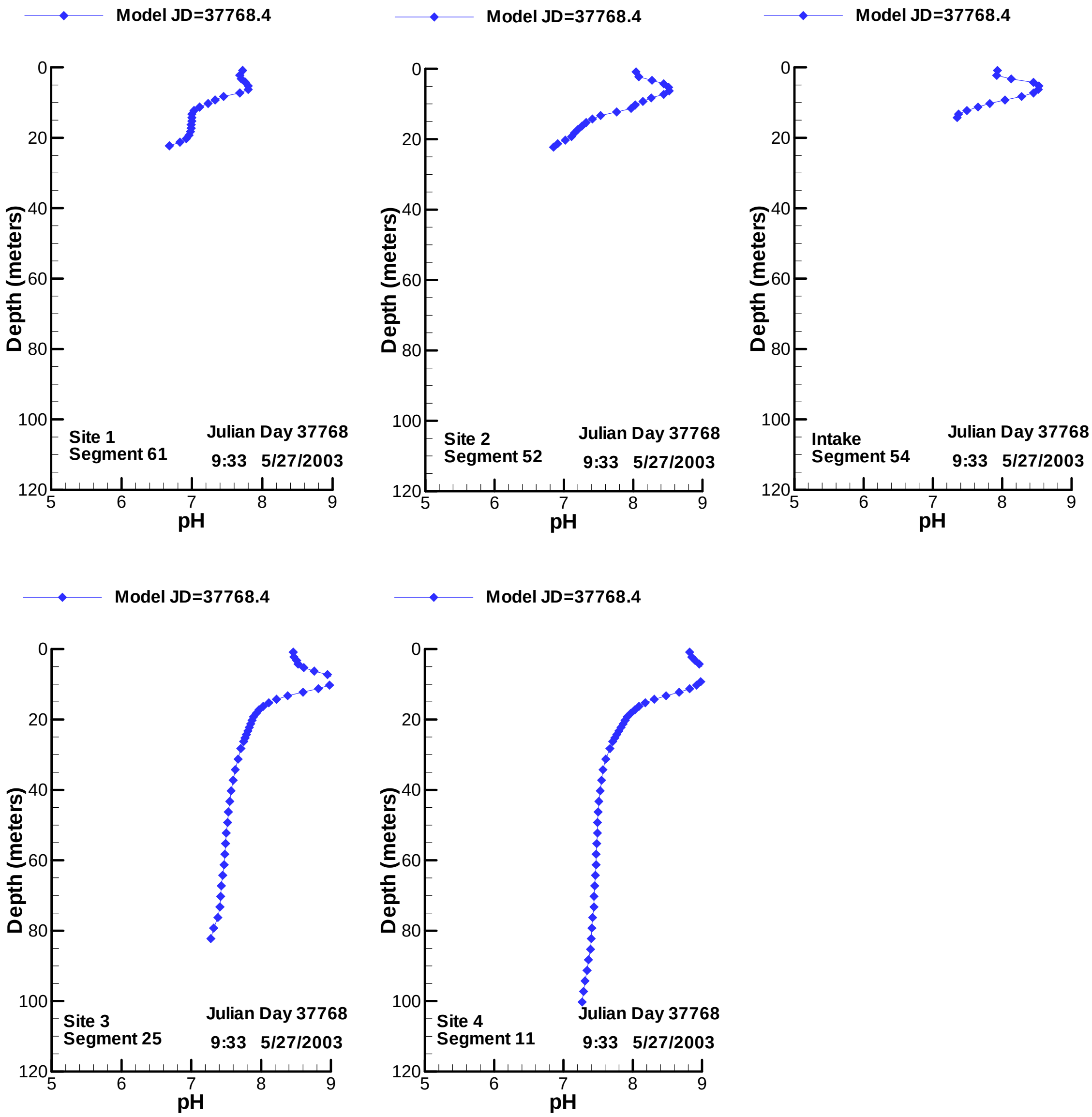

Figure 467. Vertical profiles of pH compared with data for 5/27/2003.

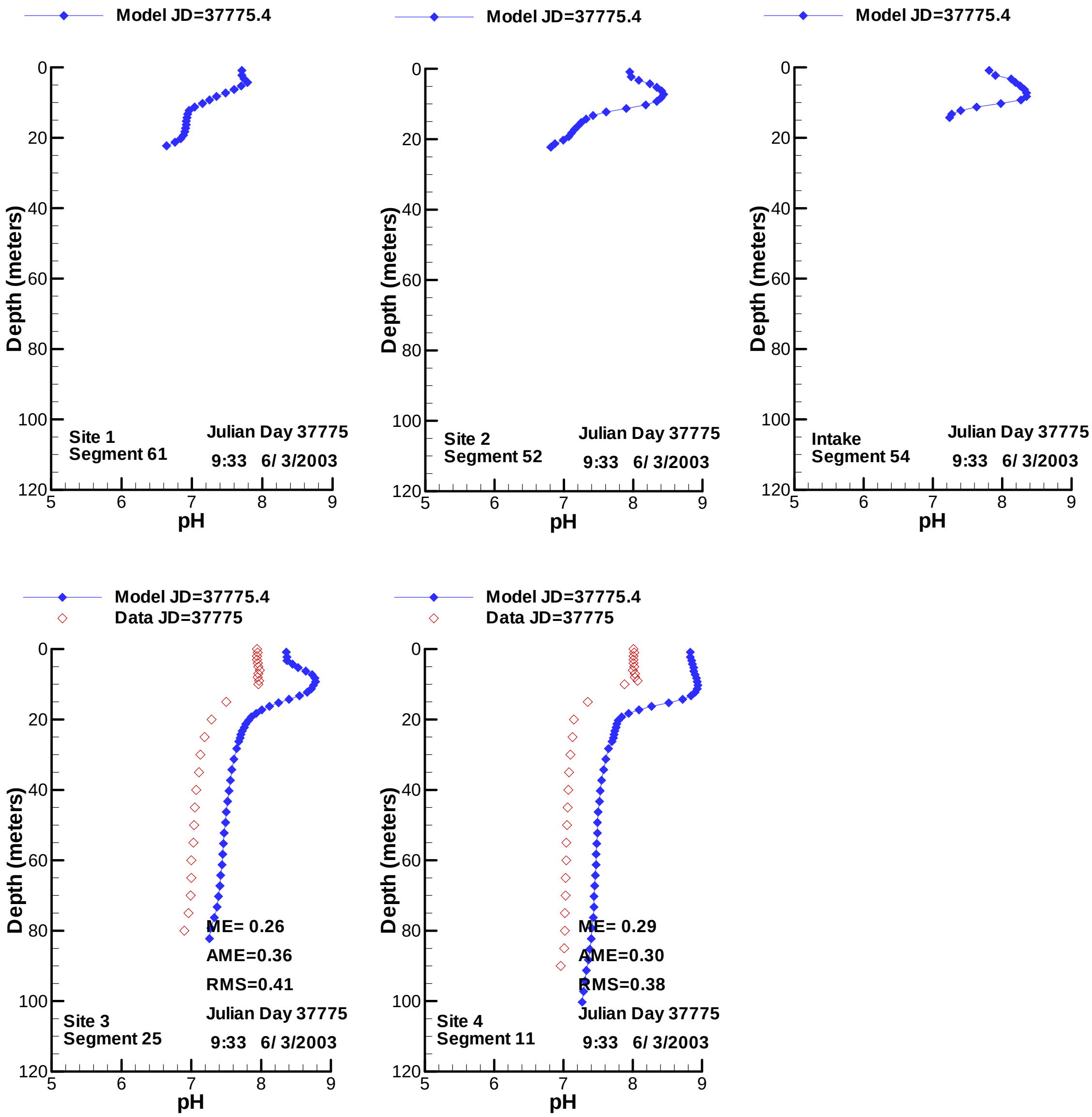

Figure 468. Vertical profiles of pH compared with data for 6/ 3/2003.

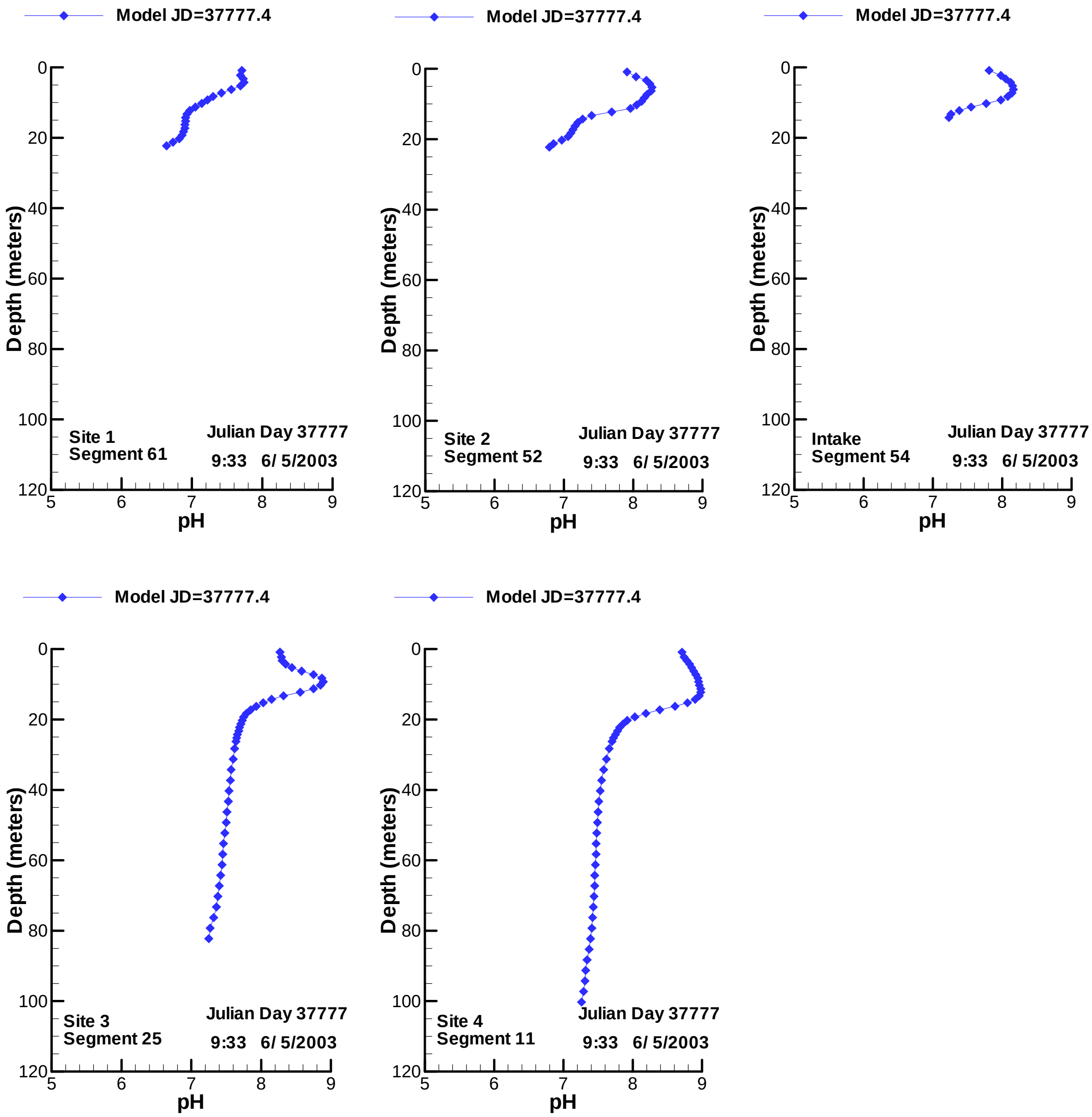

Figure 469. Vertical profiles of pH compared with data for 6/ 5/2003.

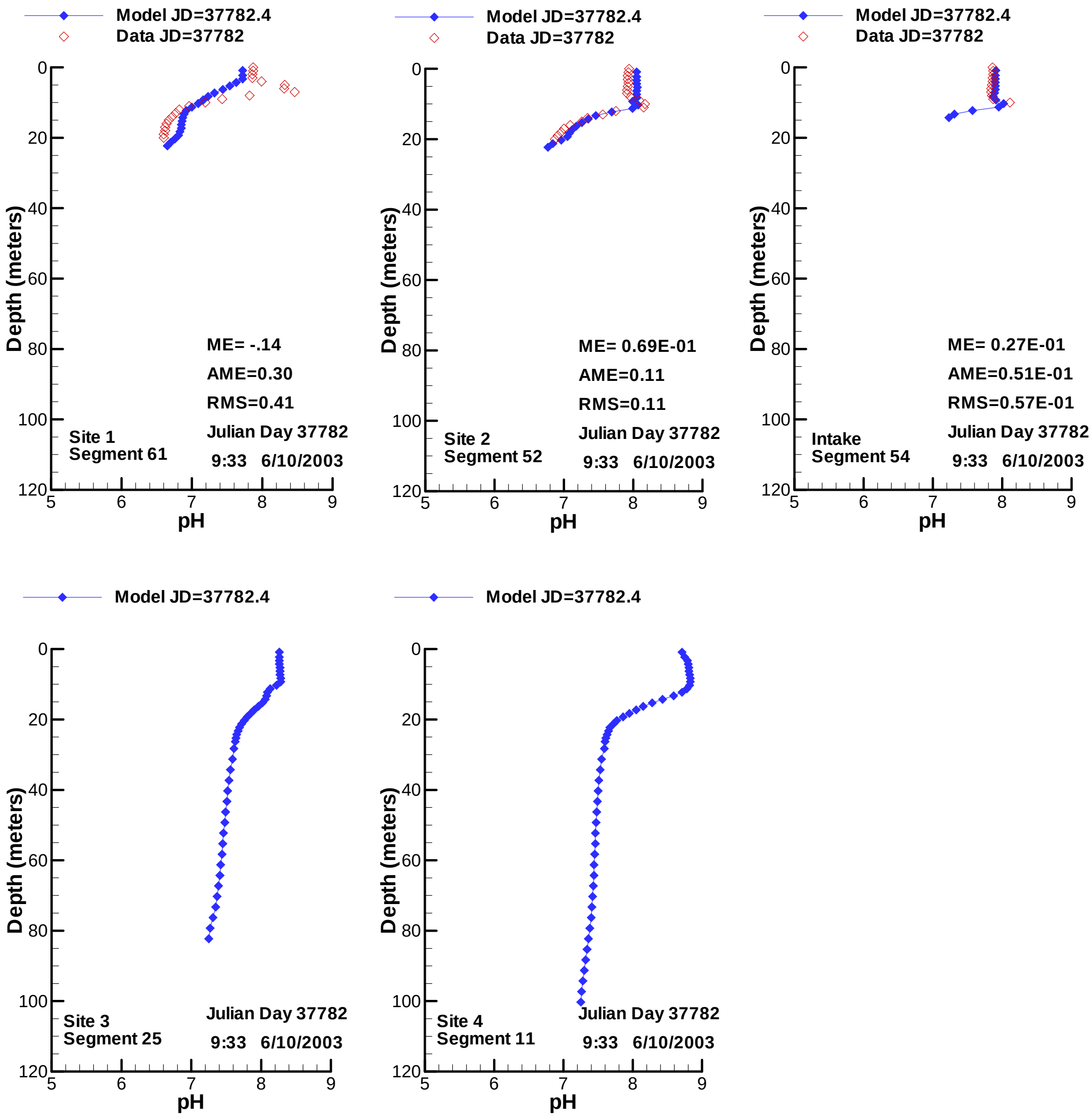

Figure 470. Vertical profiles of pH compared with data for 6/10/2003.

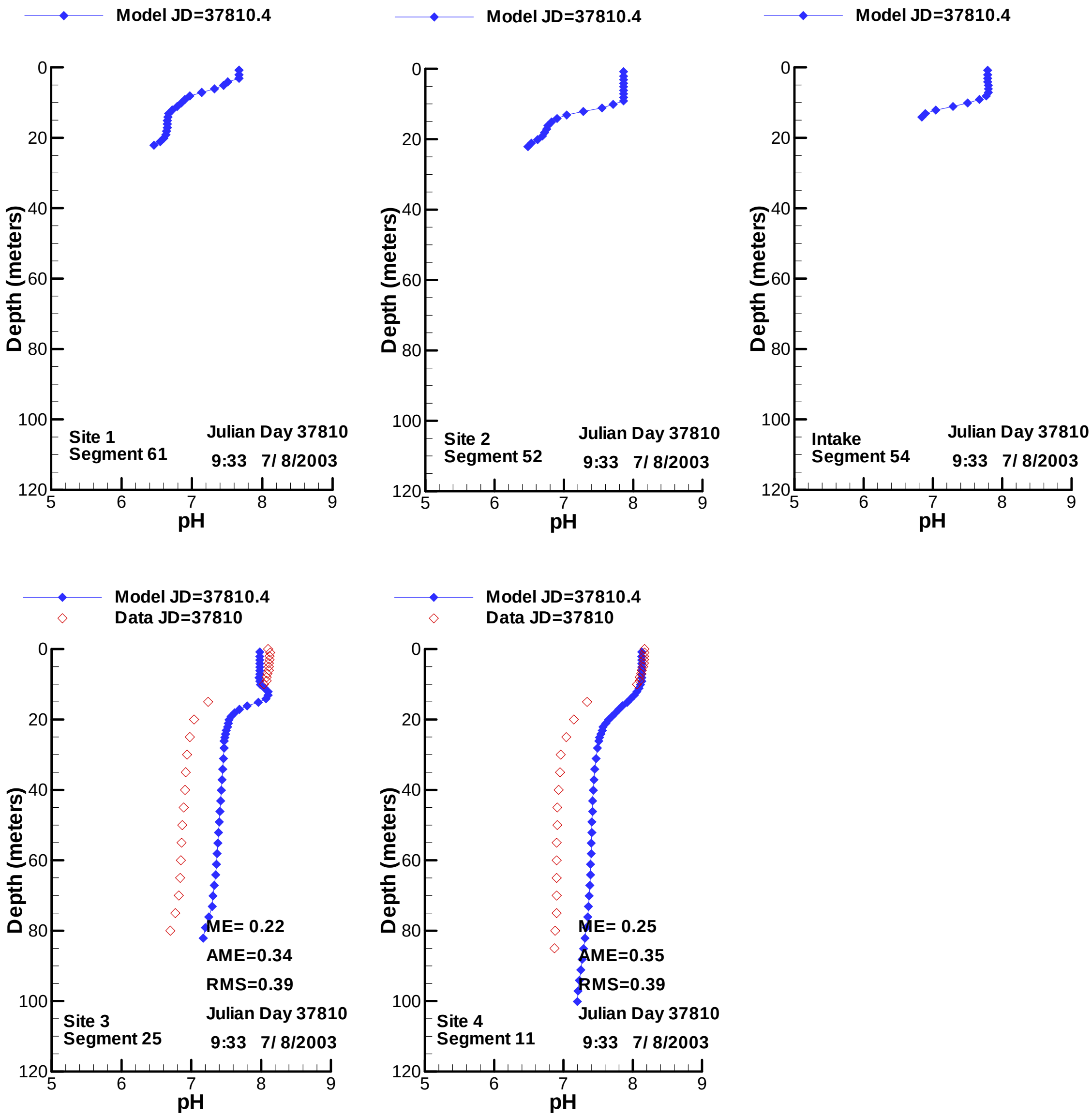

Figure 471. Vertical profiles of pH compared with data for 7/ 8/2003.

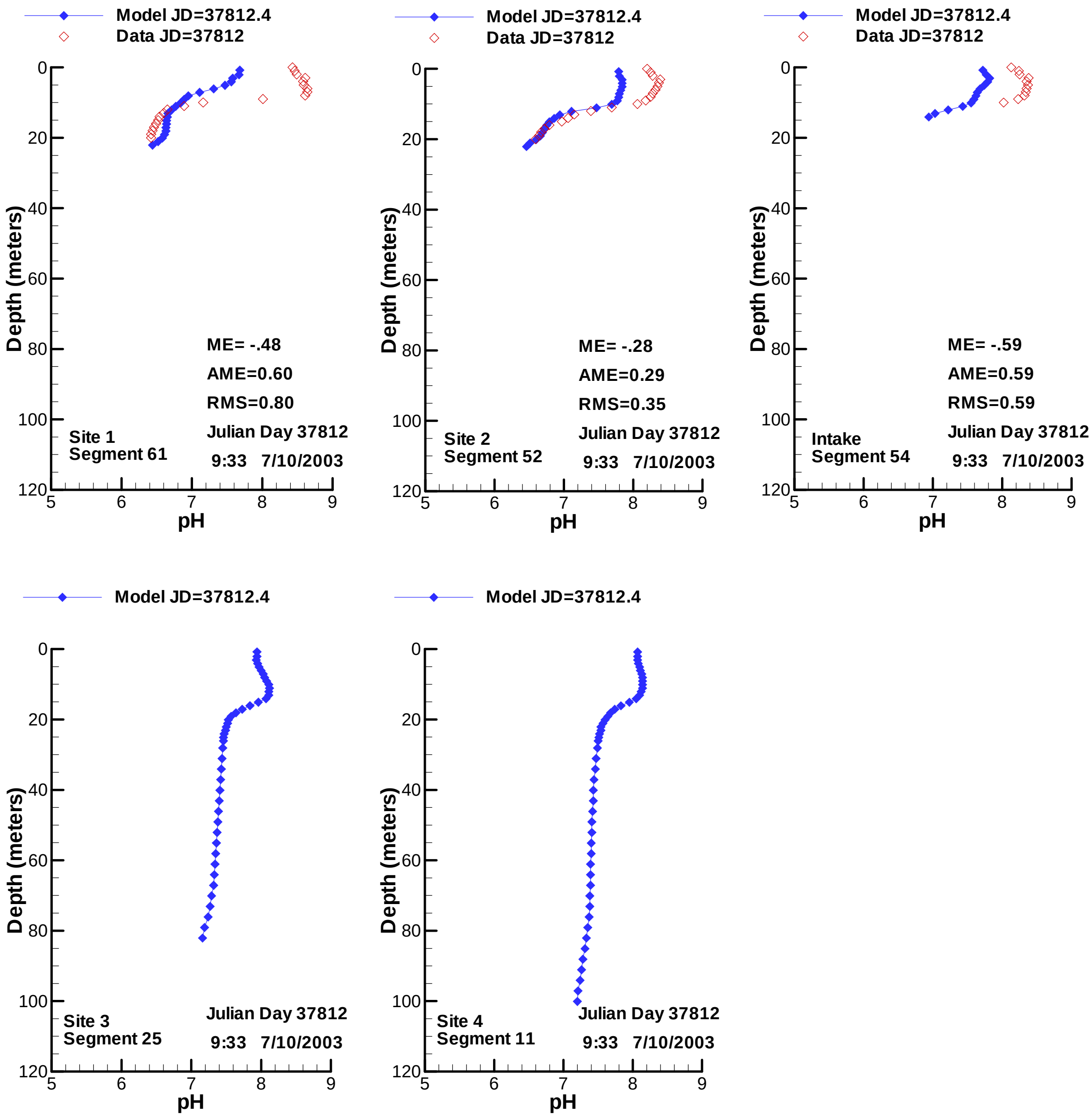

Figure 472. Vertical profiles of pH compared with data for 7/10/2003.

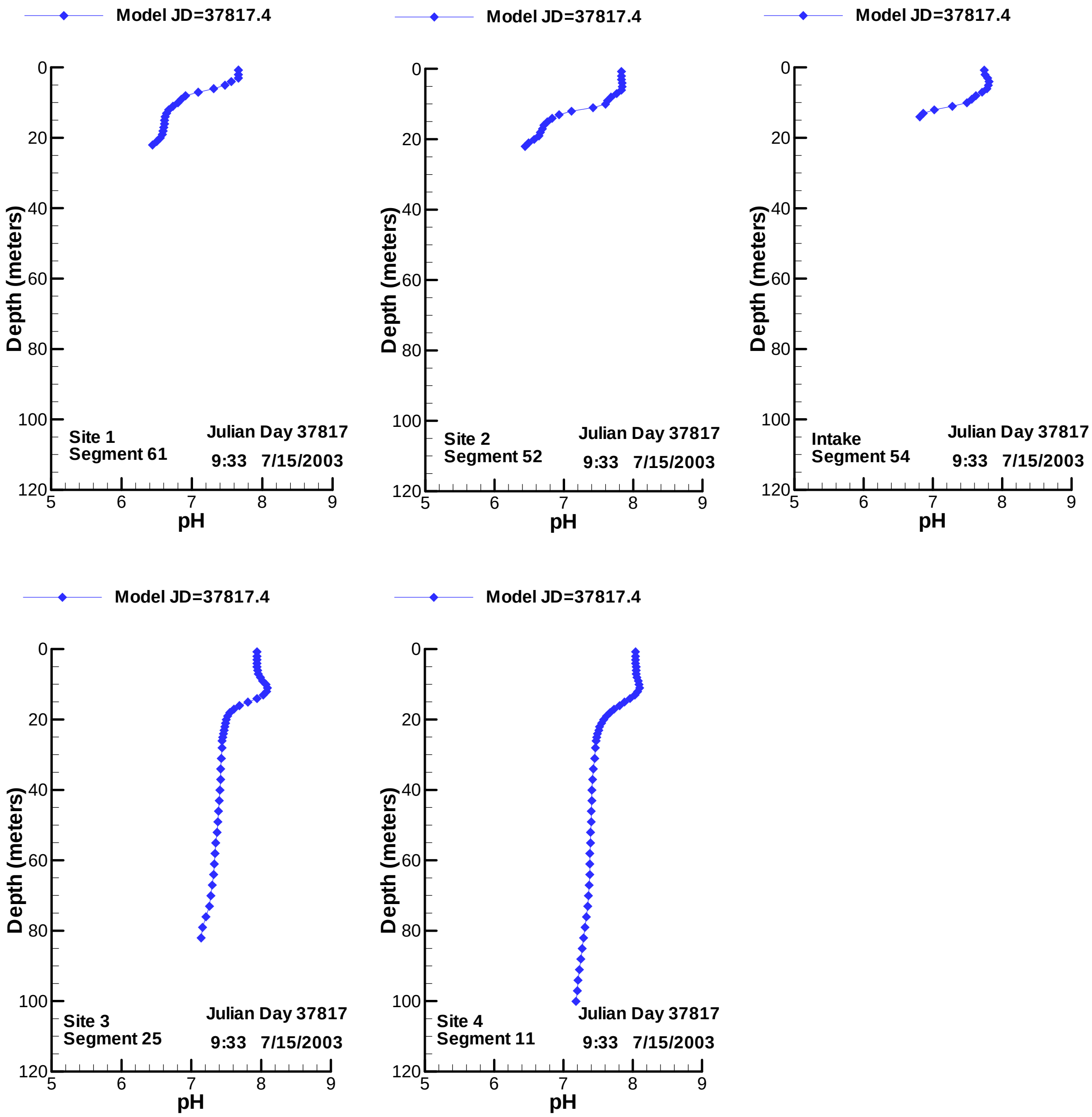

Figure 473. Vertical profiles of pH compared with data for 7/15/2003.

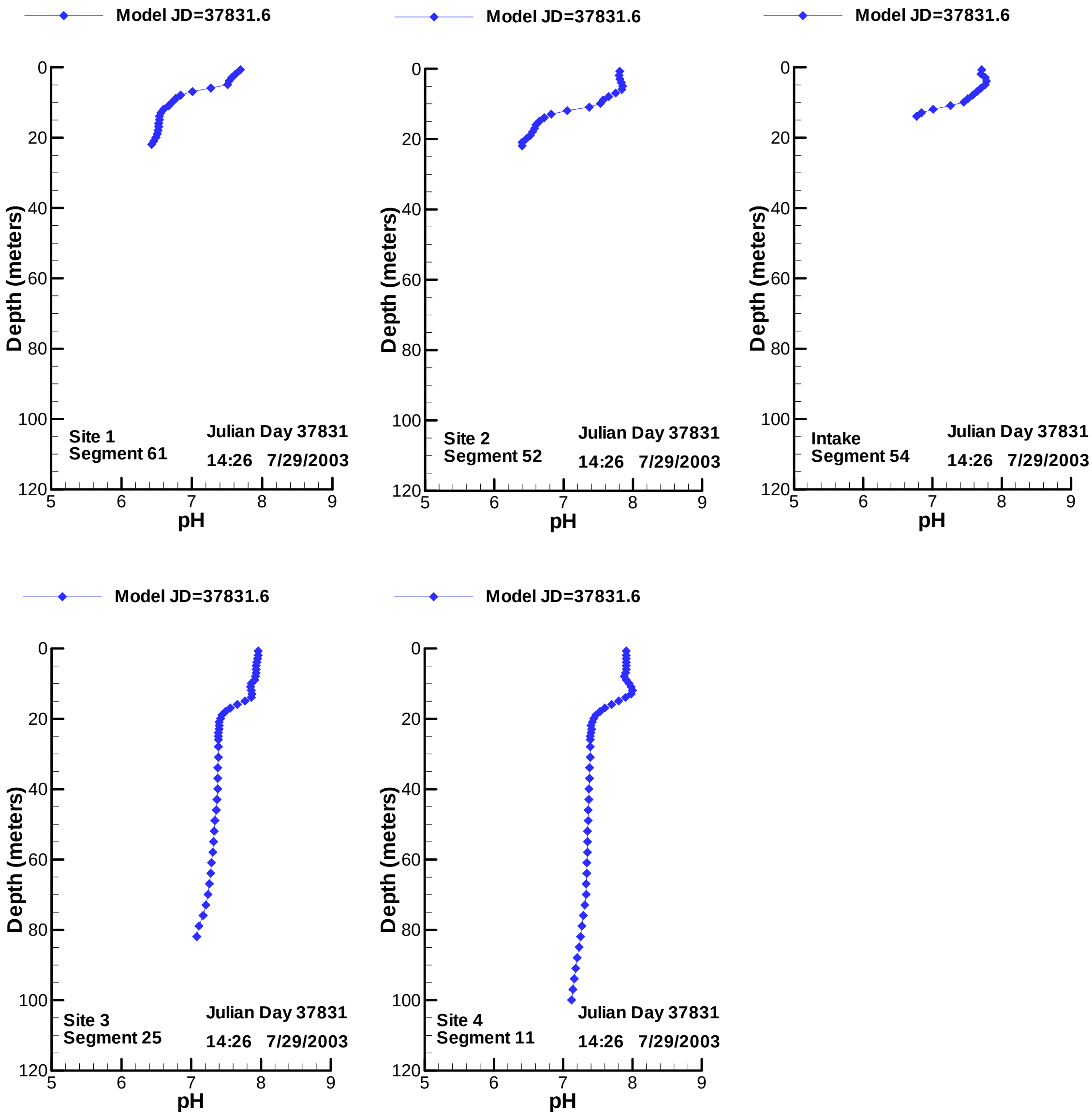

Figure 474. Vertical profiles of pH compared with data for 7/29/2003.

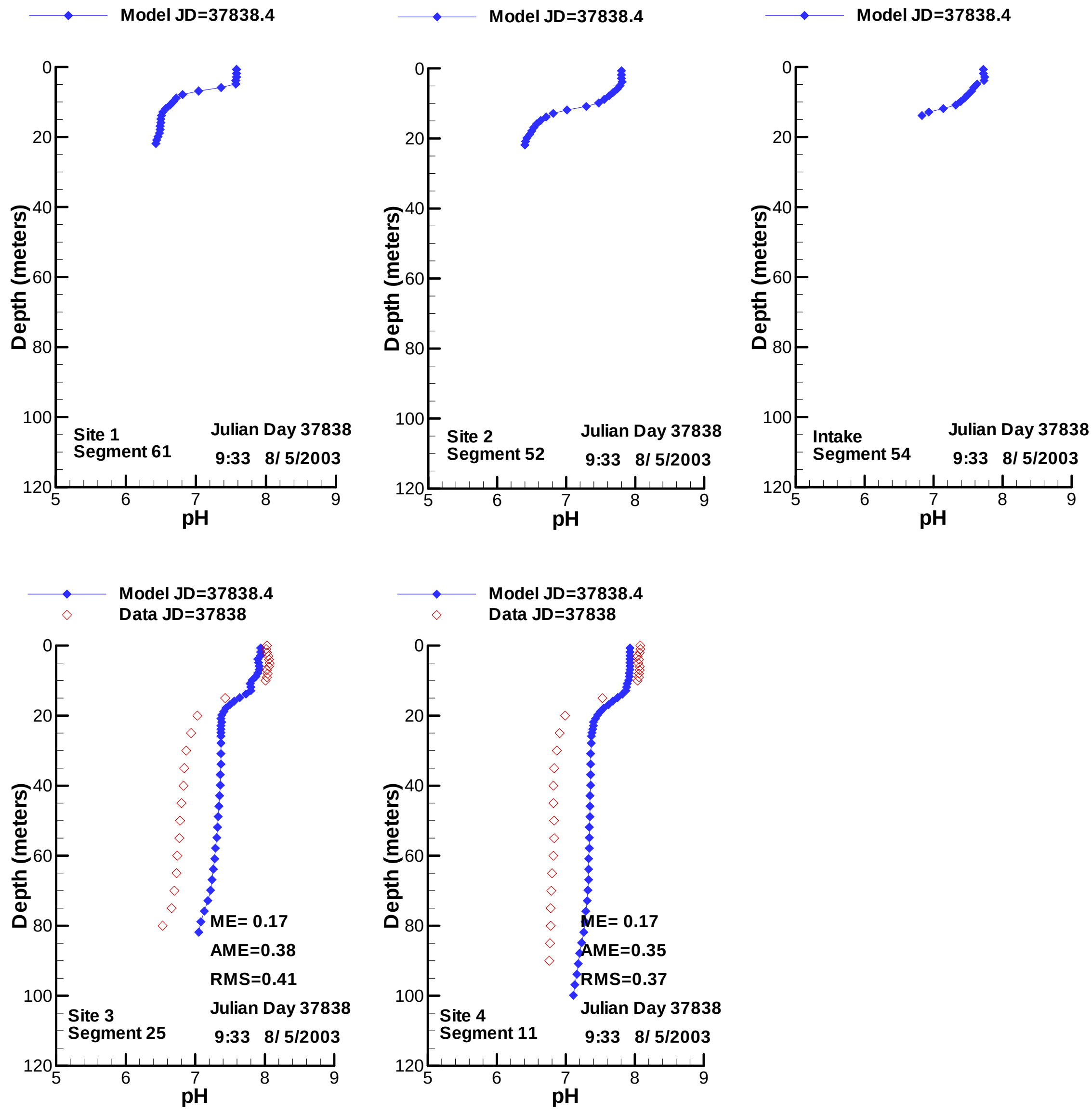

Figure 475. Vertical profiles of pH compared with data for 8/ 5/2003.

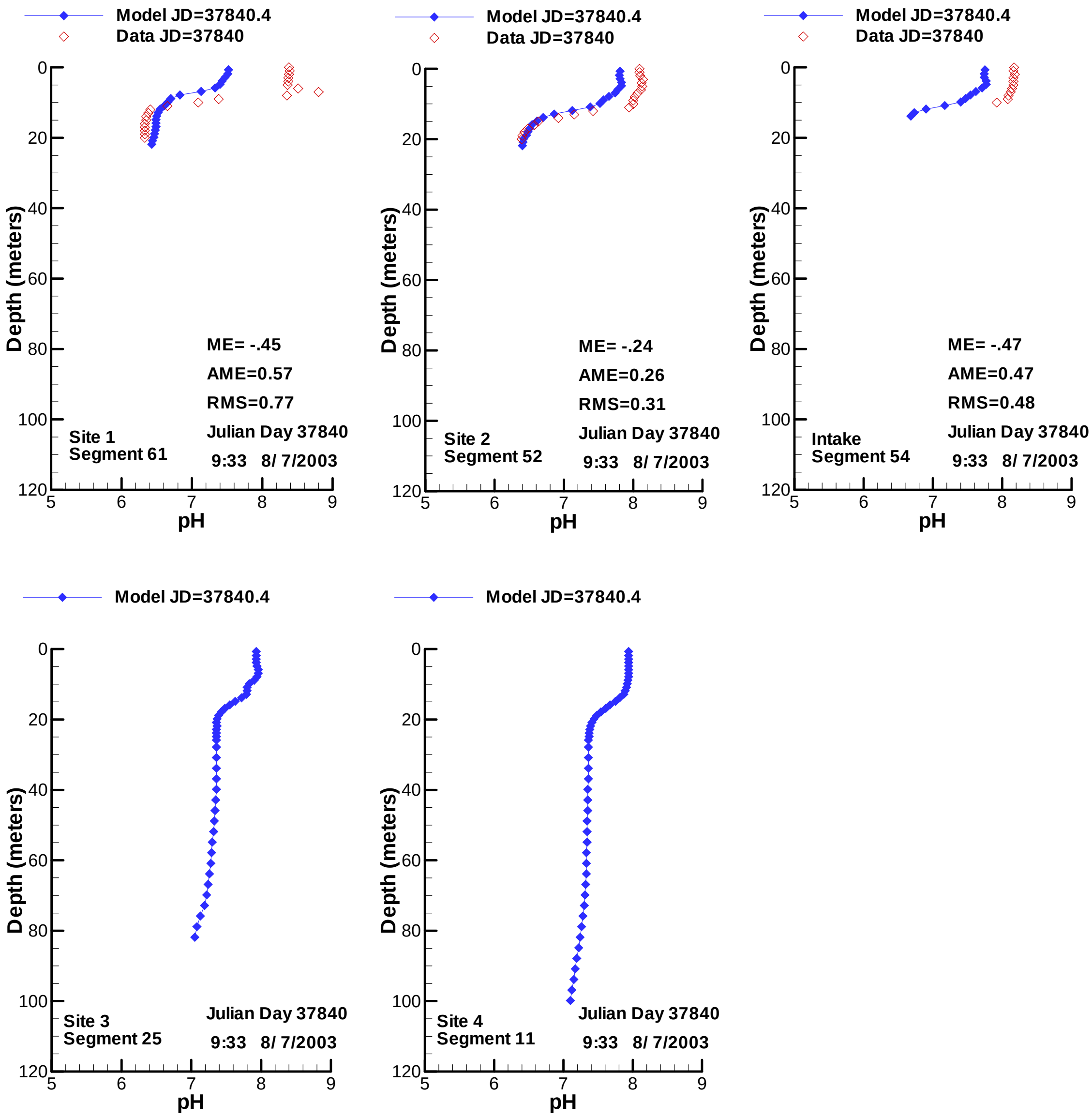

Figure 476. Vertical profiles of pH compared with data for 8/ 7/2003.

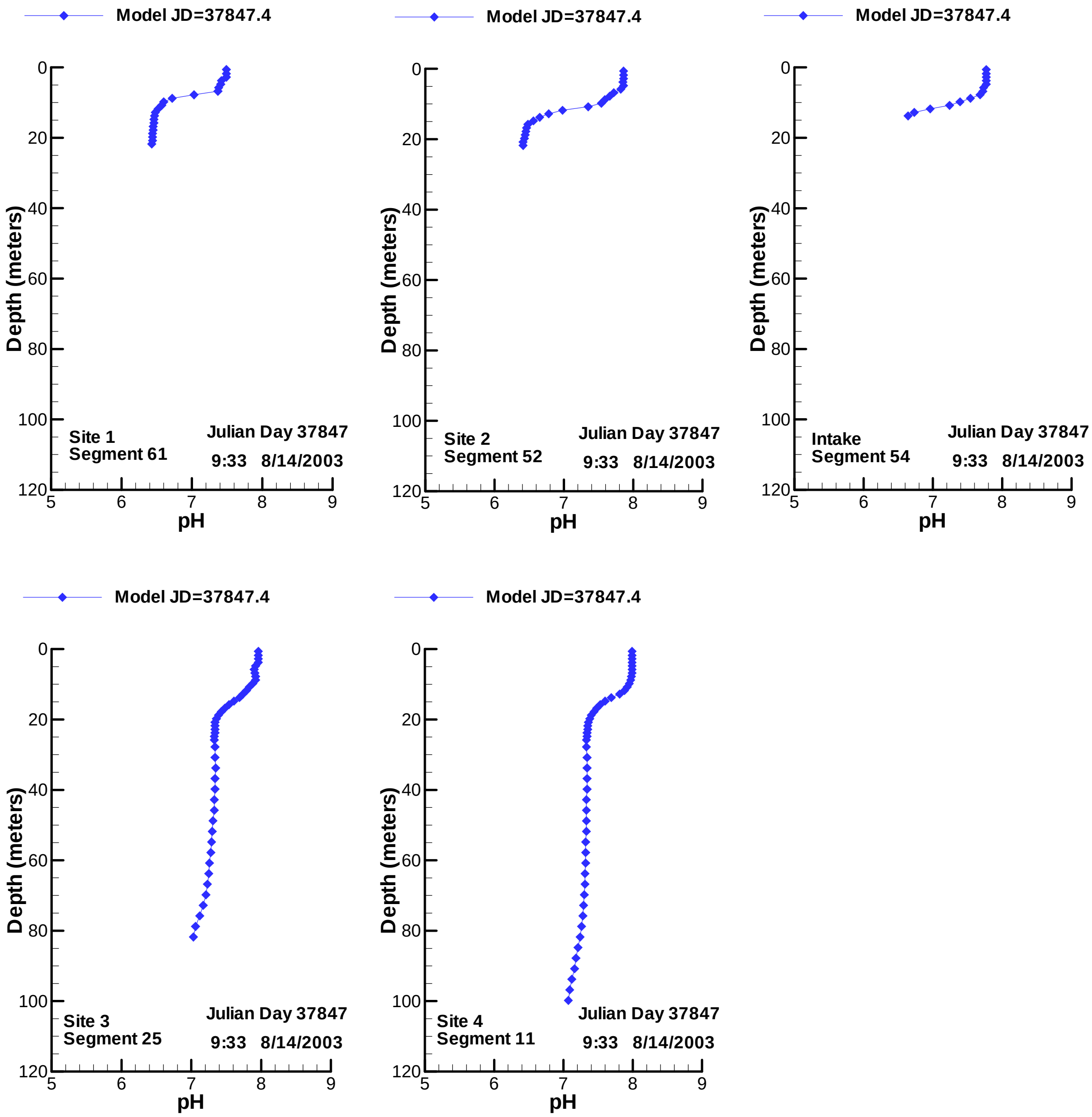

Figure 477. Vertical profiles of pH compared with data for 8/14/2003.

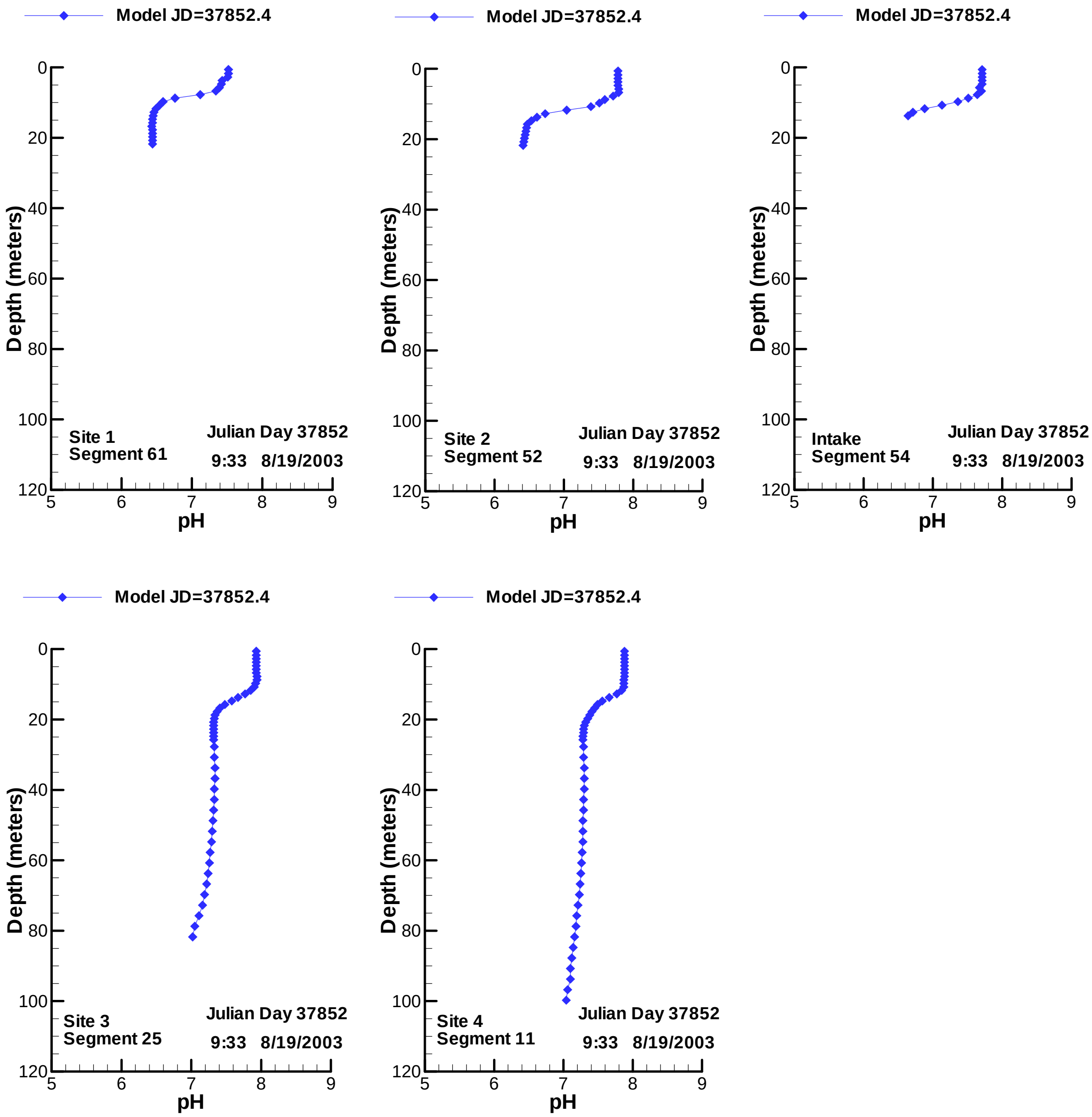

Figure 478. Vertical profiles of pH compared with data for 8/19/2003.

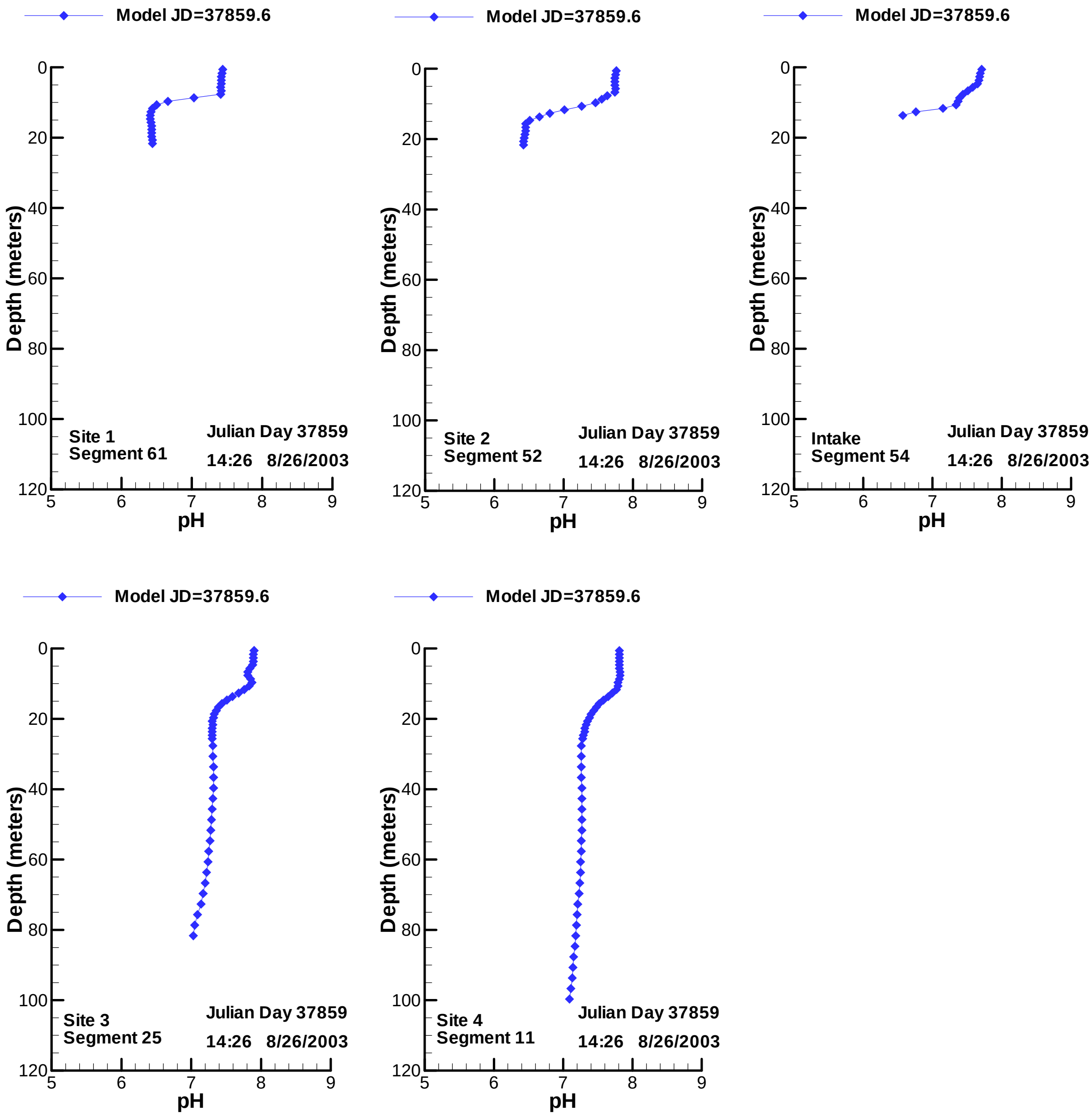

Figure 479. Vertical profiles of pH compared with data for 8/26/2003.

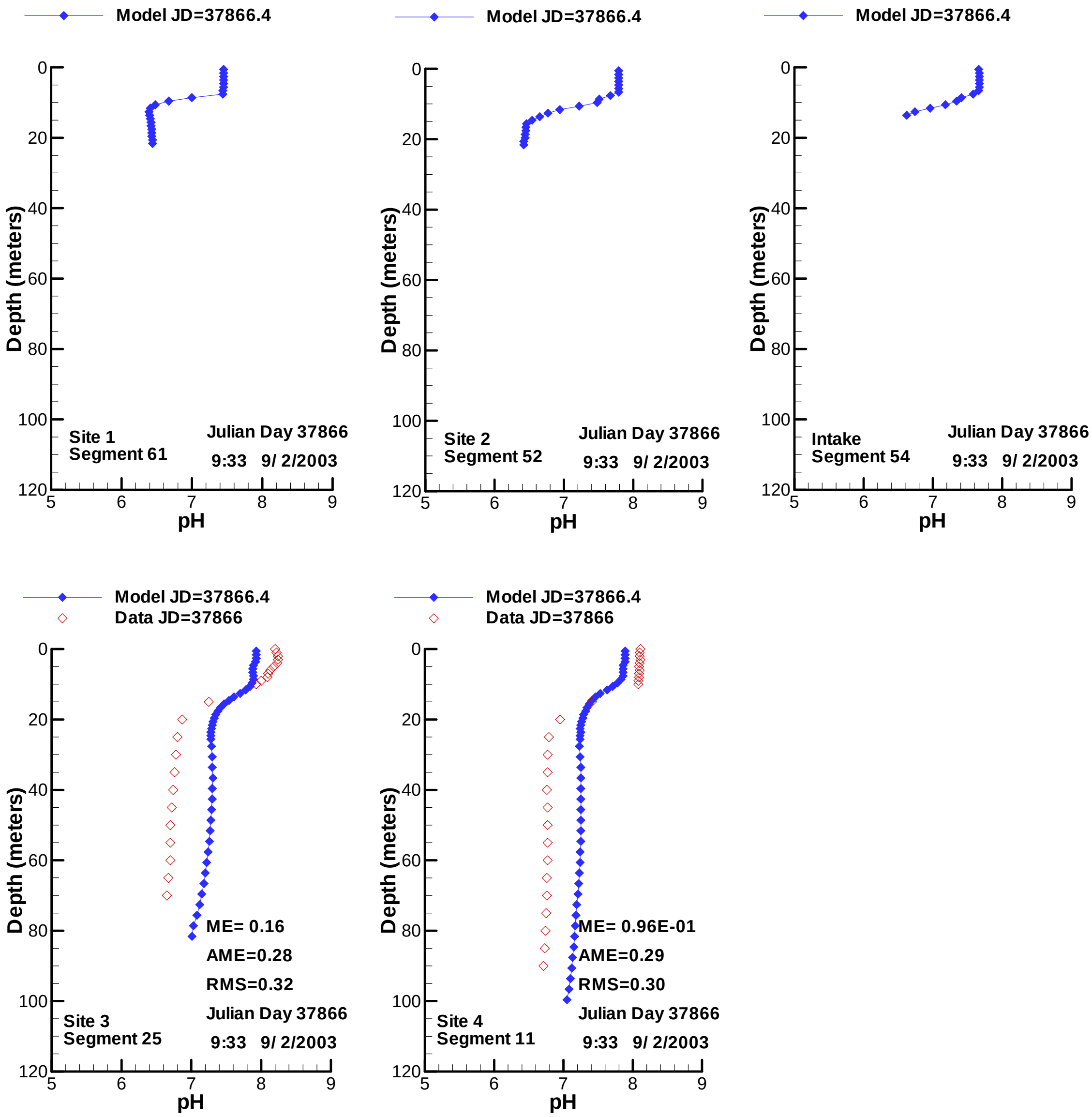

Figure 480. Vertical profiles of pH compared with data for 9/ 2/2003.

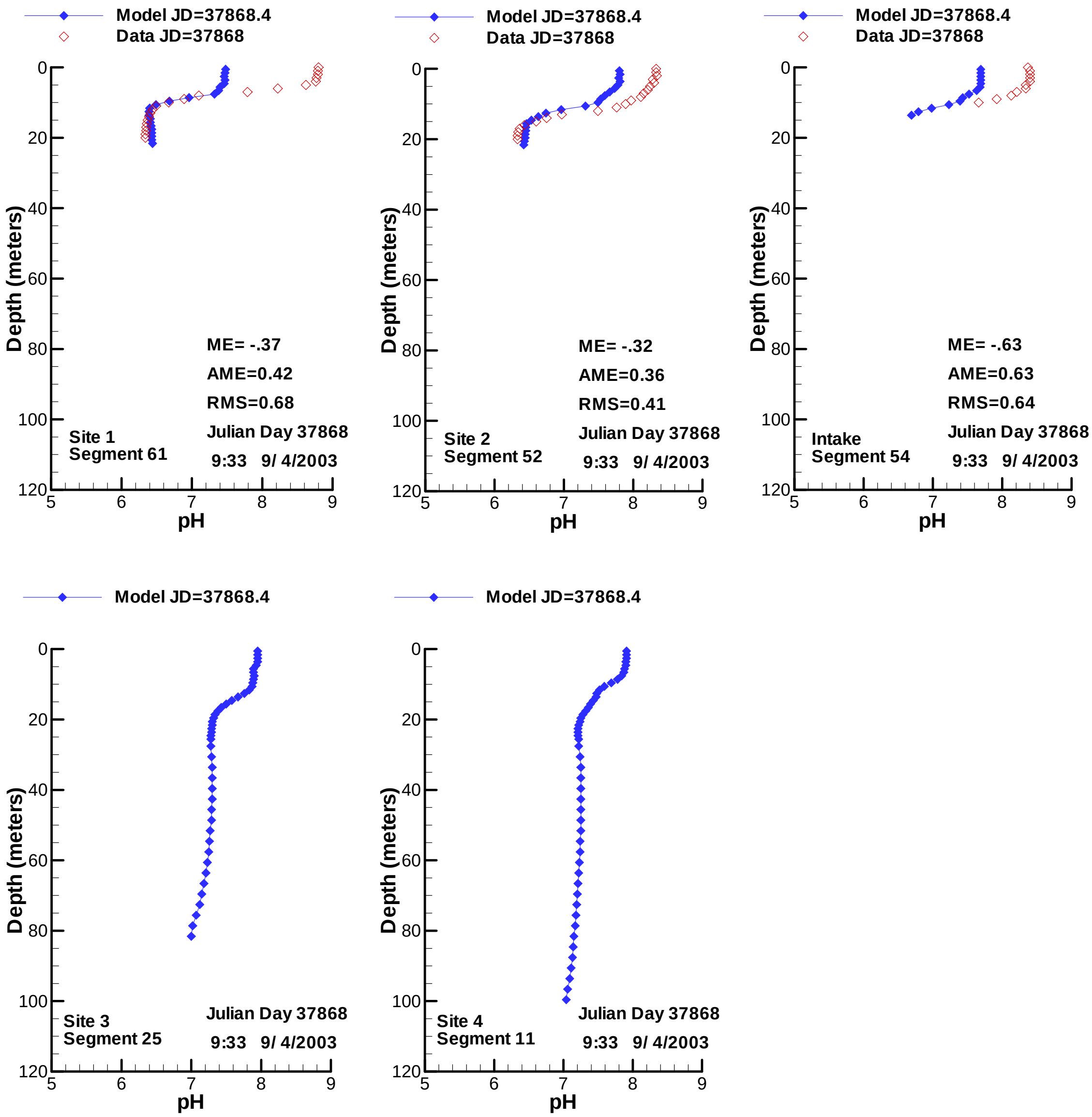

Figure 481. Vertical profiles of pH compared with data for 9/ 4/2003.

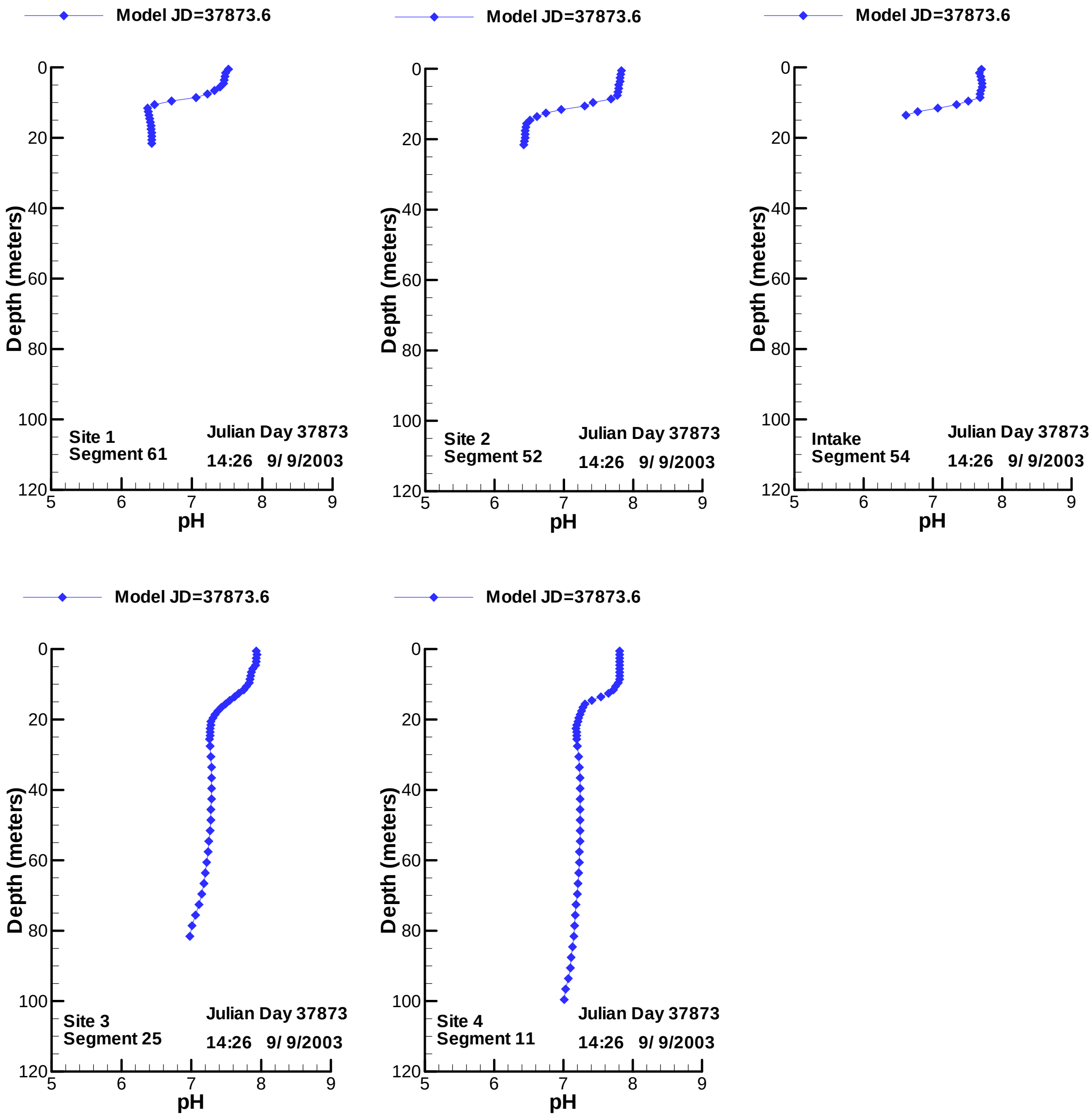

Figure 482. Vertical profiles of pH compared with data for 9/ 9/2003.

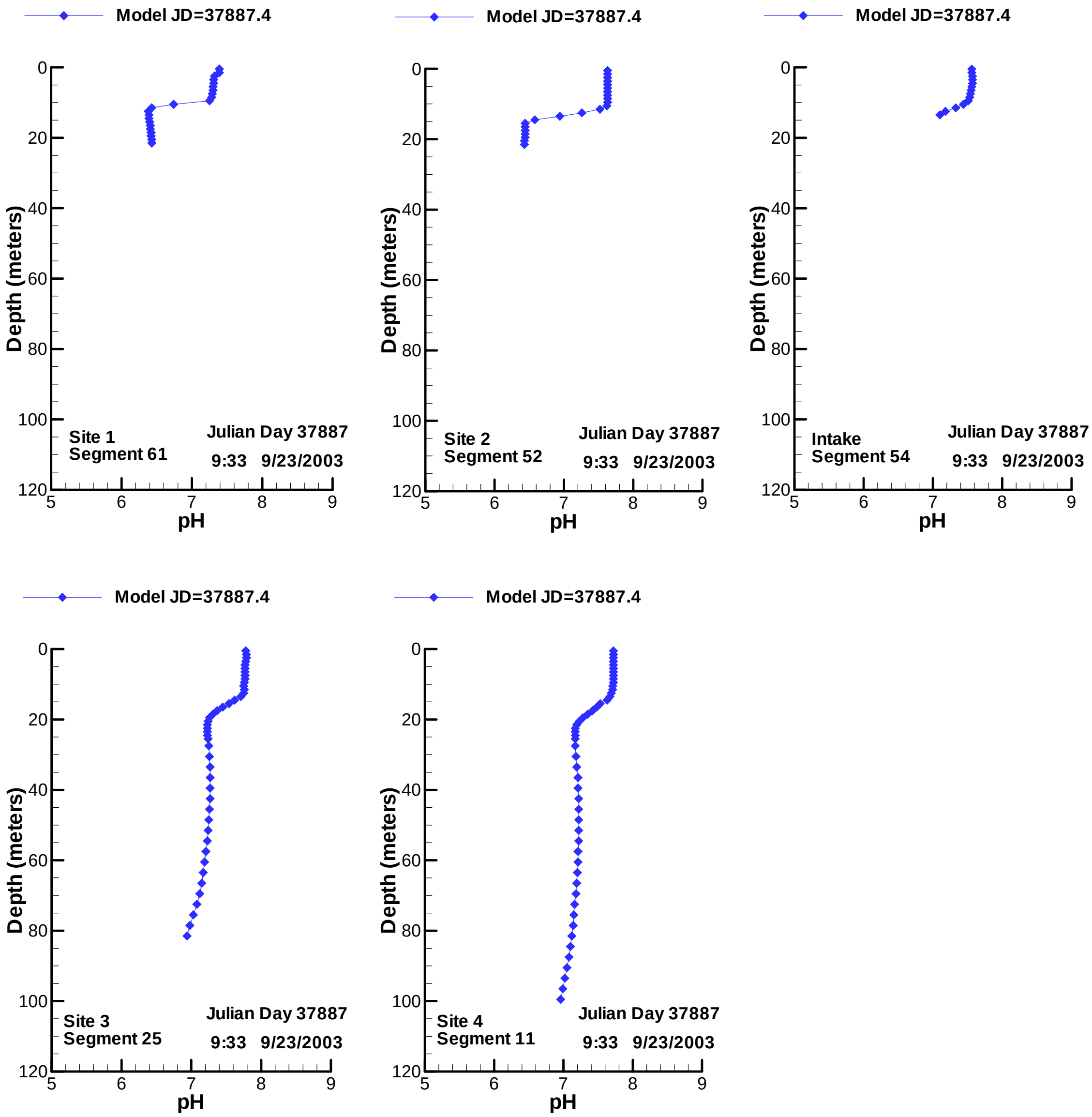

Figure 483. Vertical profiles of pH compared with data for 9/23/2003.

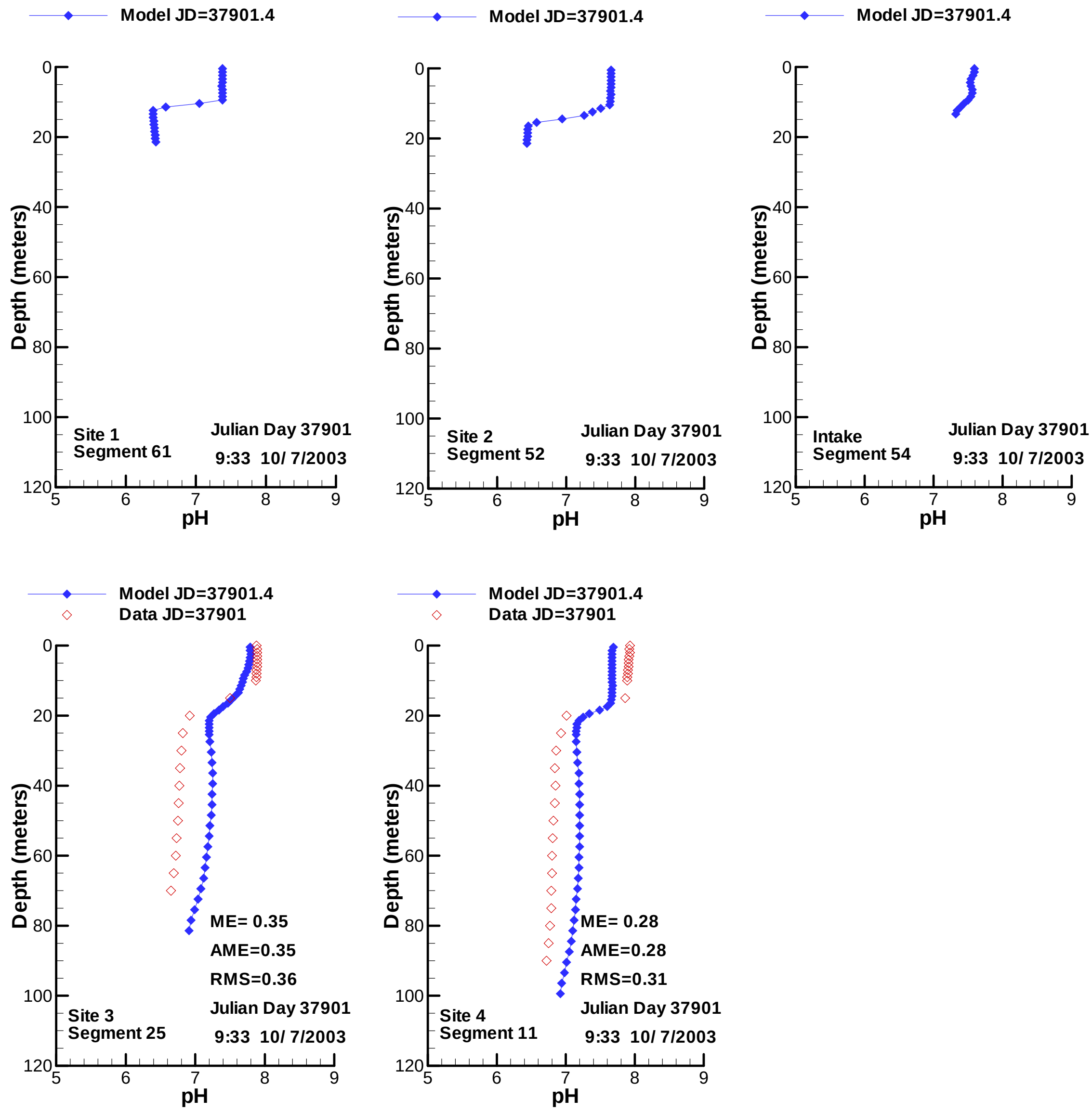

Figure 484. Vertical profiles of pH compared with data for 10/ 7/2003.

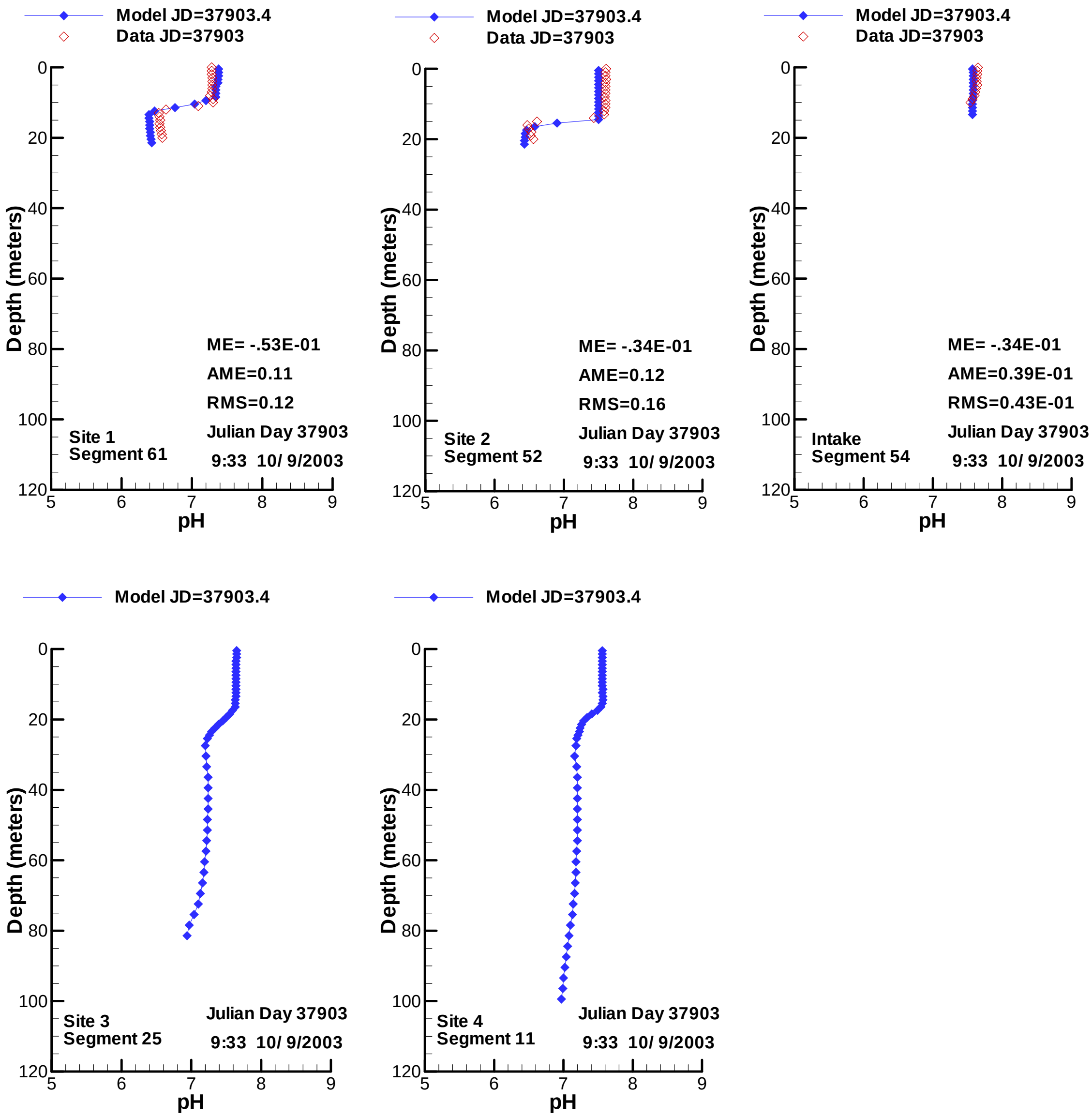

Figure 485. Vertical profiles of pH compared with data for 10/ 9/2003.

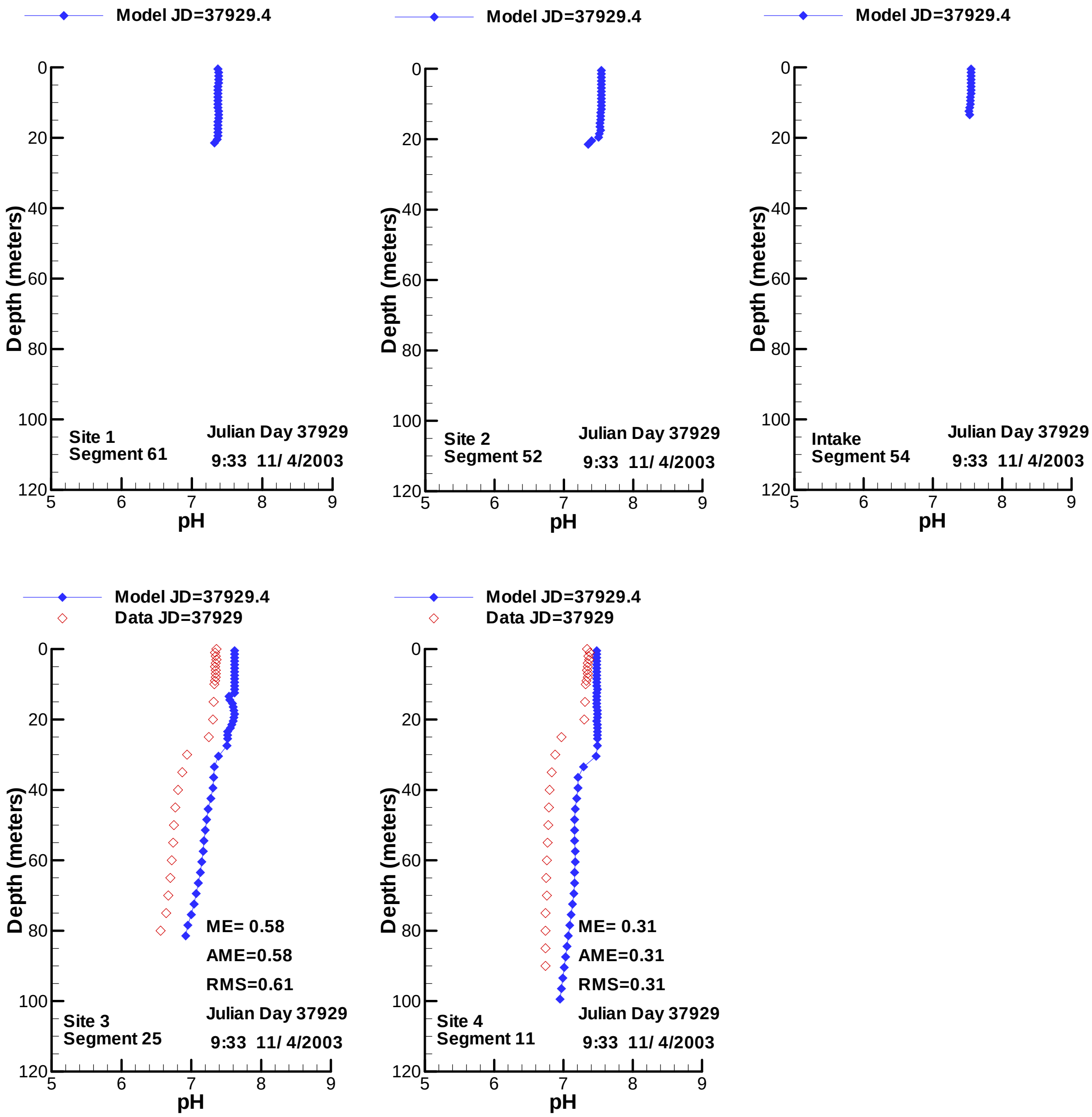

Figure 486. Vertical profiles of pH compared with data for 11/ 4/2003.

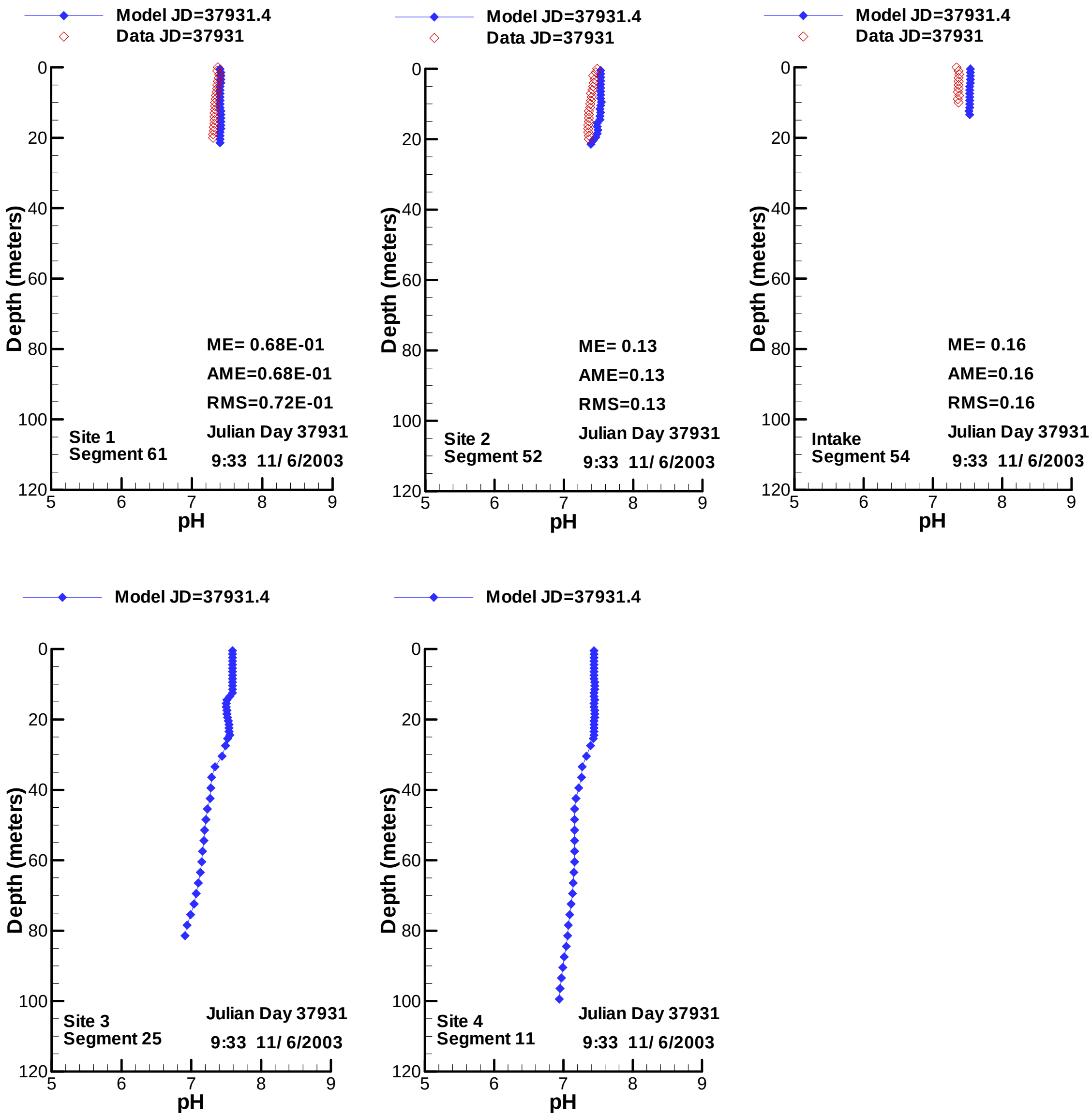

Figure 487. Vertical profiles of pH compared with data for 11/ 6/2003.

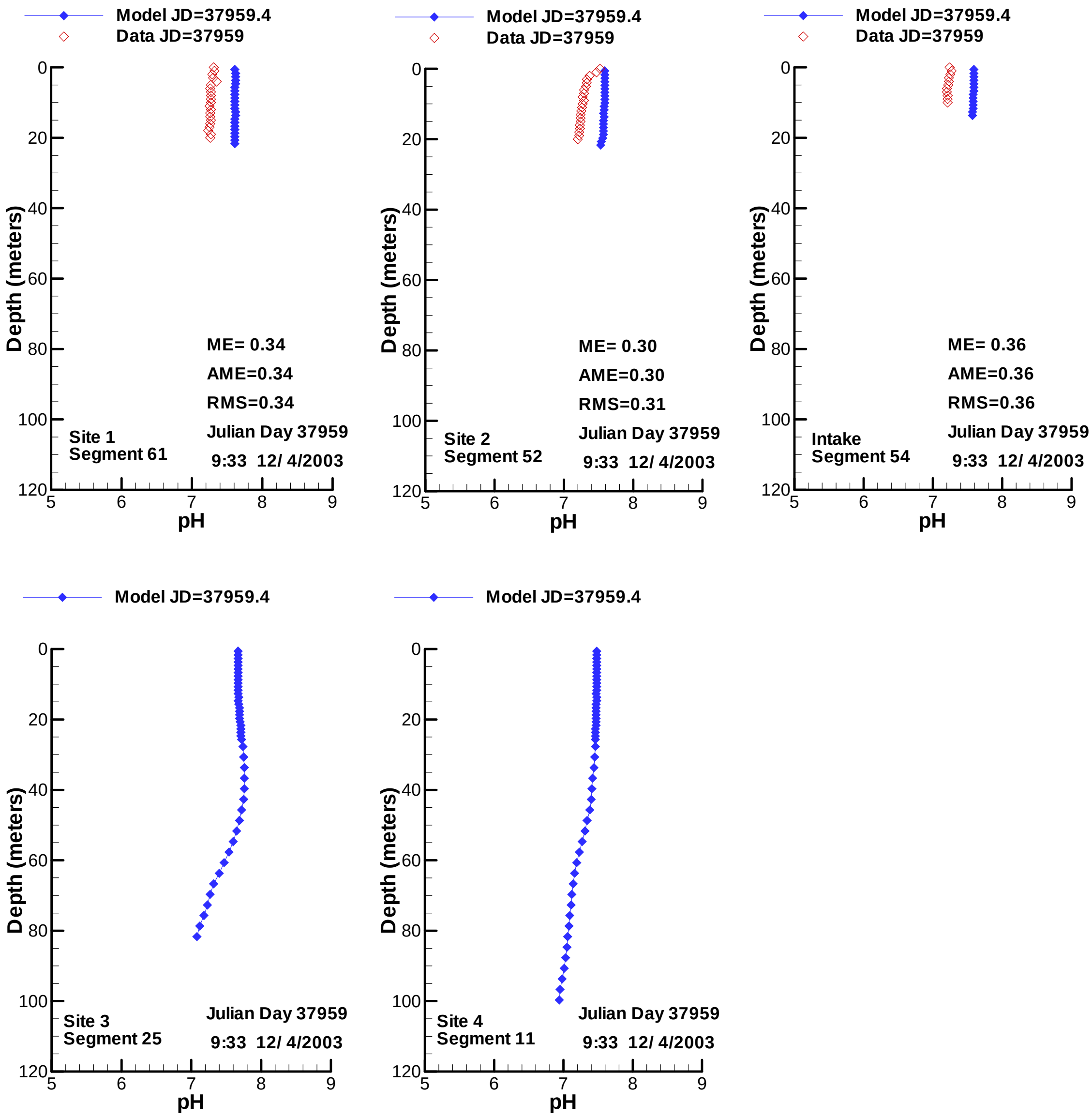

Figure 488. Vertical profiles of pH compared with data for 12/ 4/2003.

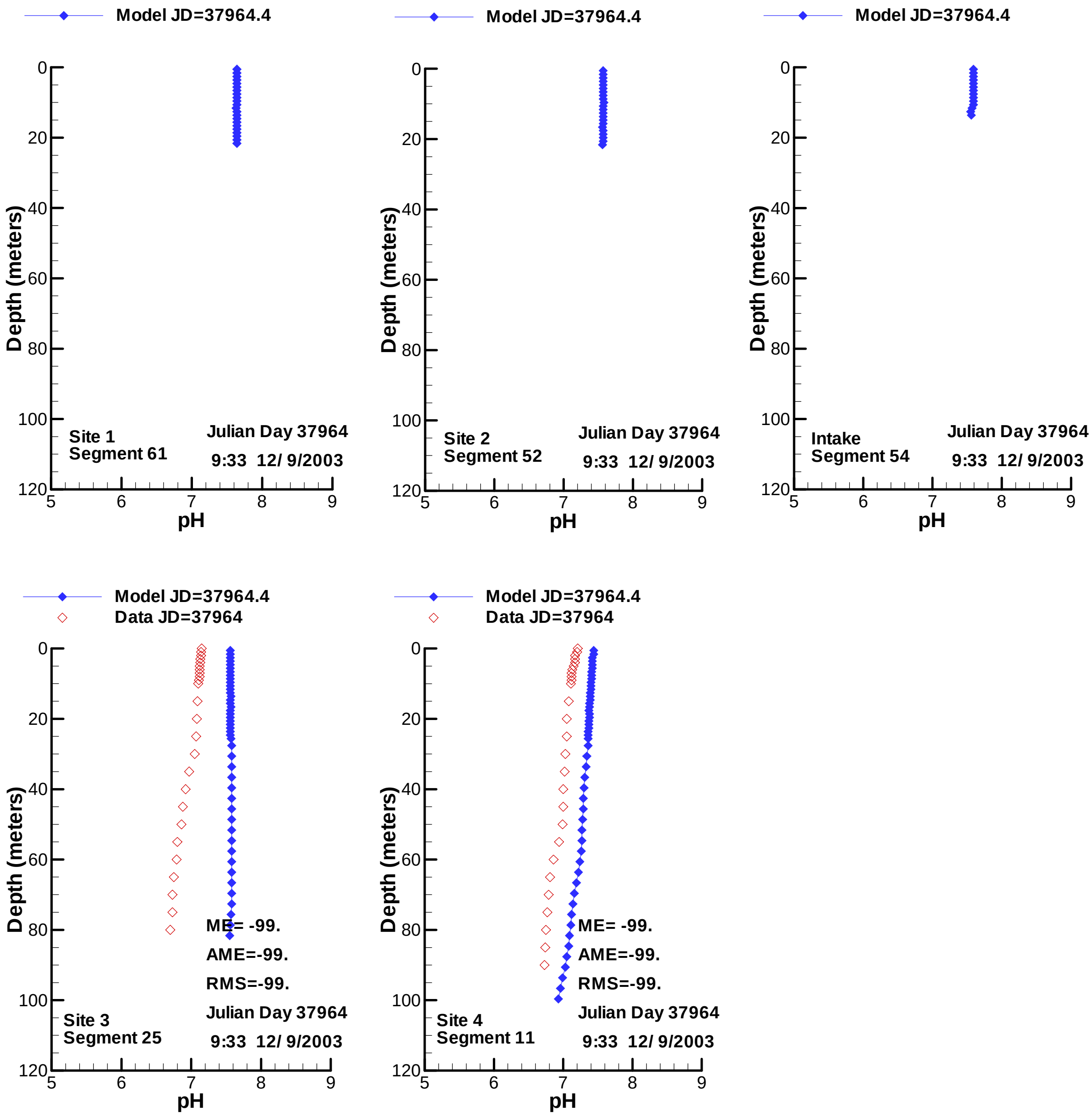

Figure 489. Vertical profiles of pH compared with data for 12/ 9/2003.

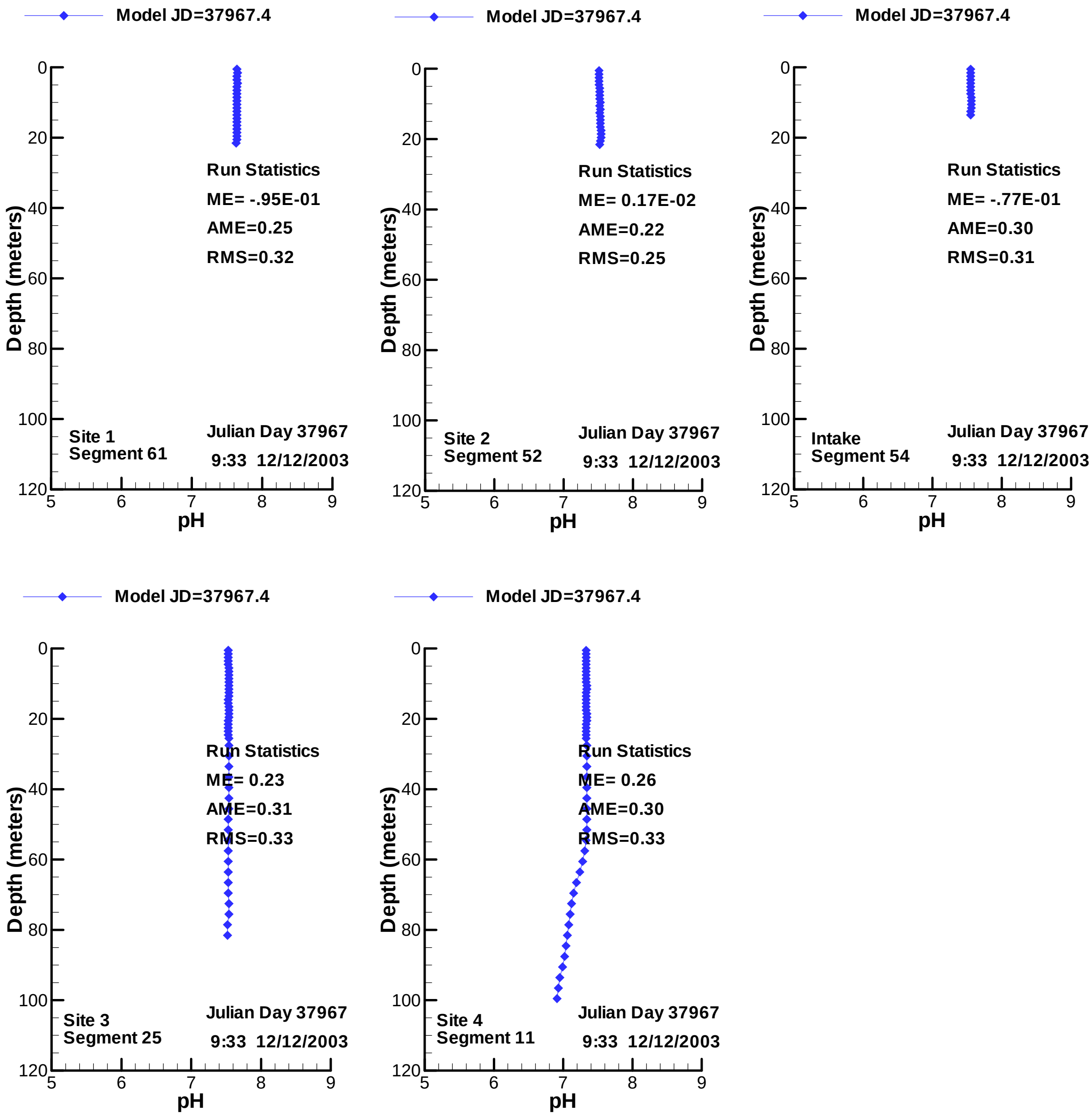

Figure 490. Vertical profiles of pH compared with data for 12/12/2003.

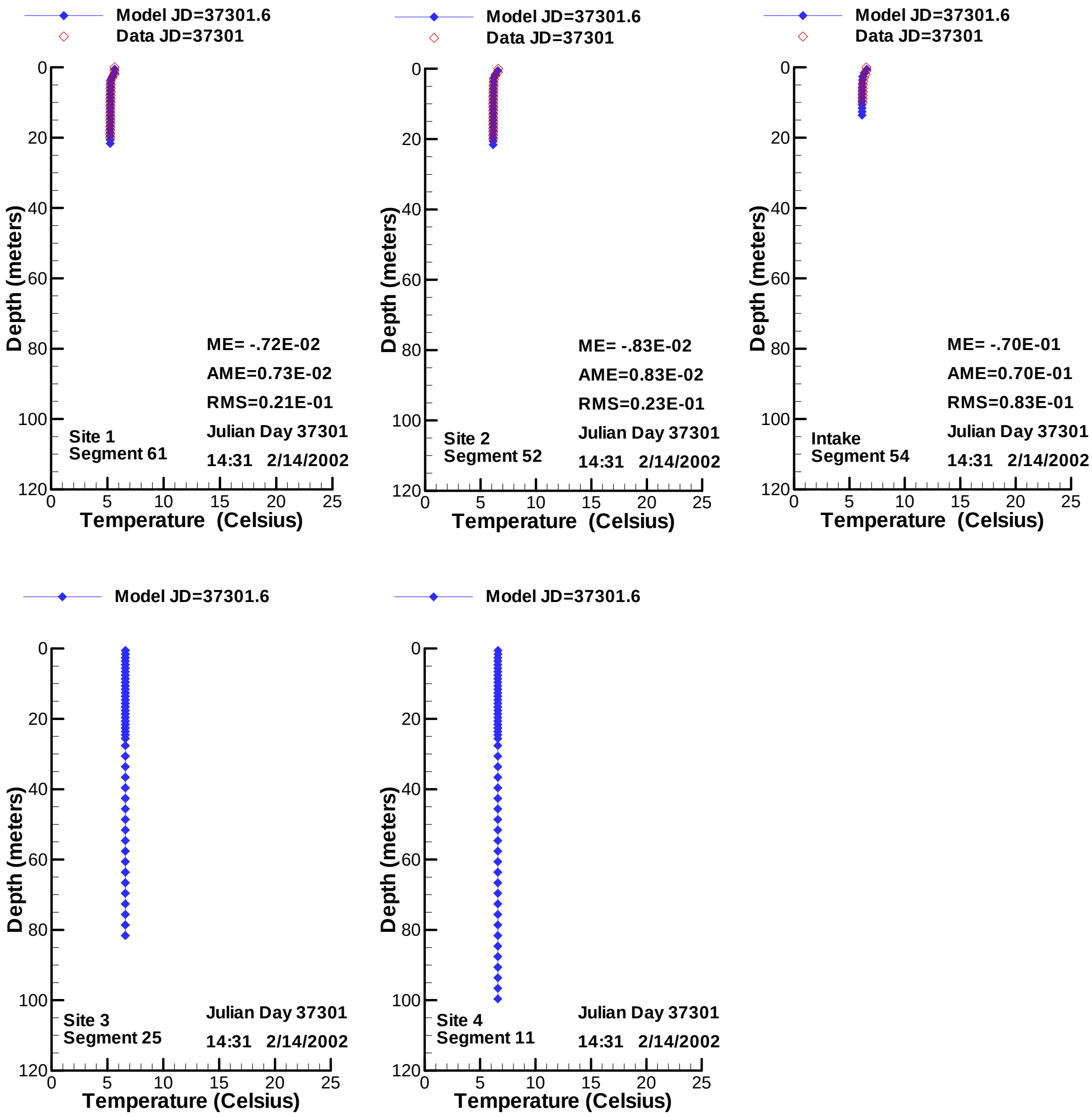

Figure 491. Vertical profiles of TEMPERATURE compared with data for 2/14/2002.

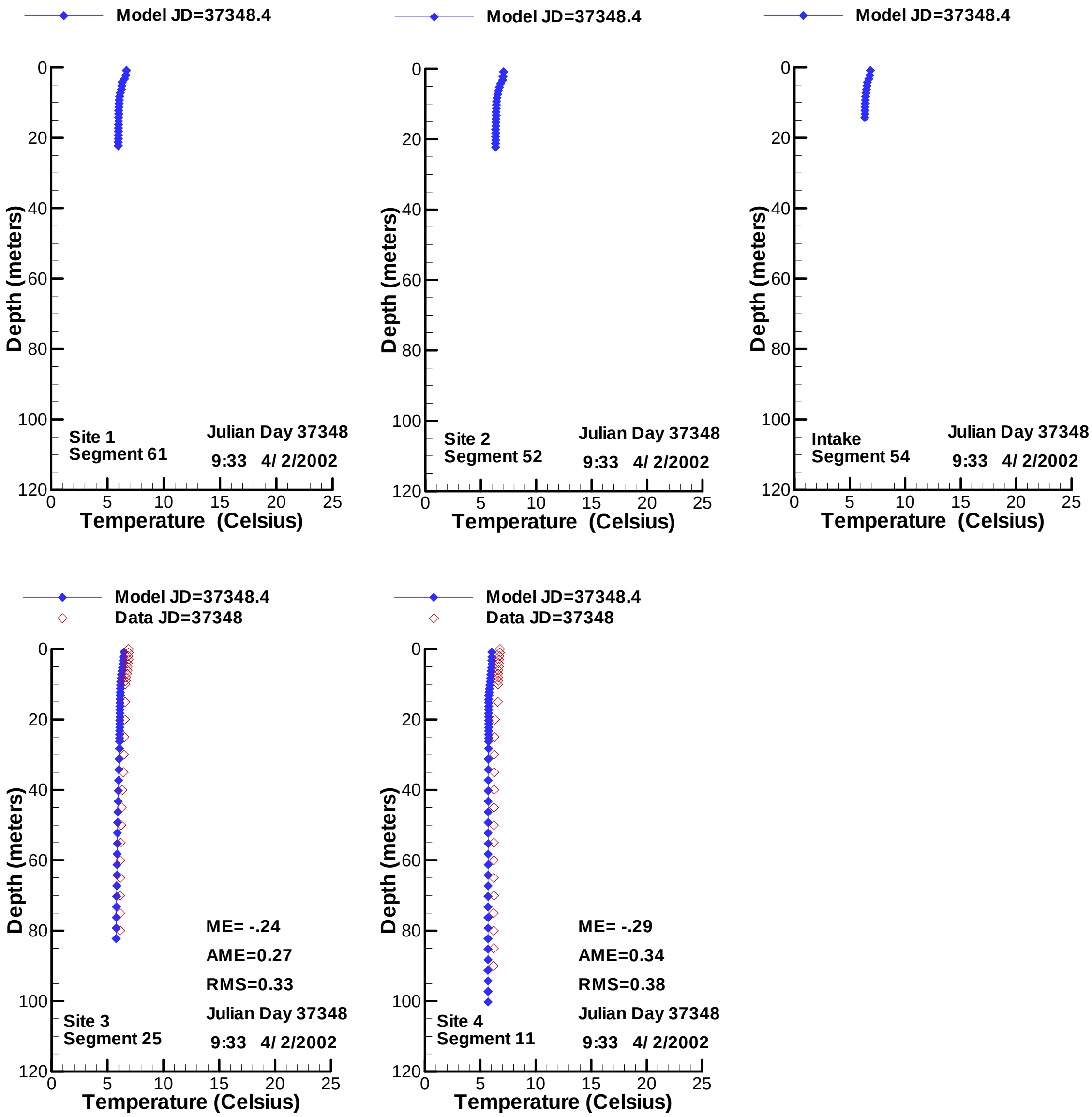

Figure 492. Vertical profiles of TEMPERATURE compared with data for 4/ 2/2002.

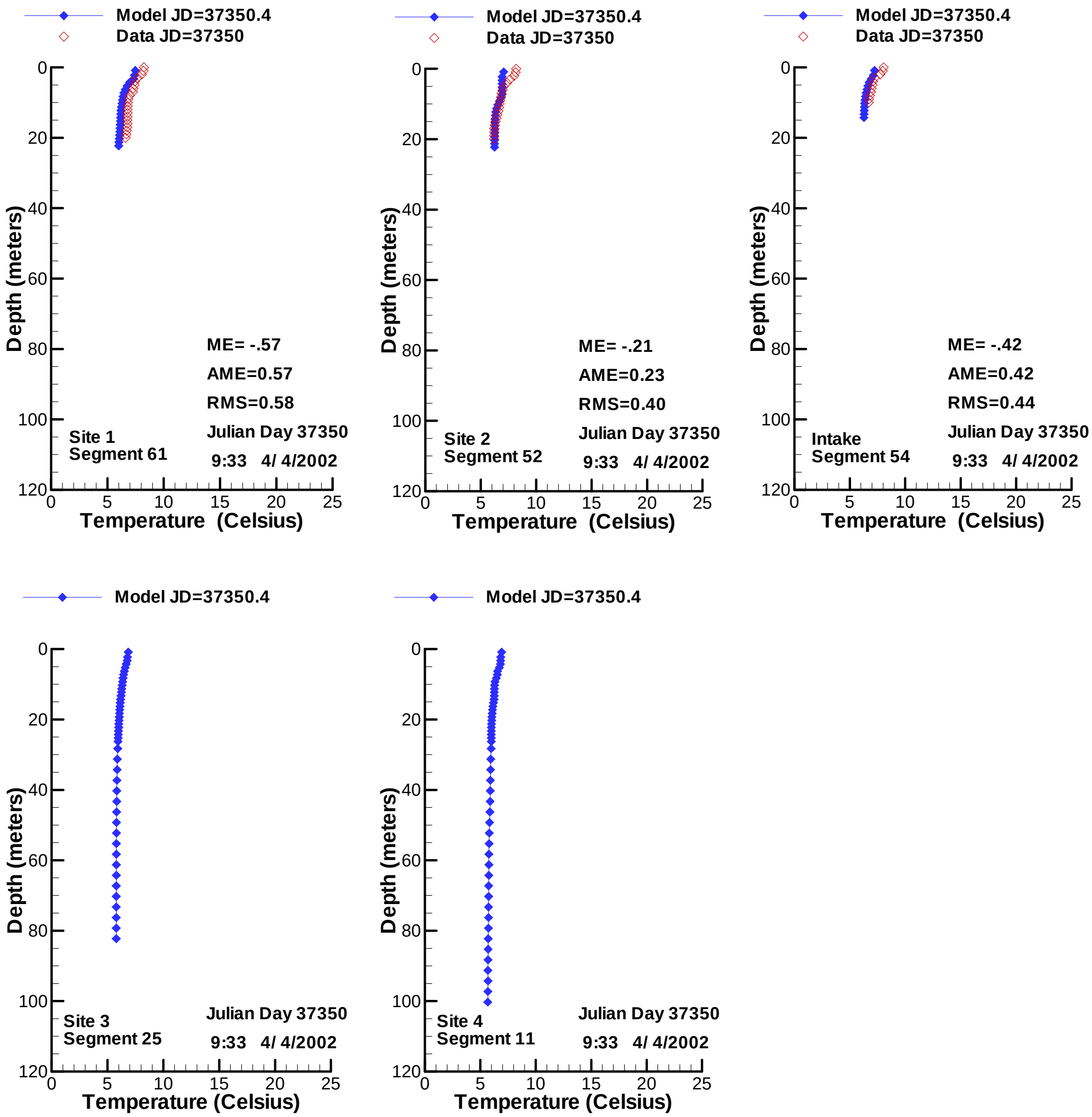

Figure 493. Vertical profiles of TEMPERATURE compared with data for 4/ 4/2002.

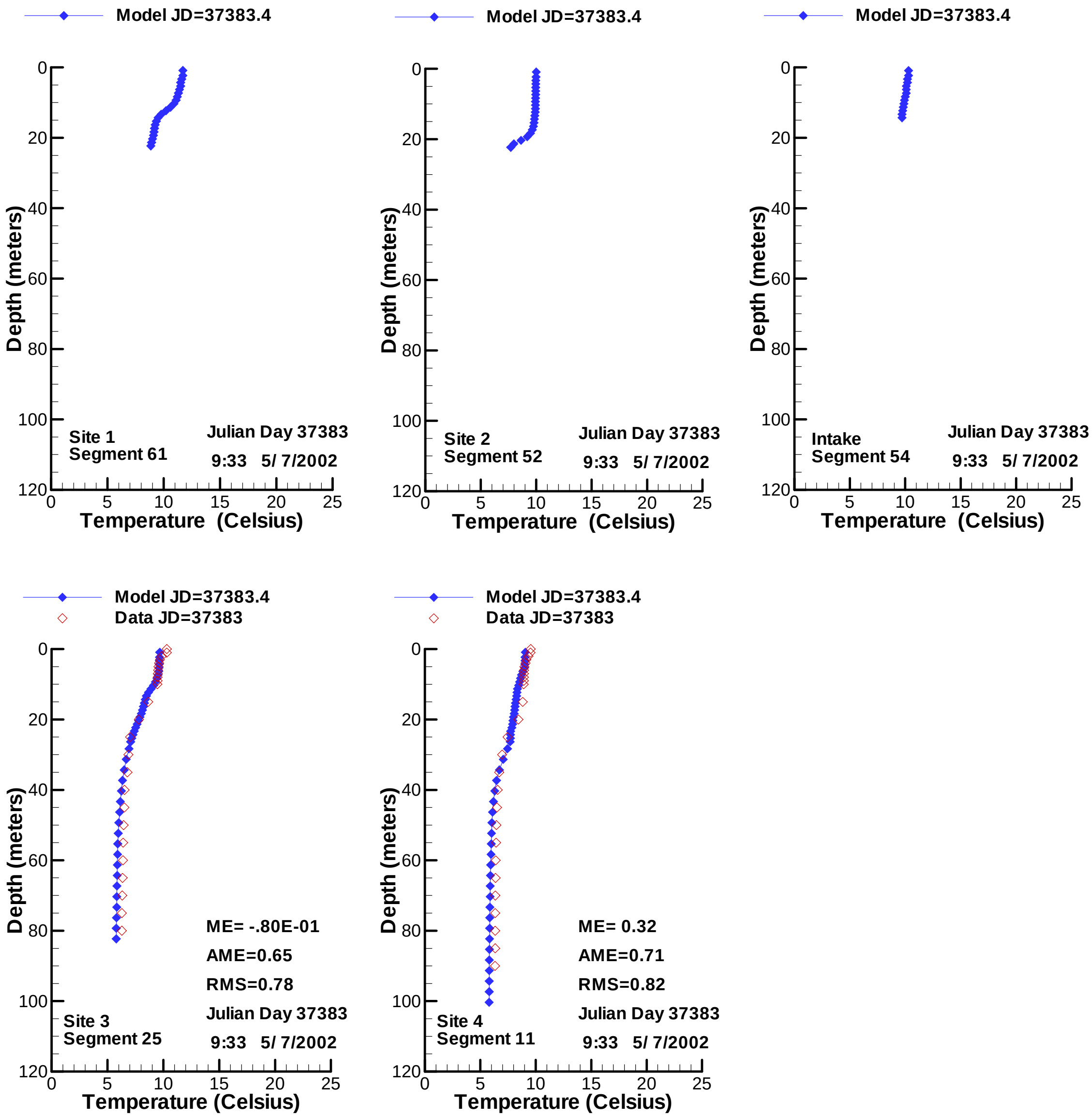

Figure 494. Vertical profiles of TEMPERATURE compared with data for 5/ 7/2002.

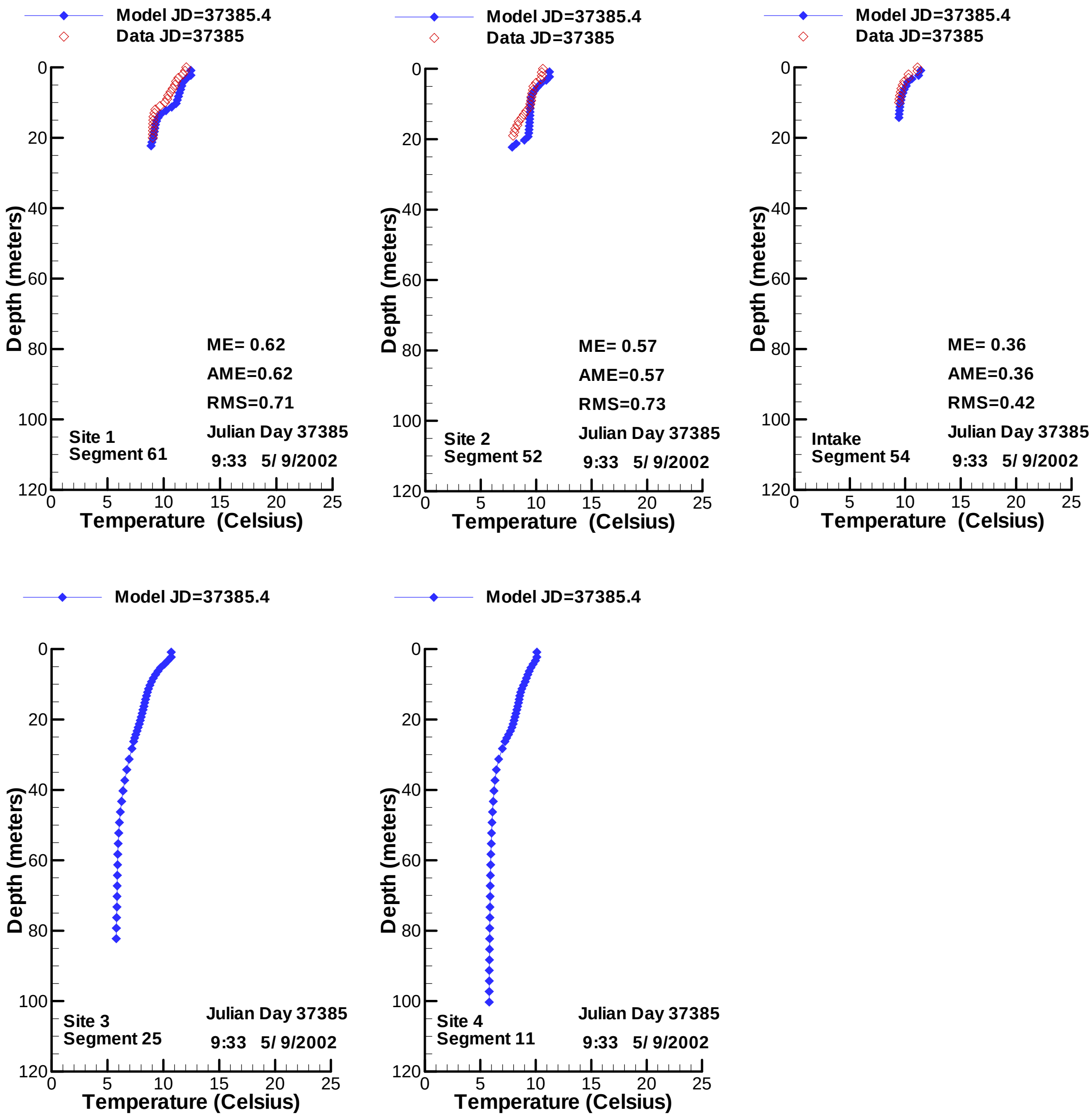

Figure 495. Vertical profiles of TEMPERATURE compared with data for 5/ 9/2002.

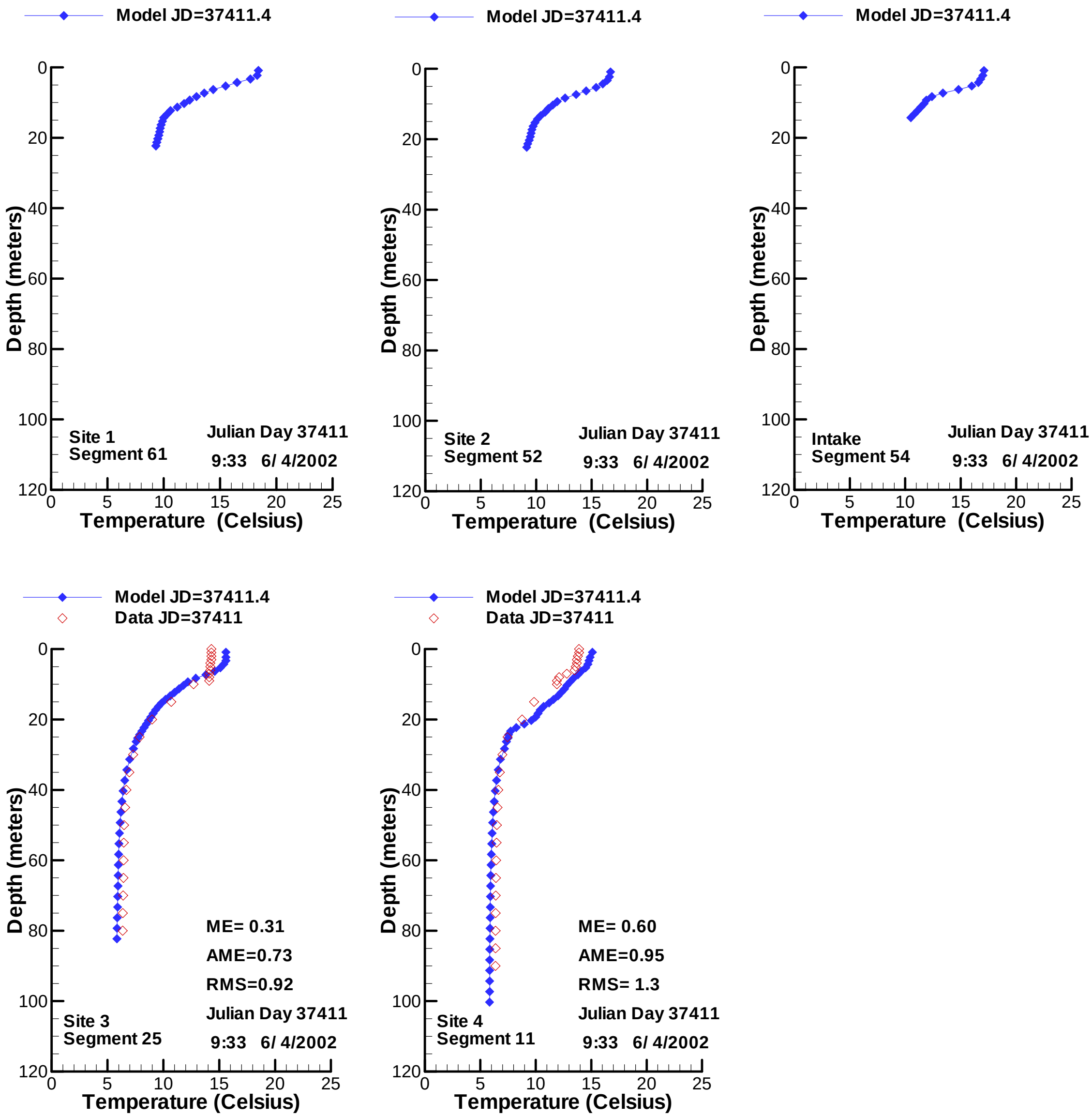

Figure 496. Vertical profiles of TEMPERATURE compared with data for 6/ 4/2002.

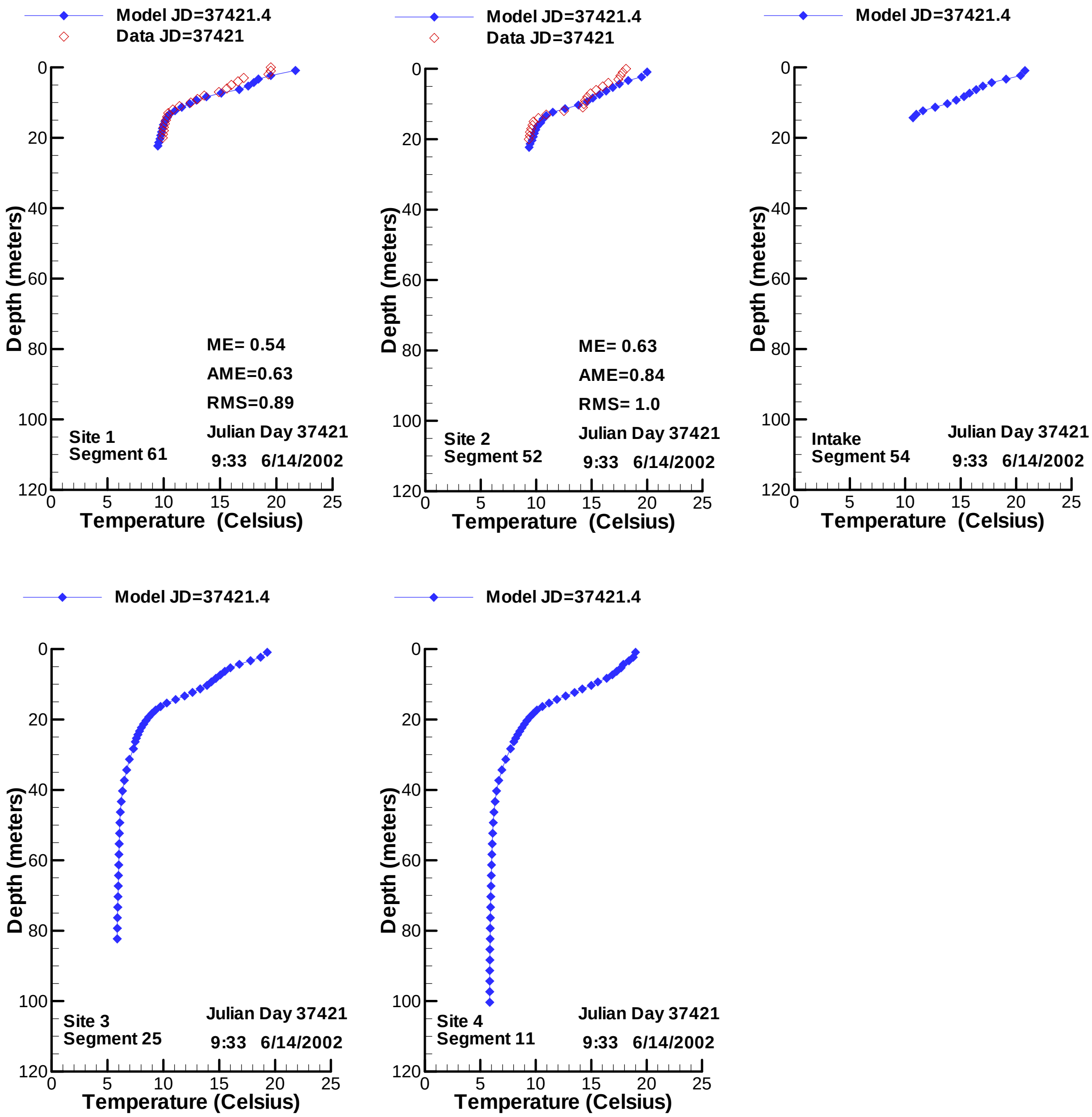

Figure 497. Vertical profiles of TEMPERATURE compared with data for 6/14/2002.

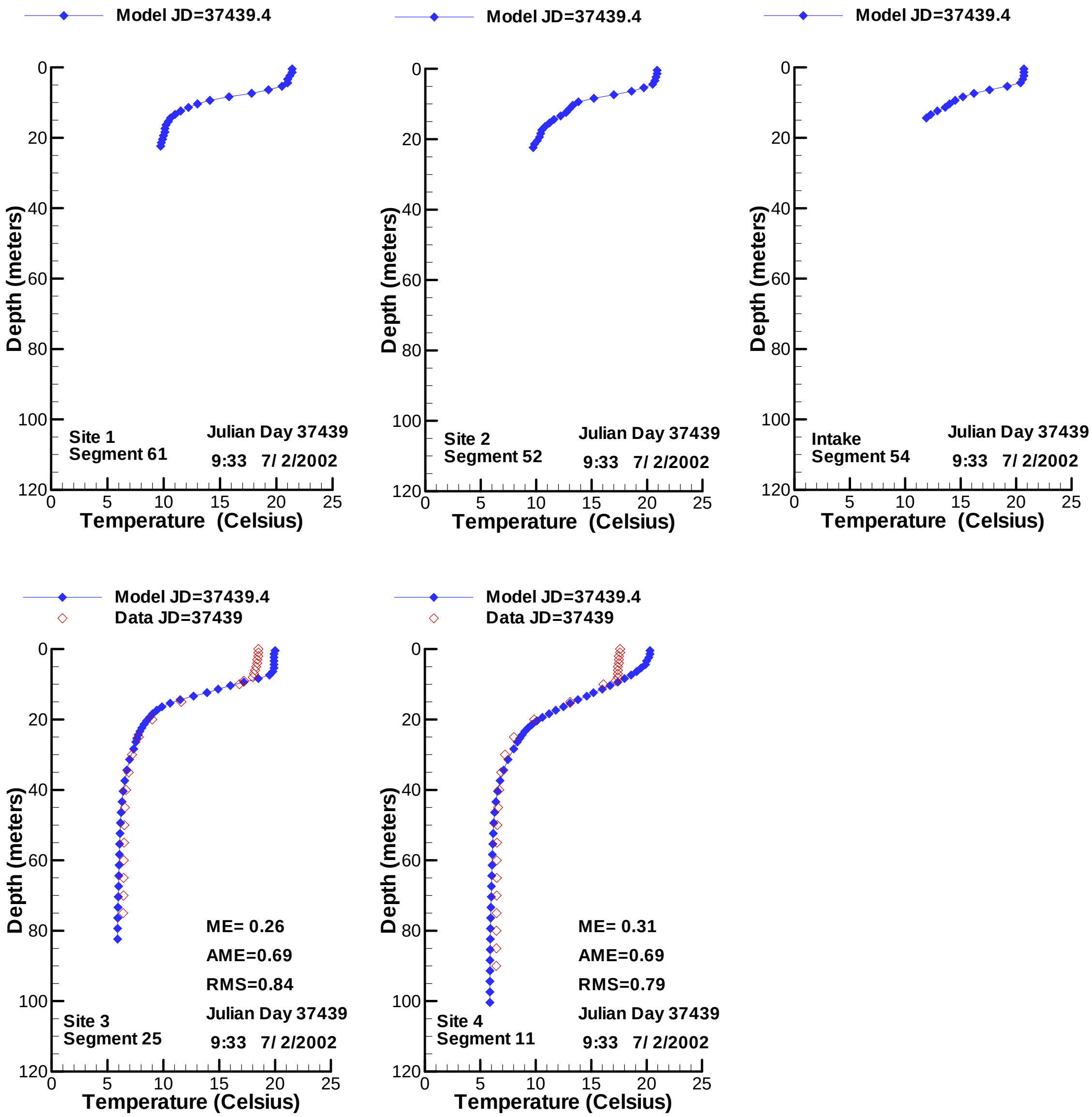

Figure 498. Vertical profiles of TEMPERATURE compared with data for 7/ 2/2002.

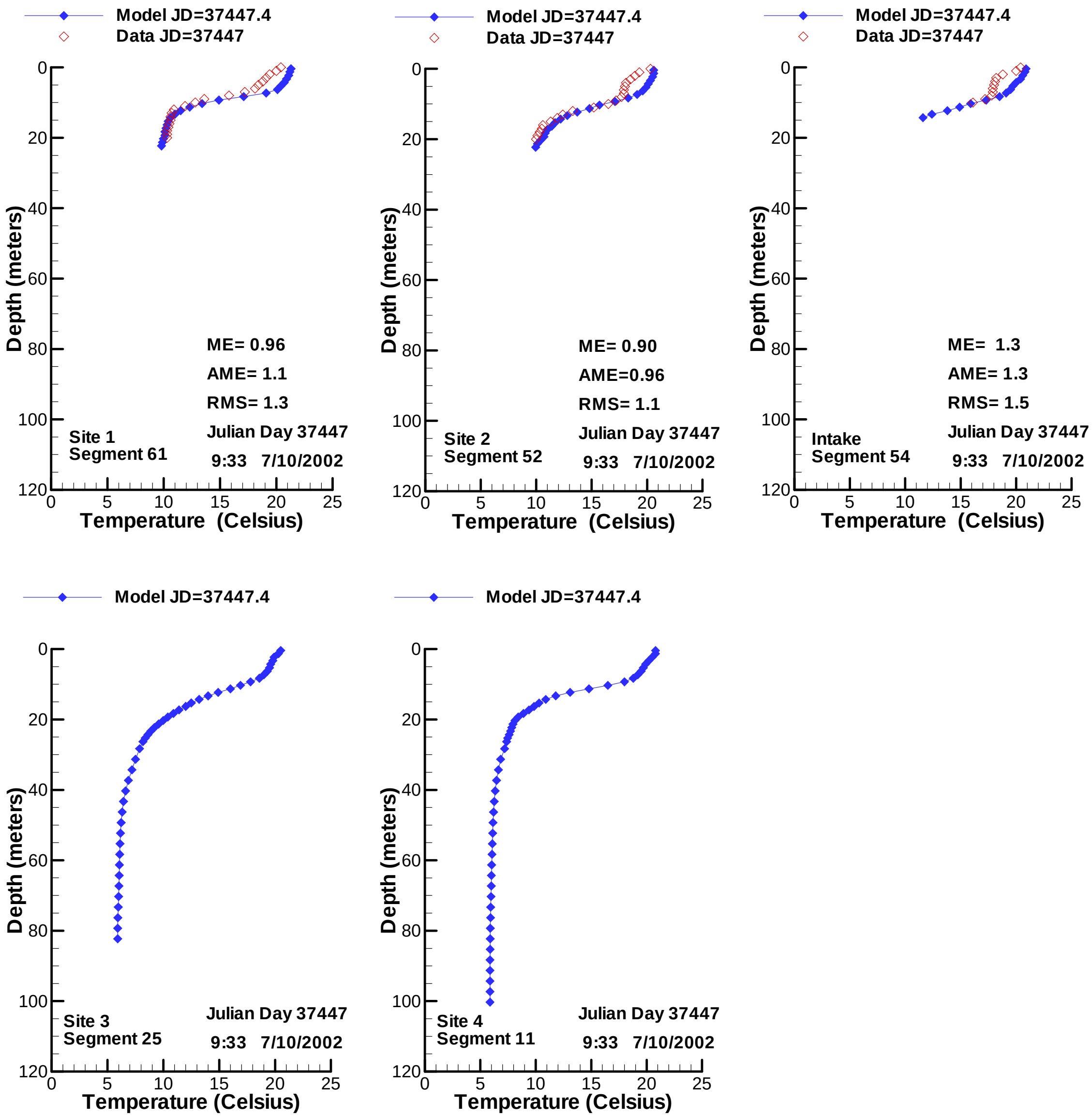

Figure 499. Vertical profiles of TEMPERATURE compared with data for 7/10/2002.

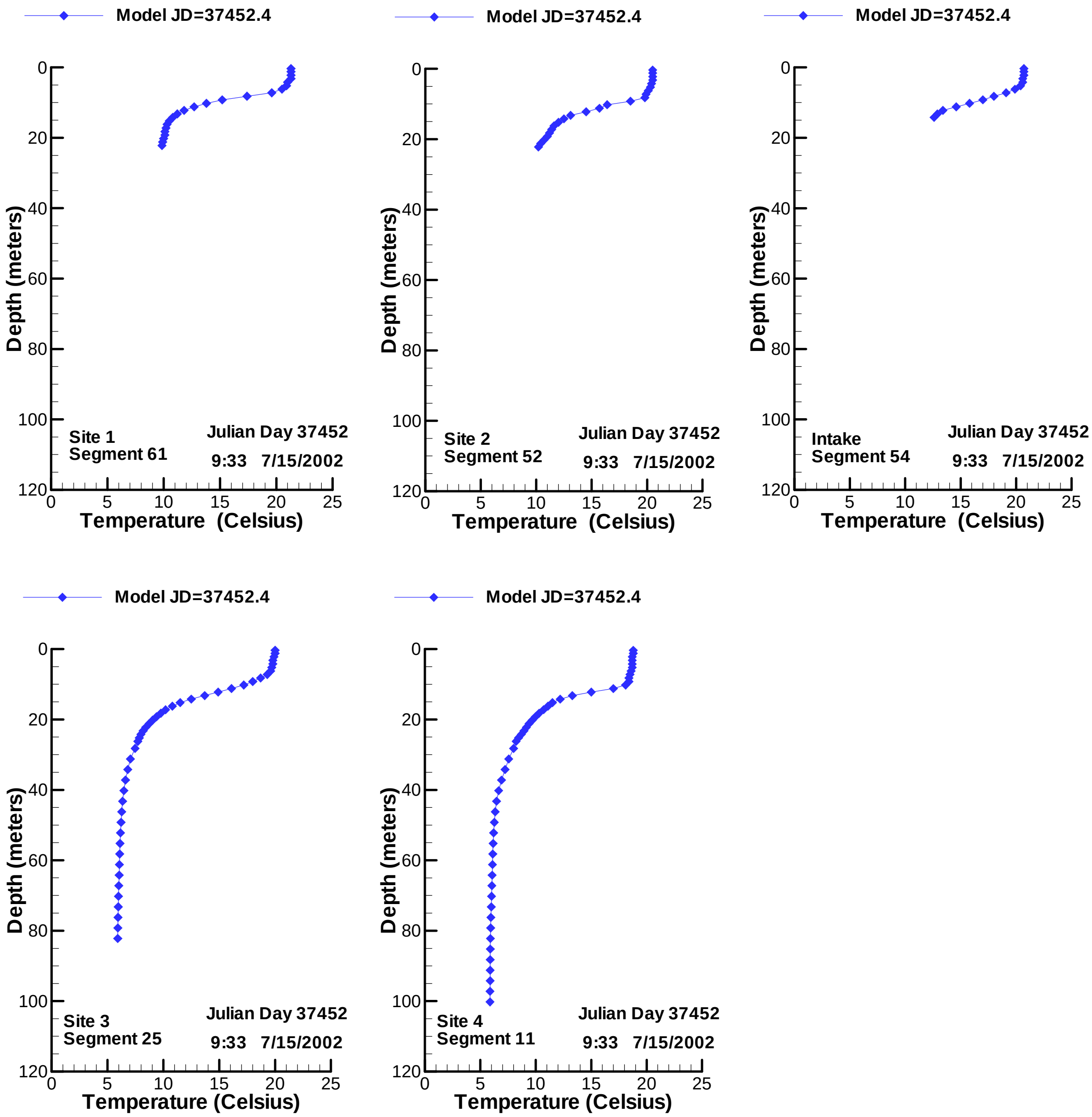

Figure 500. Vertical profiles of TEMPERATURE compared with data for 7/15/2002.

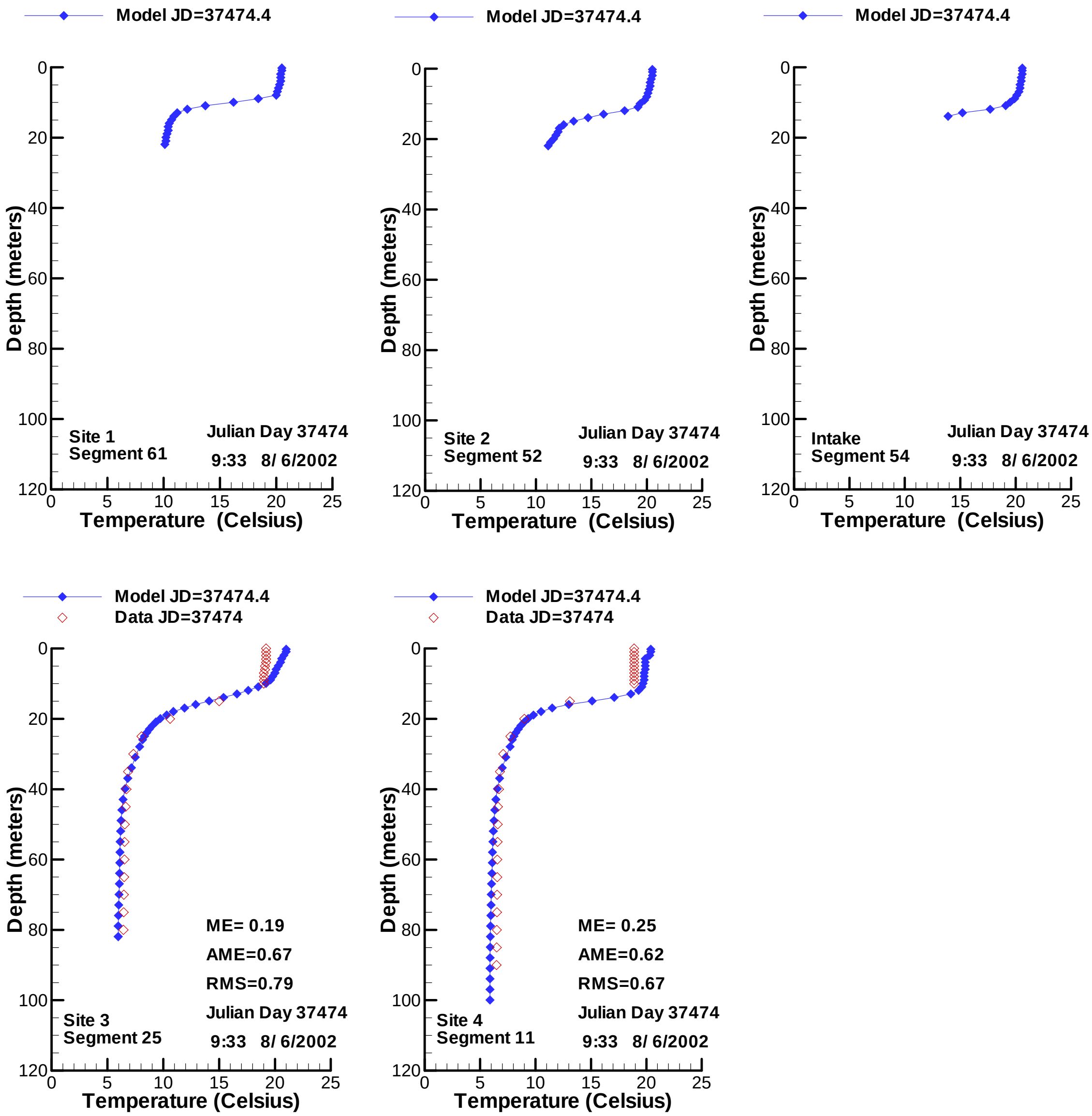

Figure 501. Vertical profiles of TEMPERATURE compared with data for 8/ 6/2002.

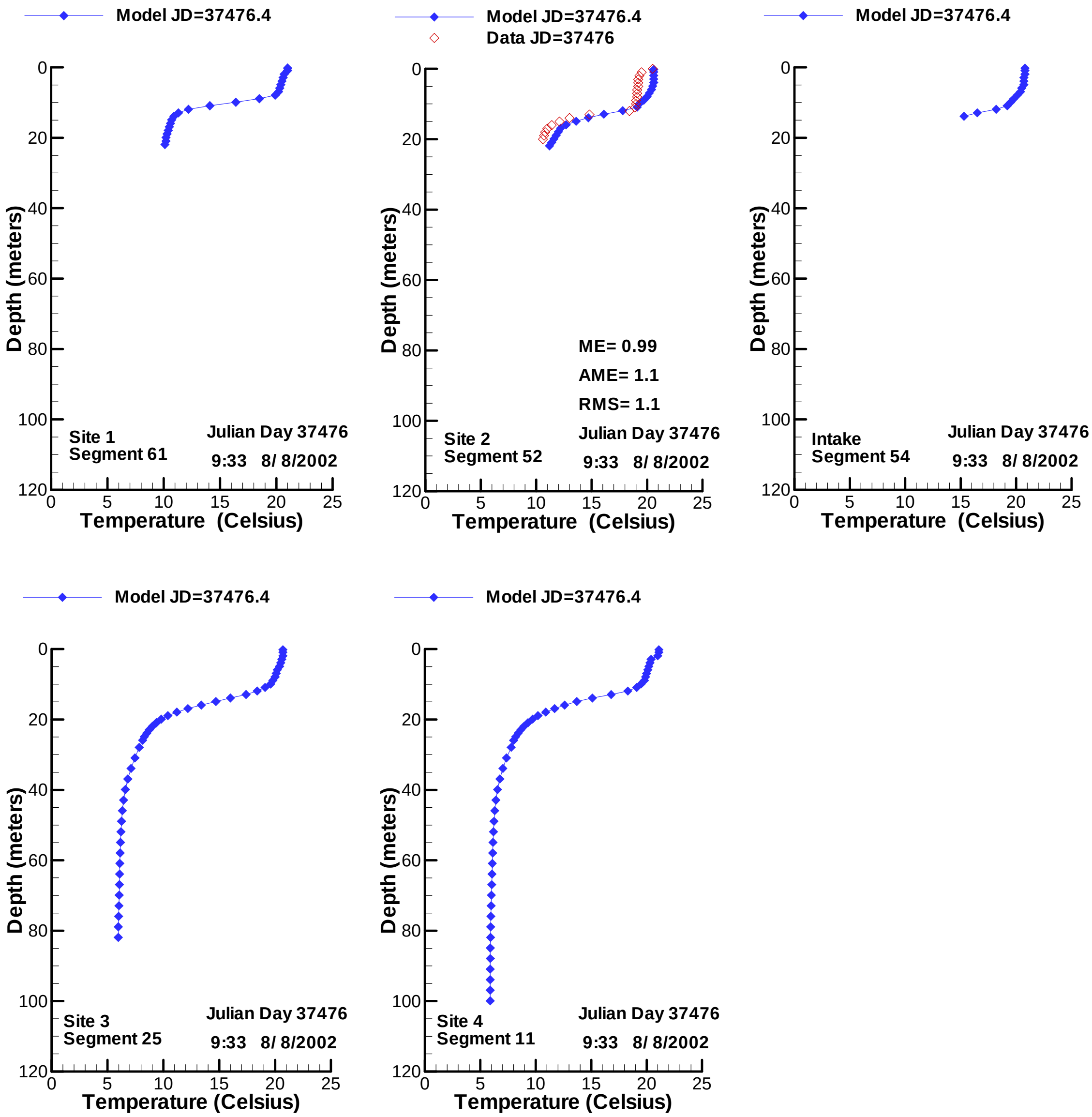

Figure 502. Vertical profiles of TEMPERATURE compared with data for 8/ 8/2002.

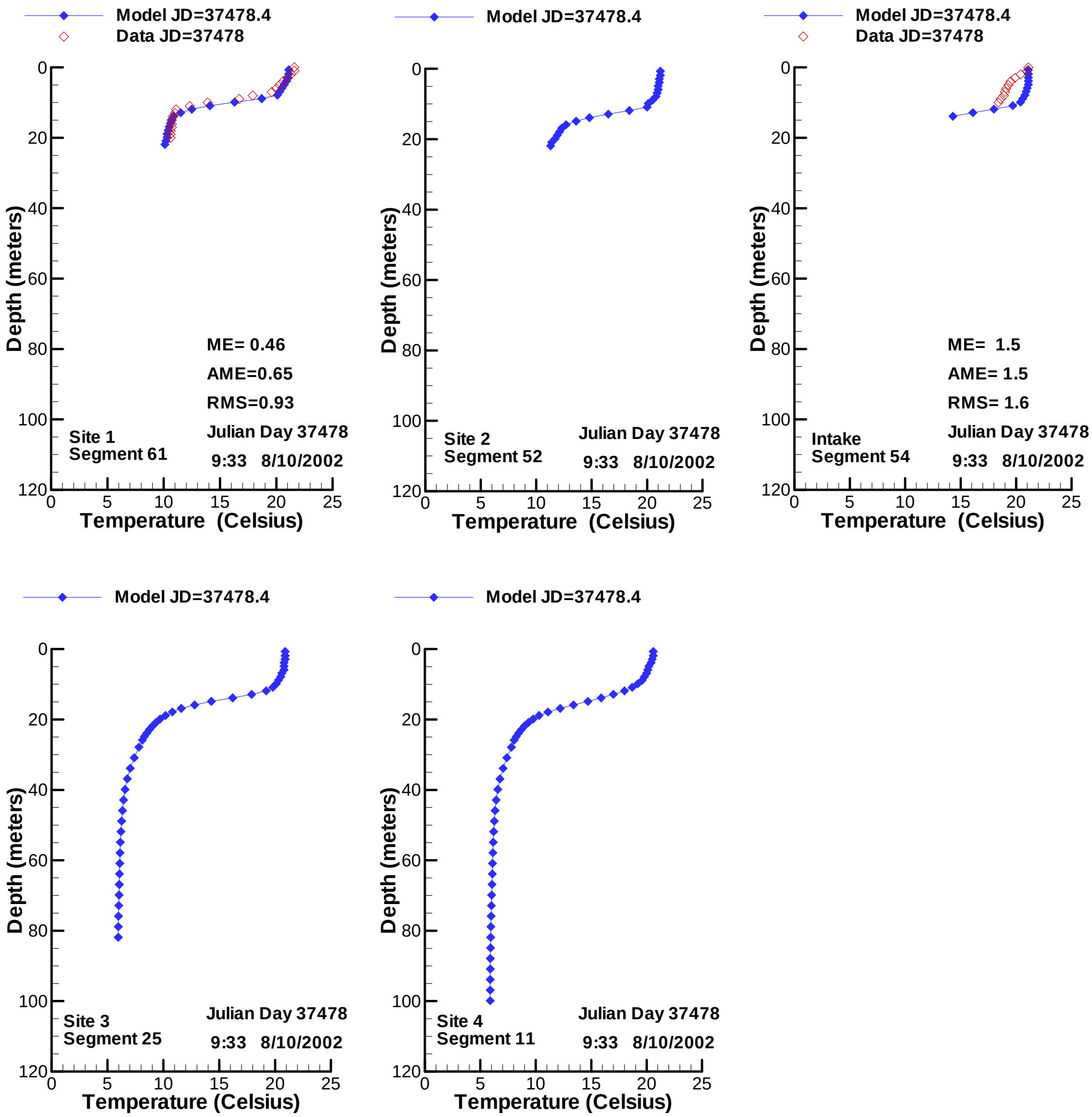

Figure 503. Vertical profiles of TEMPERATURE compared with data for 8/10/2002.

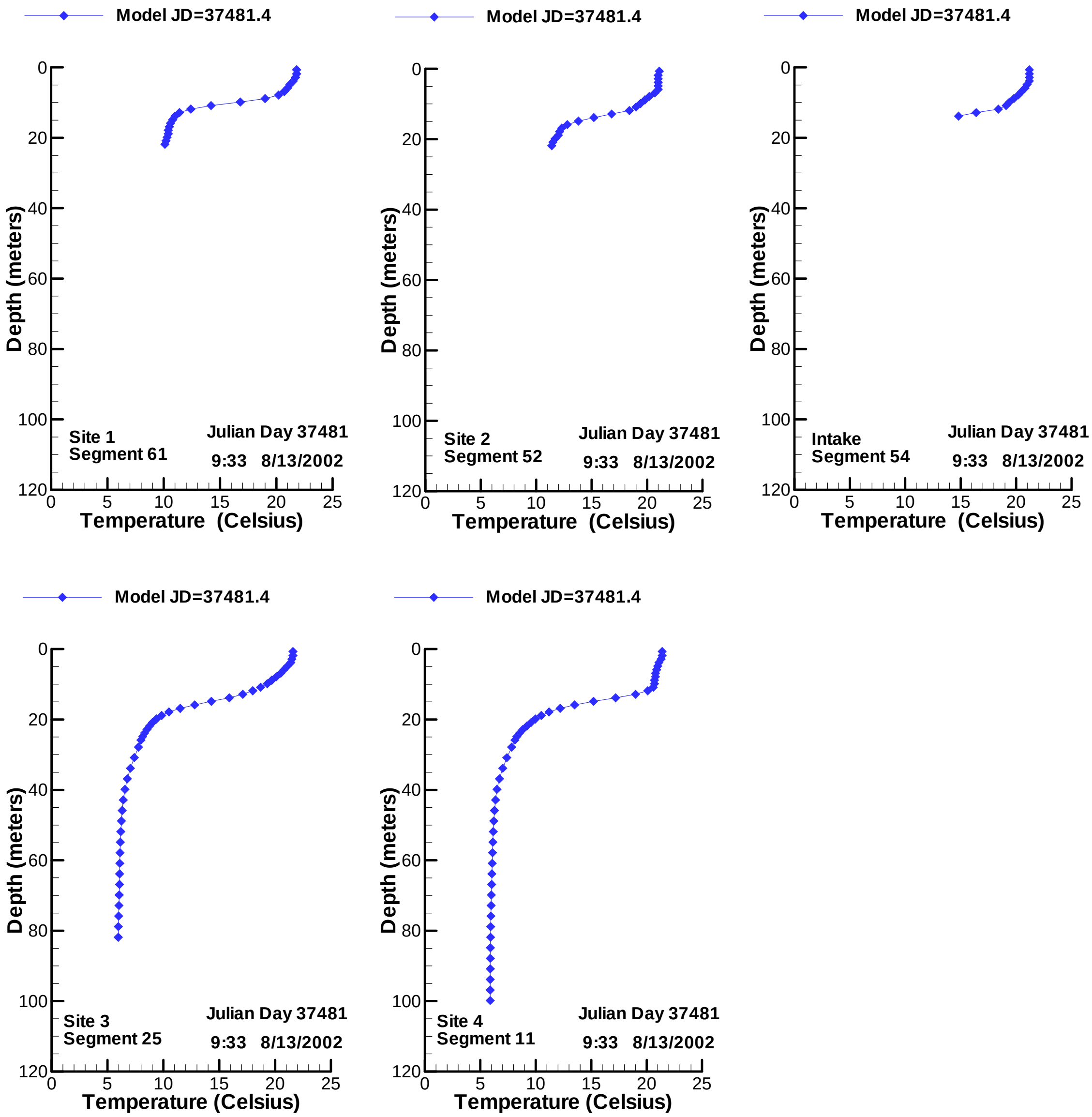

Figure 504. Vertical profiles of TEMPERATURE compared with data for 8/13/2002.

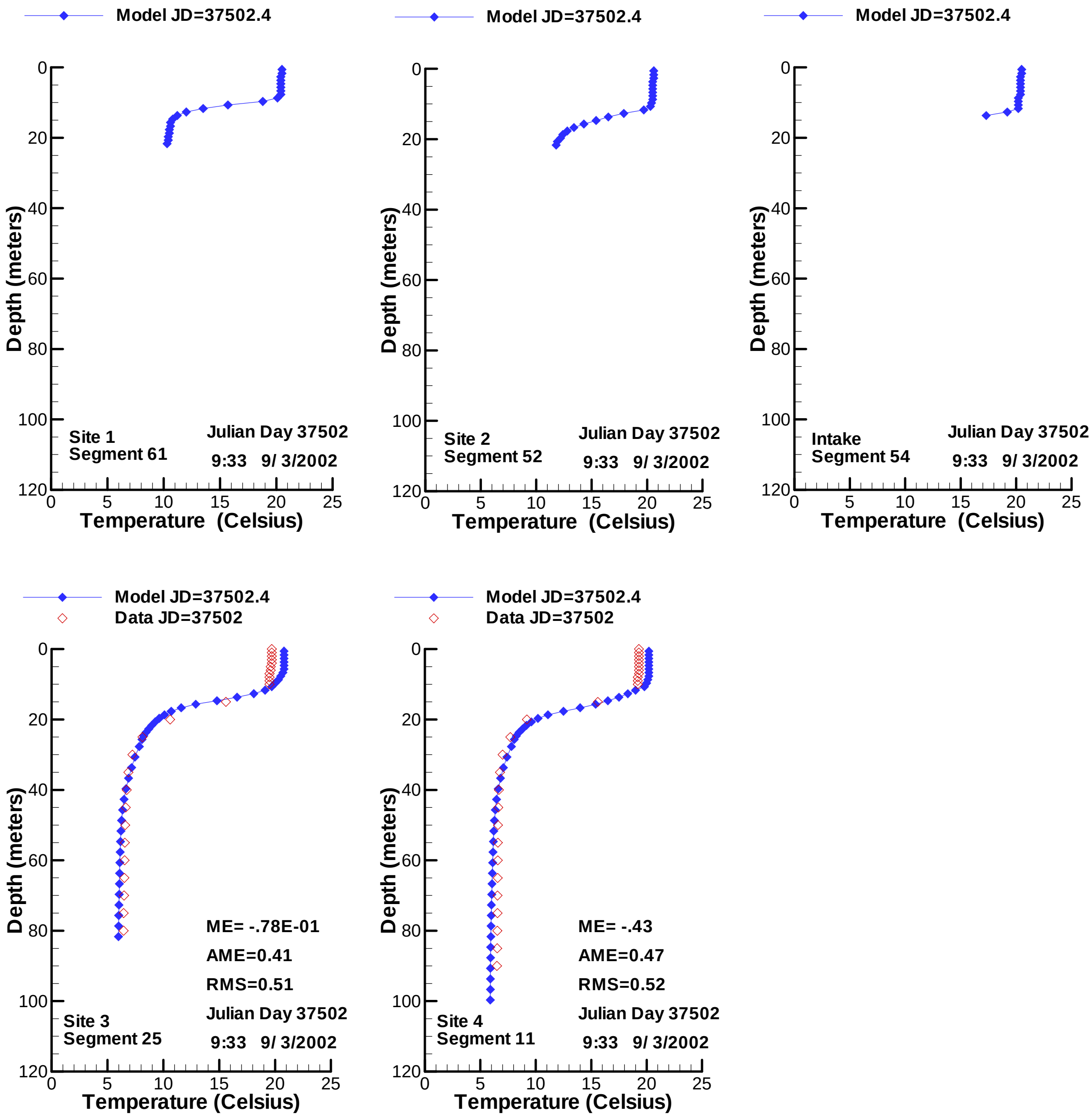

Figure 505. Vertical profiles of TEMPERATURE compared with data for 9/ 3/2002.

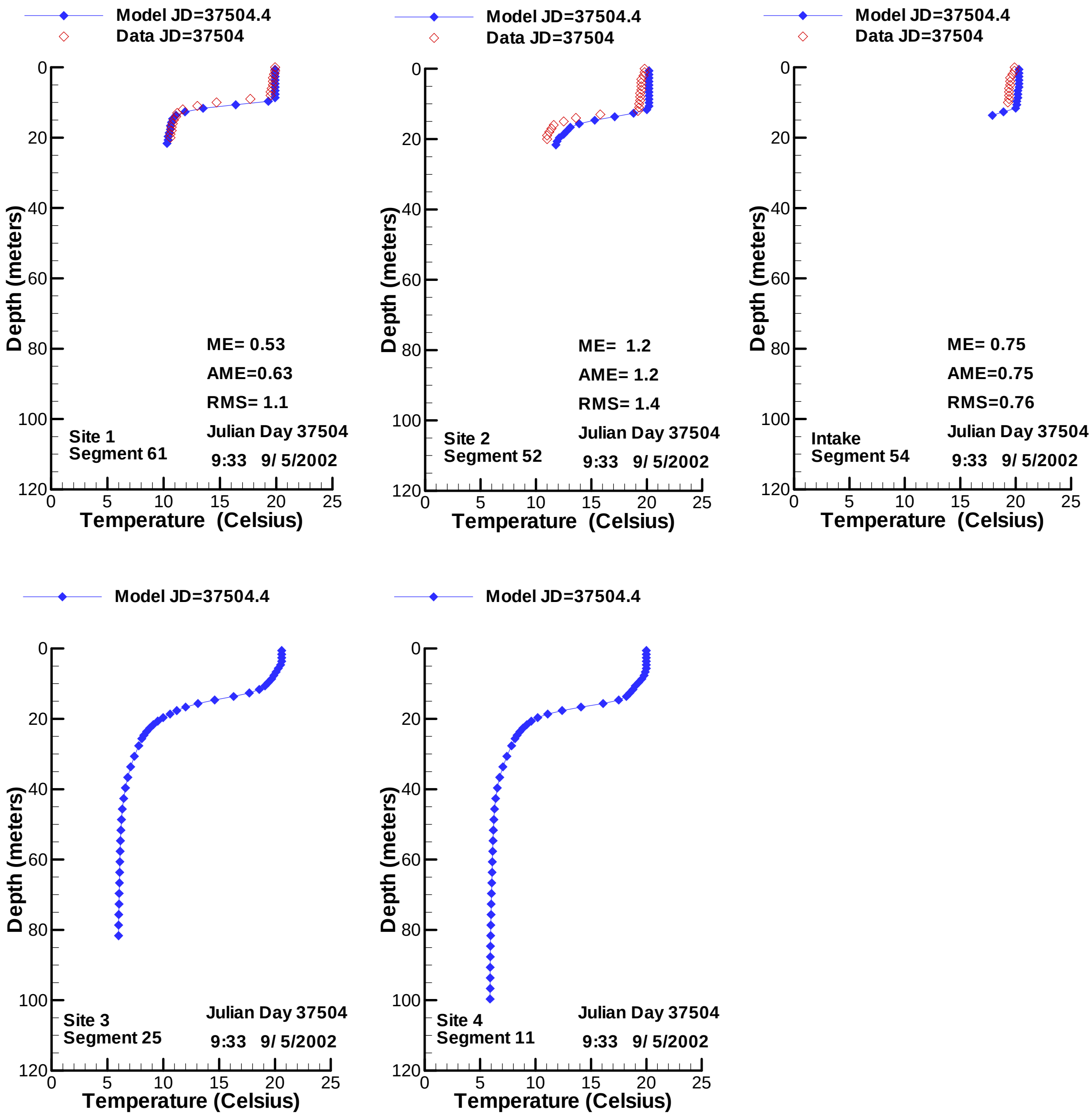

Figure 506. Vertical profiles of TEMPERATURE compared with data for 9/ 5/2002.

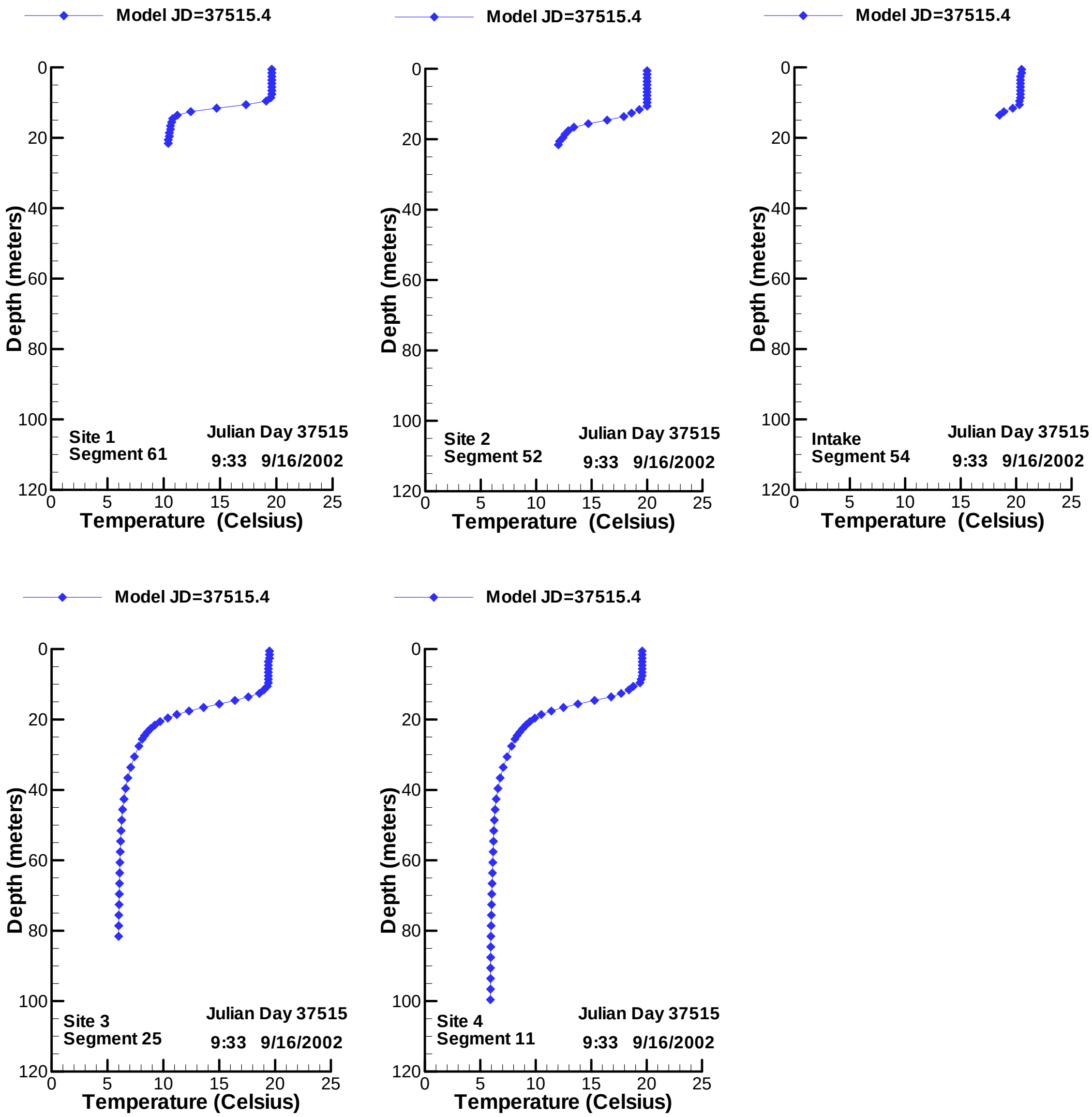

Figure 507. Vertical profiles of TEMPERATURE compared with data for 9/16/2002.

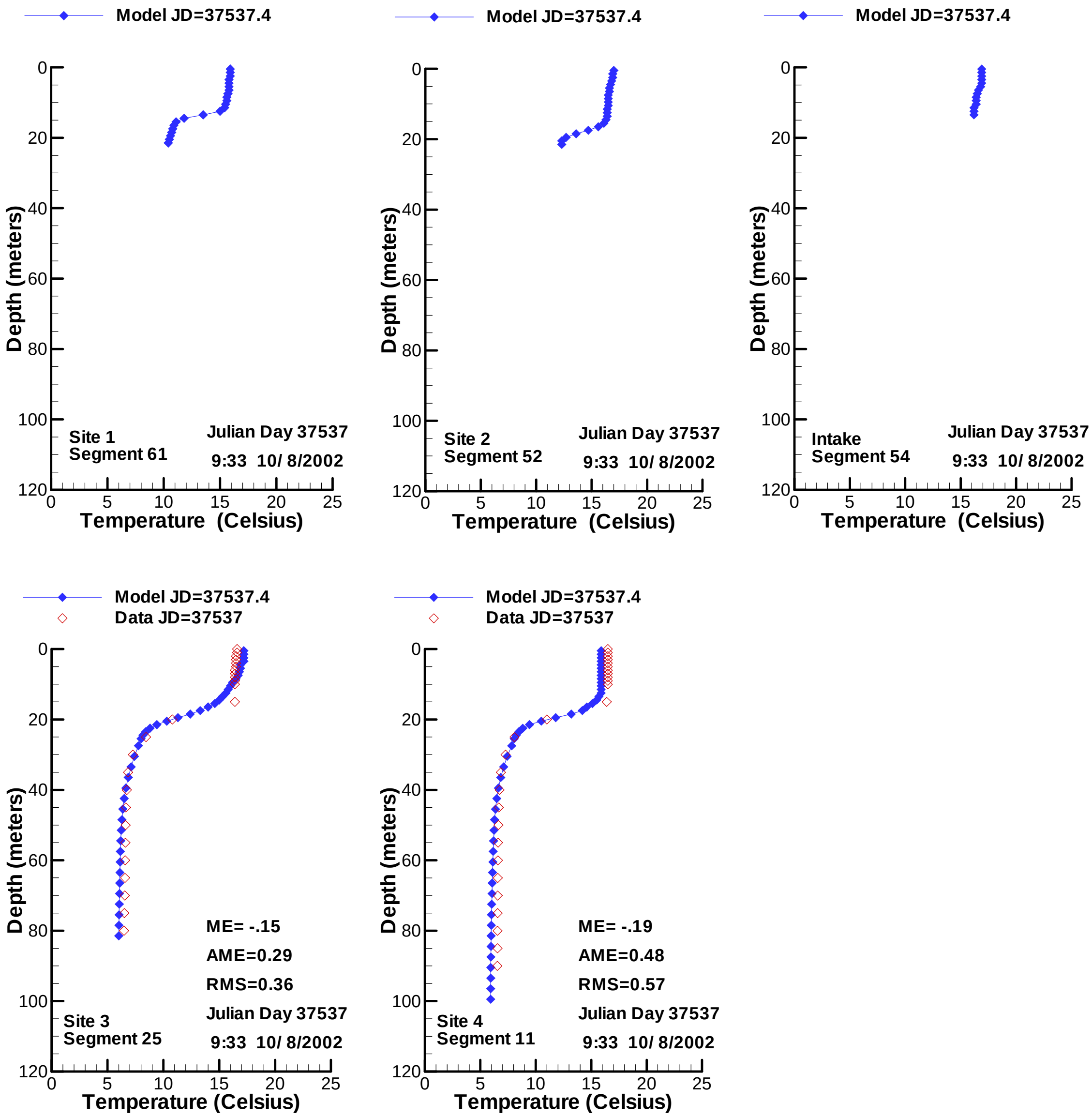

Figure 508. Vertical profiles of TEMPERATURE compared with data for 10/ 8/2002.

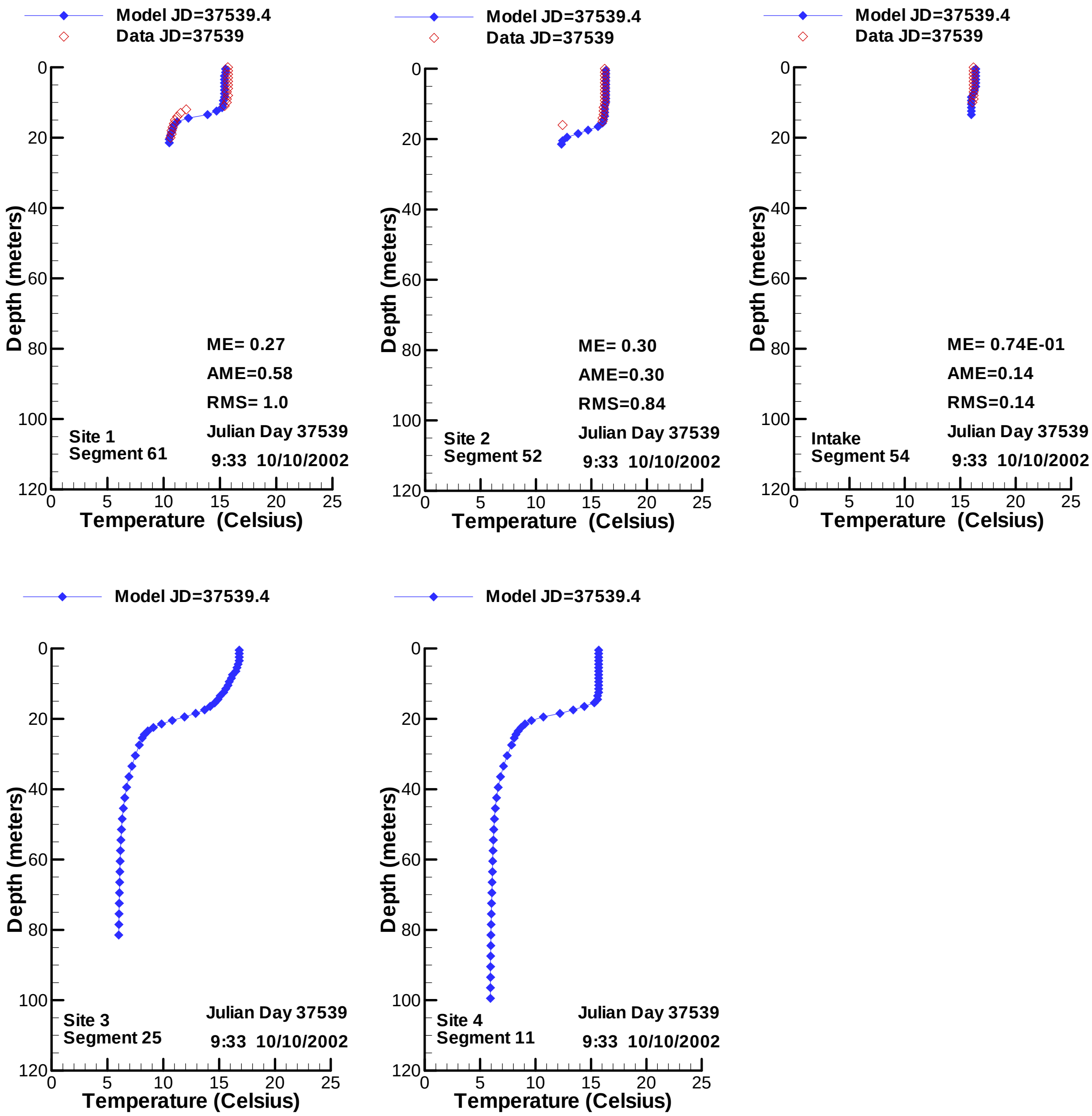

Figure 509. Vertical profiles of TEMPERATURE compared with data for 10/10/2002.

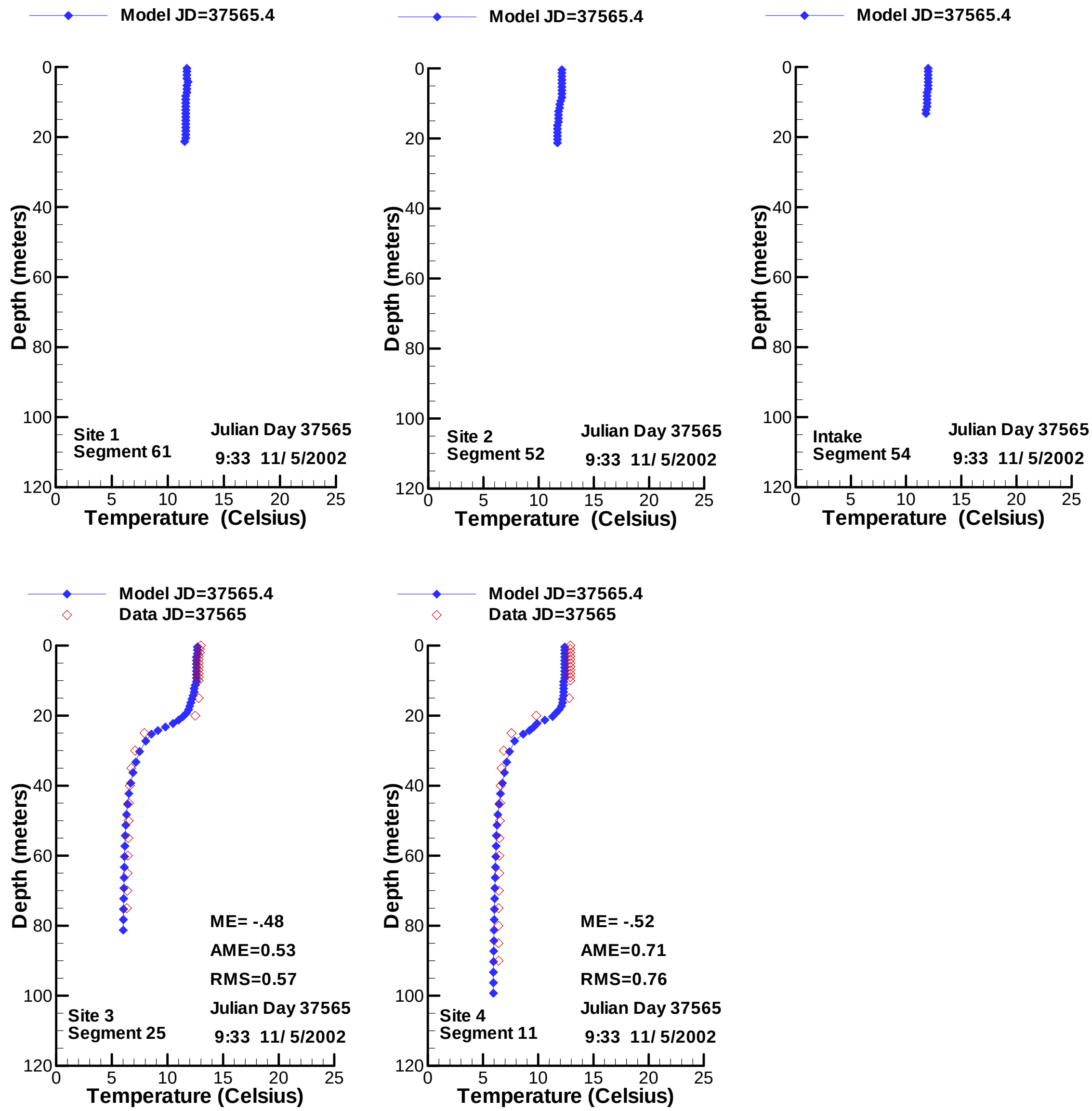

Figure 510. Vertical profiles of TEMPERATURE compared with data for 11/ 5/2002.

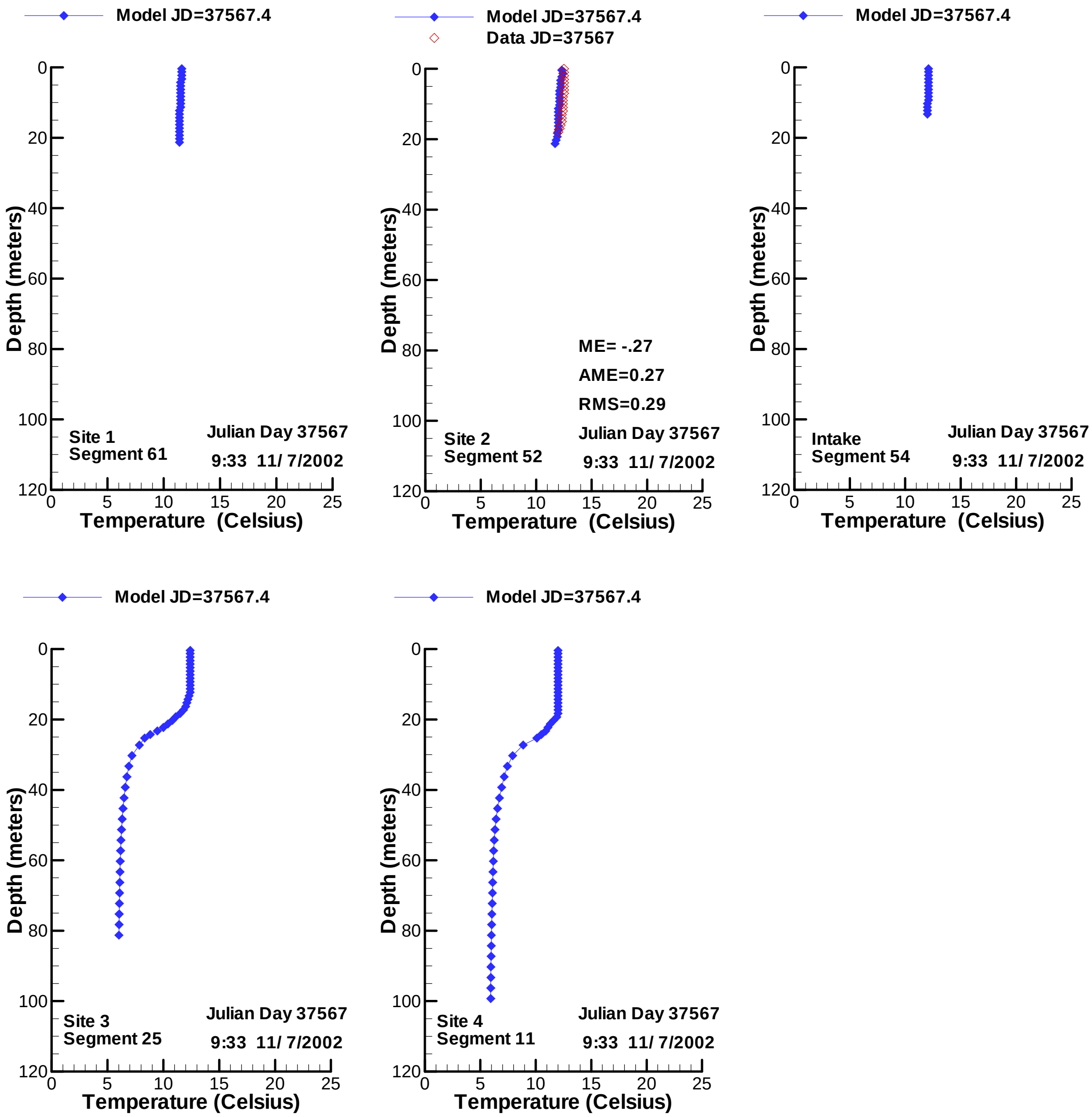

Figure 511. Vertical profiles of TEMPERATURE compared with data for 11/ 7/2002.

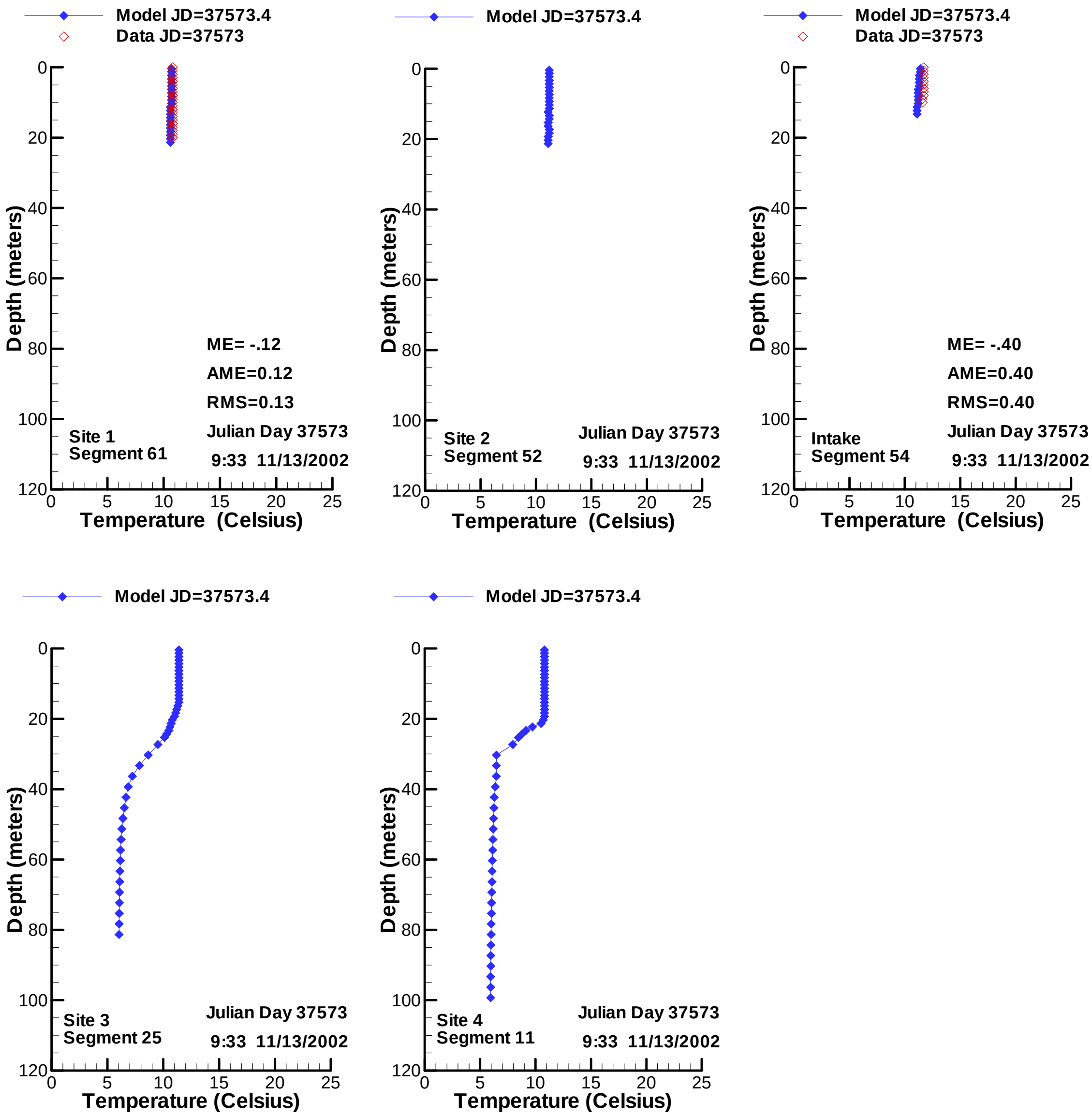

Figure 512. Vertical profiles of TEMPERATURE compared with data for 11/13/2002.

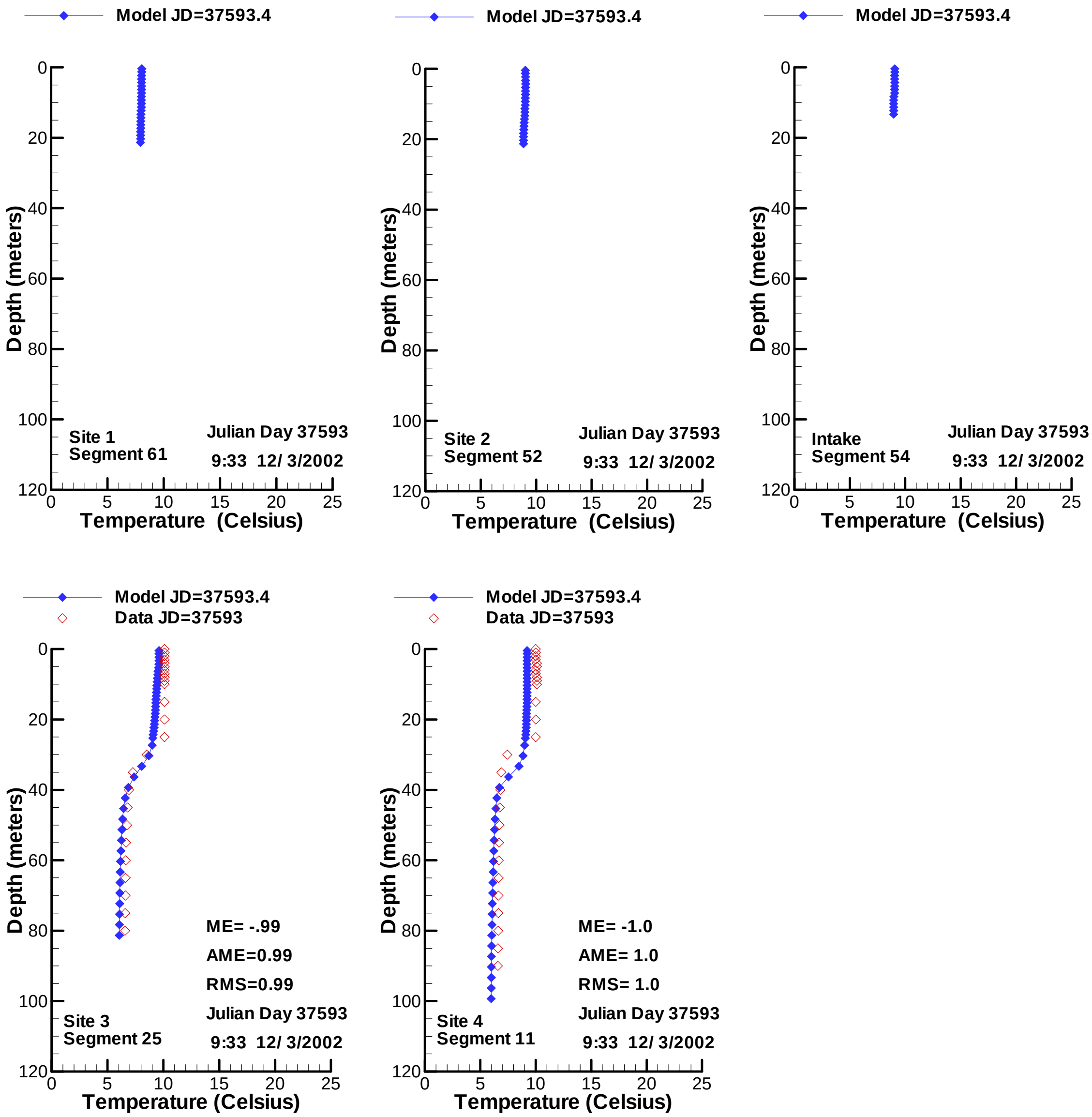

Figure 513. Vertical profiles of TEMPERATURE compared with data for 12/ 3/2002.

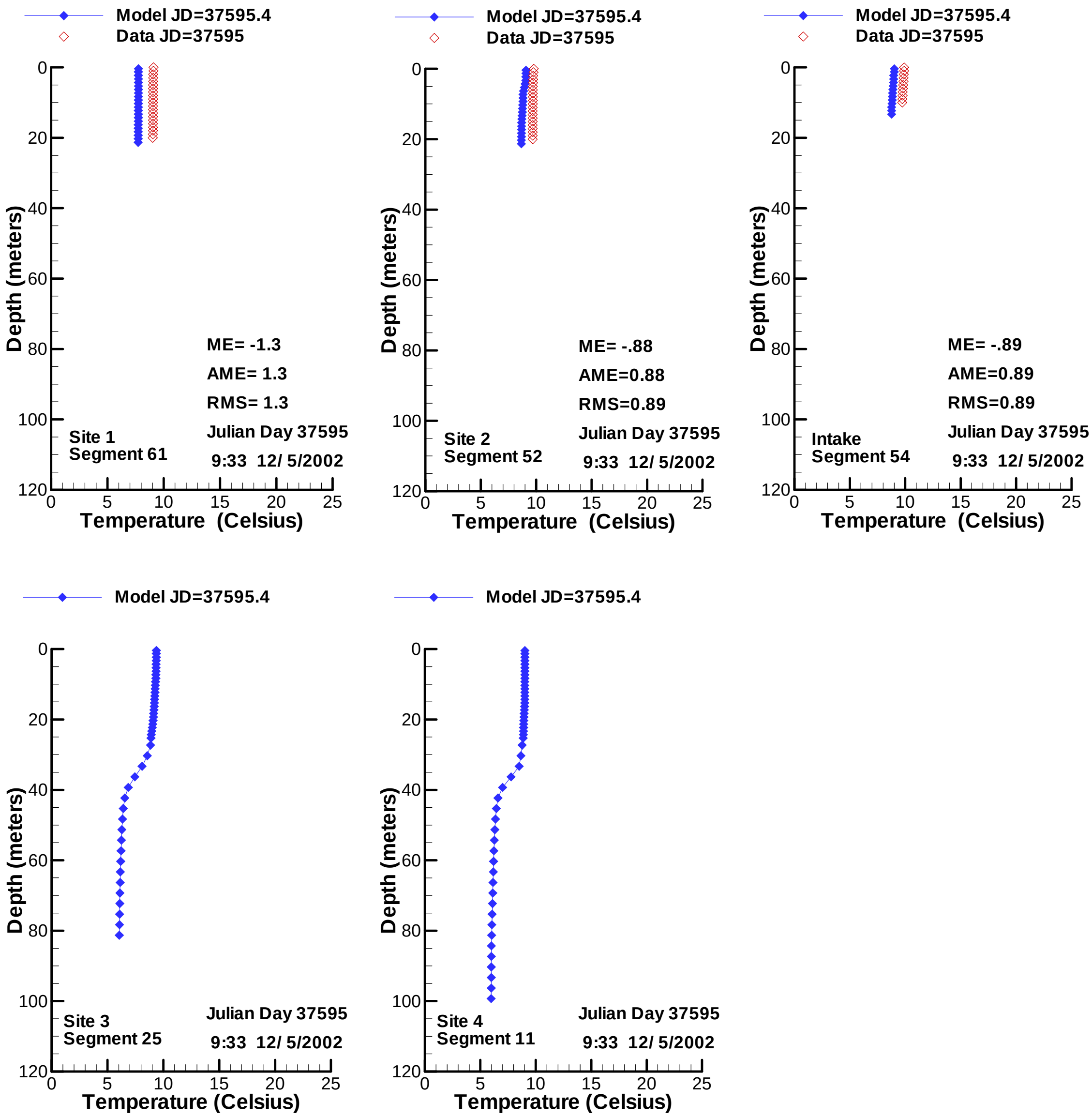

Figure 514. Vertical profiles of TEMPERATURE compared with data for 12/ 5/2002.

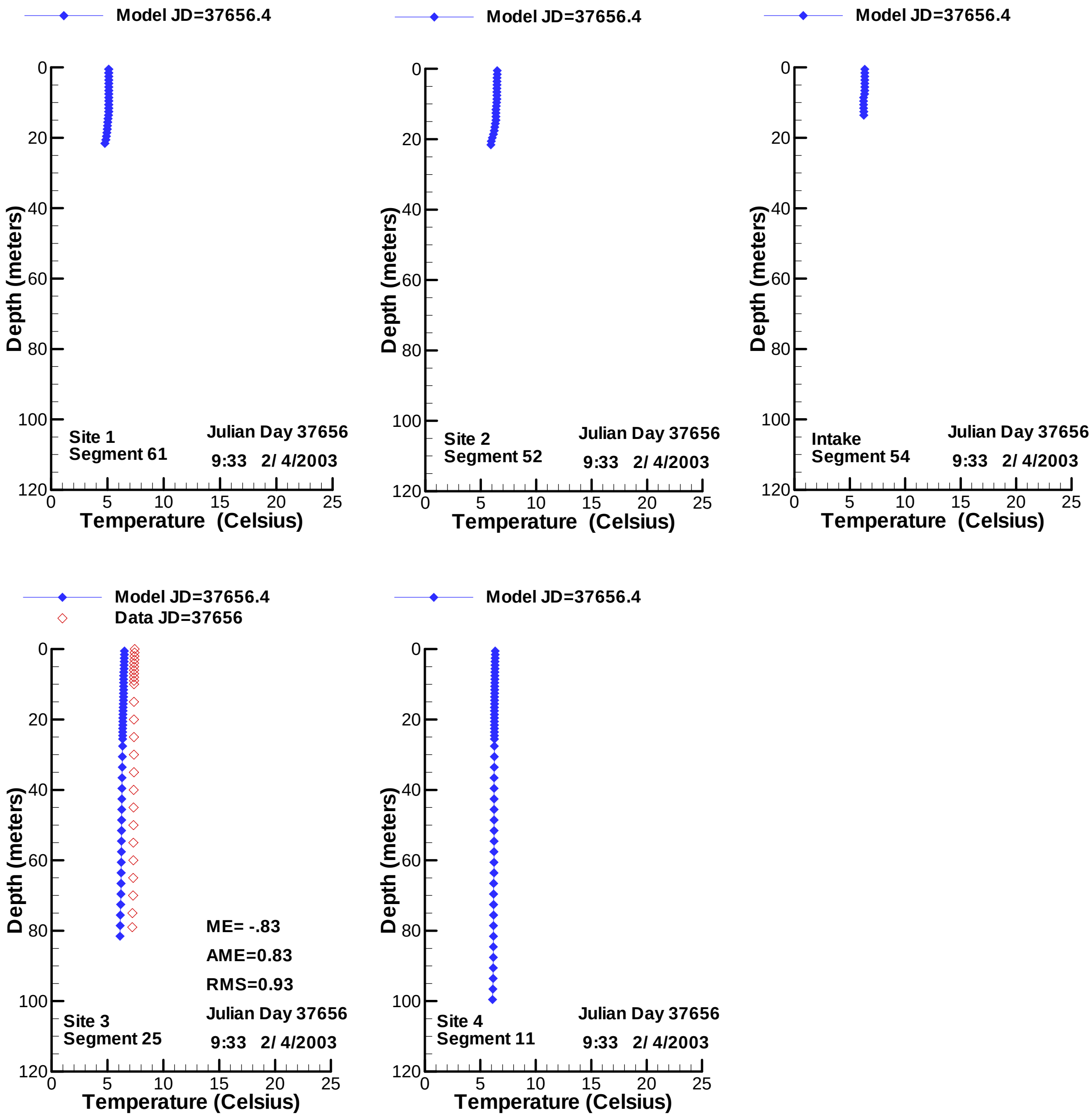

Figure 515. Vertical profiles of TEMPERATURE compared with data for 2/ 4/2003.

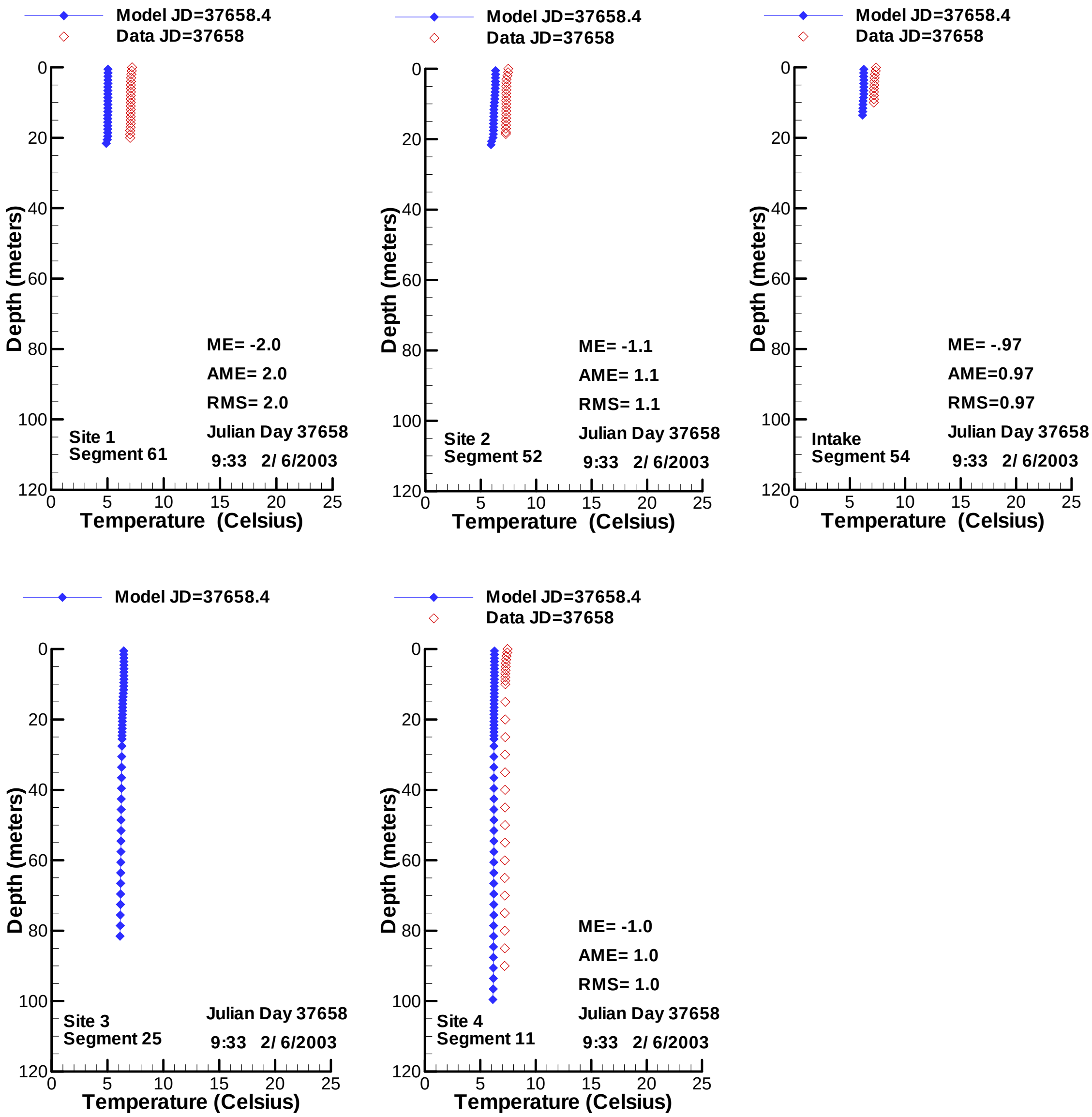

Figure 516. Vertical profiles of TEMPERATURE compared with data for 2/ 6/2003.

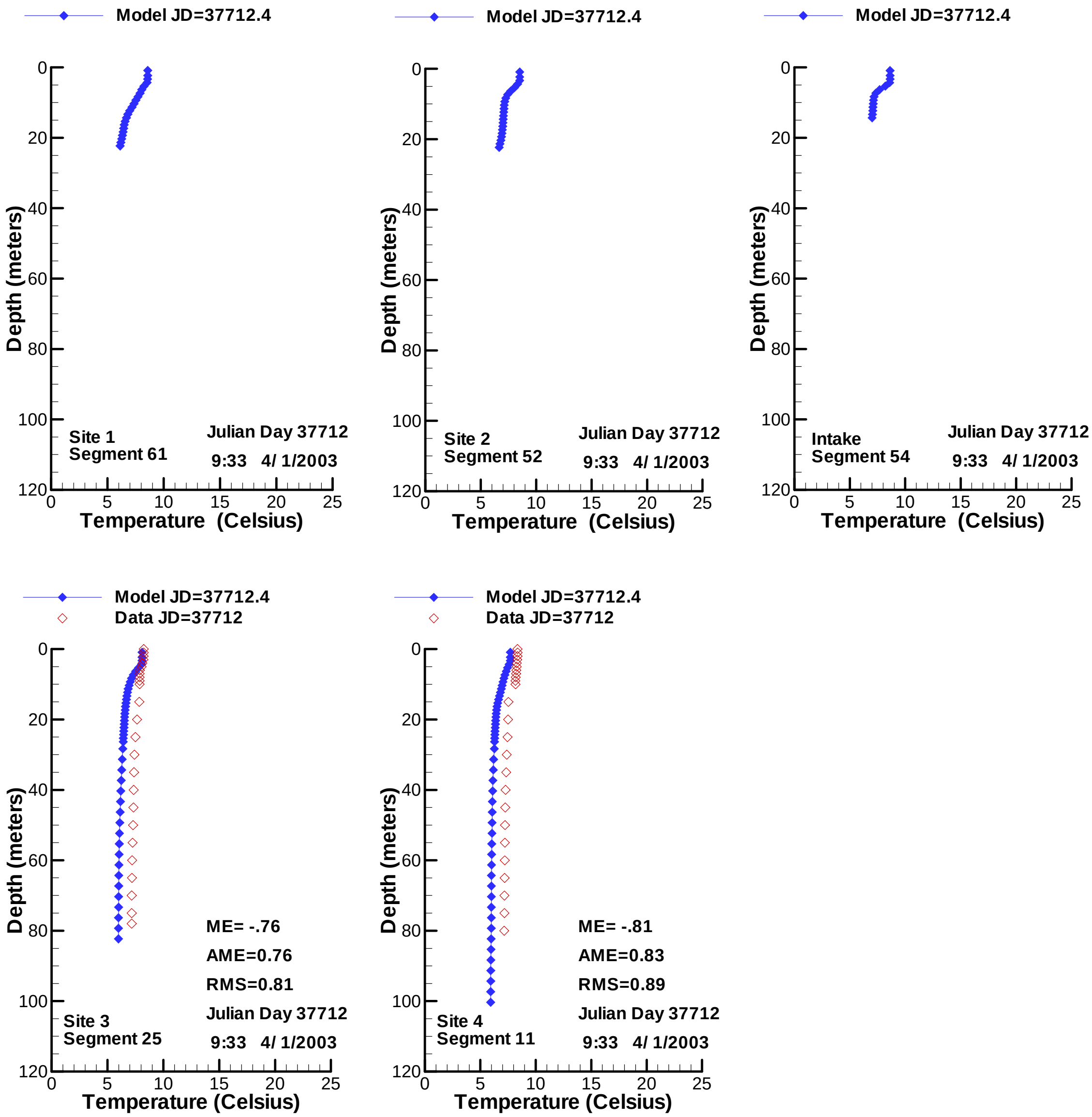

Figure 517. Vertical profiles of TEMPERATURE compared with data for 4/ 1/2003.

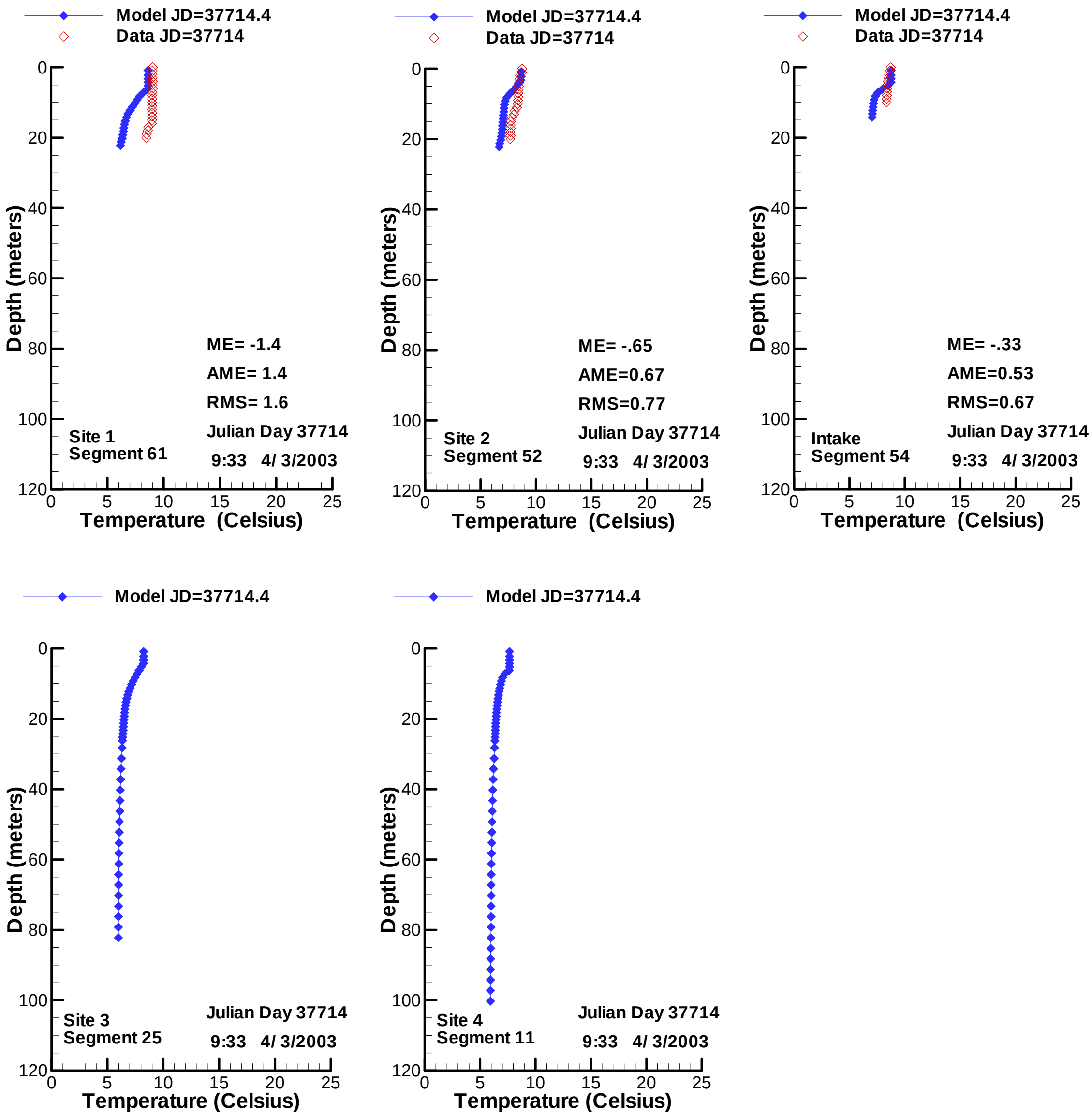

Figure 518. Vertical profiles of TEMPERATURE compared with data for 4/ 3/2003.

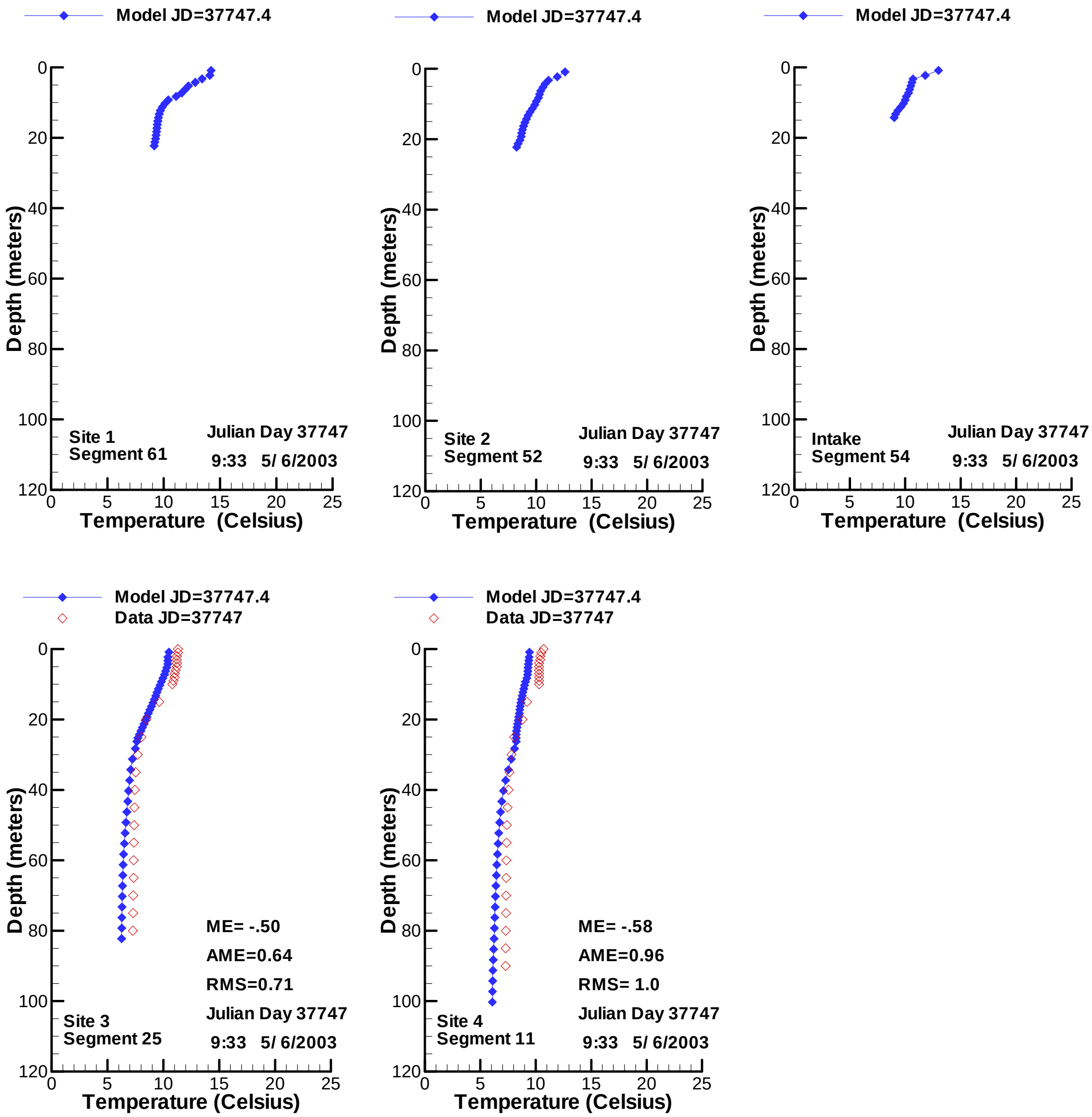

Figure 519. Vertical profiles of TEMPERATURE compared with data for 5/ 6/2003.

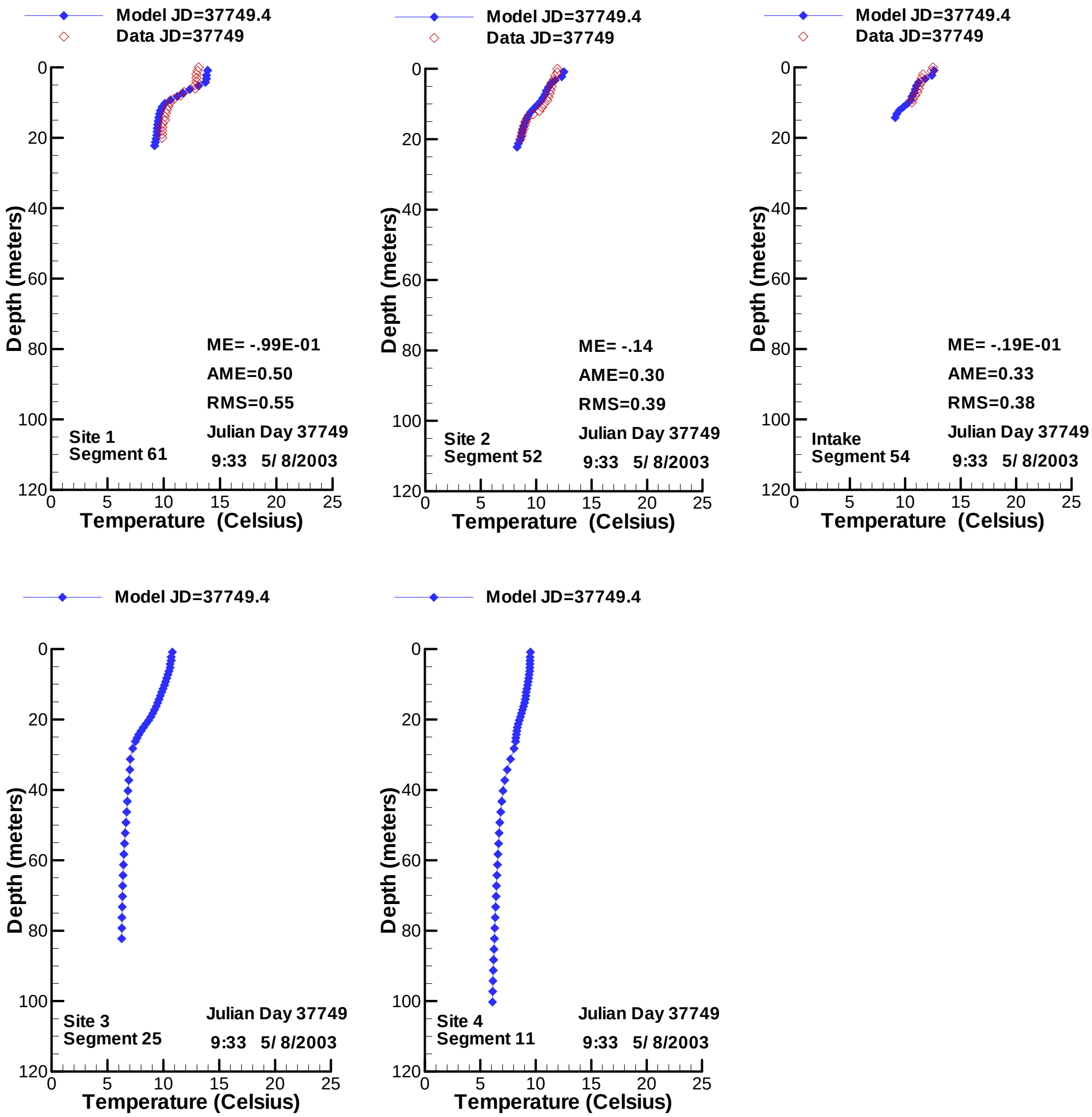

Figure 520. Vertical profiles of TEMPERATURE compared with data for 5/ 8/2003.

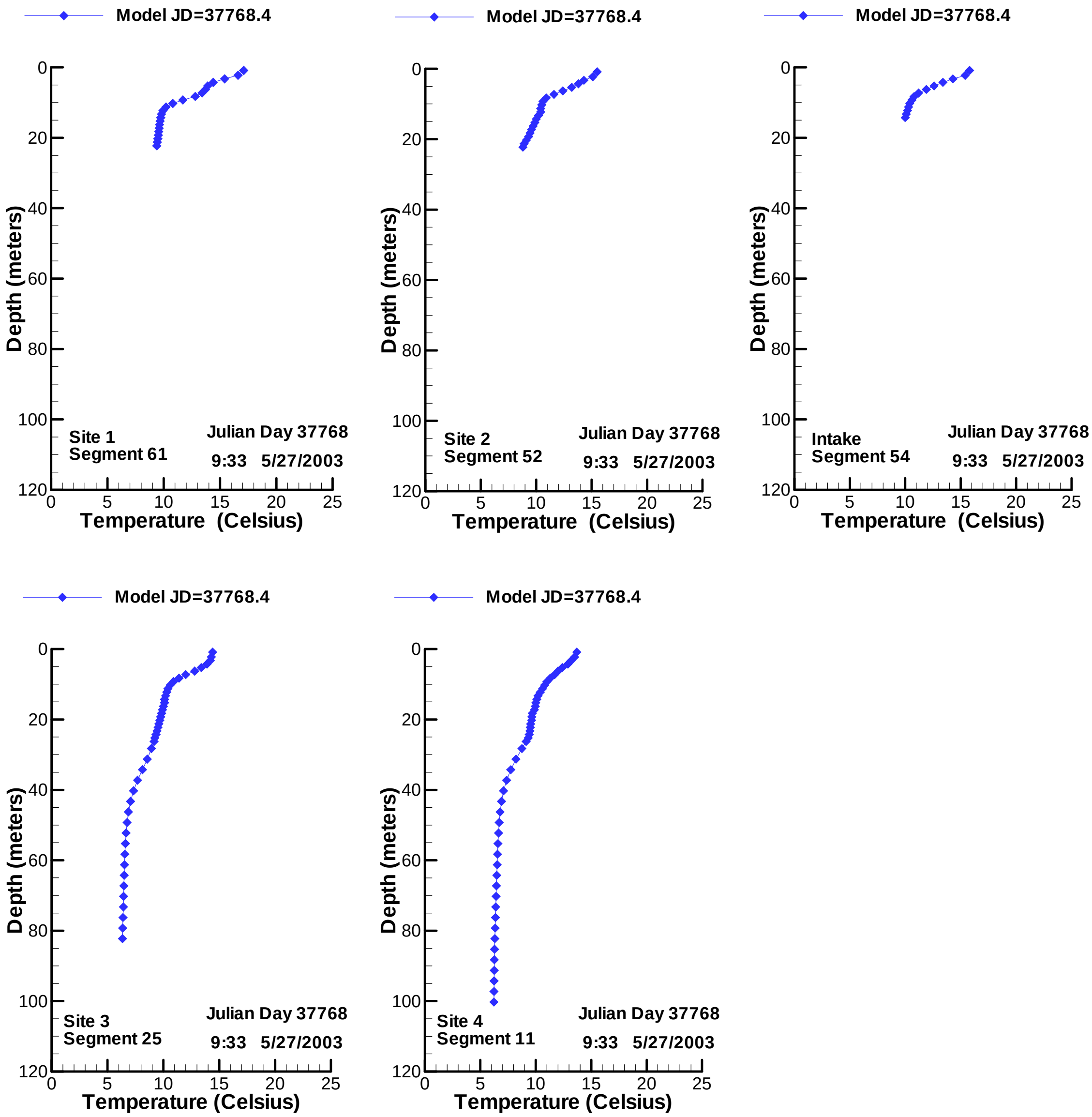

Figure 521. Vertical profiles of TEMPERATURE compared with data for 5/27/2003.

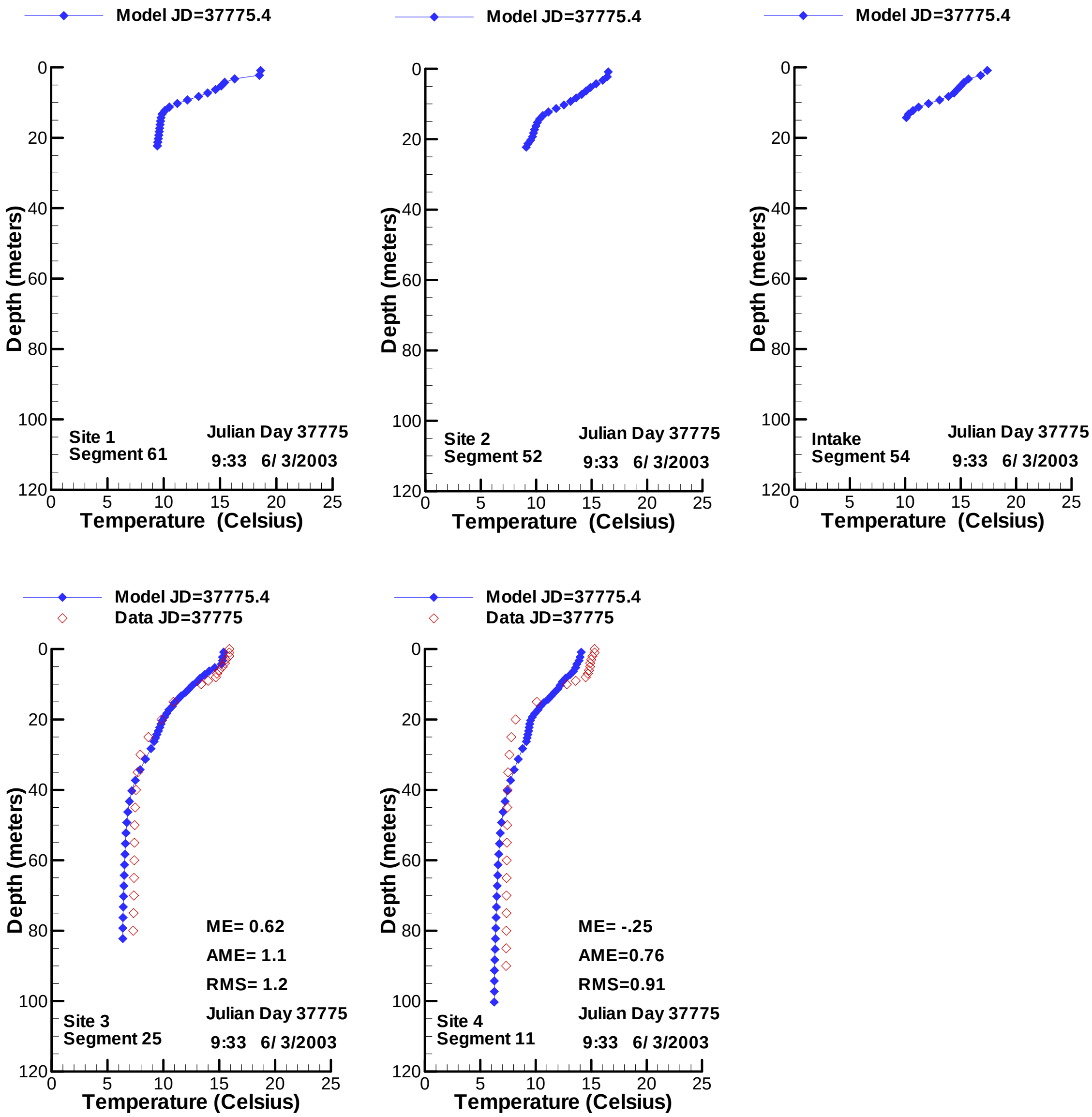

Figure 522. Vertical profiles of TEMPERATURE compared with data for 6/ 3/2003.

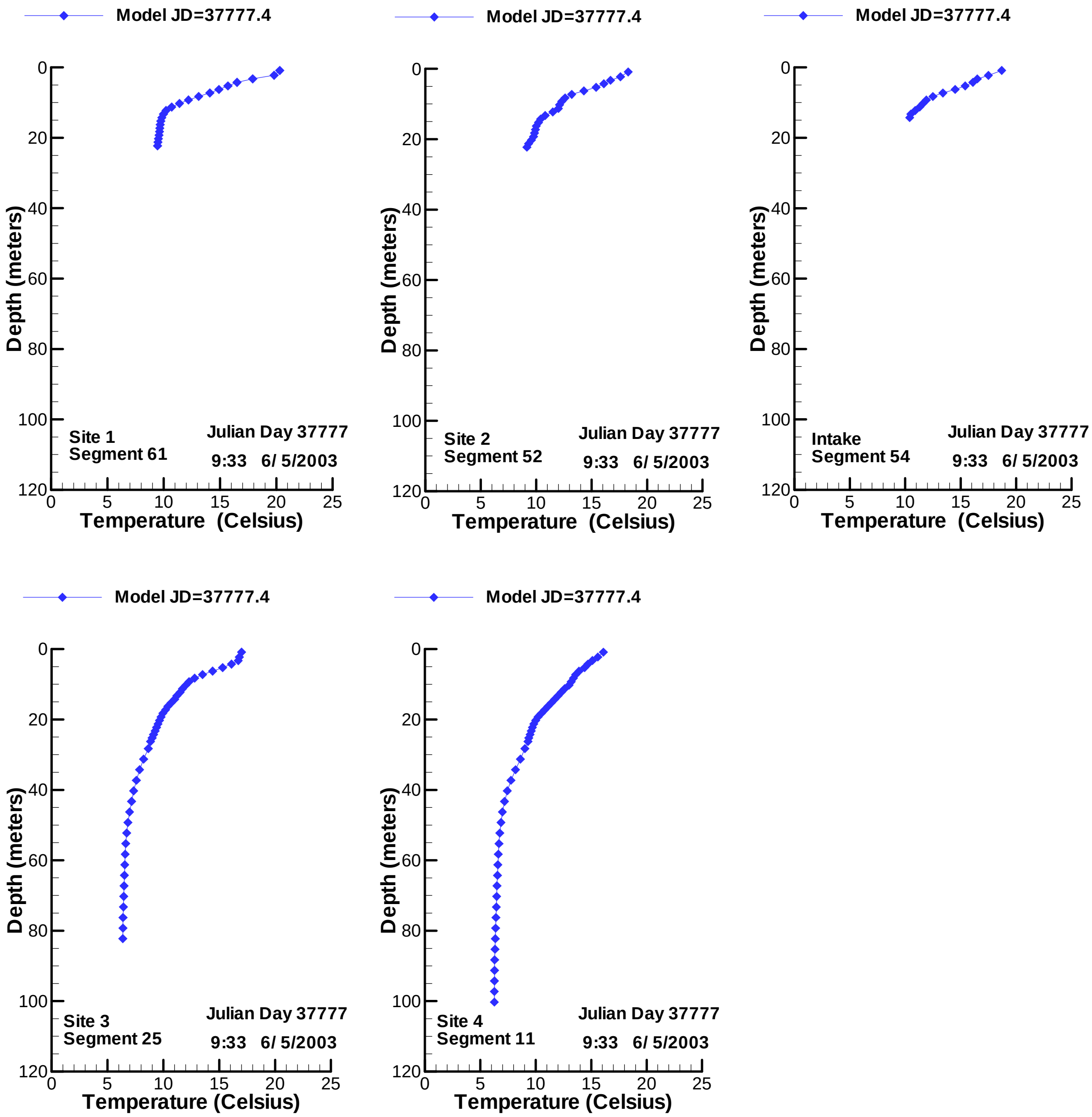

Figure 523. Vertical profiles of TEMPERATURE compared with data for 6/ 5/2003.

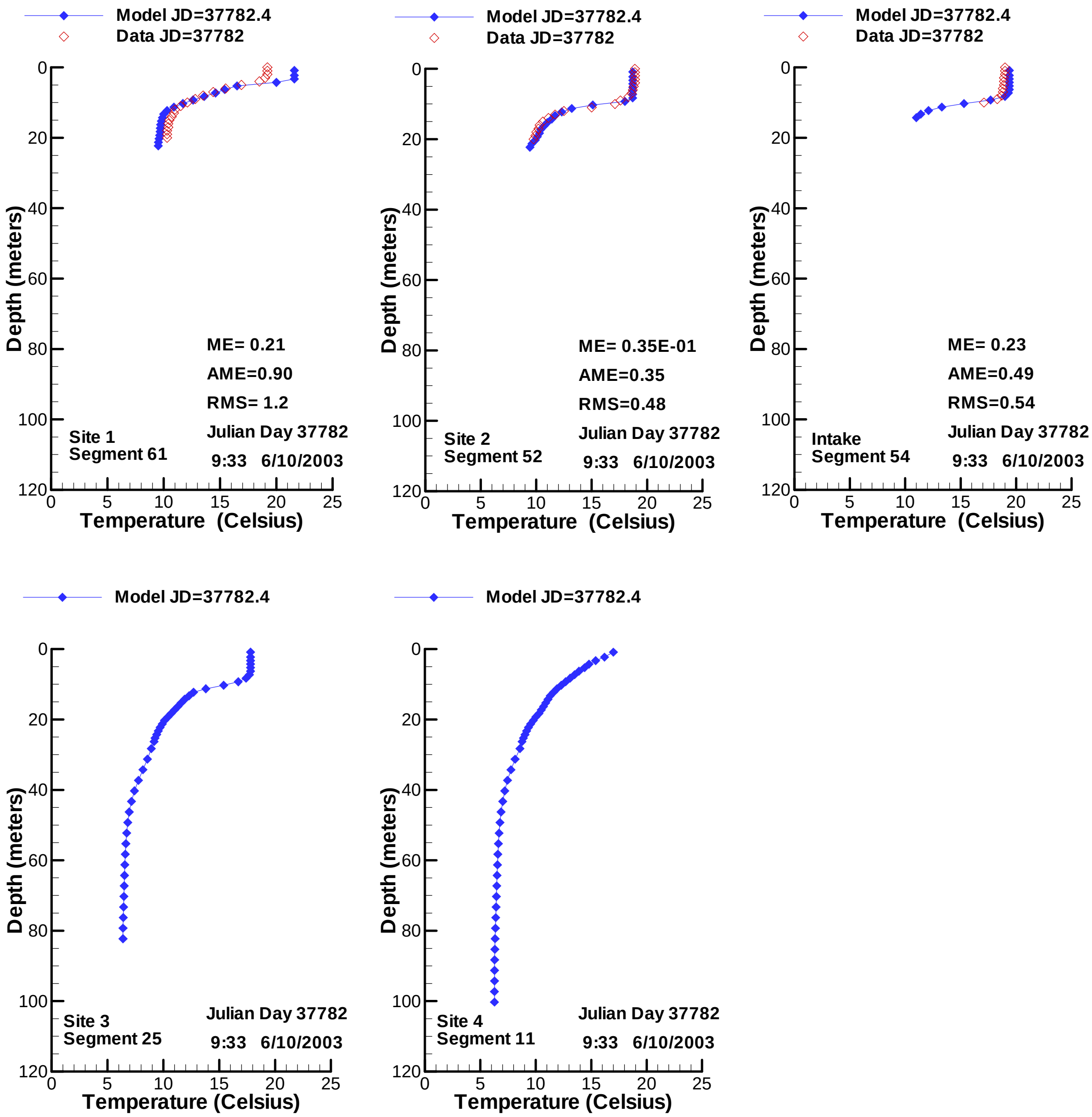

Figure 524. Vertical profiles of TEMPERATURE compared with data for 6/10/2003.

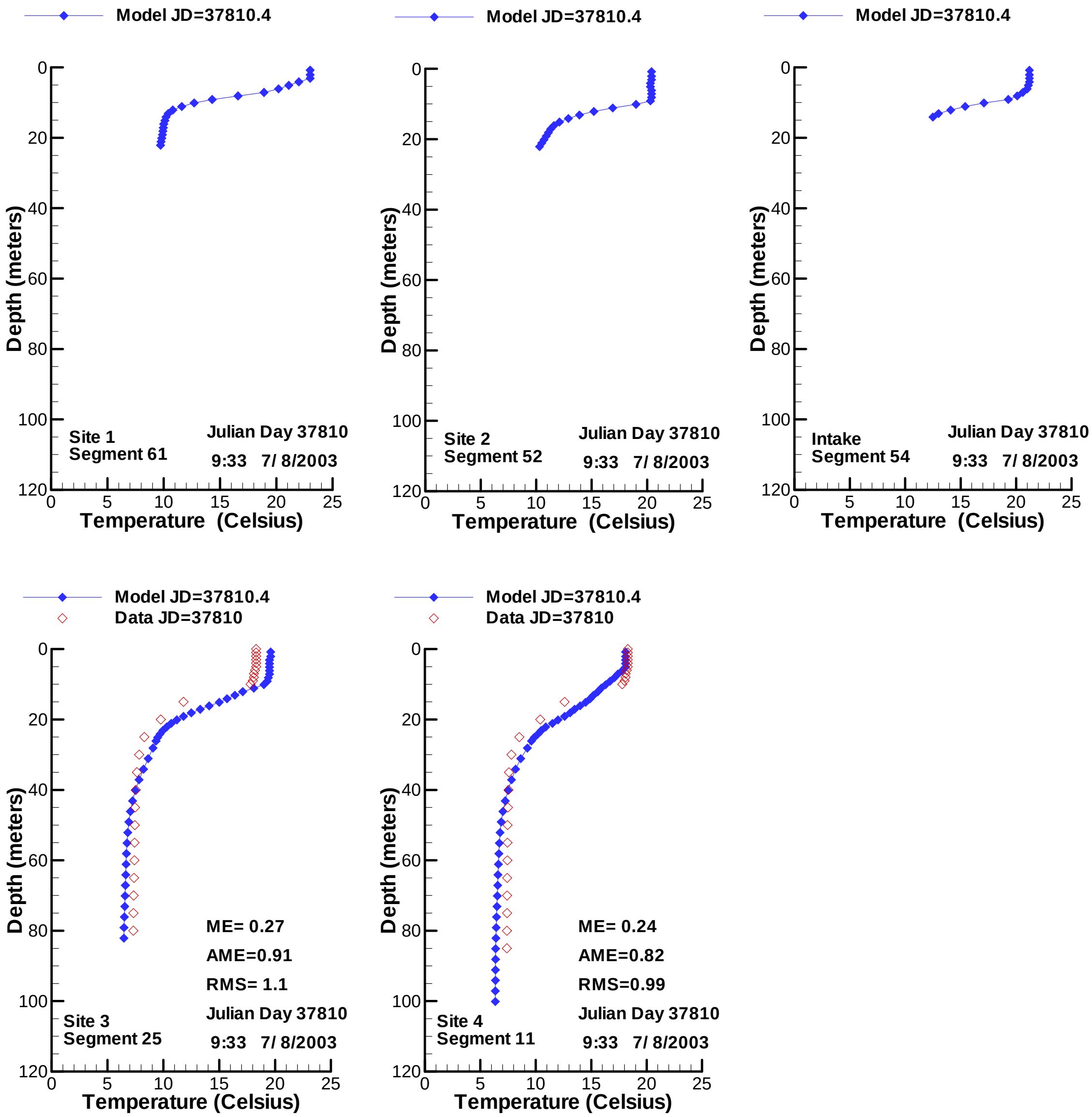

Figure 525. Vertical profiles of TEMPERATURE compared with data for 7/ 8/2003.

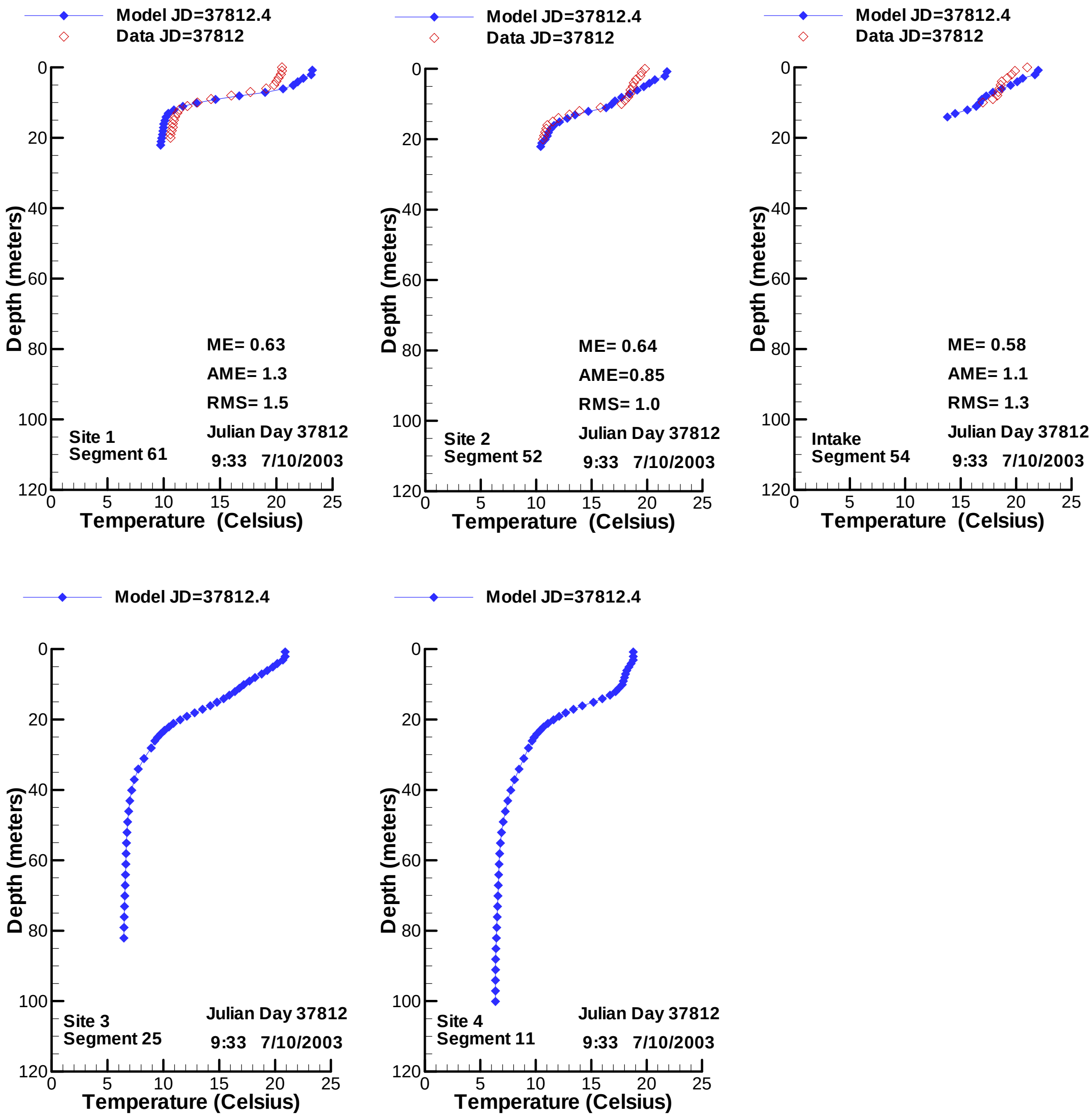

Figure 526. Vertical profiles of TEMPERATURE compared with data for 7/10/2003.

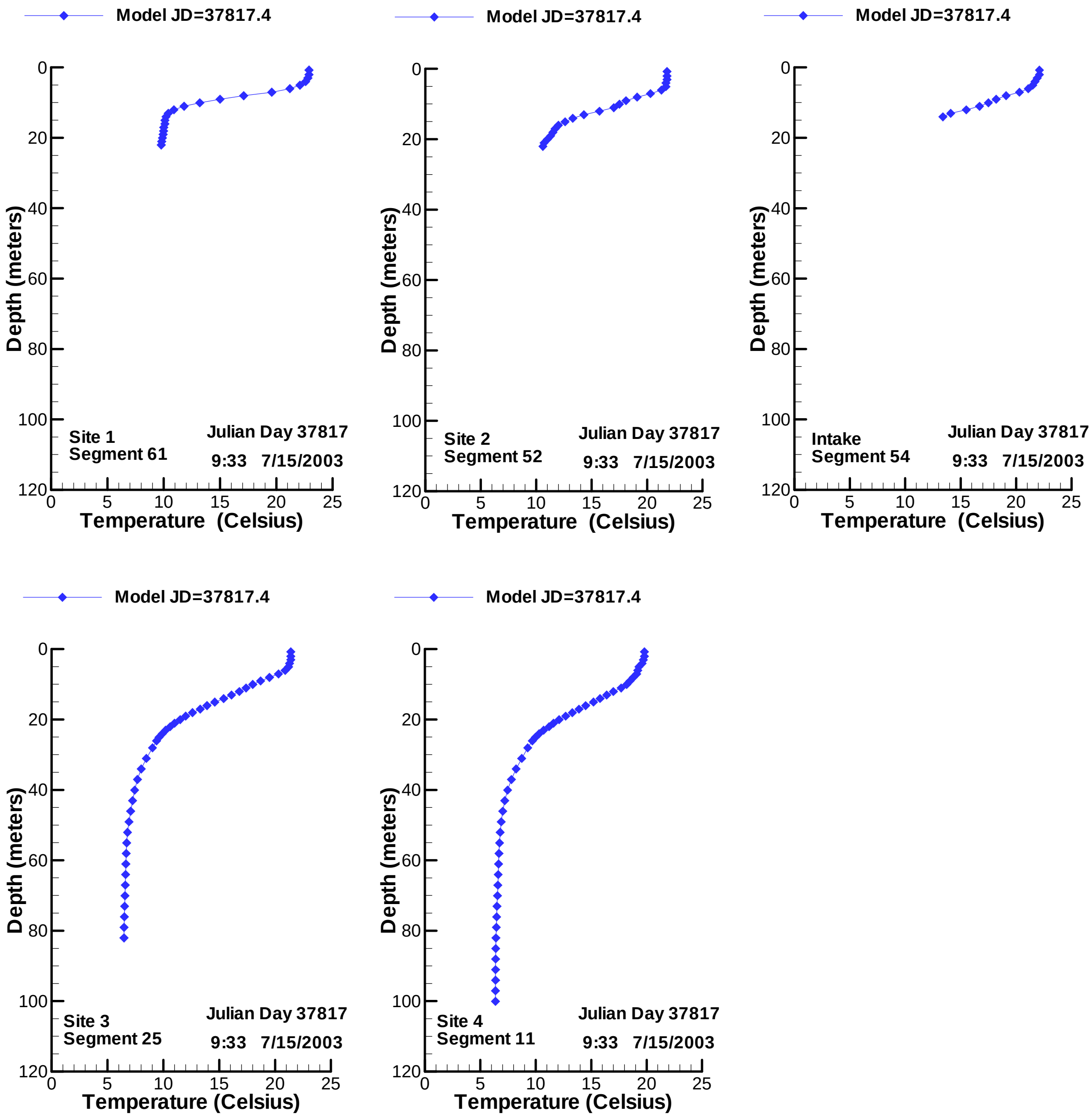

Figure 527. Vertical profiles of TEMPERATURE compared with data for 7/15/2003.

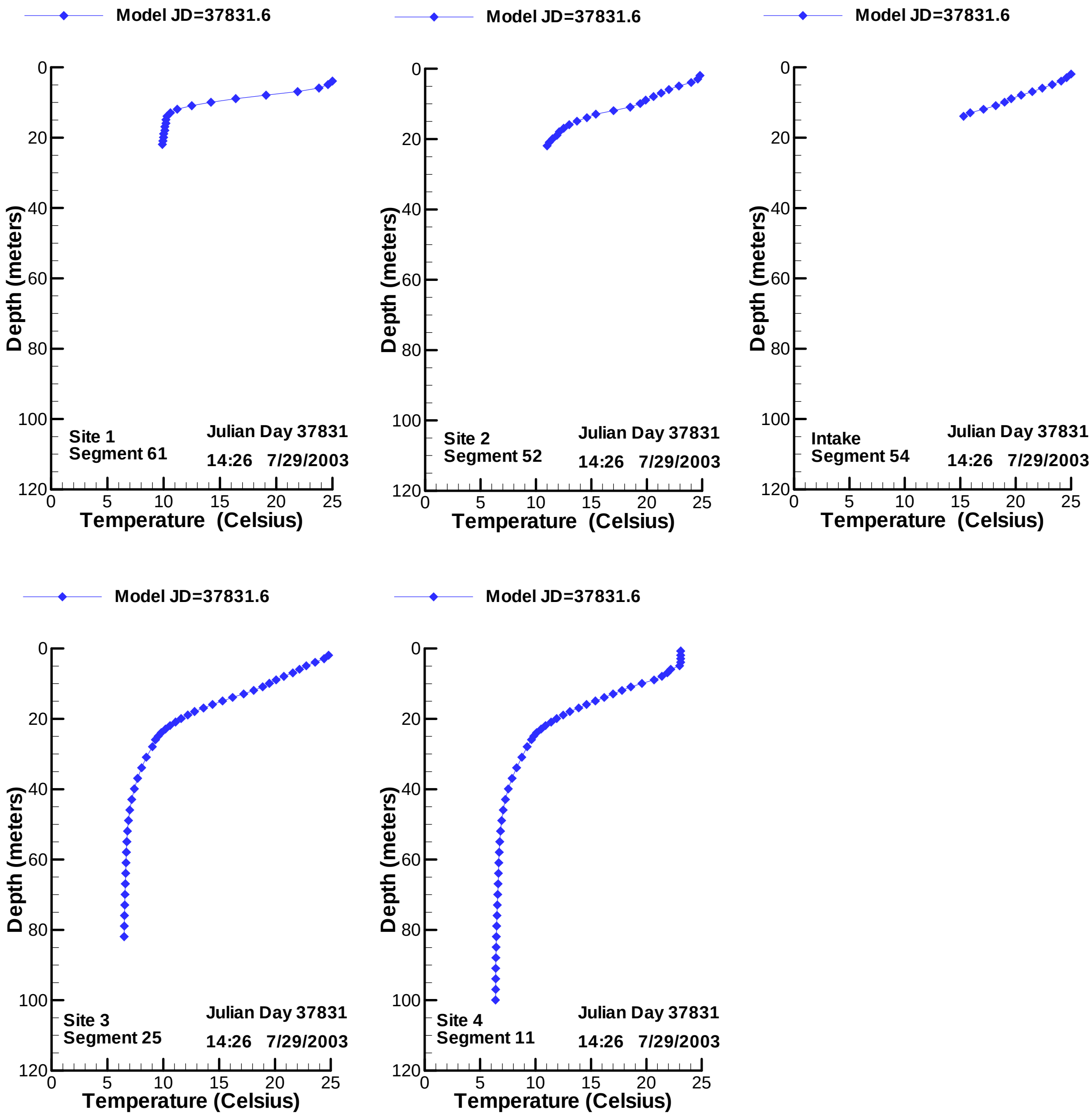

Figure 528. Vertical profiles of TEMPERATURE compared with data for 7/29/2003.

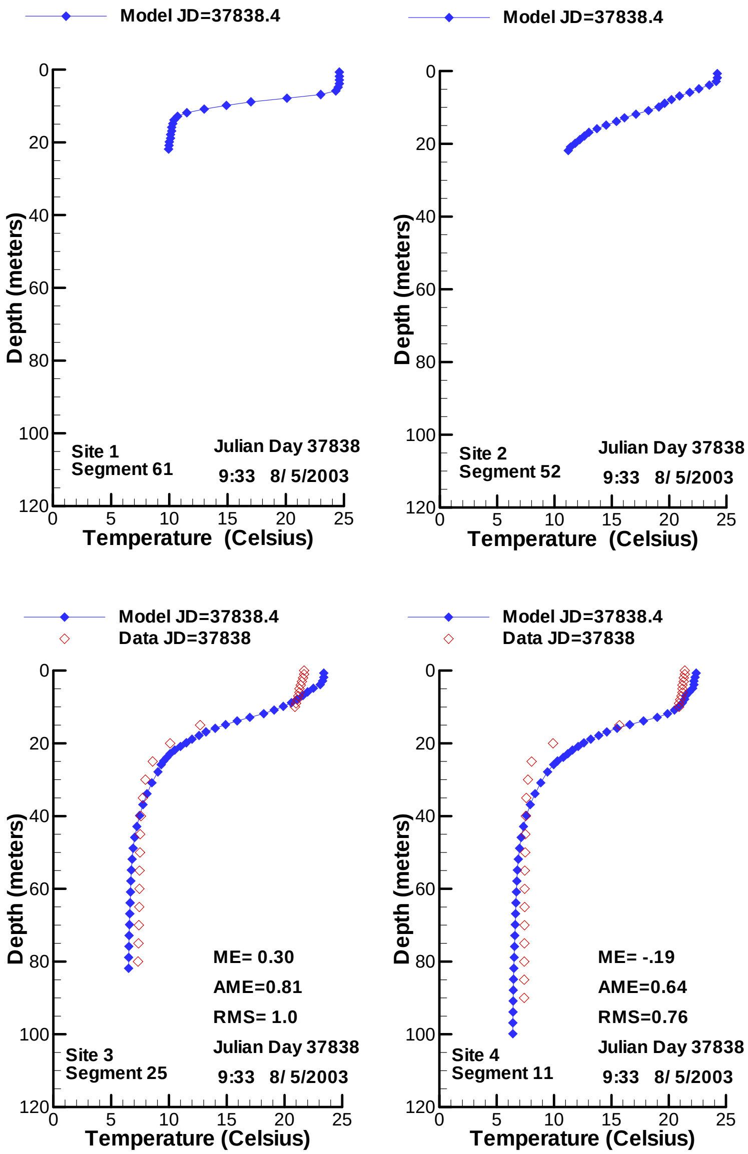

Figure 529. Vertical profiles of TEMPERATURE compared with data for 8/ 5/2003.

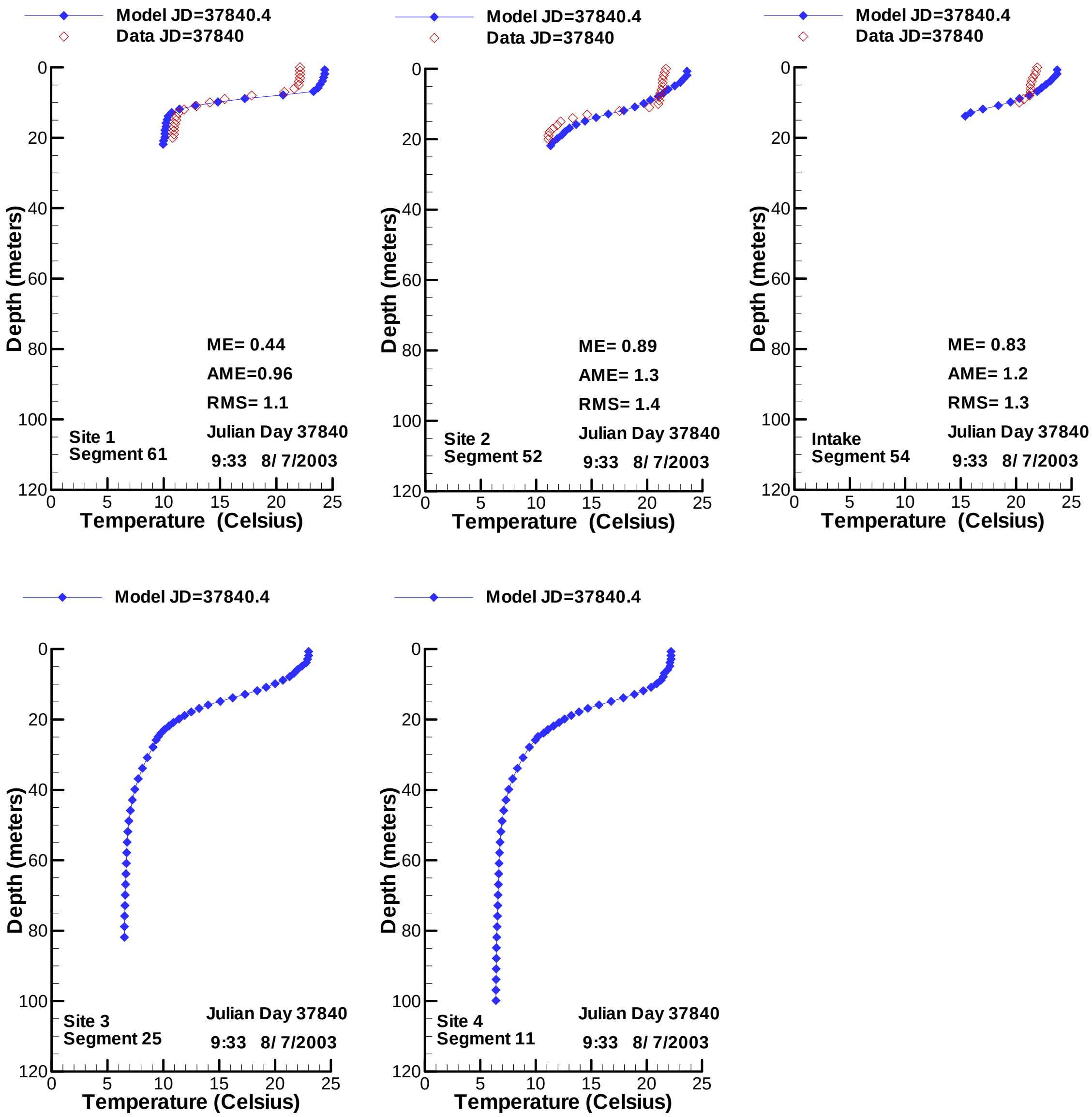

Figure 530. Vertical profiles of TEMPERATURE compared with data for 8/ 7/2003.

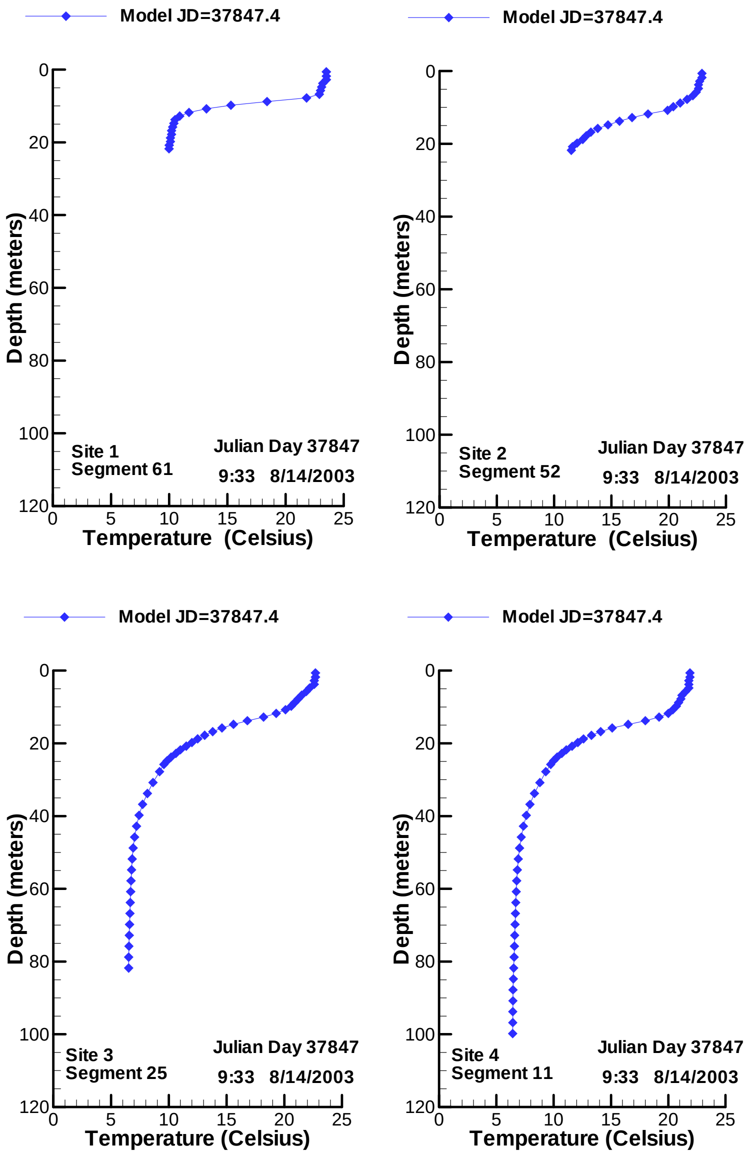

Figure 531. Vertical profiles of TEMPERATURE compared with data for 8/14/2003.

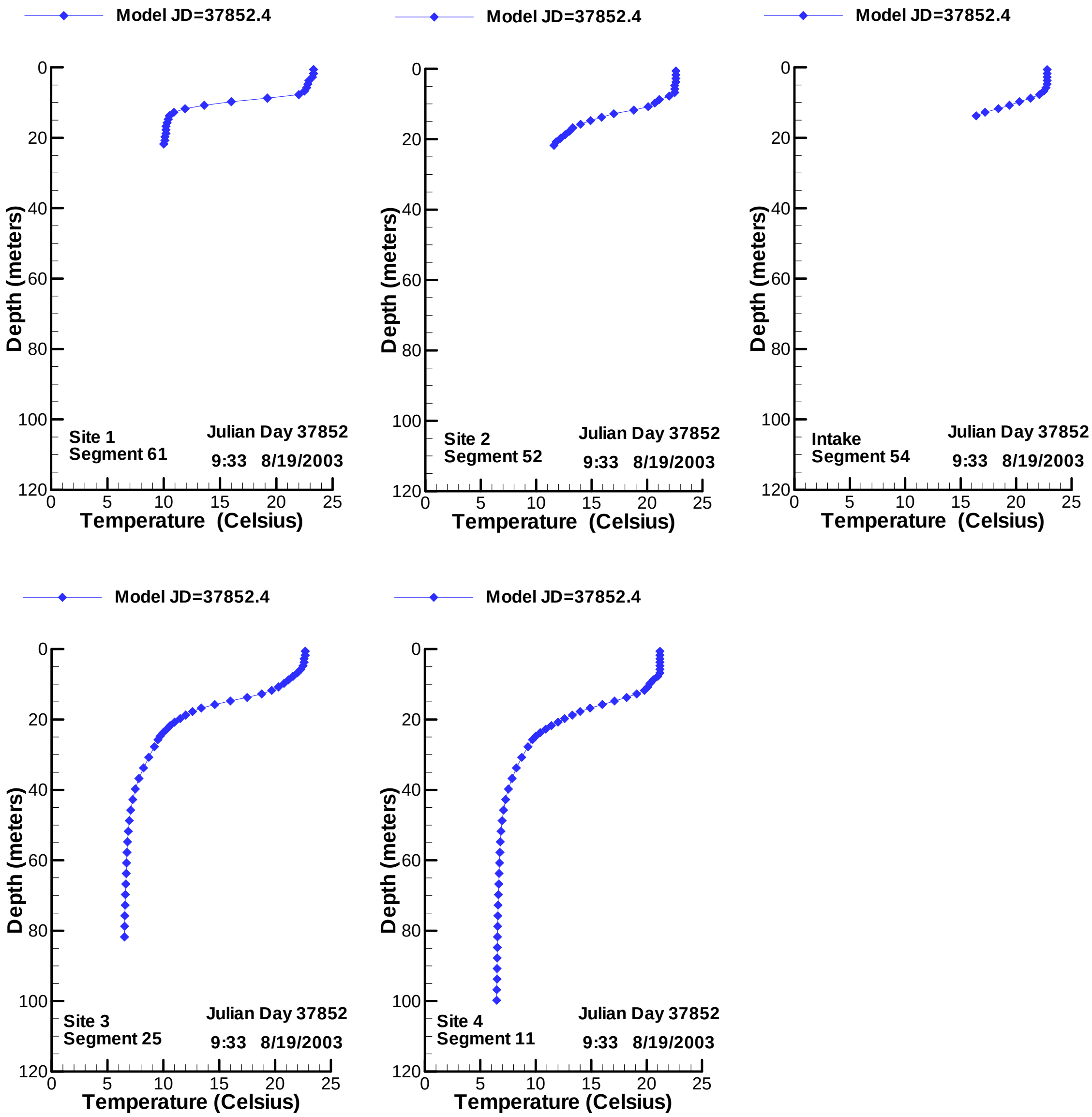

Figure 532. Vertical profiles of TEMPERATURE compared with data for 8/19/2003.

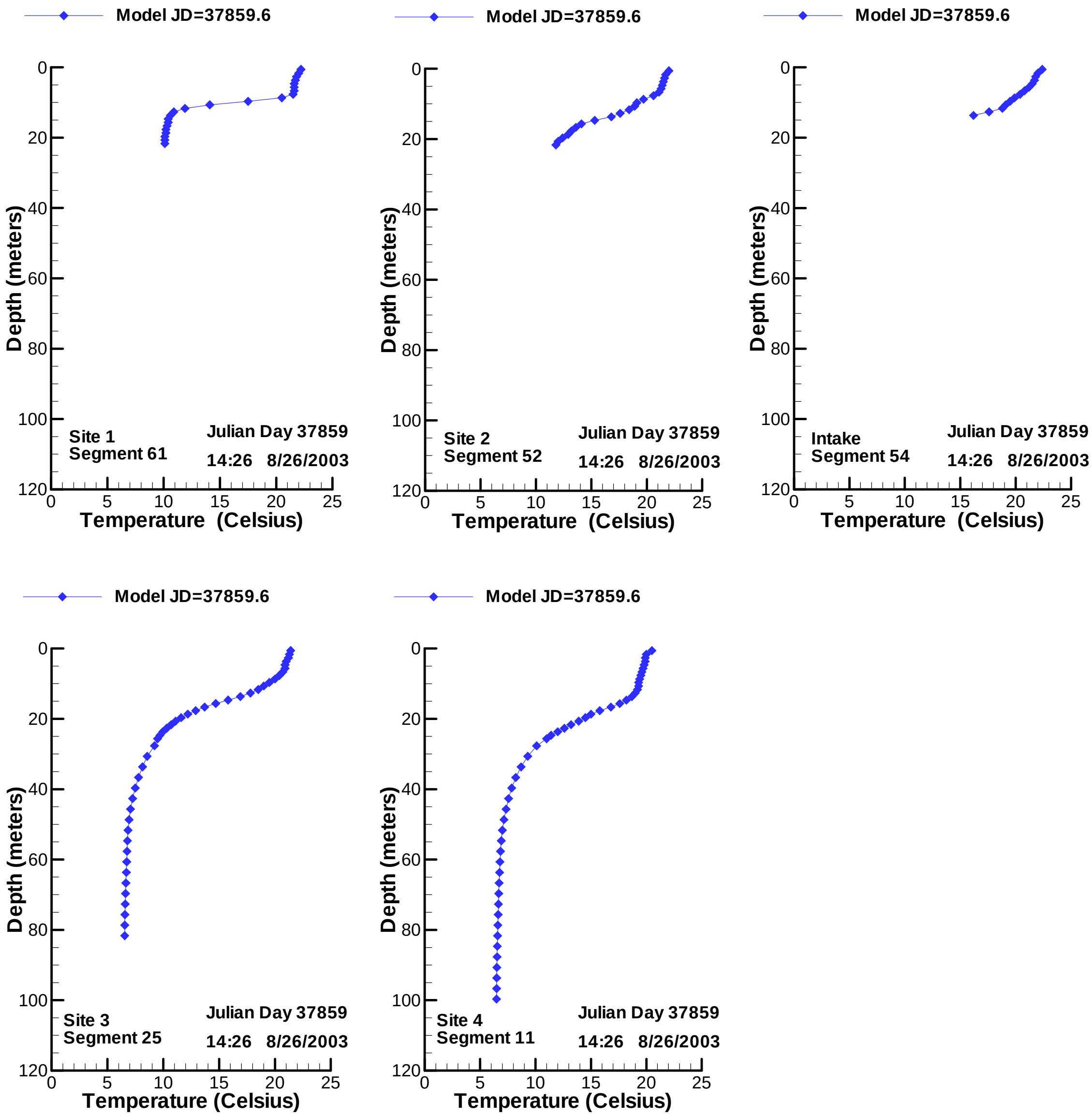

Figure 533. Vertical profiles of TEMPERATURE compared with data for 8/26/2003.

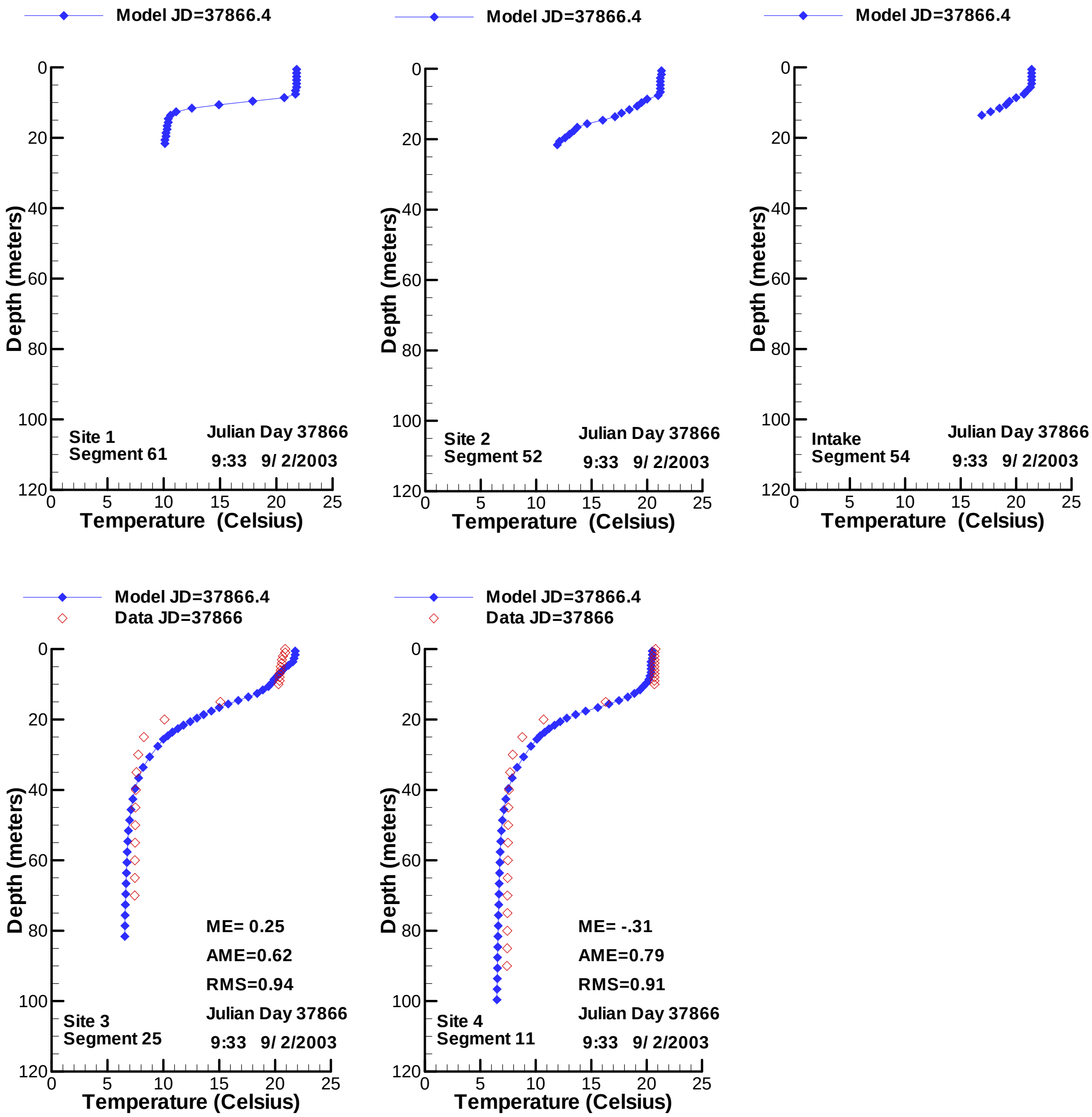

Figure 534. Vertical profiles of TEMPERATURE compared with data for 9/ 2/2003.

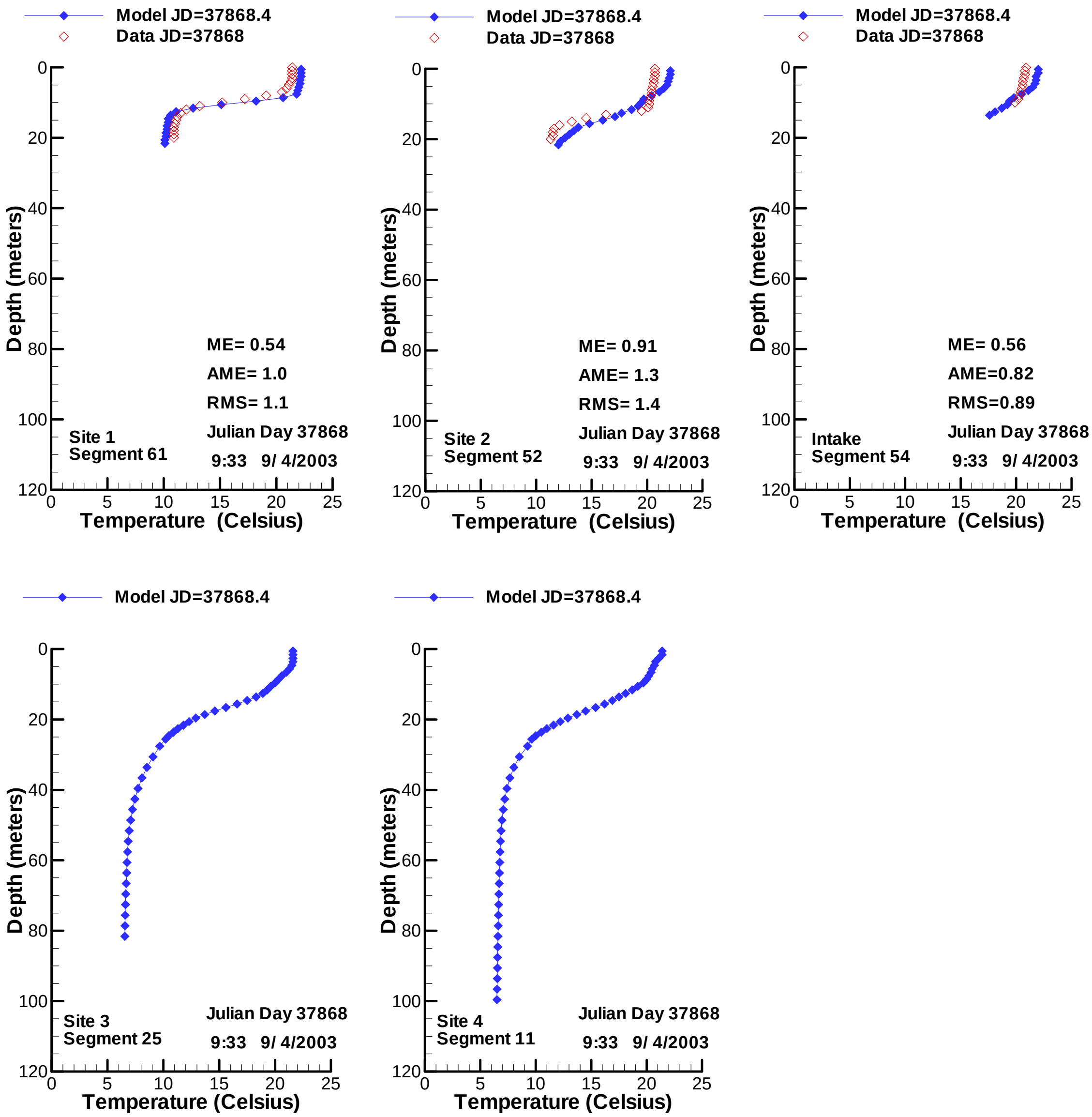

Figure 535. Vertical profiles of TEMPERATURE compared with data for 9/ 4/2003.

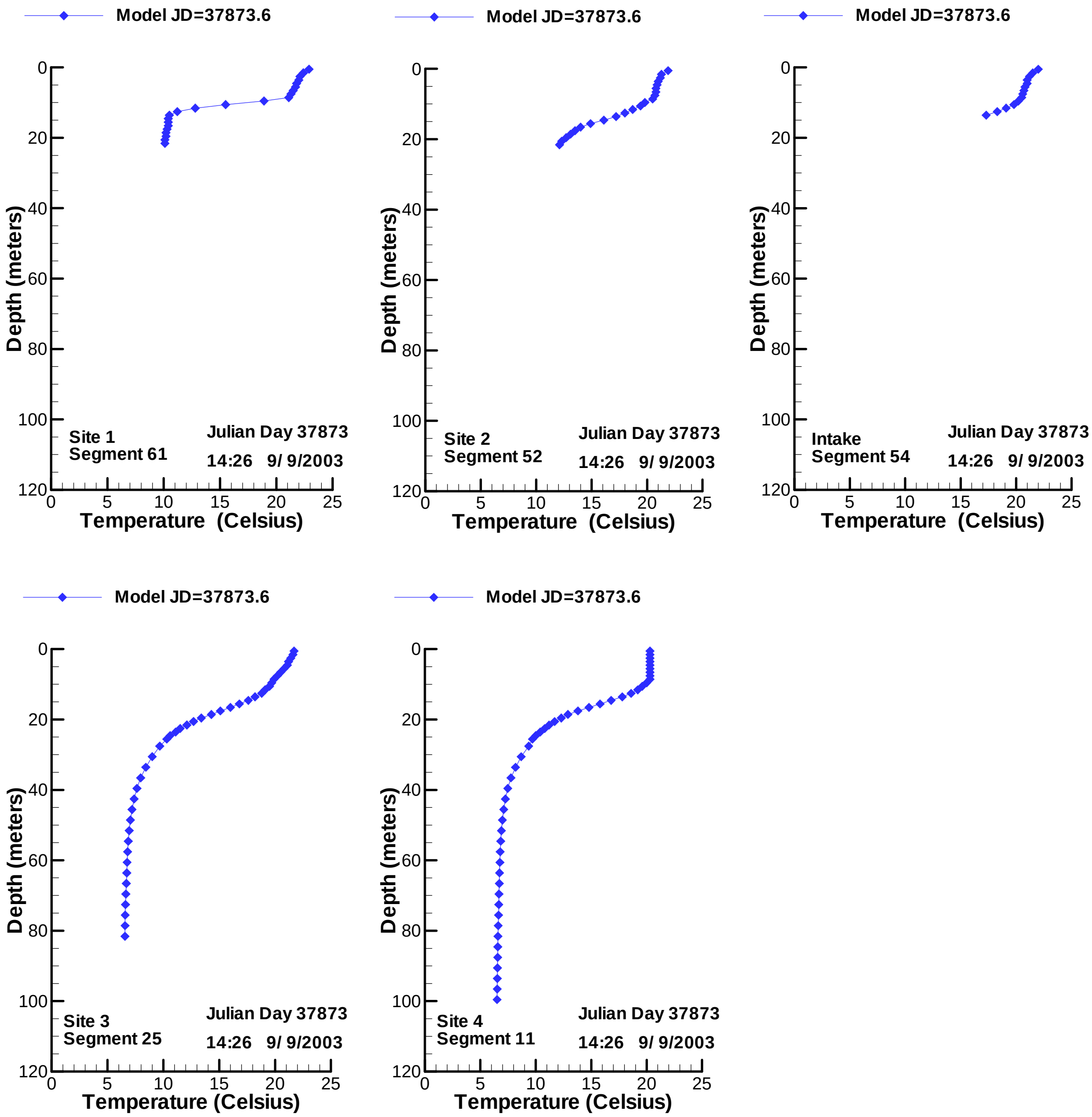

Figure 536. Vertical profiles of TEMPERATURE compared with data for 9/ 9/2003.

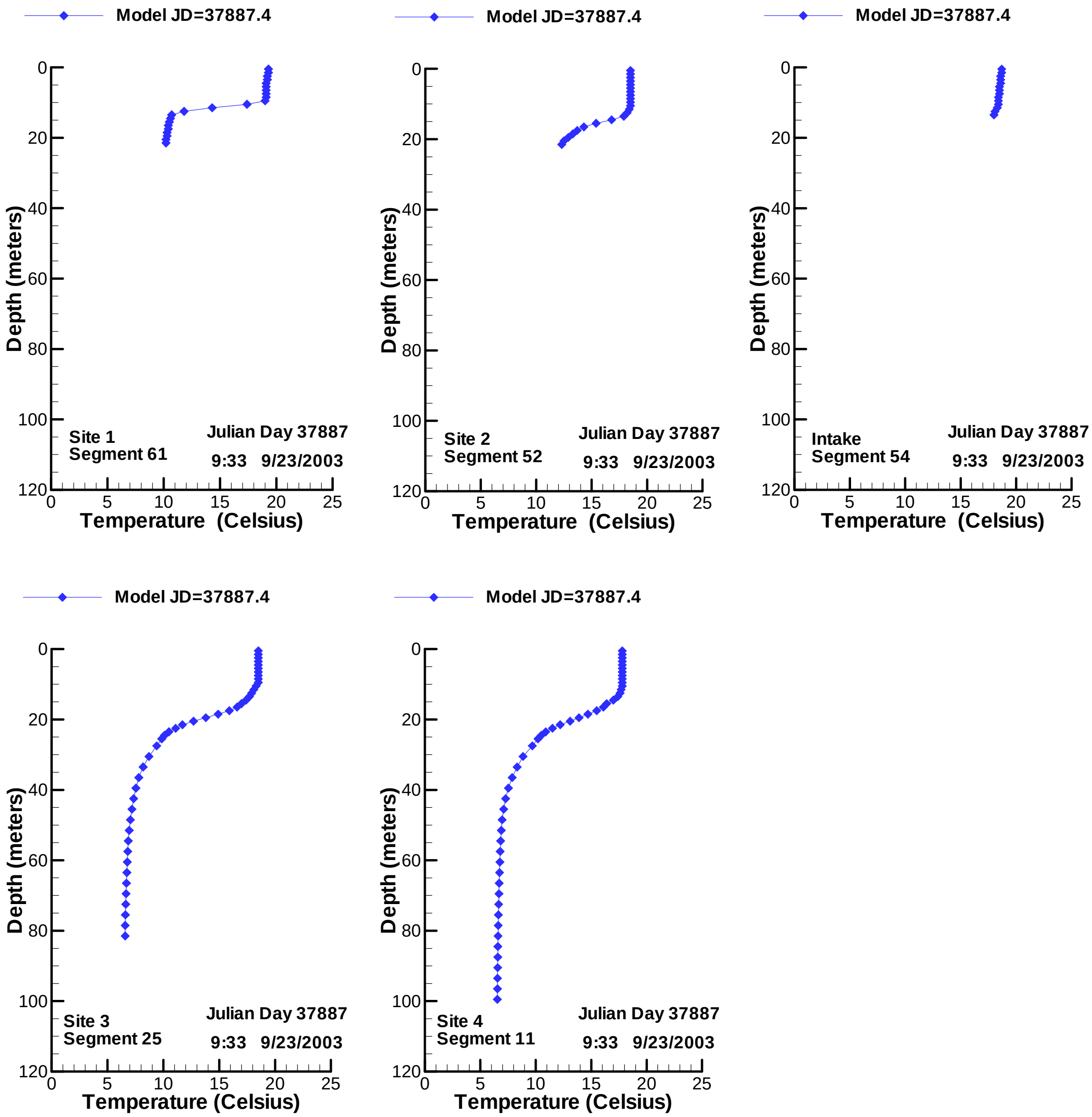

Figure 537. Vertical profiles of TEMPERATURE compared with data for 9/23/2003.

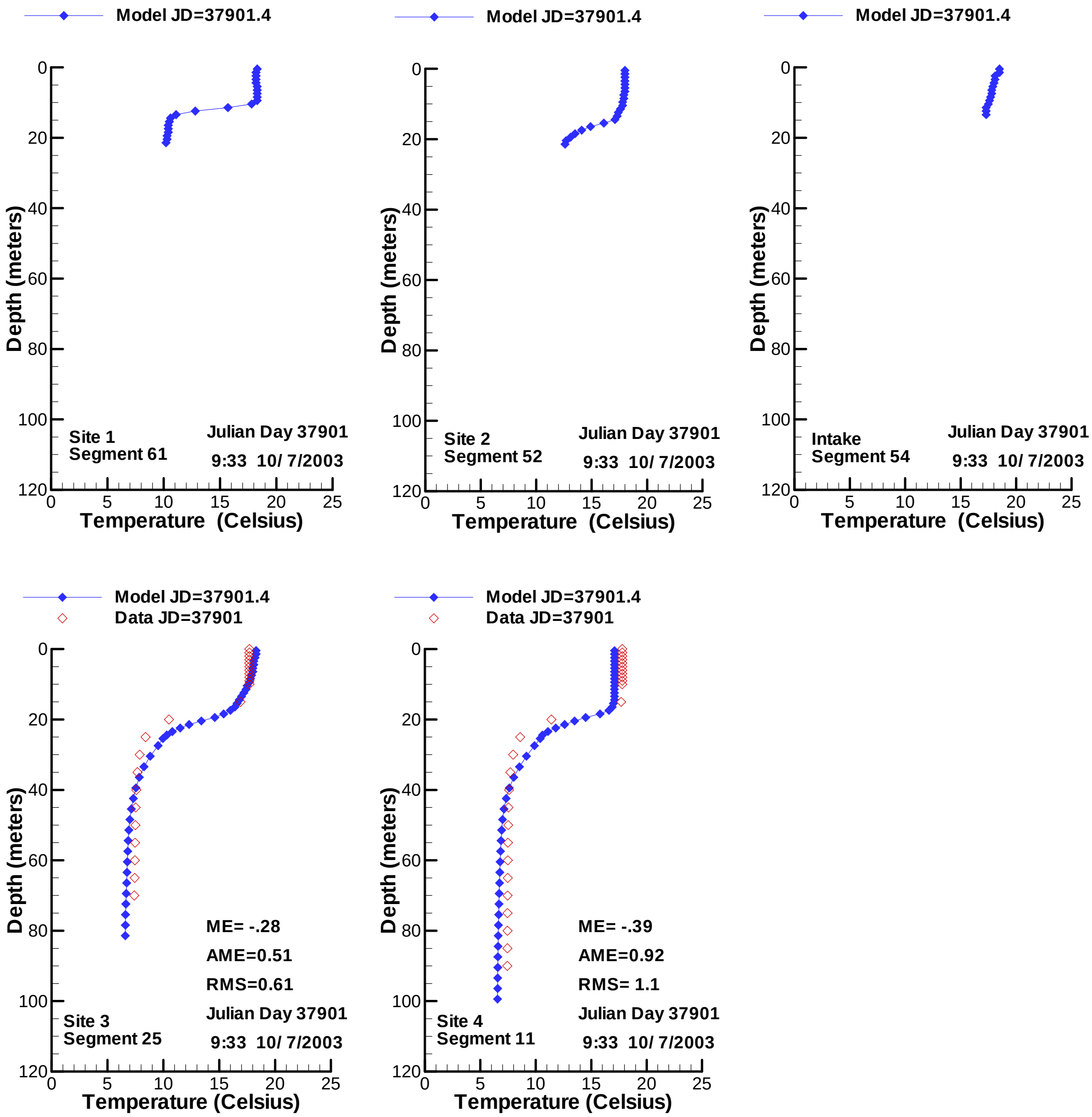

Figure 538. Vertical profiles of TEMPERATURE compared with data for 10/ 7/2003.

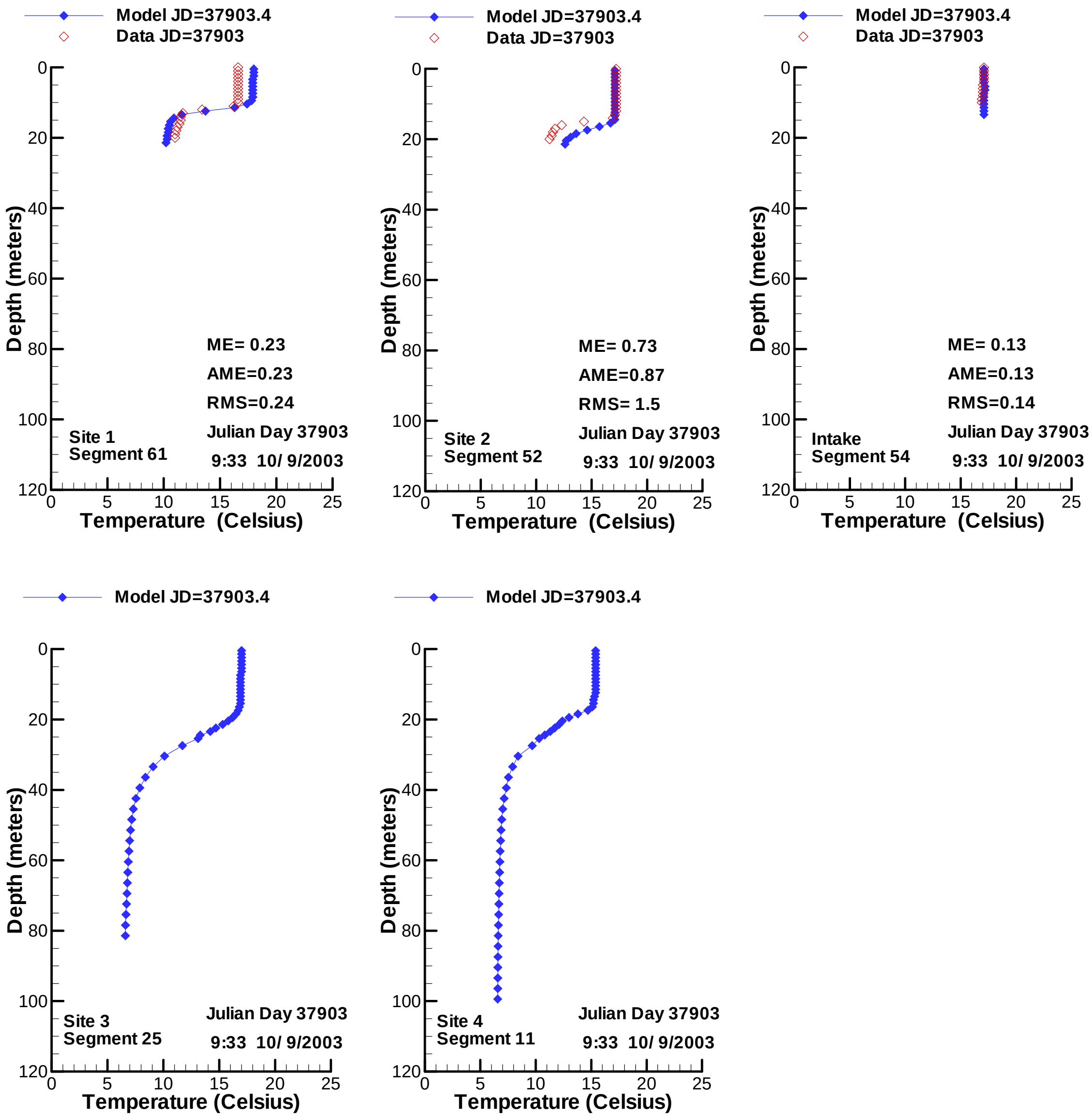

Figure 539. Vertical profiles of TEMPERATURE compared with data for 10/ 9/2003.

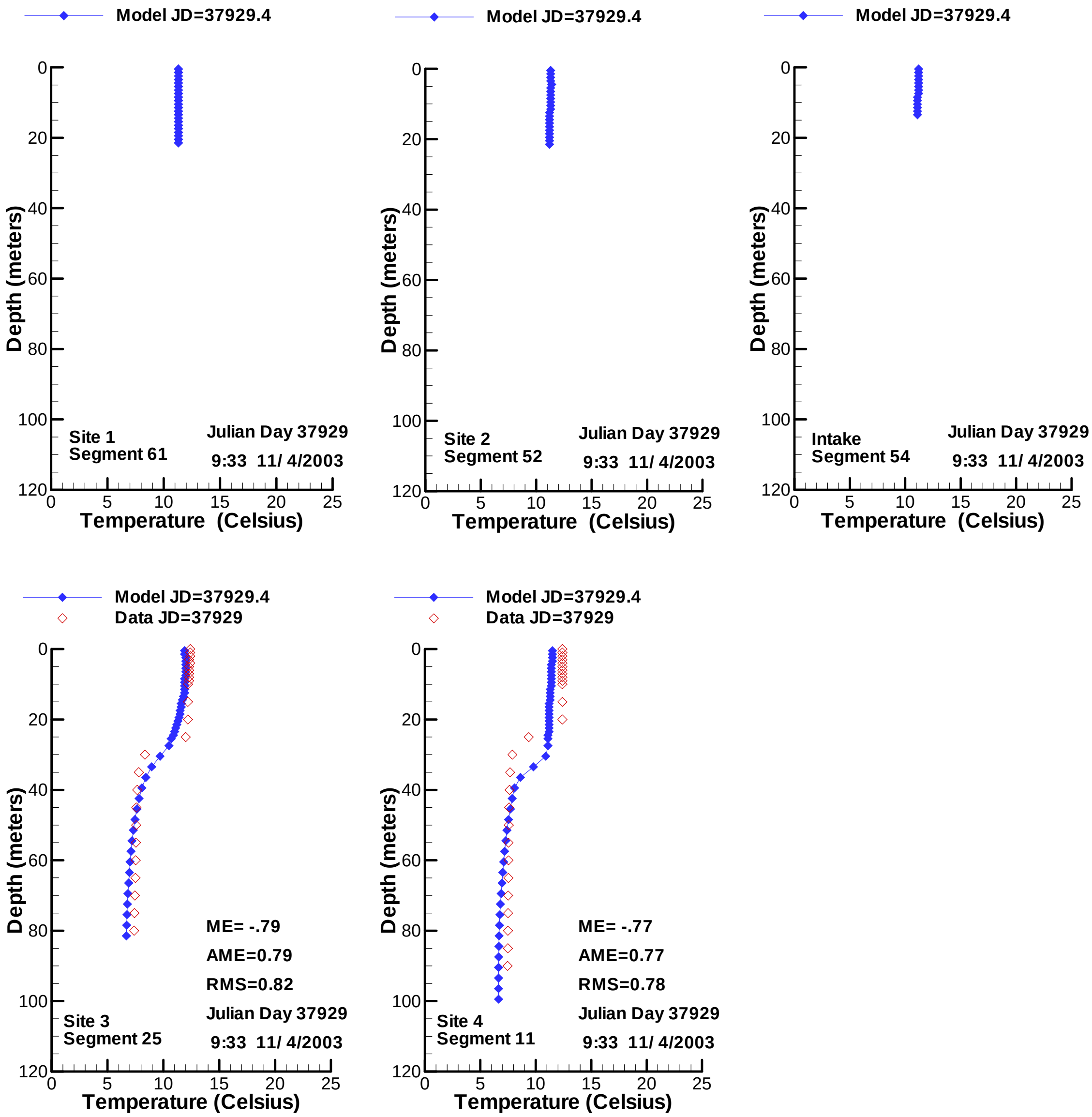

Figure 540. Vertical profiles of TEMPERATURE compared with data for 11/ 4/2003.

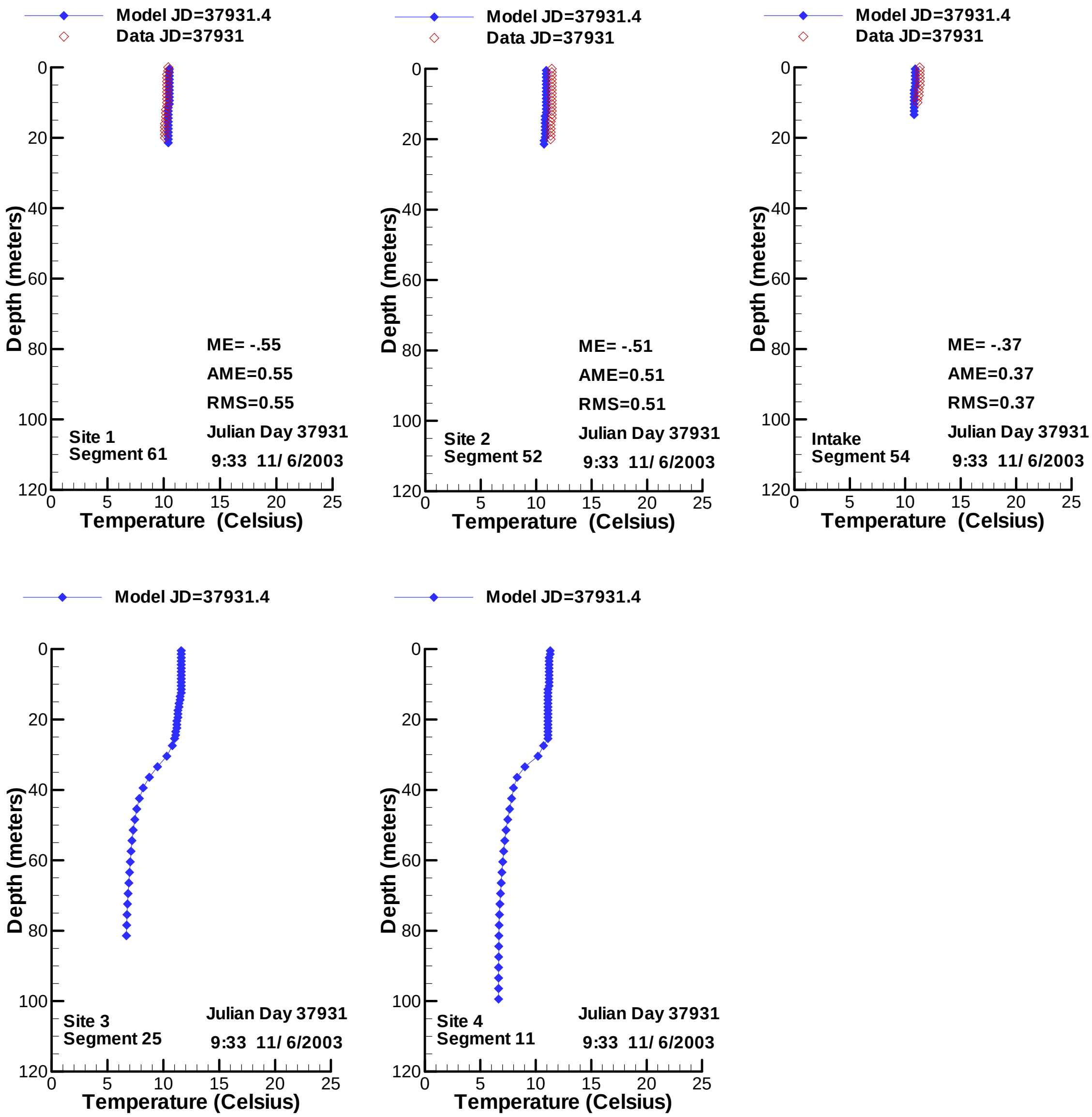

Figure 541. Vertical profiles of TEMPERATURE compared with data for 11/ 6/2003.

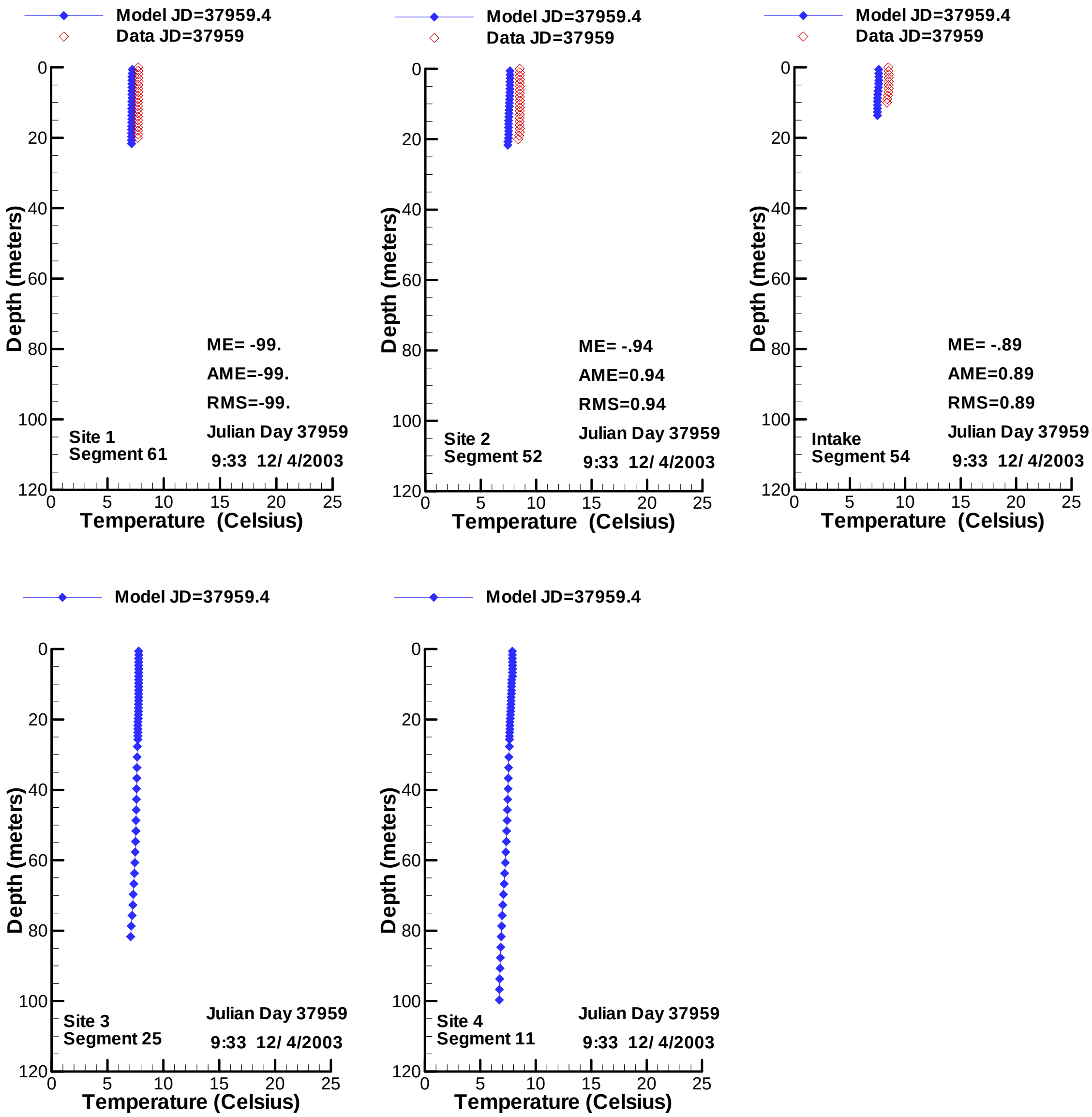

Figure 542. Vertical profiles of TEMPERATURE compared with data for 12/ 4/2003.

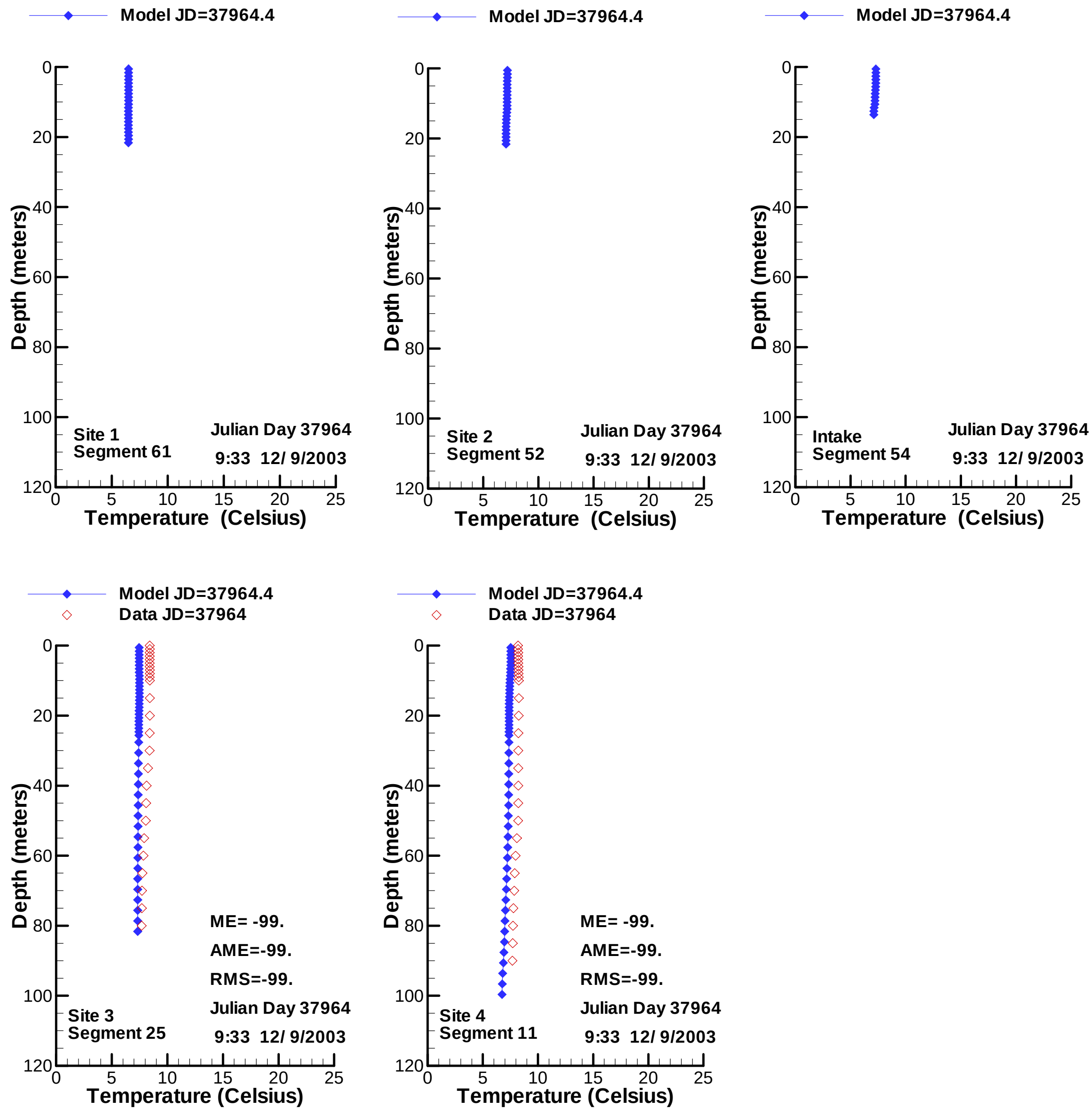

Figure 543. Vertical profiles of TEMPERATURE compared with data for 12/ 9/2003.

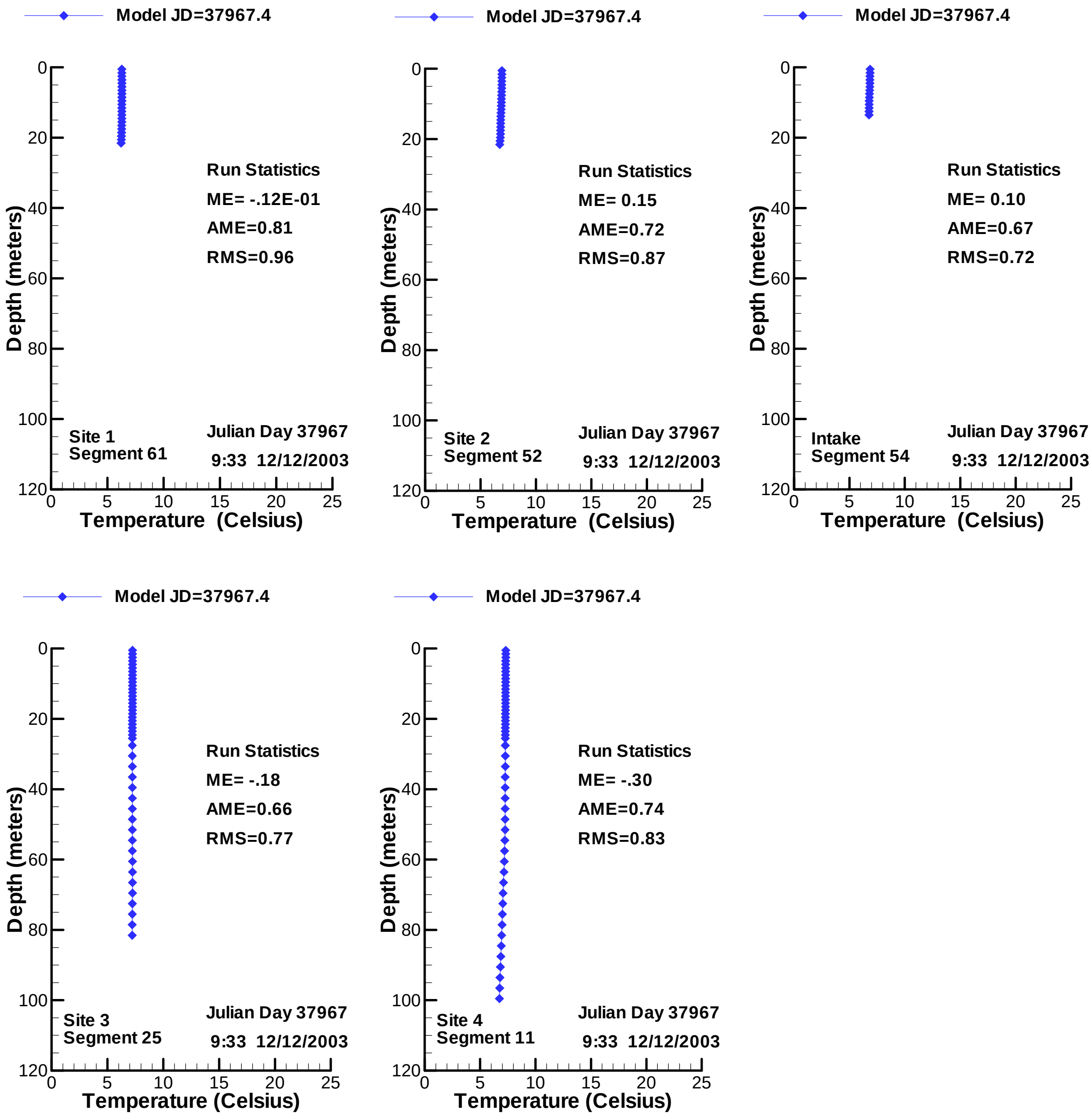

Figure 544. Vertical profiles of TEMPERATURE compared with data for 12/12/2003.

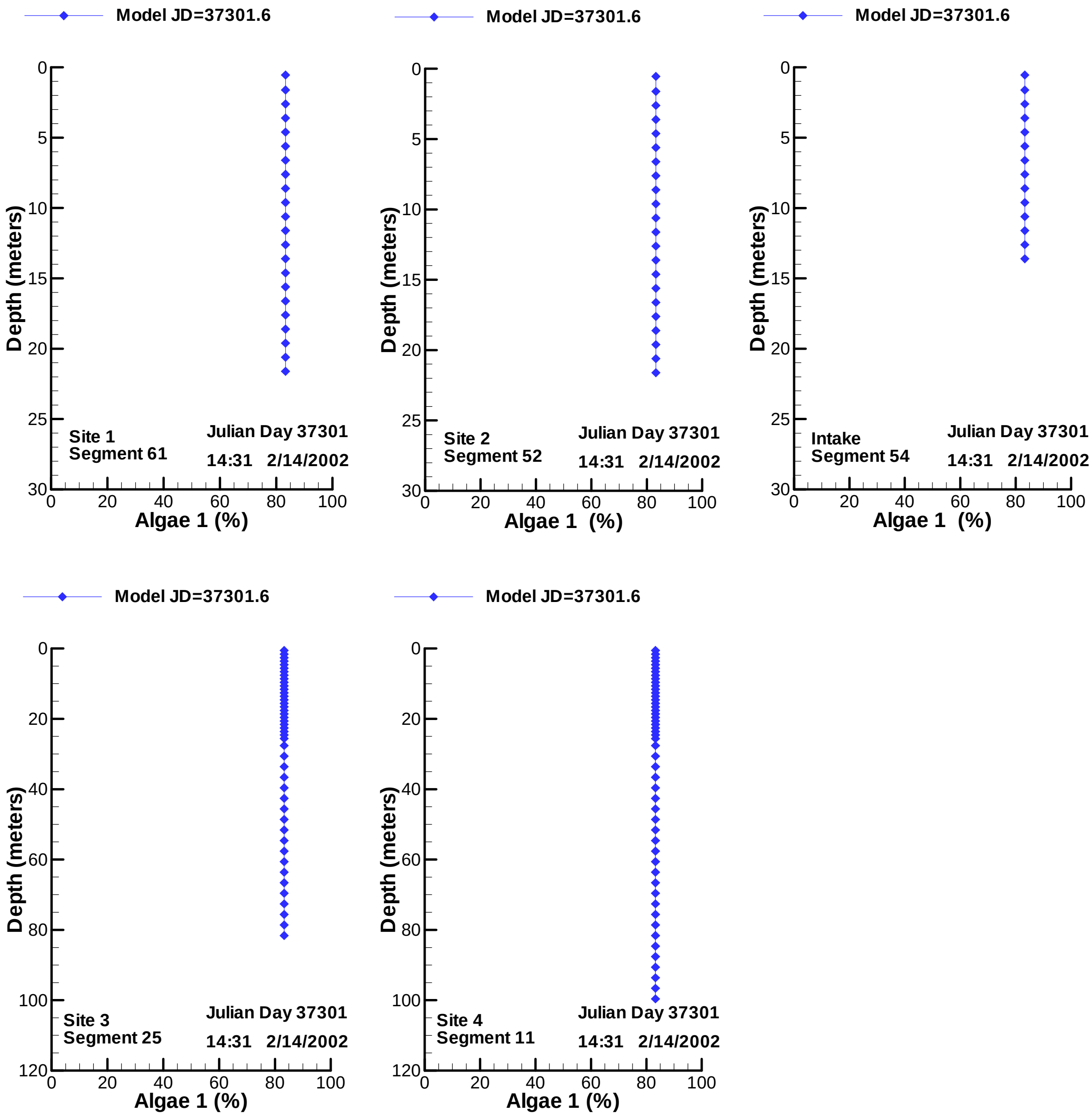

Figure 545. Vertical profiles of CHRYSOPHYTA compared with data for 2/14/2002.

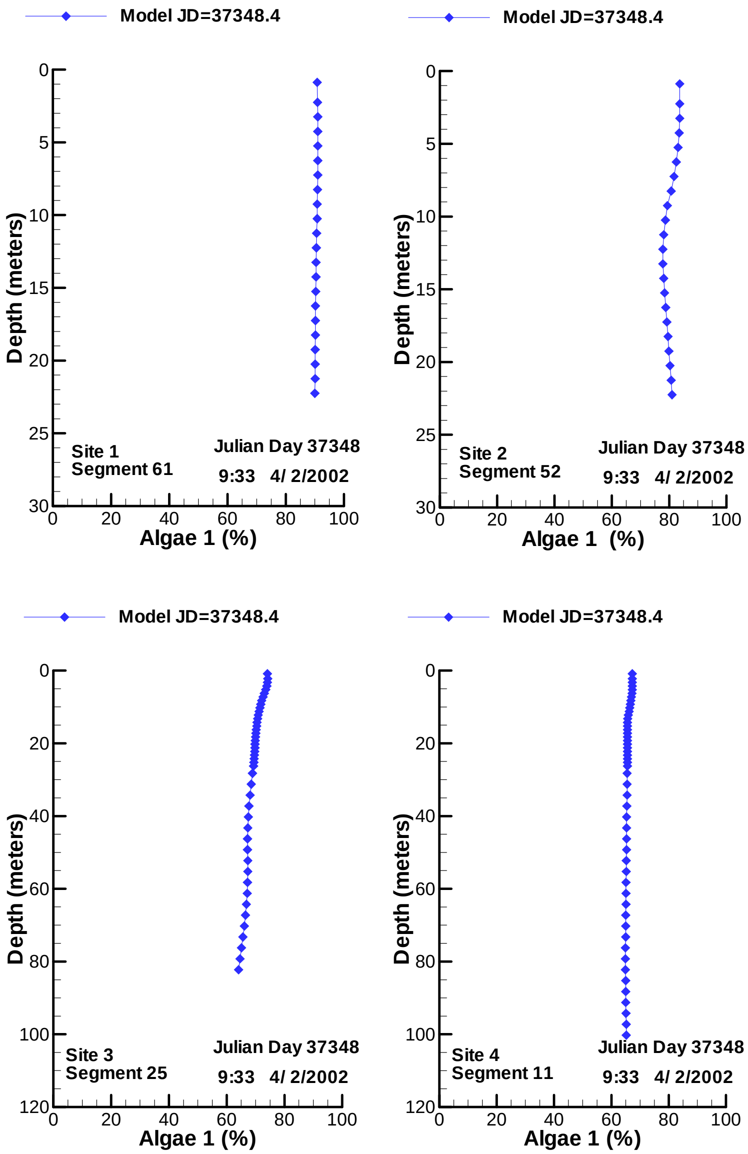

Figure 546. Vertical profiles of CHRYSOPHYTA compared with data for 4/ 2/2002.

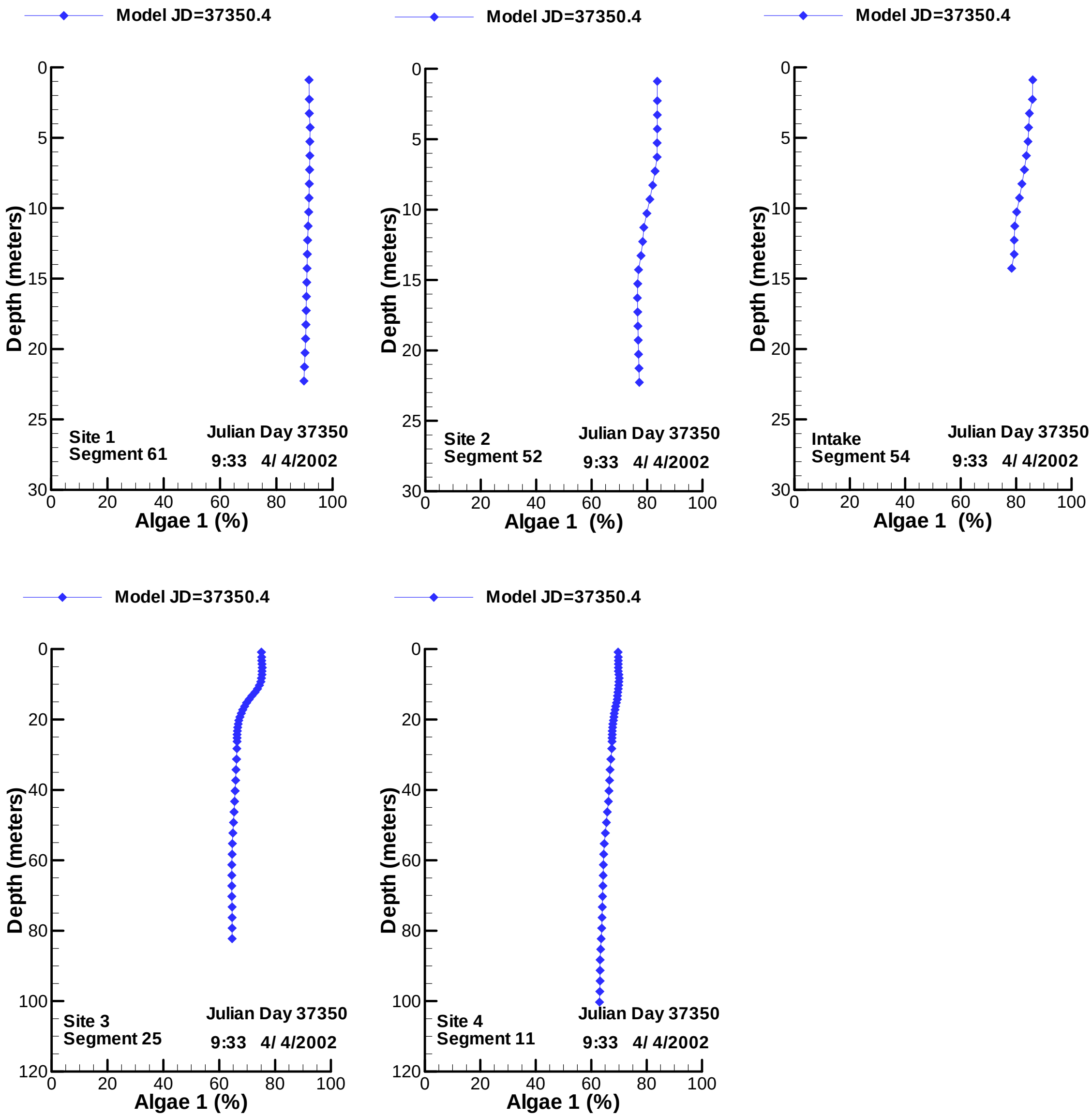

Figure 547. Vertical profiles of CHRYSOPHYTA compared with data for 4/ 4/2002.

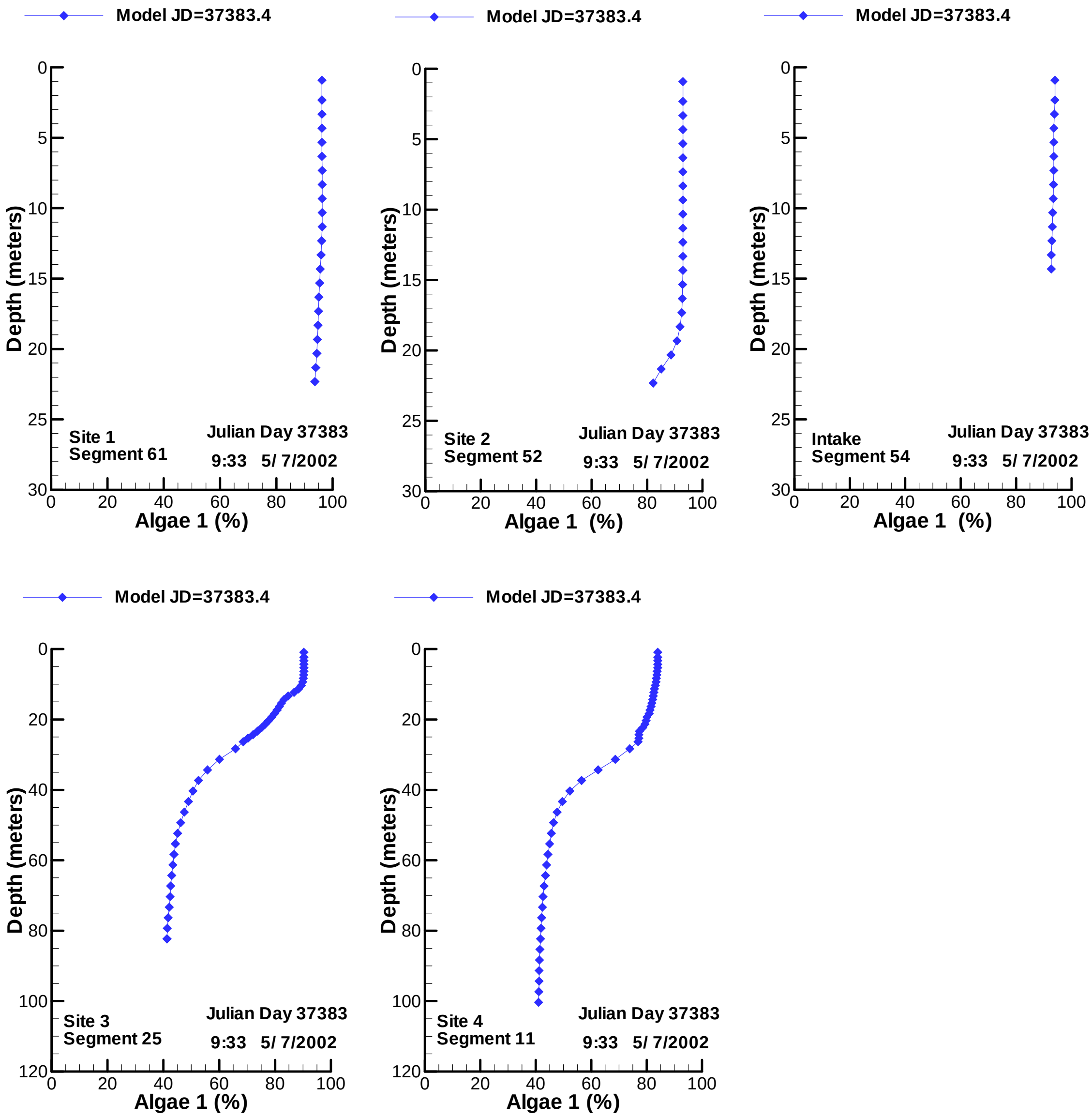

Figure 548. Vertical profiles of CHRYSOPHYTA compared with data for 5/ 7/2002.

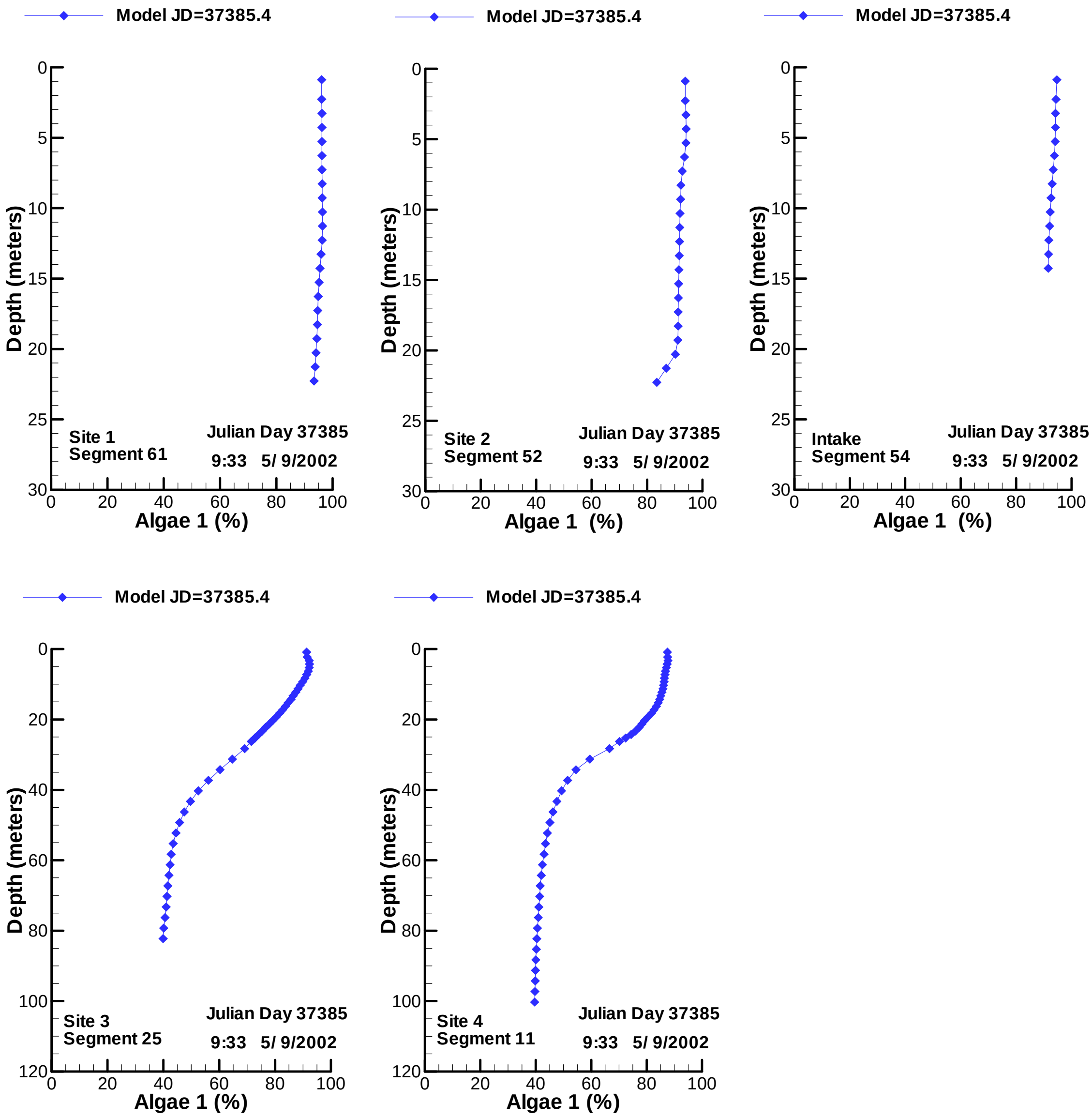

Figure 549. Vertical profiles of CHRYSOPHYTA compared with data for 5/ 9/2002.

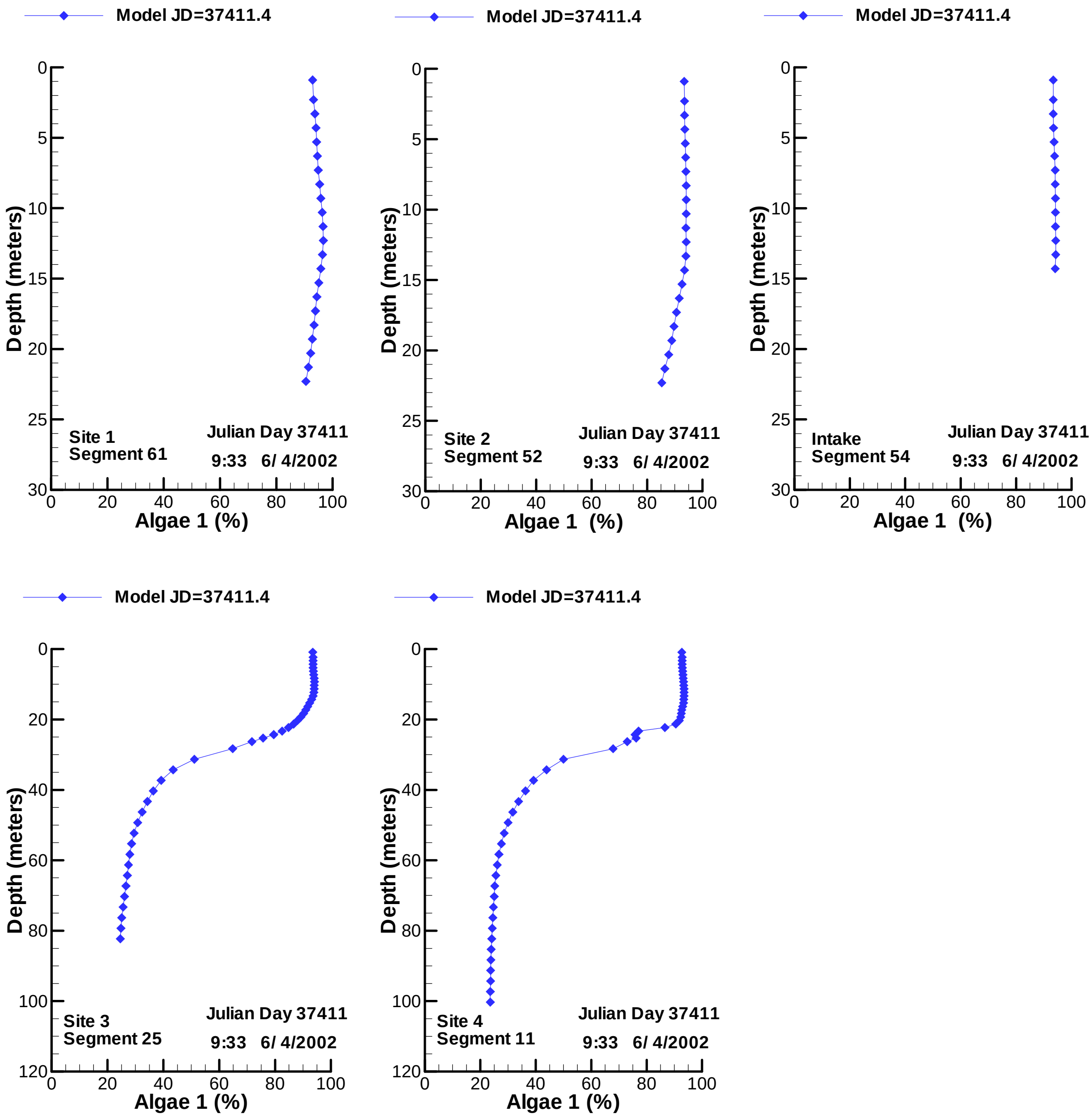

Figure 550. Vertical profiles of CHRYSOPHYTA compared with data for 6/ 4/2002.

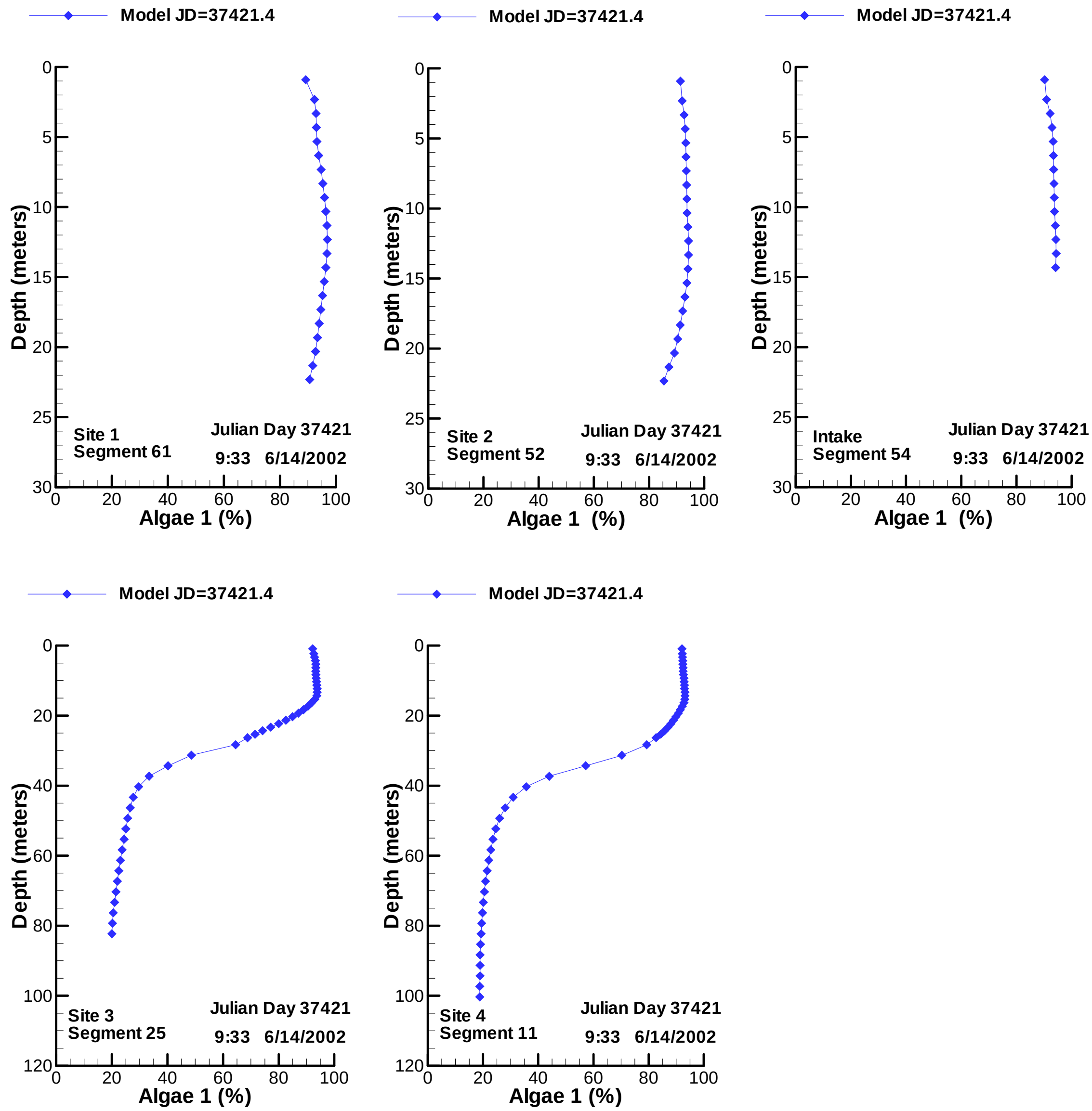

Figure 551. Vertical profiles of CHRYSOPHYTA compared with data for 6/14/2002.

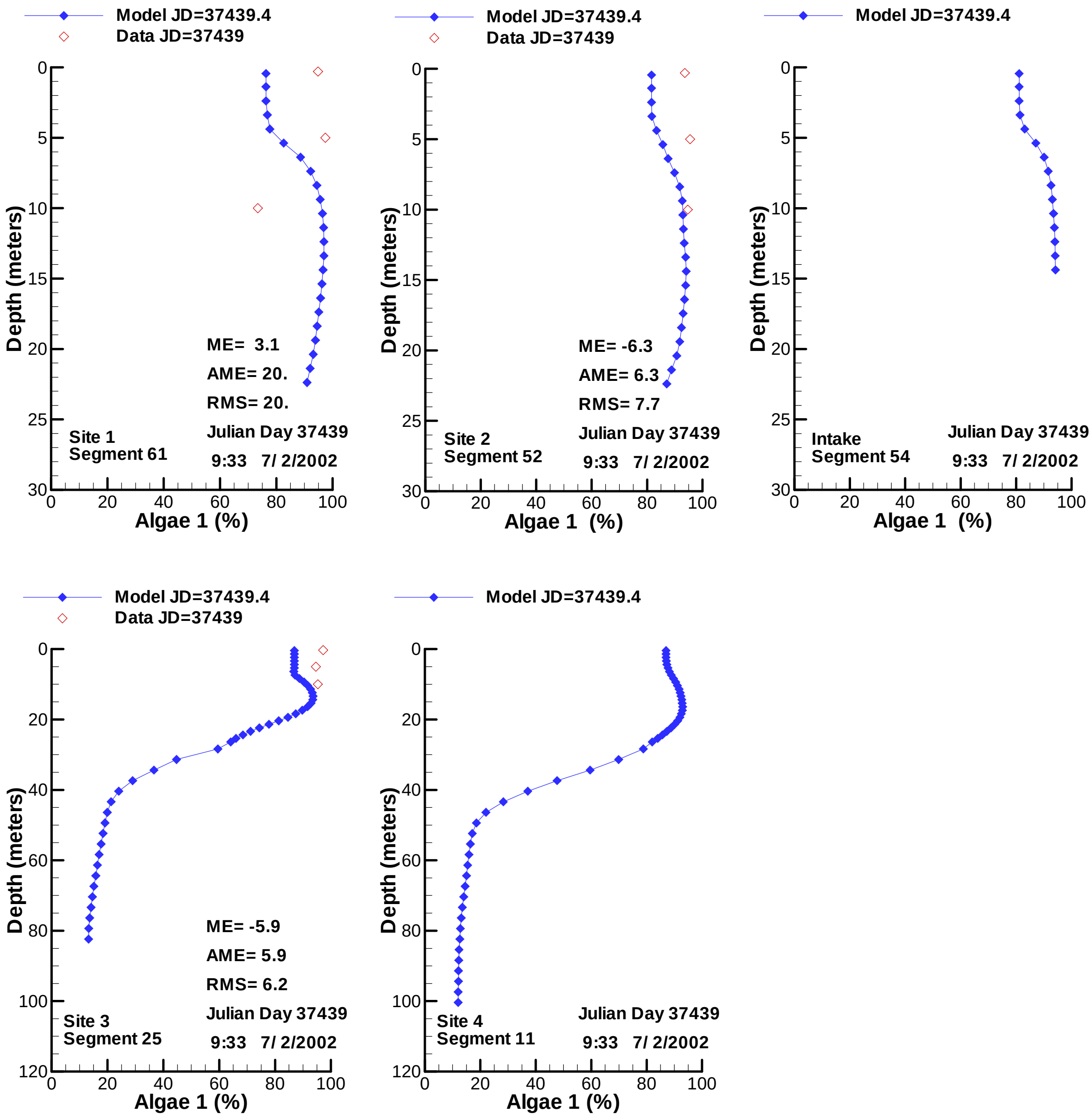

Figure 552. Vertical profiles of CHRYSOPHYTA compared with data for 7/ 2/2002.

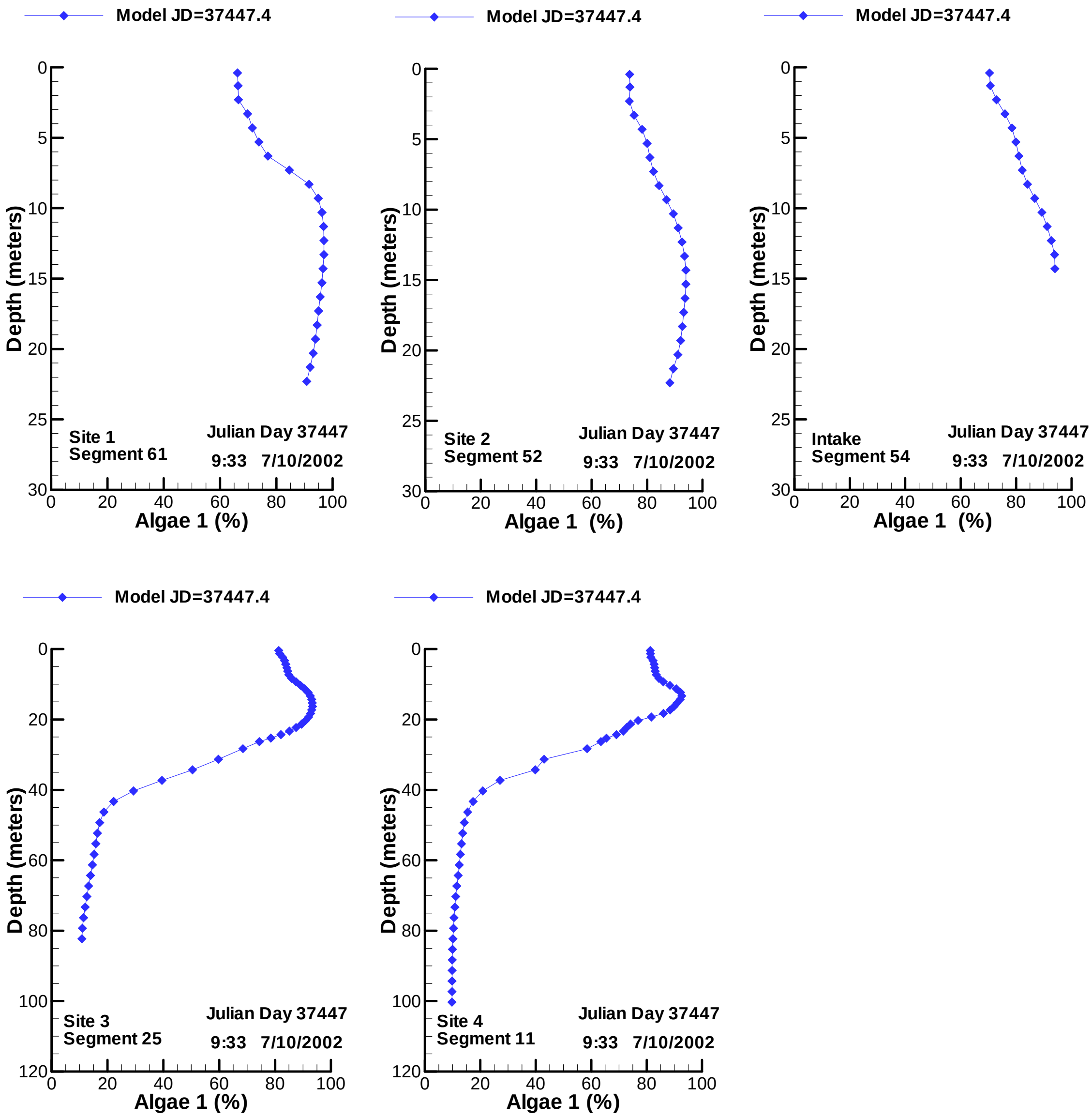

Figure 553. Vertical profiles of CHRYSOPHYTA compared with data for 7/10/2002.

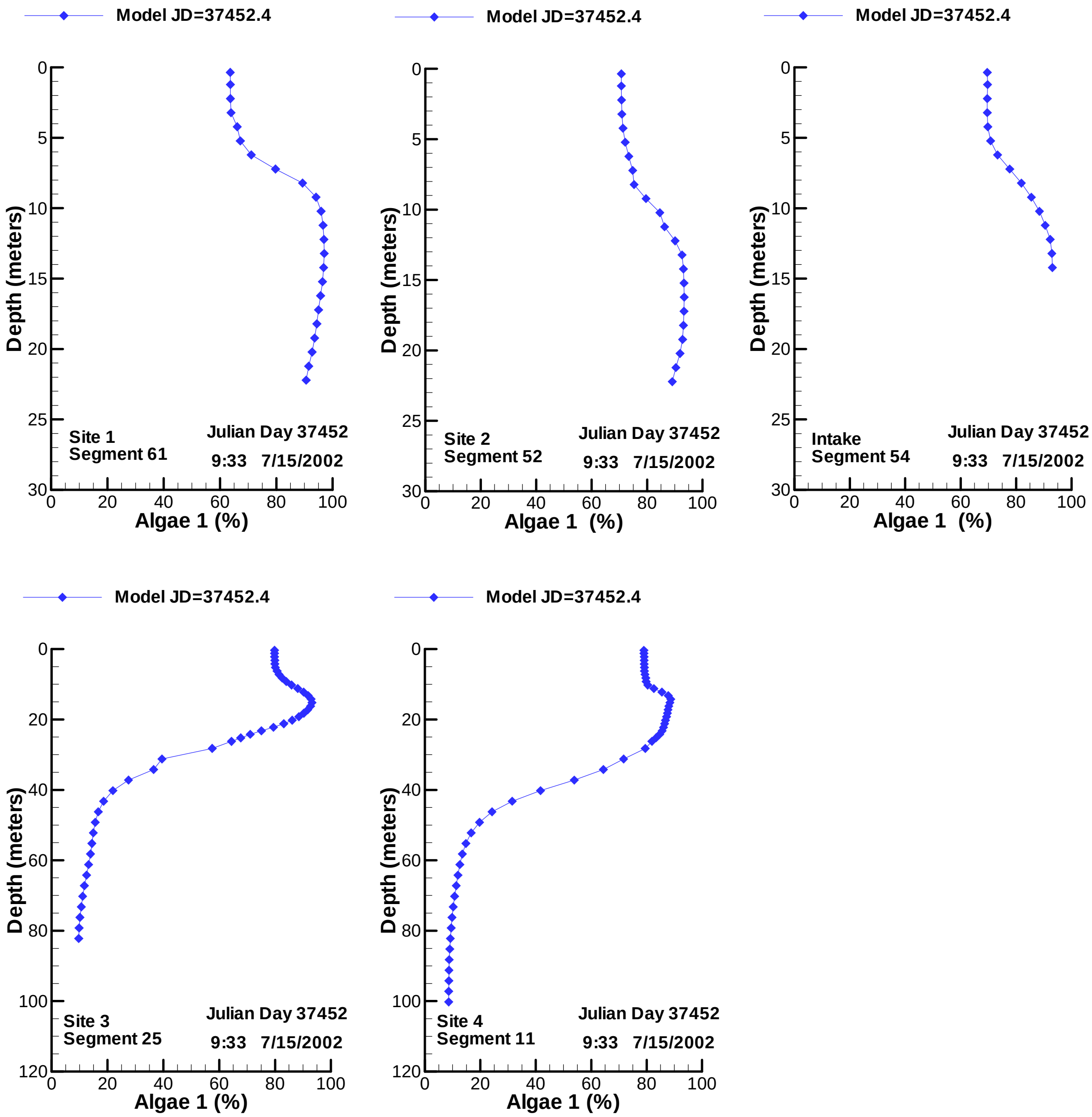

Figure 554. Vertical profiles of CHRYSOPHYTA compared with data for 7/15/2002.

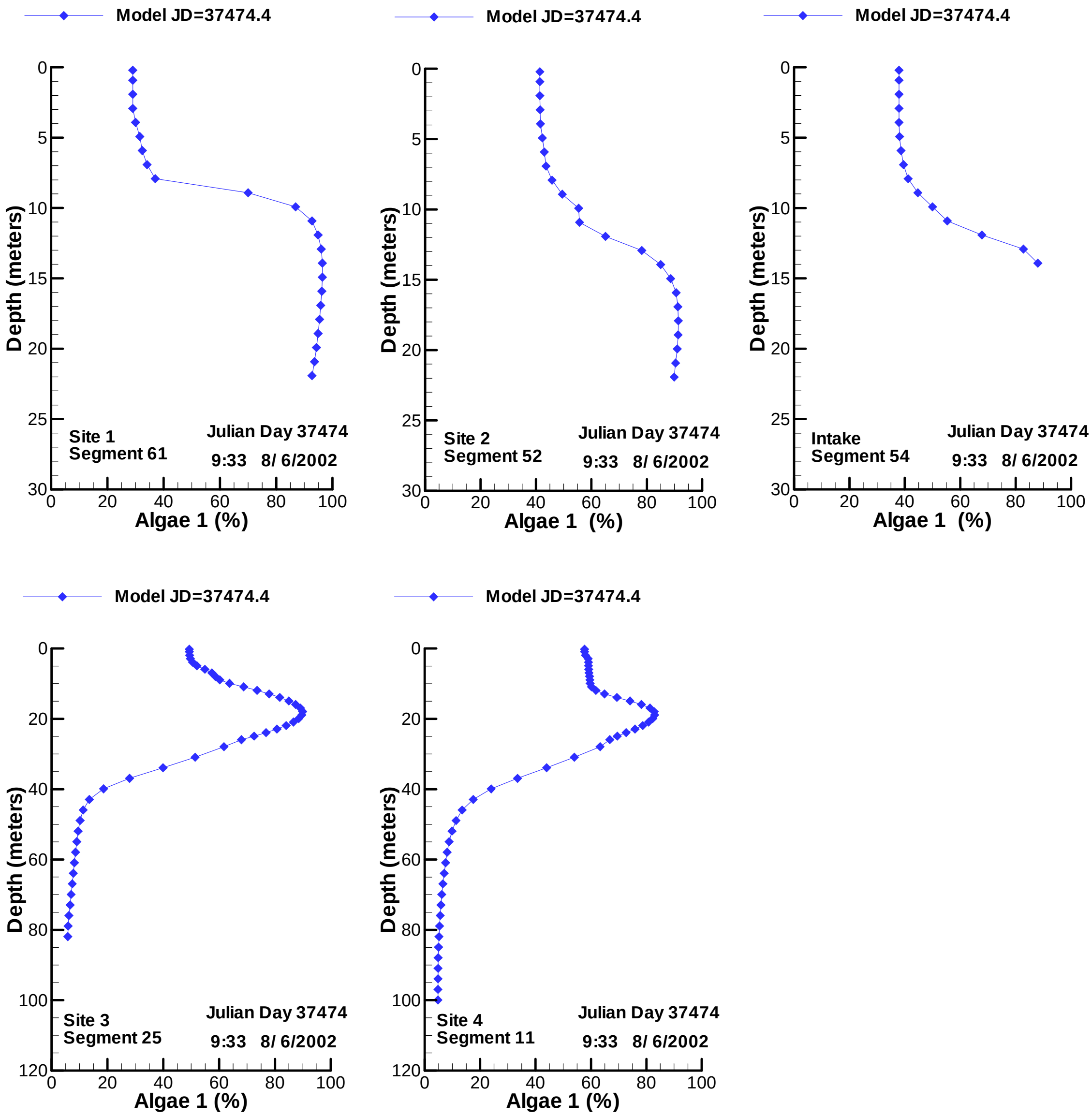

Figure 555. Vertical profiles of CHRYSOPHYTA compared with data for 8/ 6/2002.

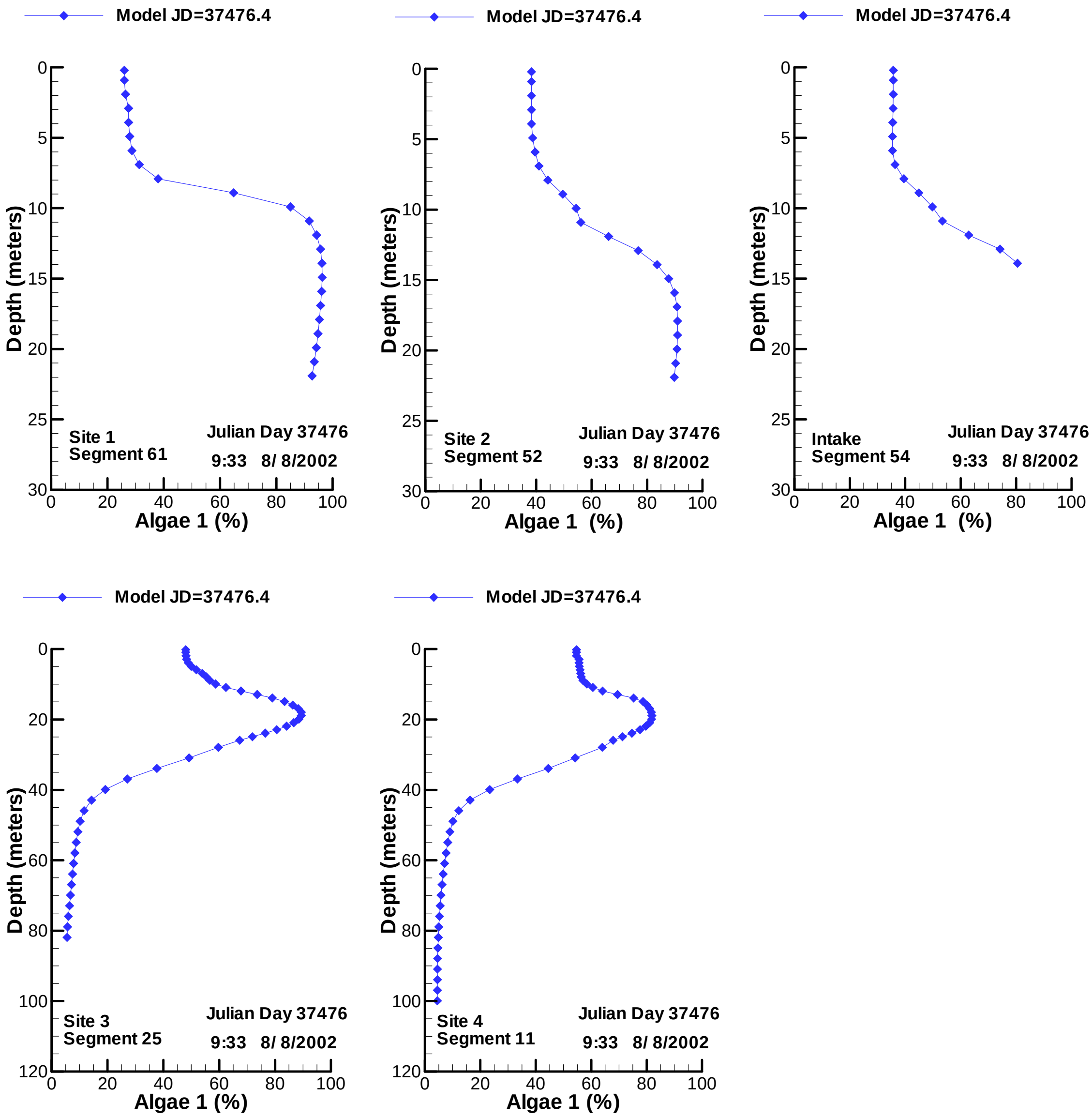

Figure 556. Vertical profiles of CHRYSOPHYTA compared with data for 8/ 8/2002.

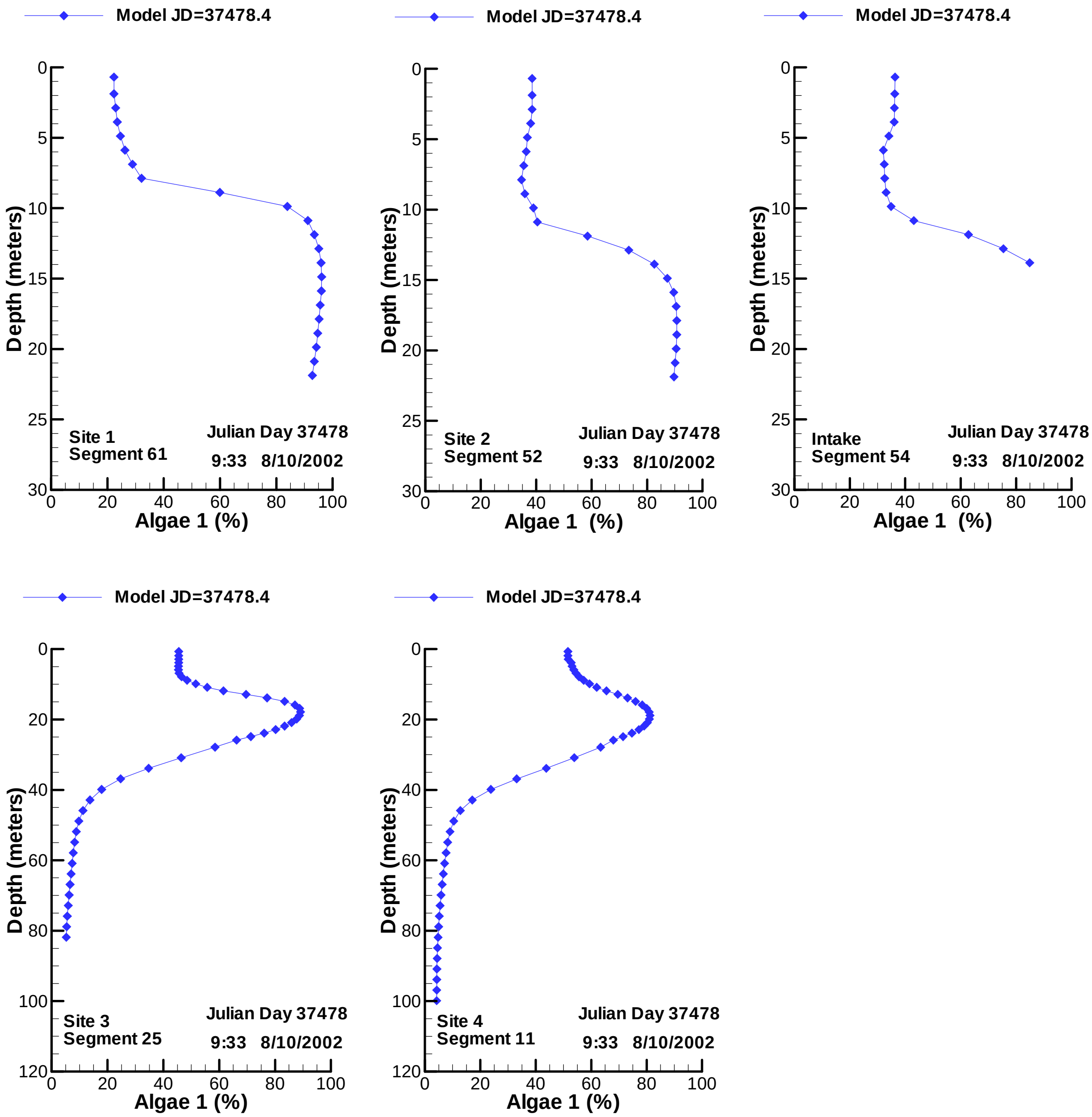

Figure 557. Vertical profiles of CHRYSOPHYTA compared with data for 8/10/2002.

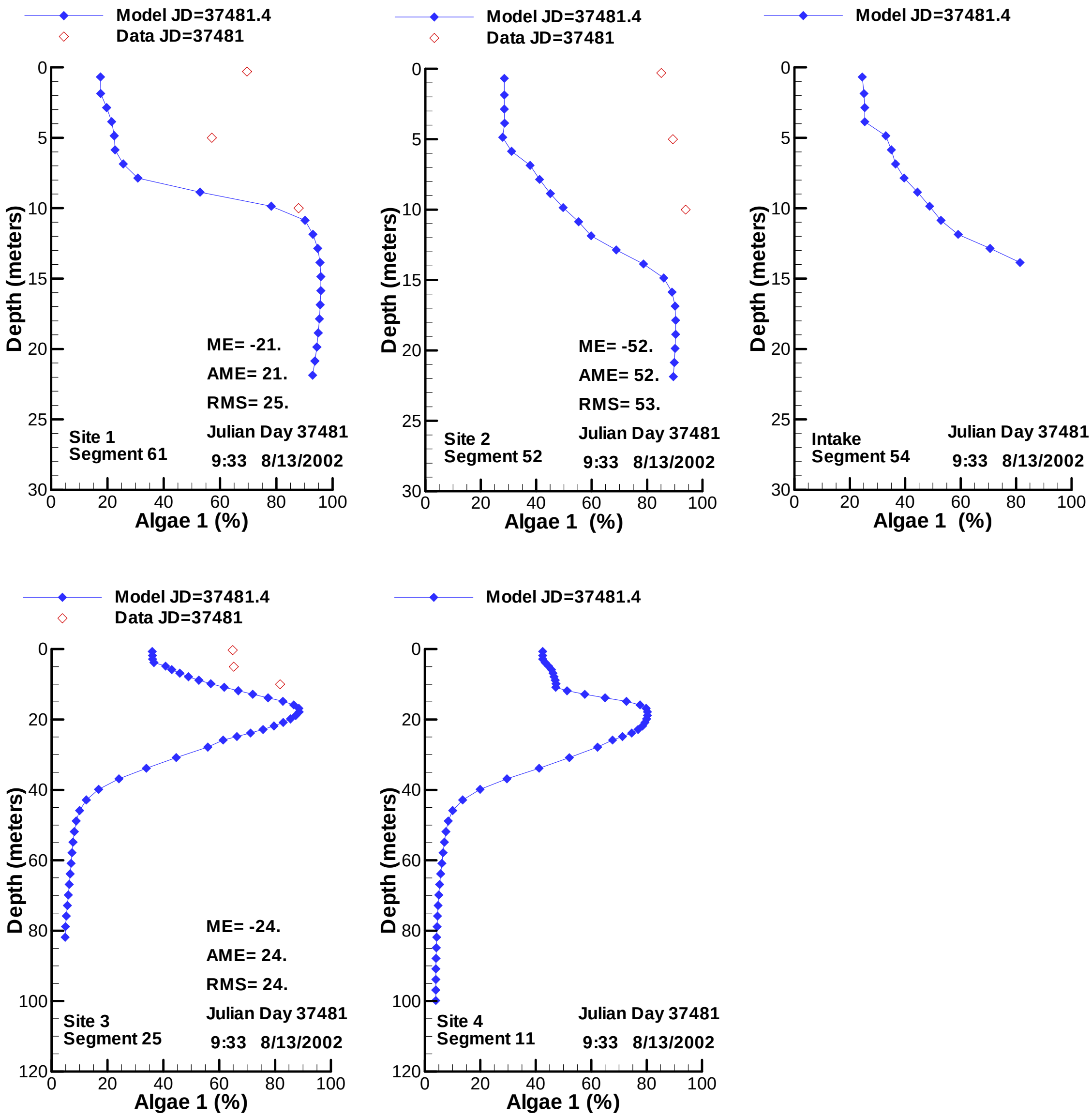

Figure 558. Vertical profiles of CHRYSOPHYTA compared with data for 8/13/2002.

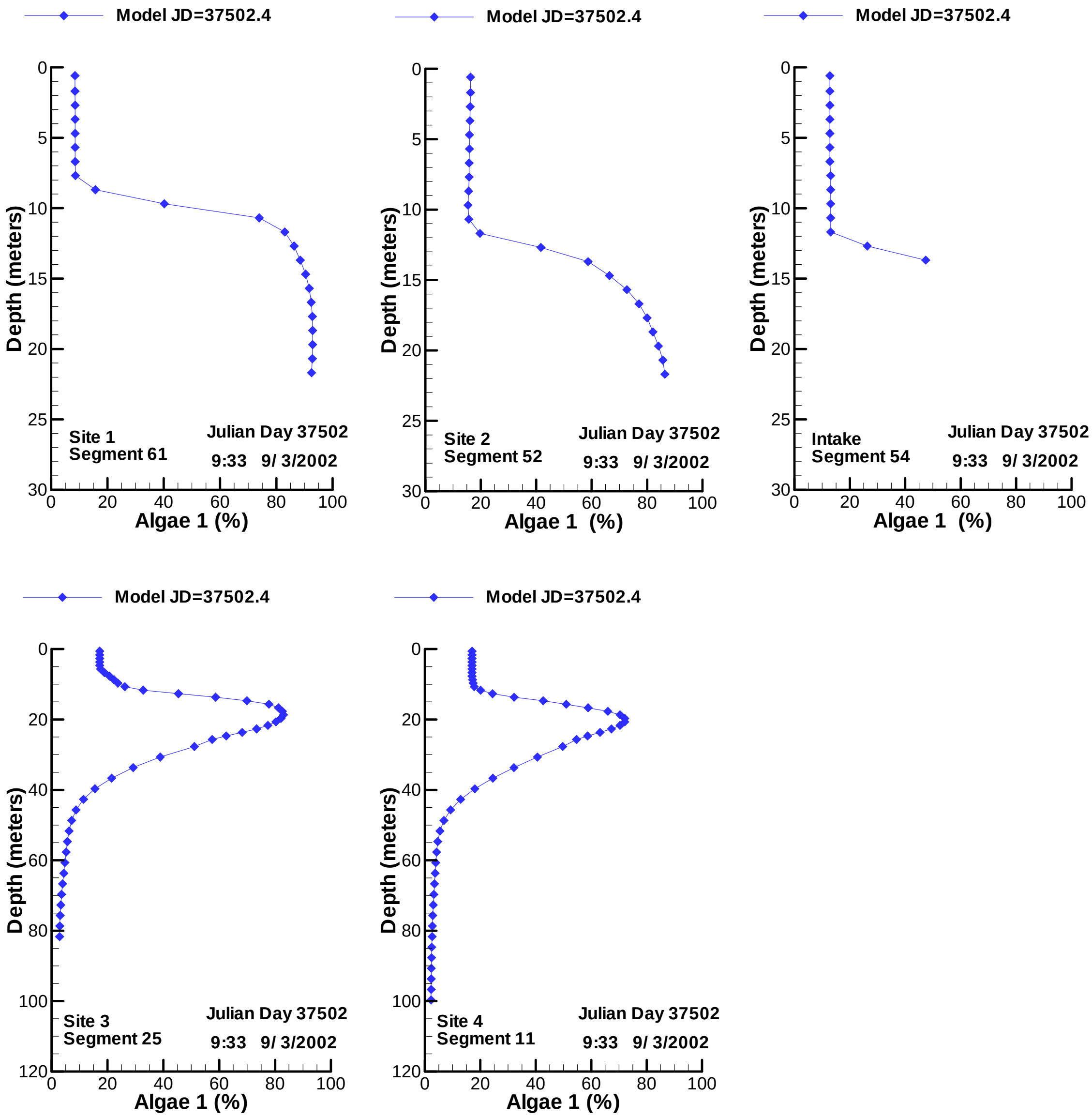

Figure 559. Vertical profiles of CHRYSOPHYTA compared with data for 9/ 3/2002.

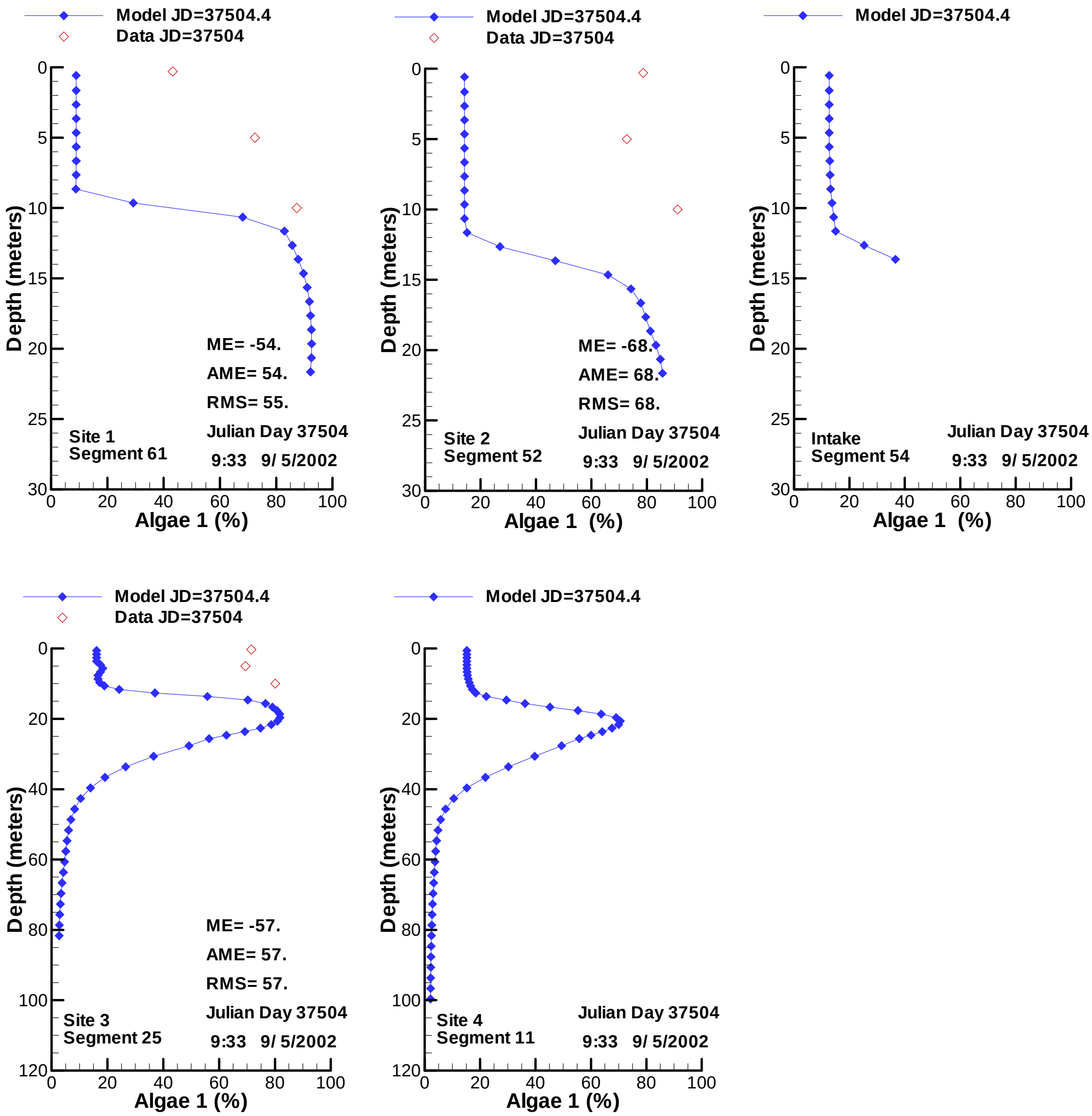

Figure 560. Vertical profiles of CHRYSOPHYTA compared with data for 9/ 5/2002.

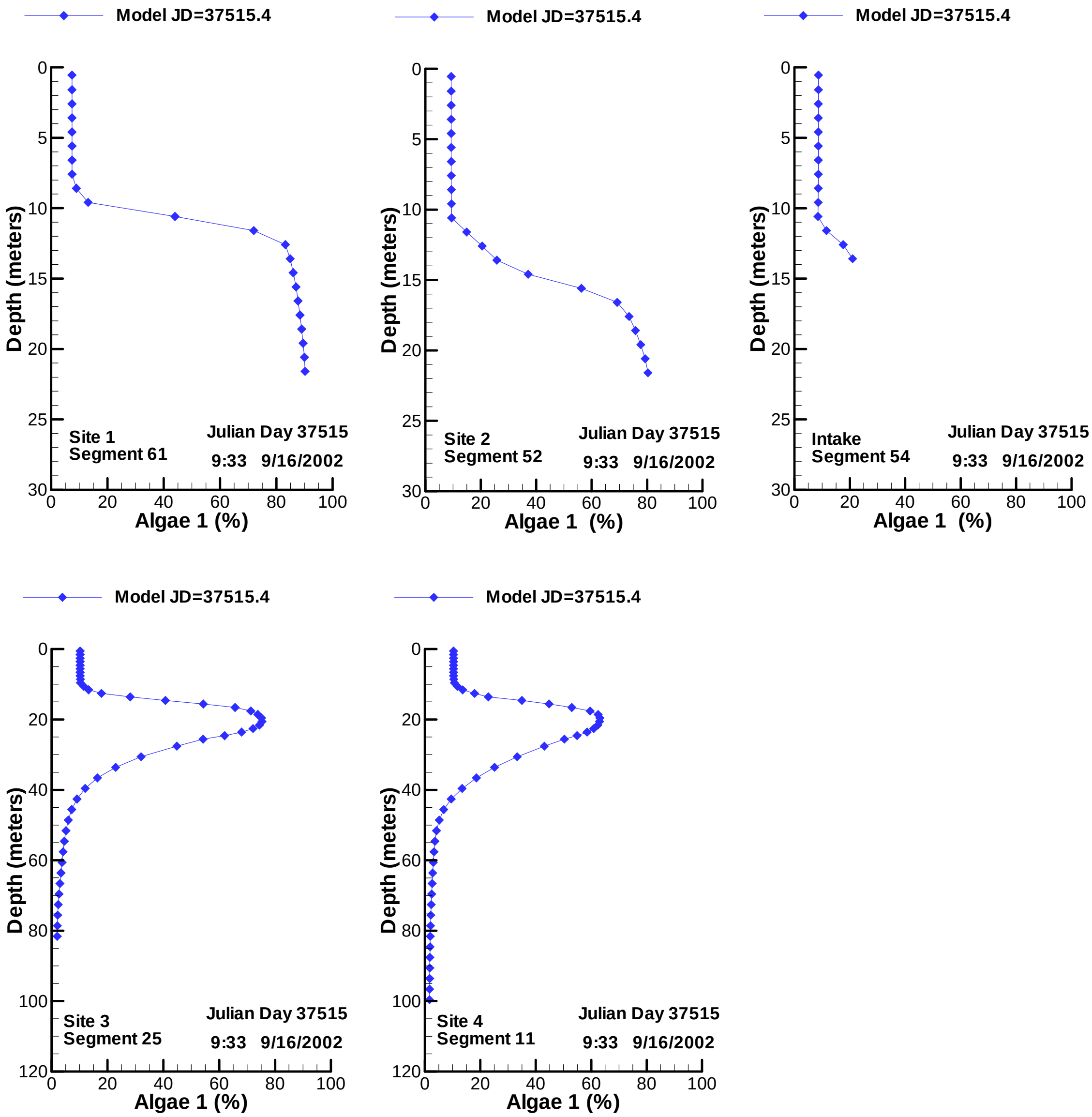

Figure 561. Vertical profiles of CHRYSOPHYTA compared with data for 9/16/2002.

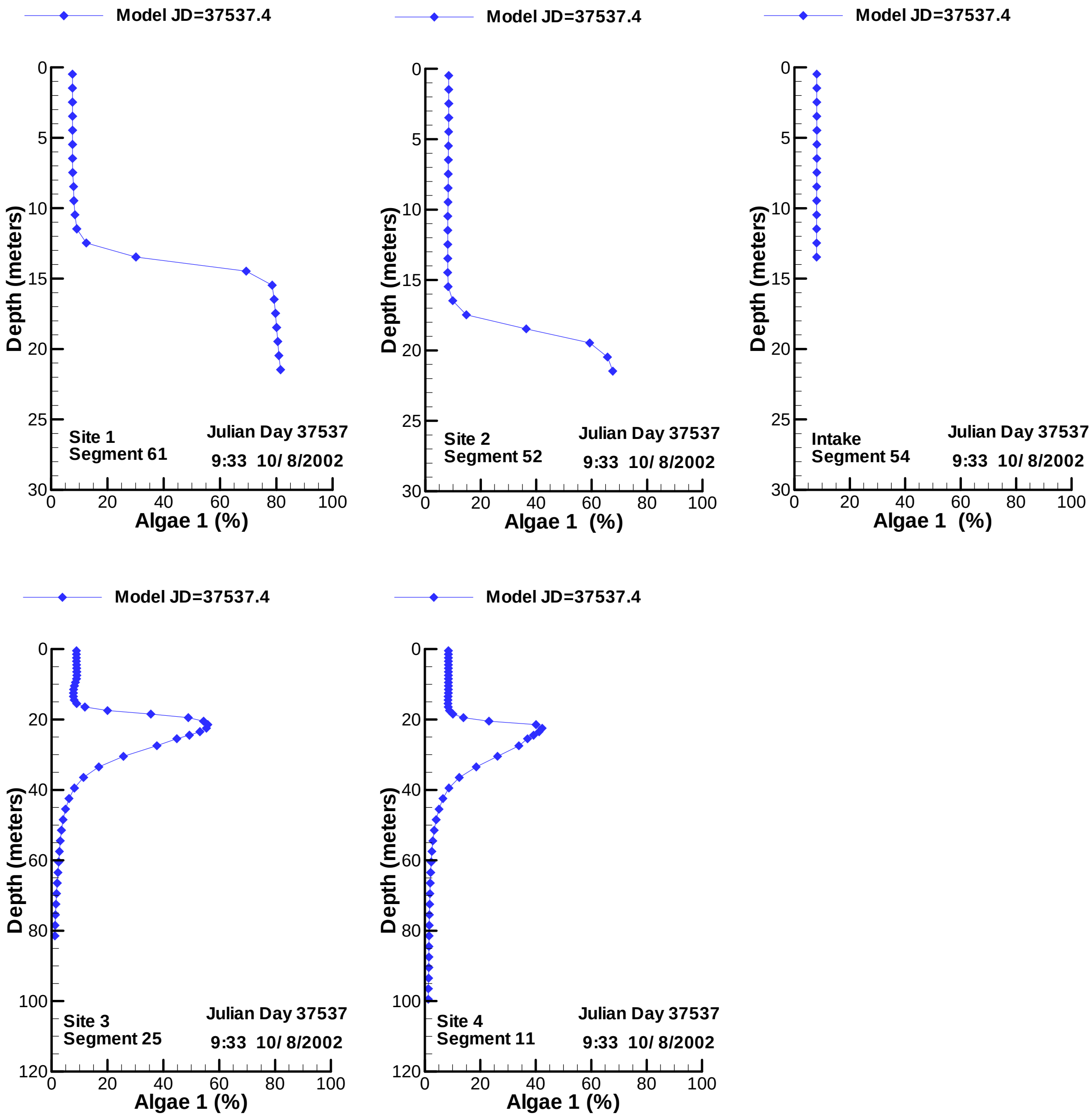

Figure 562. Vertical profiles of CHRYSOPHYTA compared with data for 10/ 8/2002.

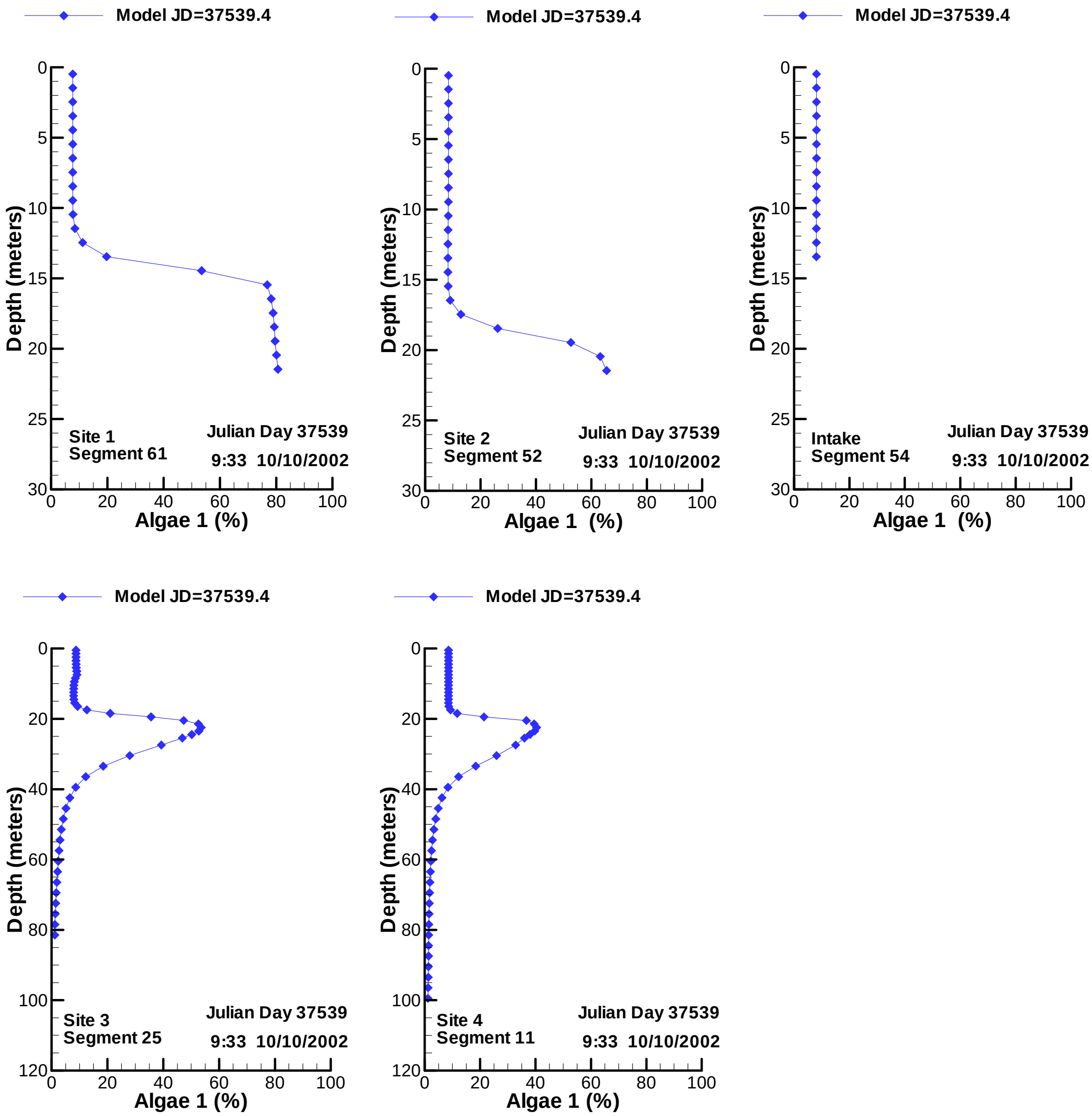

Figure 563. Vertical profiles of CHRYSOPHYTA compared with data for 10/10/2002.

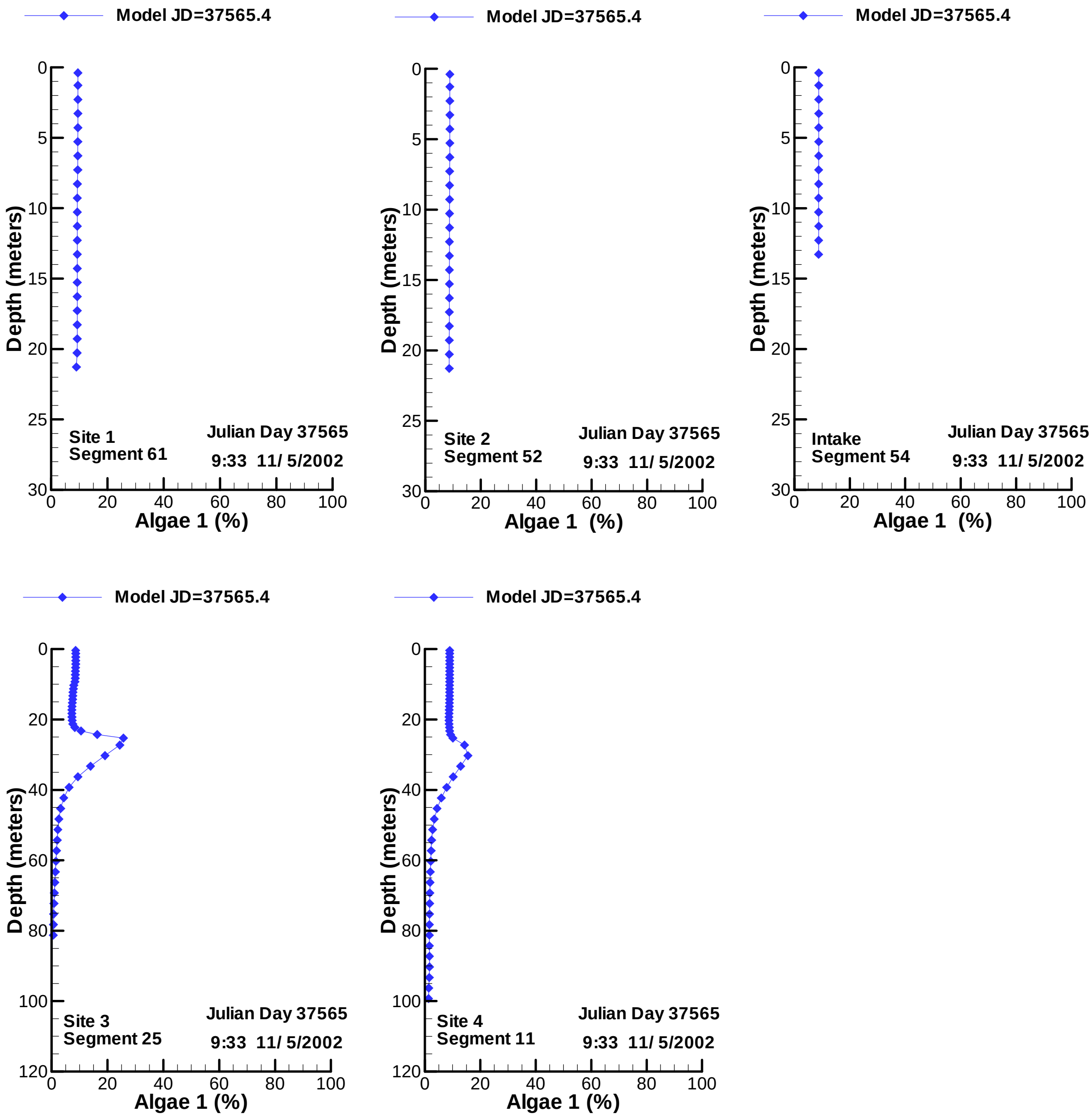

Figure 564. Vertical profiles of CHRYSOPHYTA compared with data for 11/ 5/2002.

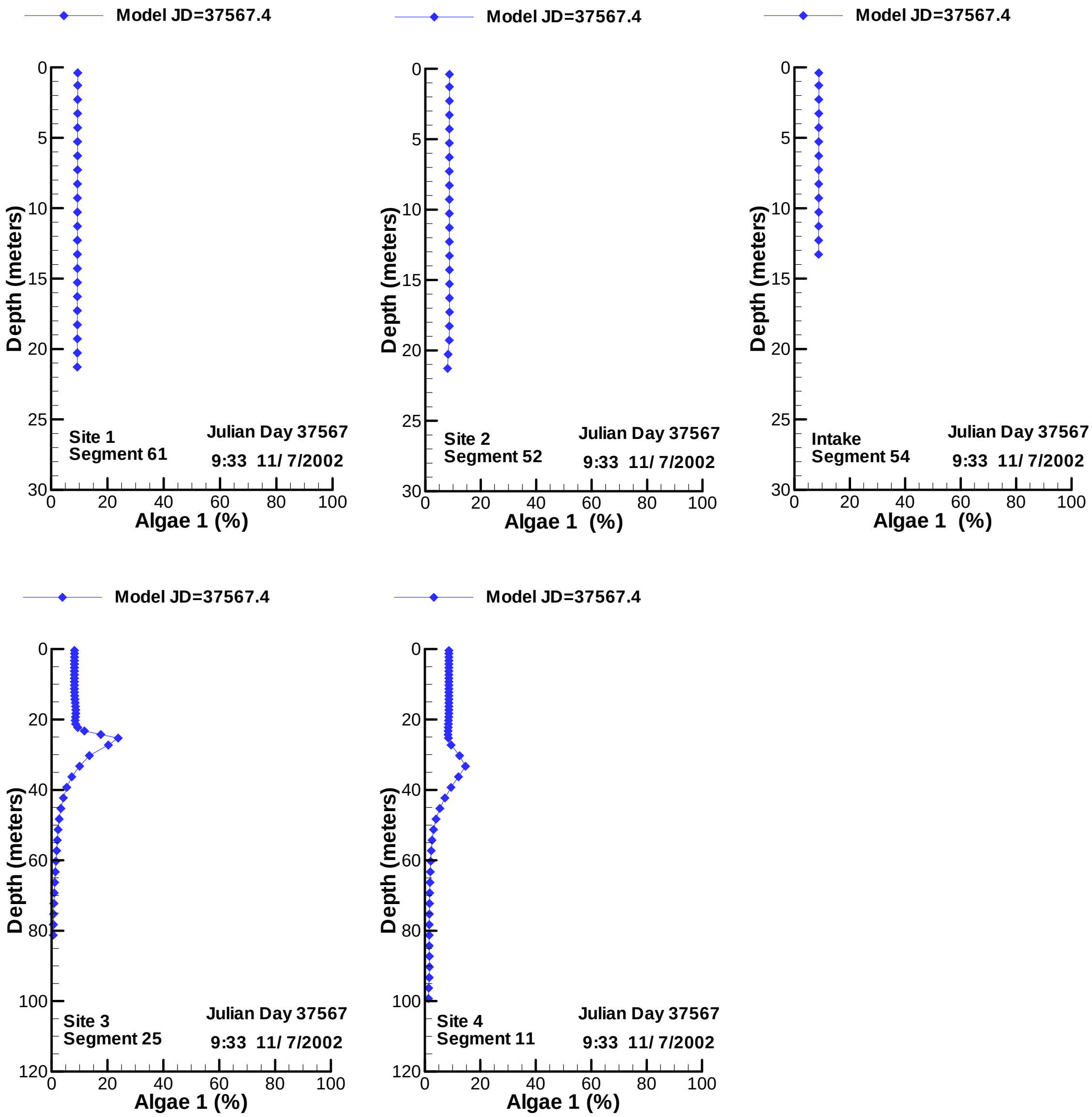

Figure 565. Vertical profiles of CHRYSOPHYTA compared with data for 11/ 7/2002.

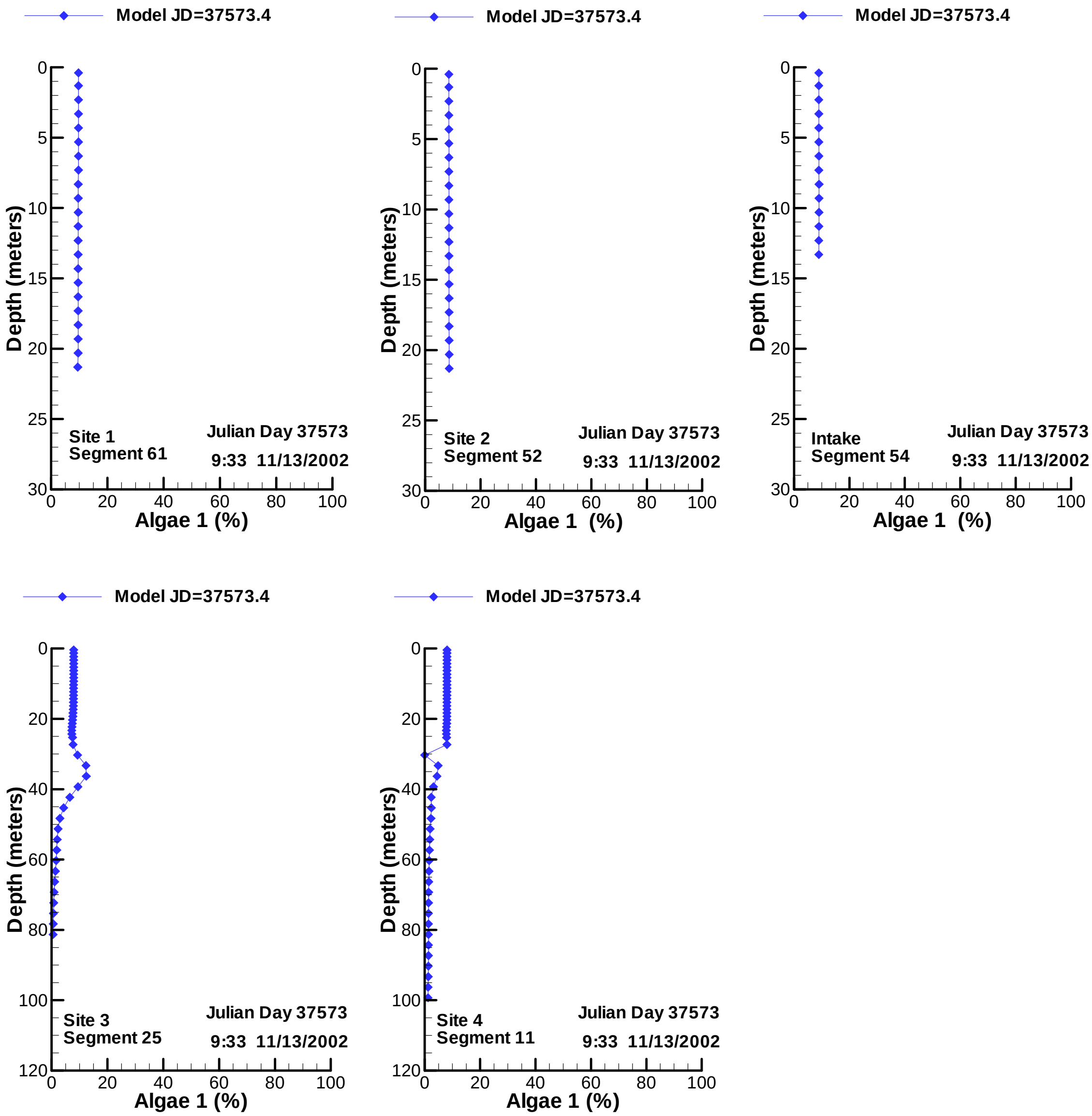

Figure 566. Vertical profiles of CHRYSOPHYTA compared with data for 11/13/2002.

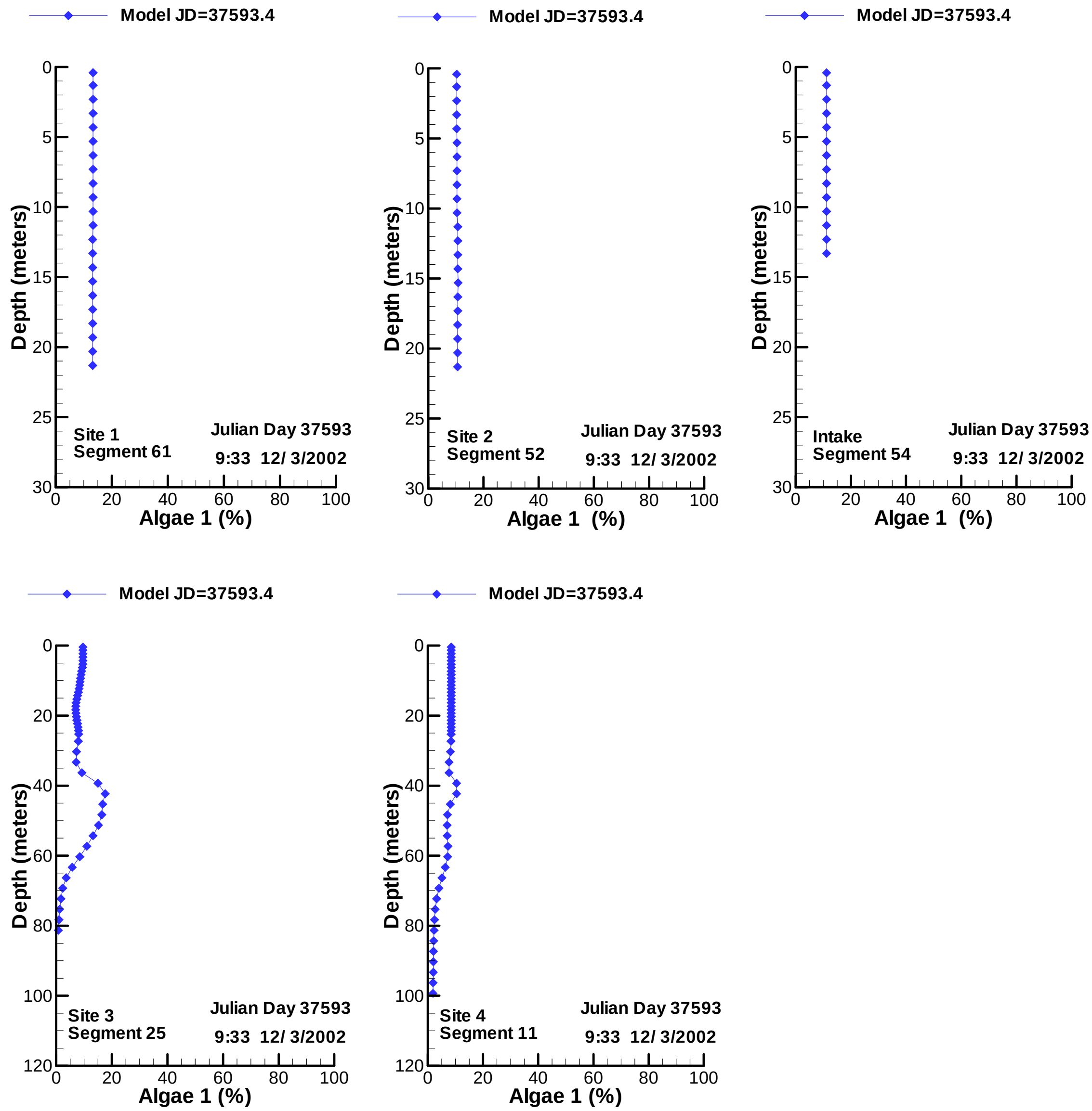

Figure 567. Vertical profiles of CHRYSOPHYTA compared with data for 12/ 3/2002.

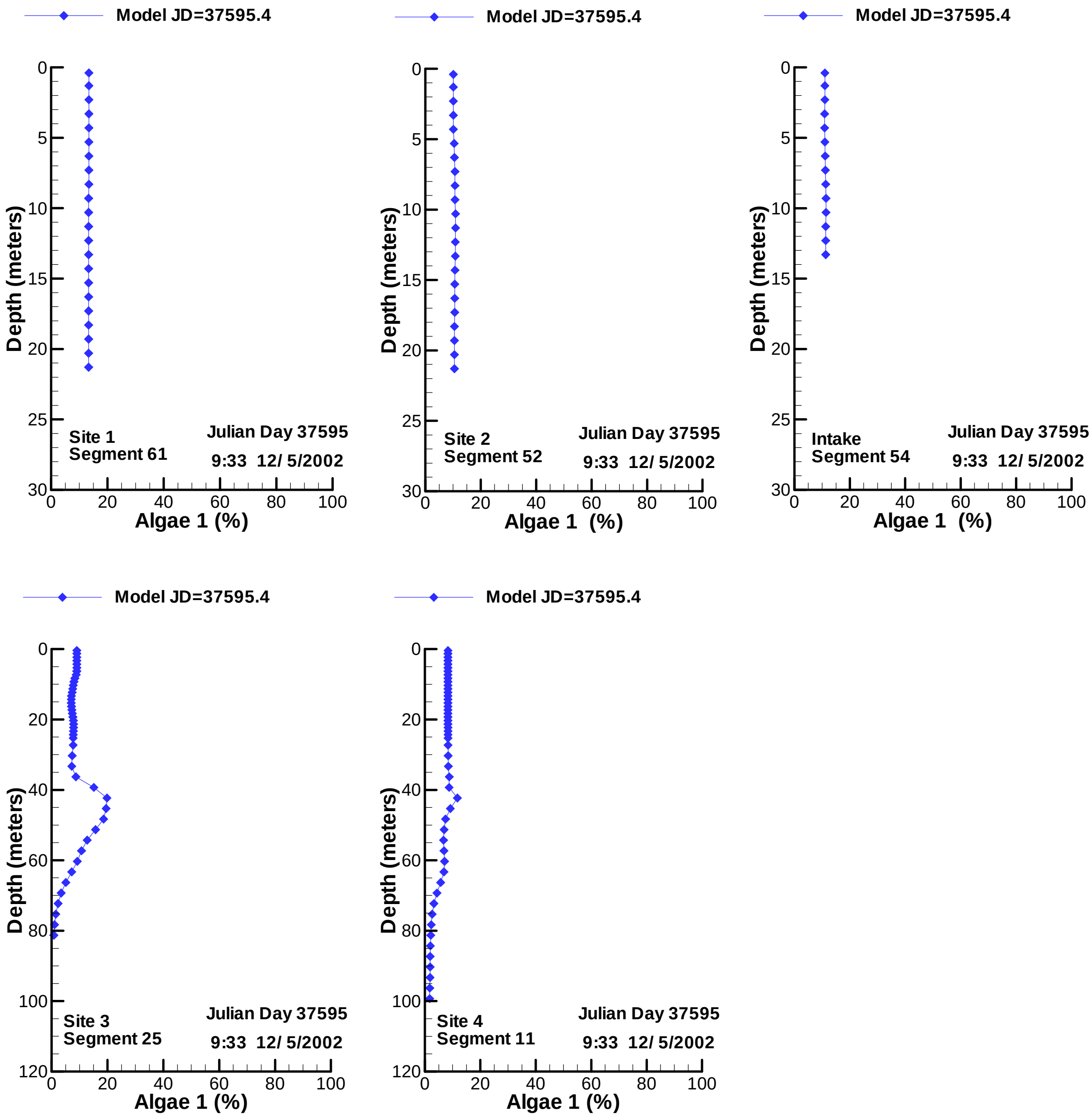

Figure 568. Vertical profiles of CHRYSOPHYTA compared with data for 12/ 5/2002.

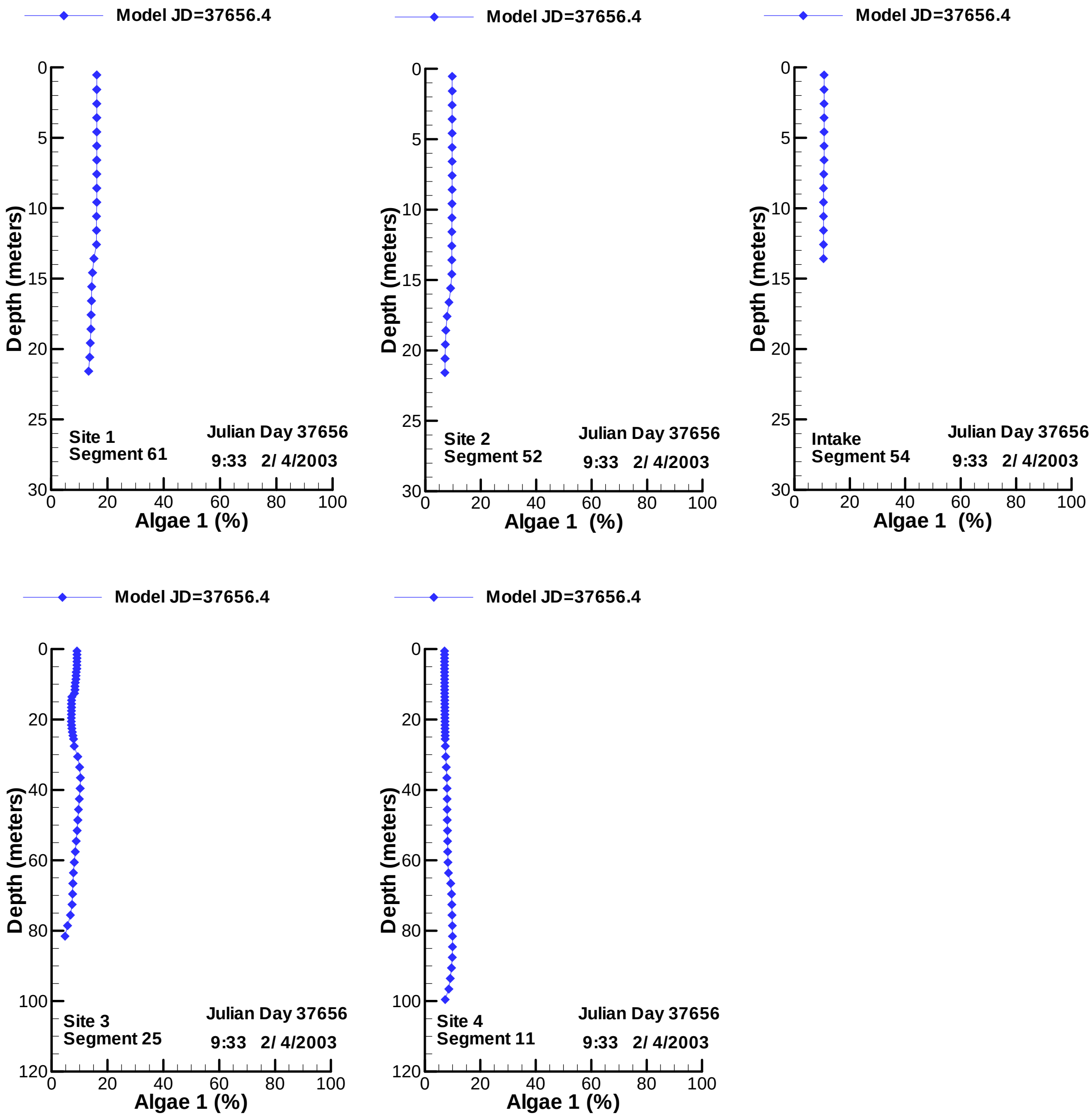

Figure 569. Vertical profiles of CHRYSOPHYTA compared with data for 2/ 4/2003.

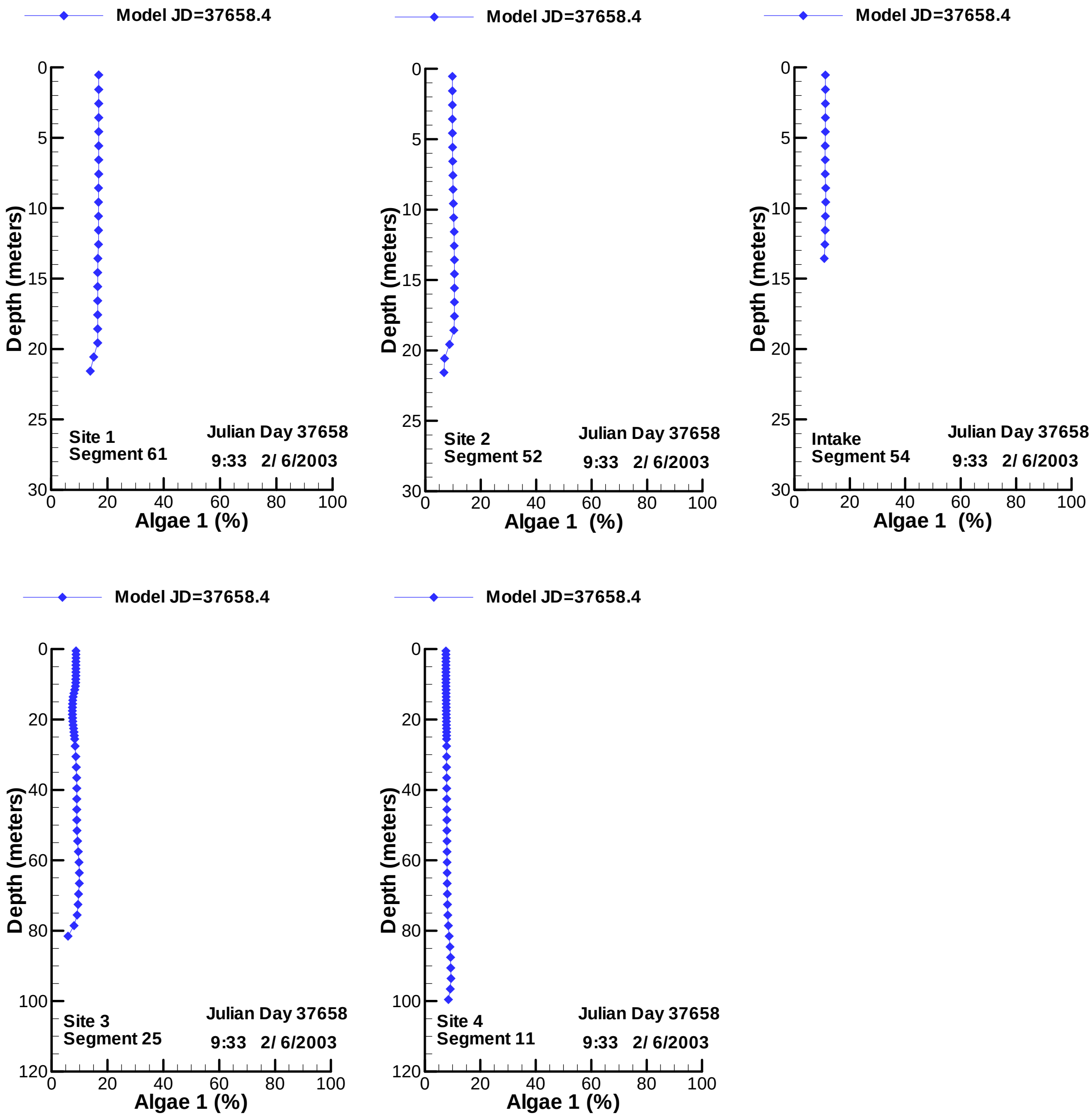

Figure 570. Vertical profiles of CHRYSOPHYTA compared with data for 2/ 6/2003.

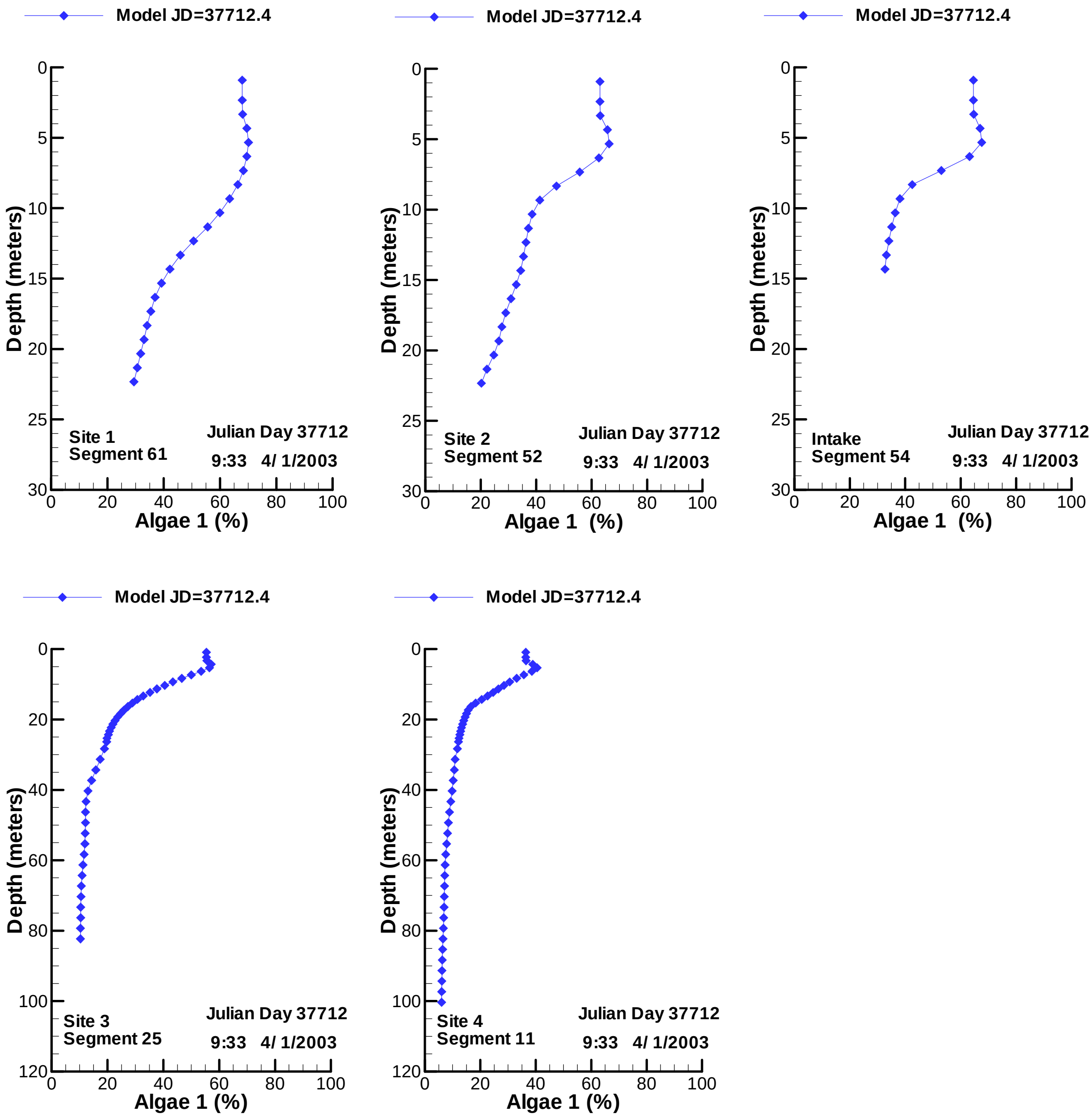

Figure 571. Vertical profiles of CHRYSOPHYTA compared with data for 4/ 1/2003.

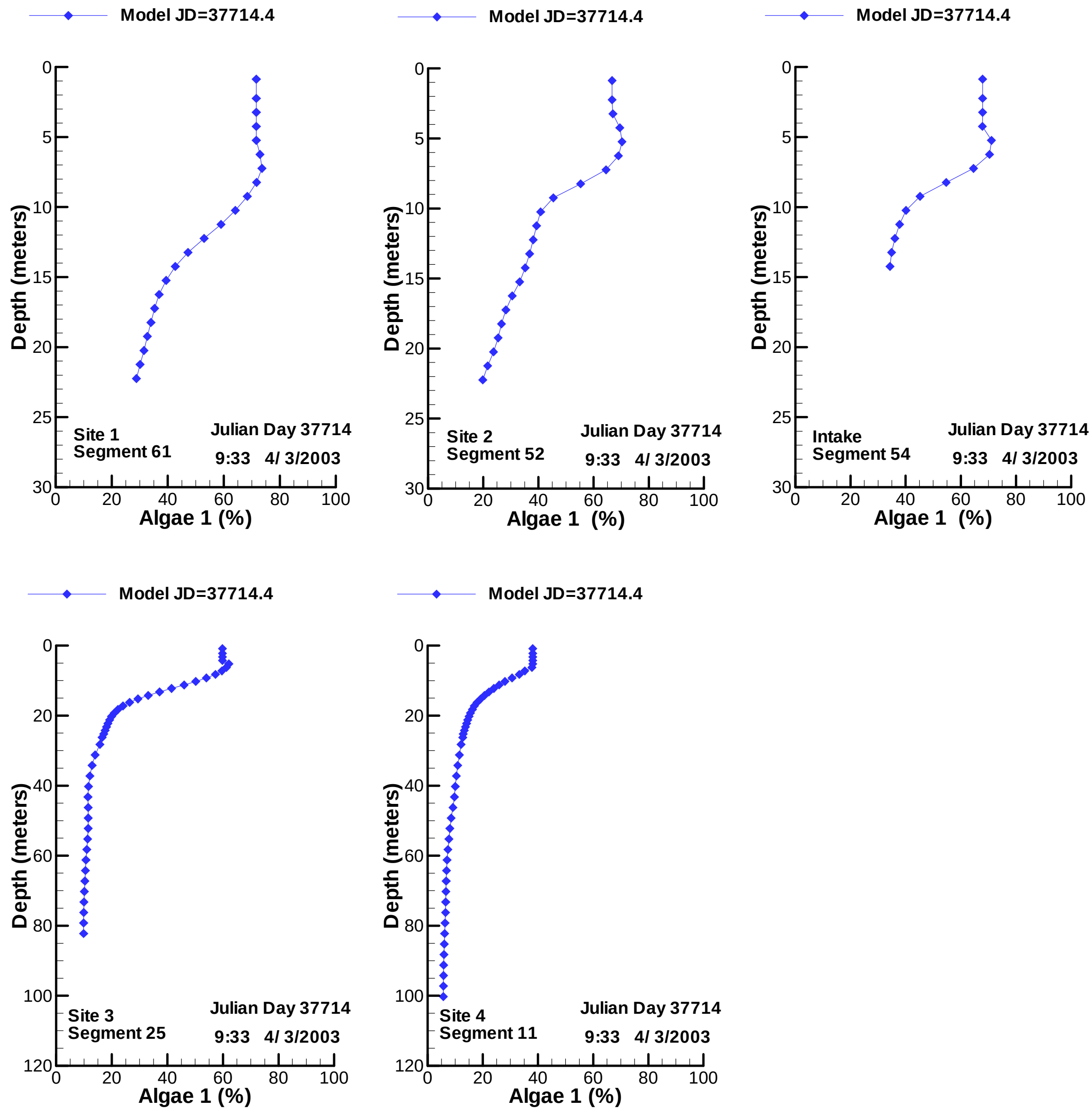

Figure 572. Vertical profiles of CHRYSOPHYTA compared with data for 4/ 3/2003.

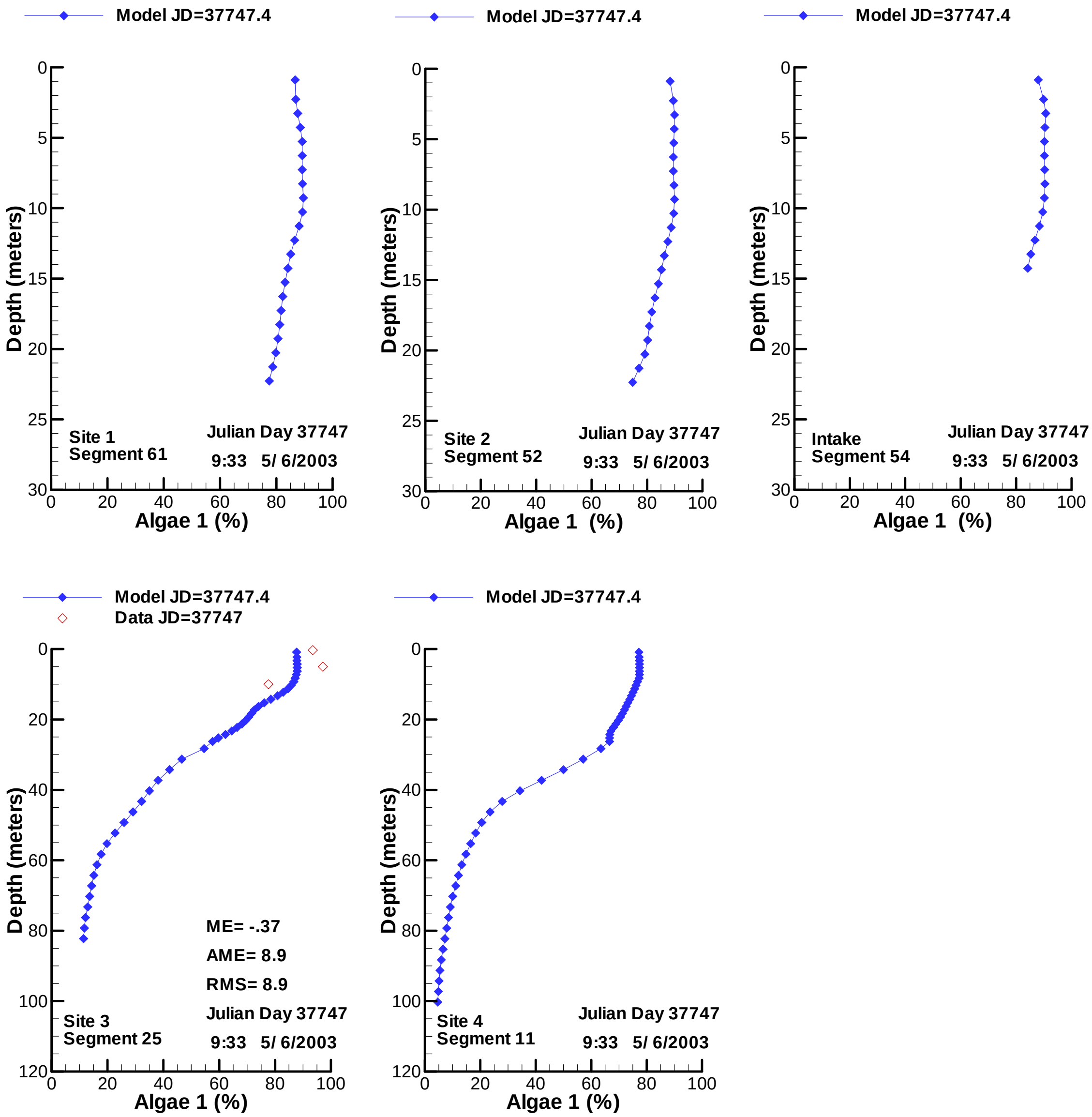

Figure 573. Vertical profiles of CHRYSOPHYTA compared with data for 5/ 6/2003.

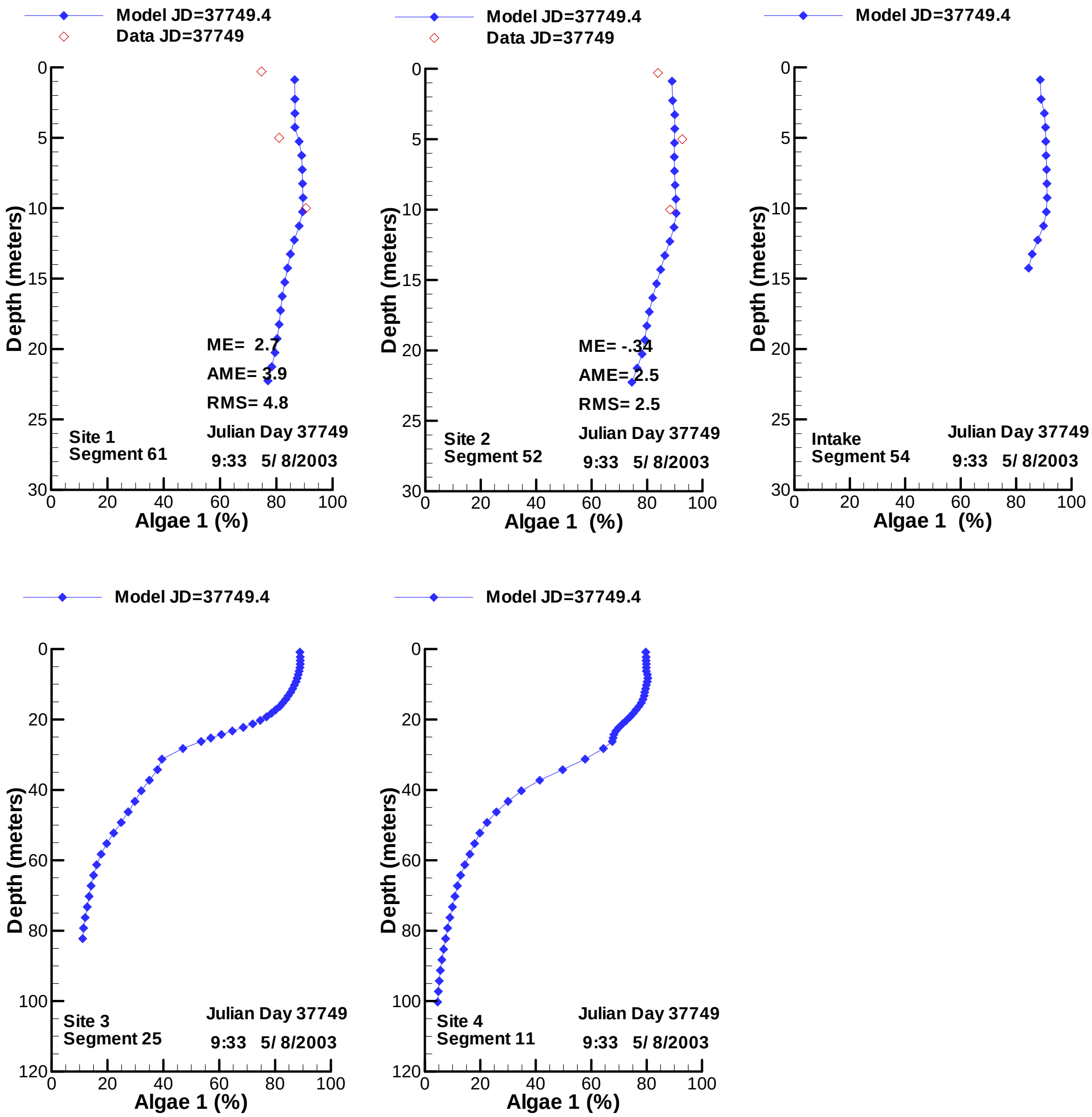

Figure 574. Vertical profiles of CHRYSOPHYTA compared with data for 5/ 8/2003.

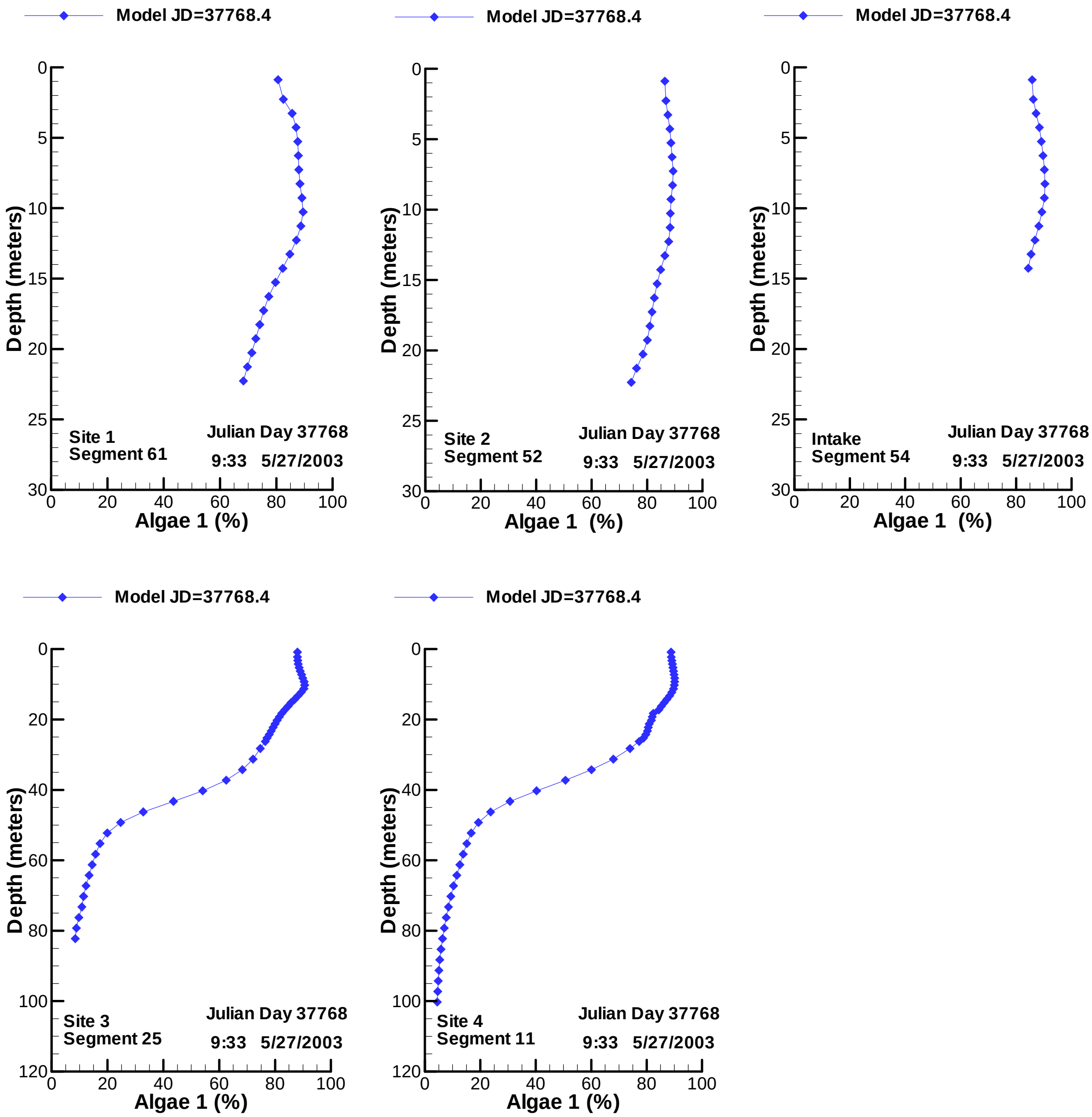

Figure 575. Vertical profiles of CHRYSOPHYTA compared with data for 5/27/2003.

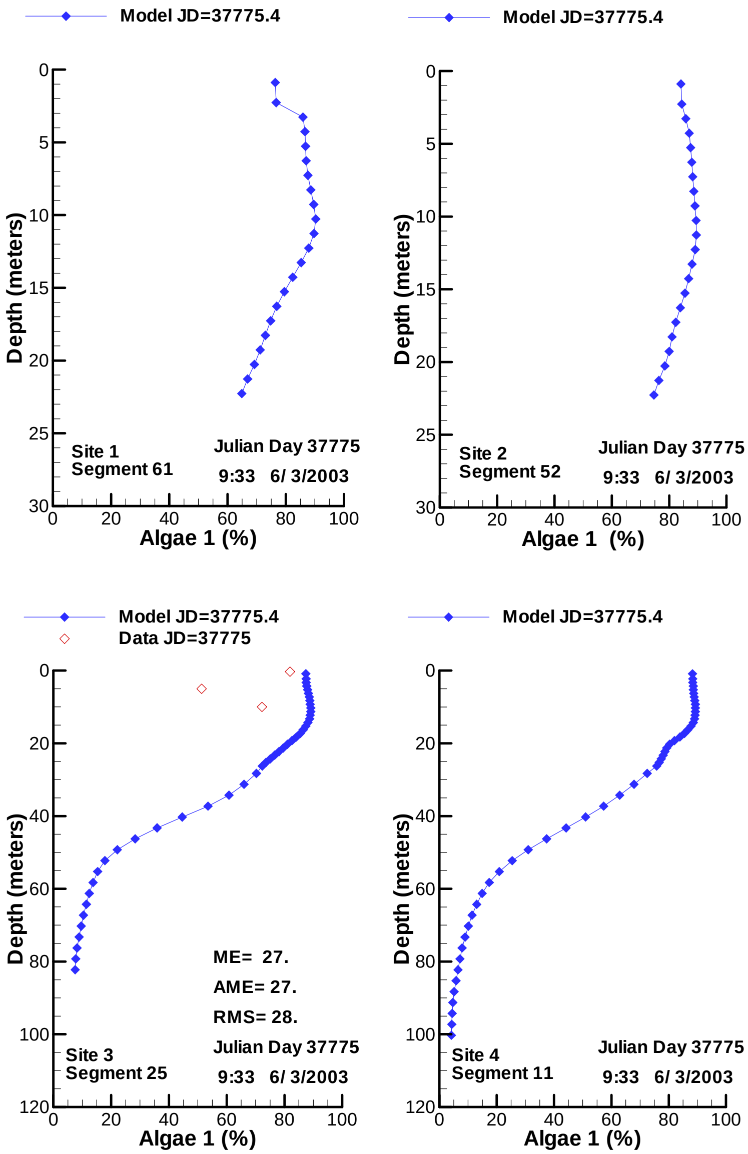

Figure 576. Vertical profiles of CHRYSOPHYTA compared with data for 6/ 3/2003.

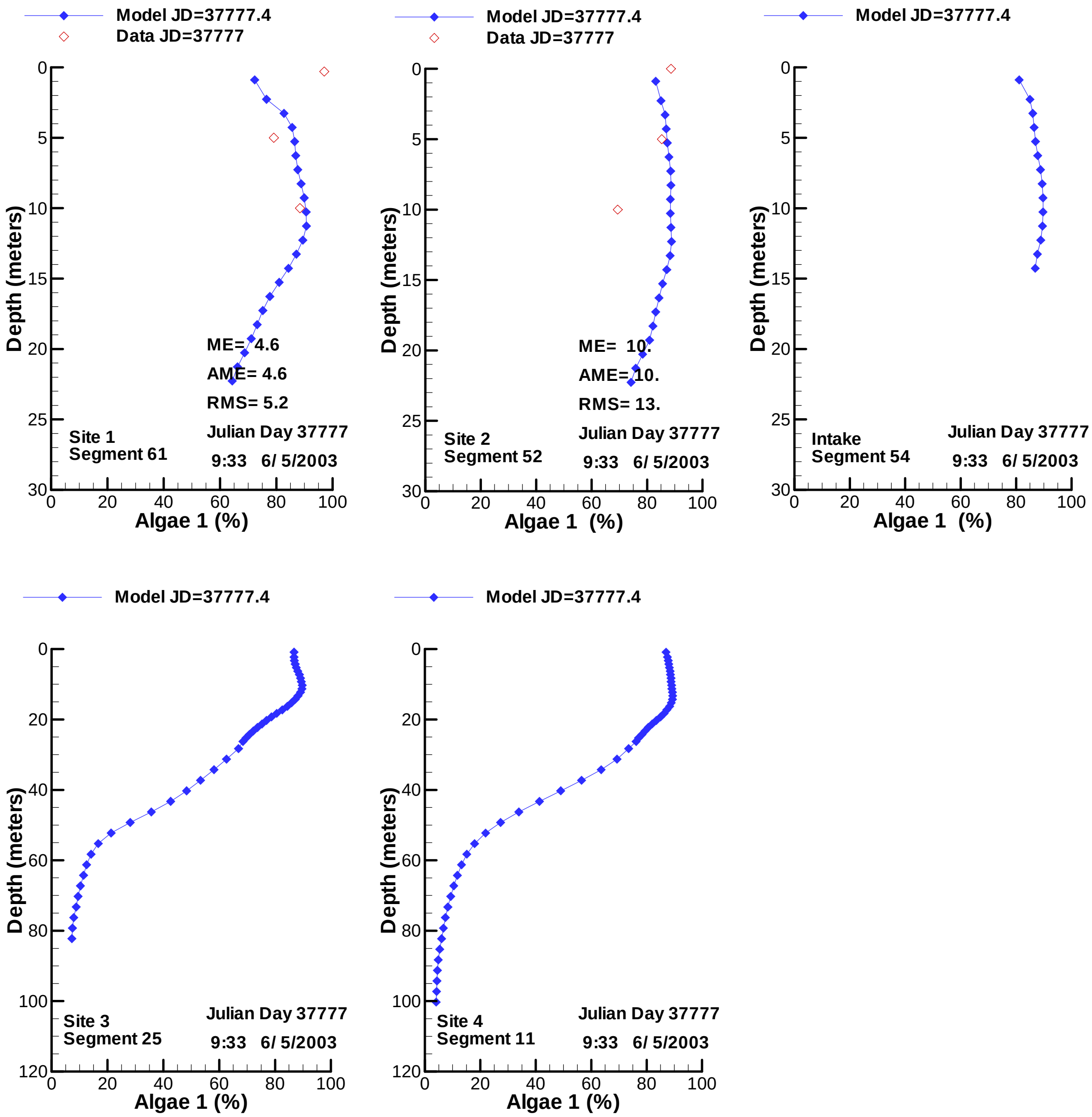

Figure 577. Vertical profiles of CHRYSOPHYTA compared with data for 6/ 5/2003.

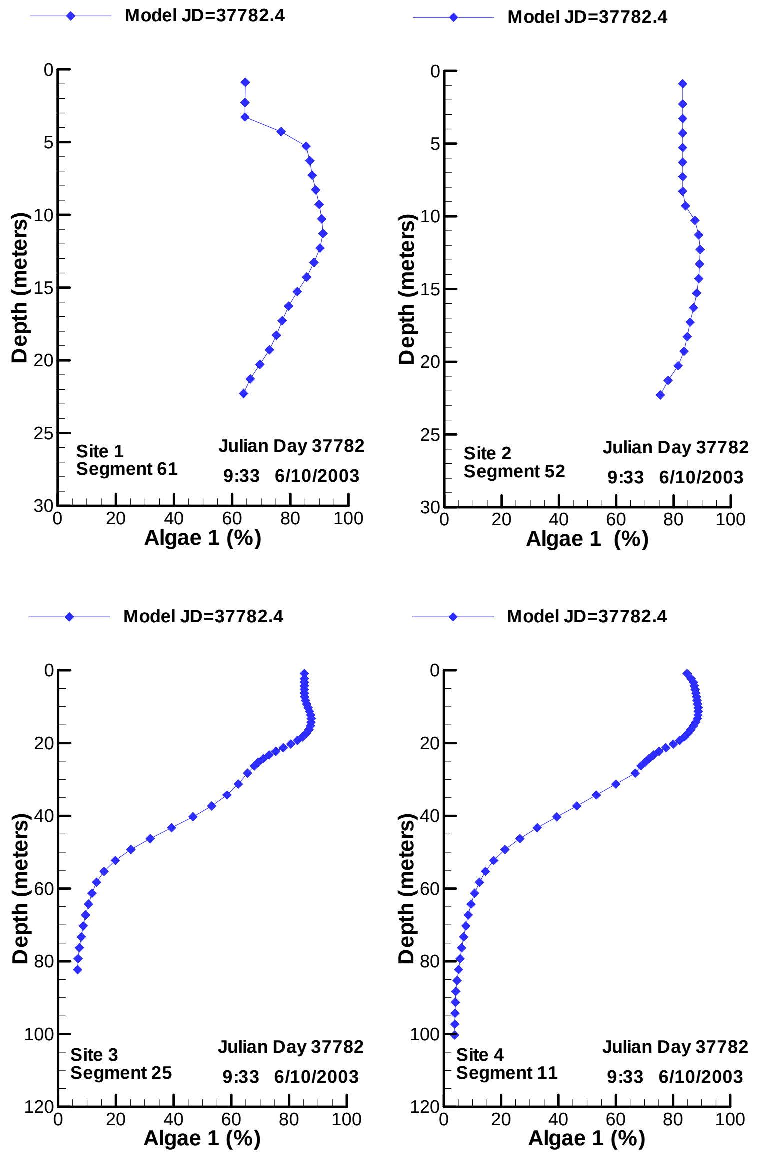

Figure 578. Vertical profiles of CHRYSOPHYTA compared with data for 6/10/2003.

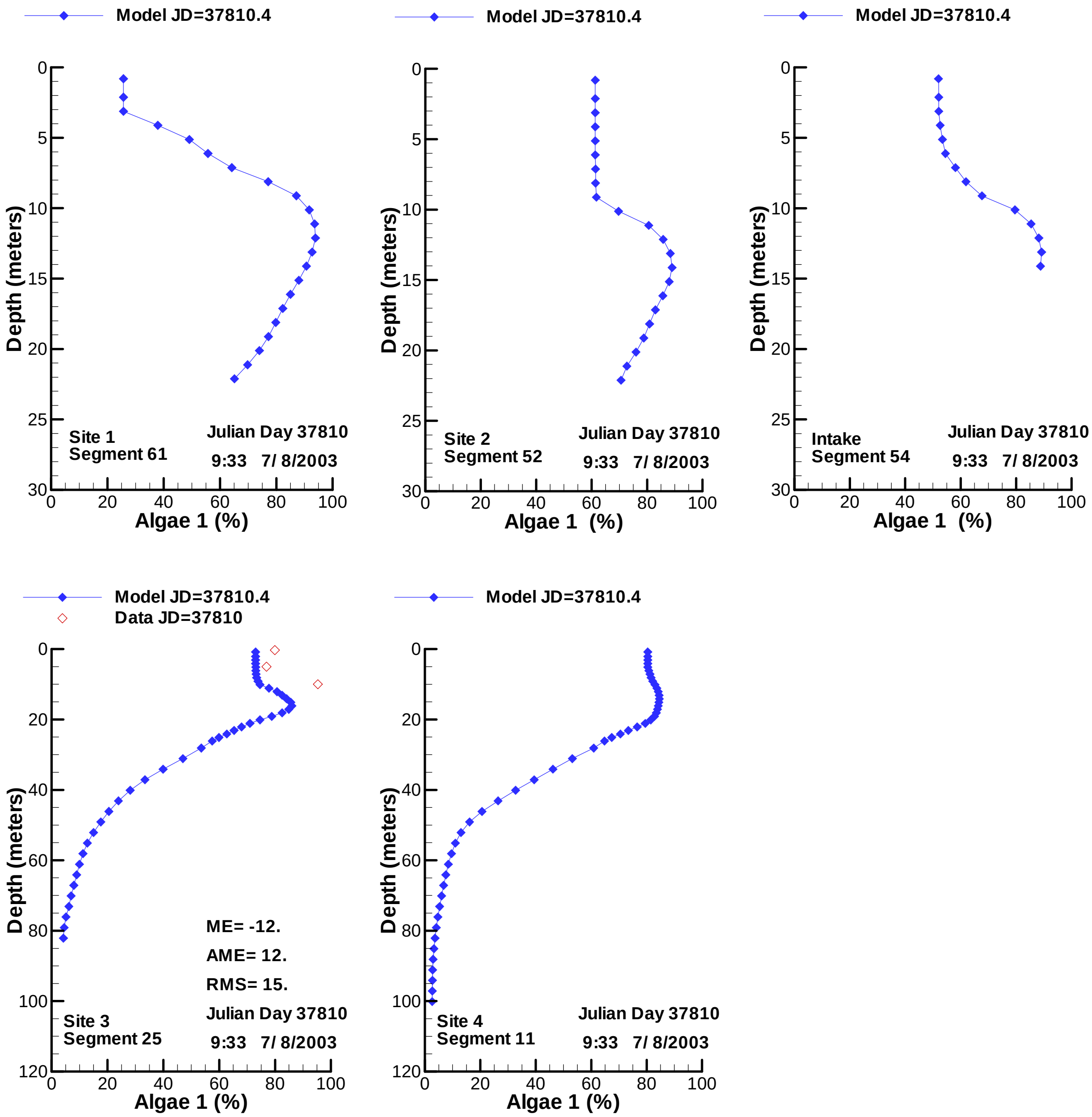

Figure 579. Vertical profiles of CHRYSOPHYTA compared with data for 7/ 8/2003.

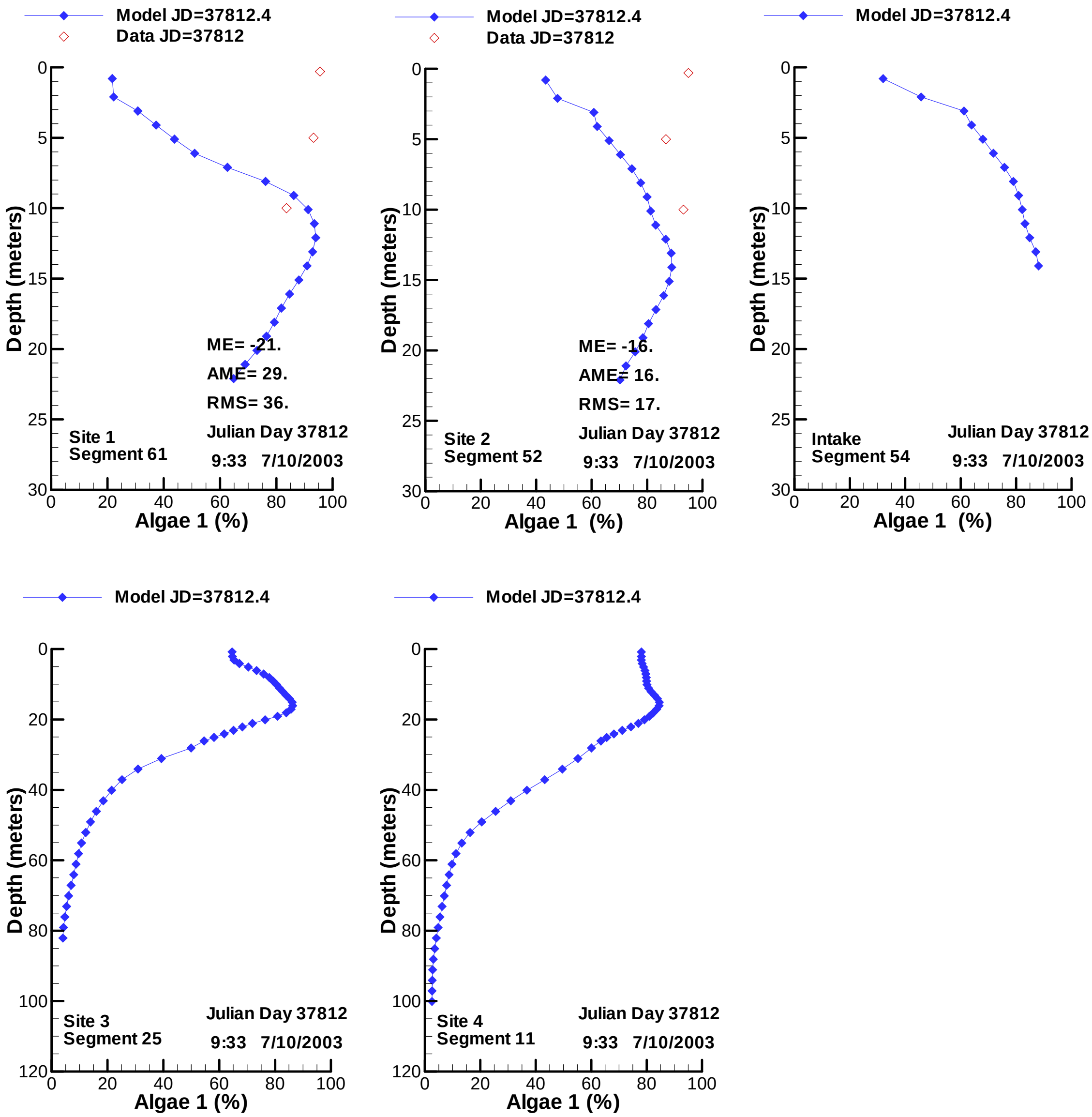

Figure 580. Vertical profiles of CHRYSOPHYTA compared with data for 7/10/2003.

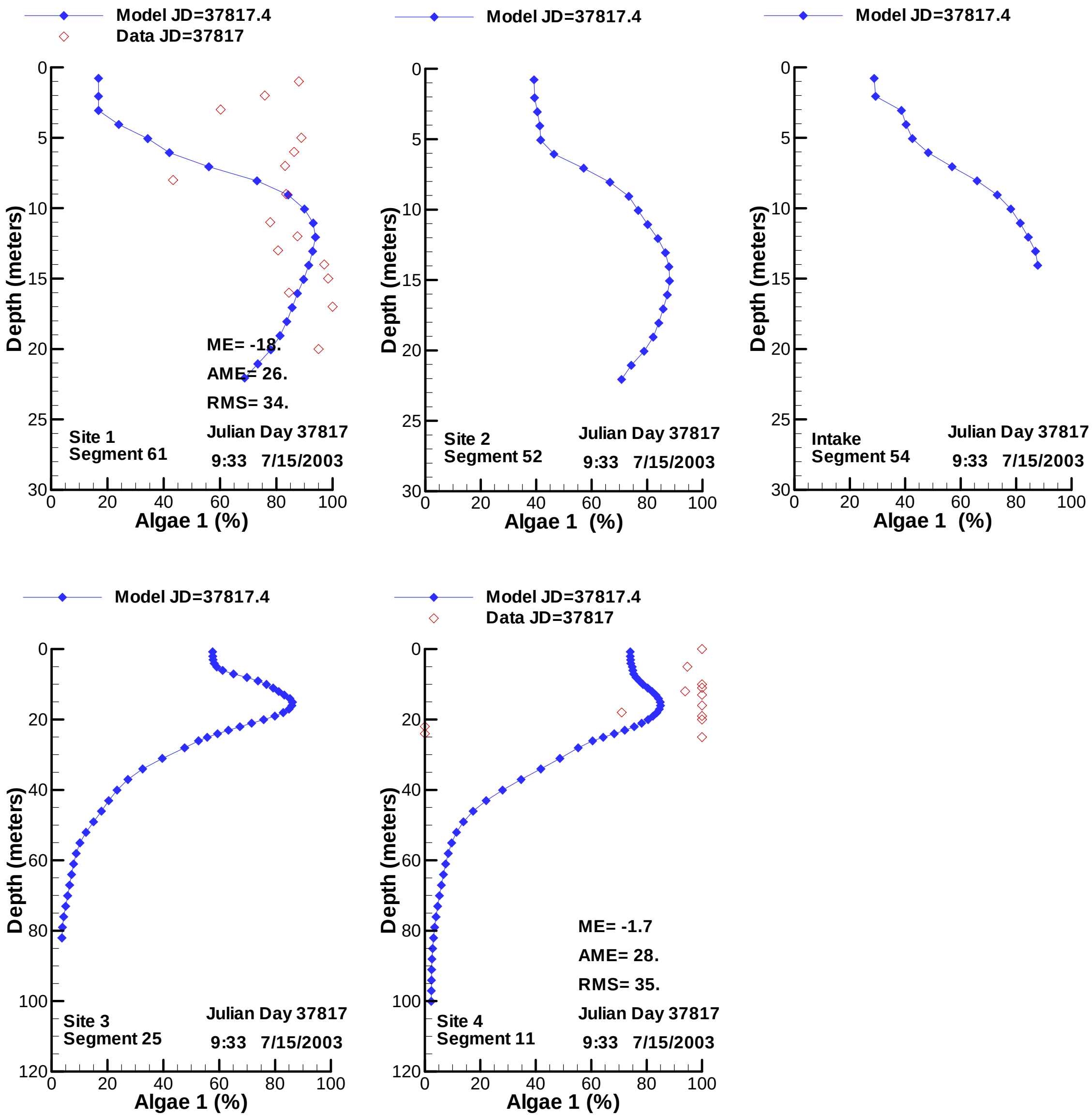

Figure 581. Vertical profiles of CHRYSOPHYTA compared with data for 7/15/2003.

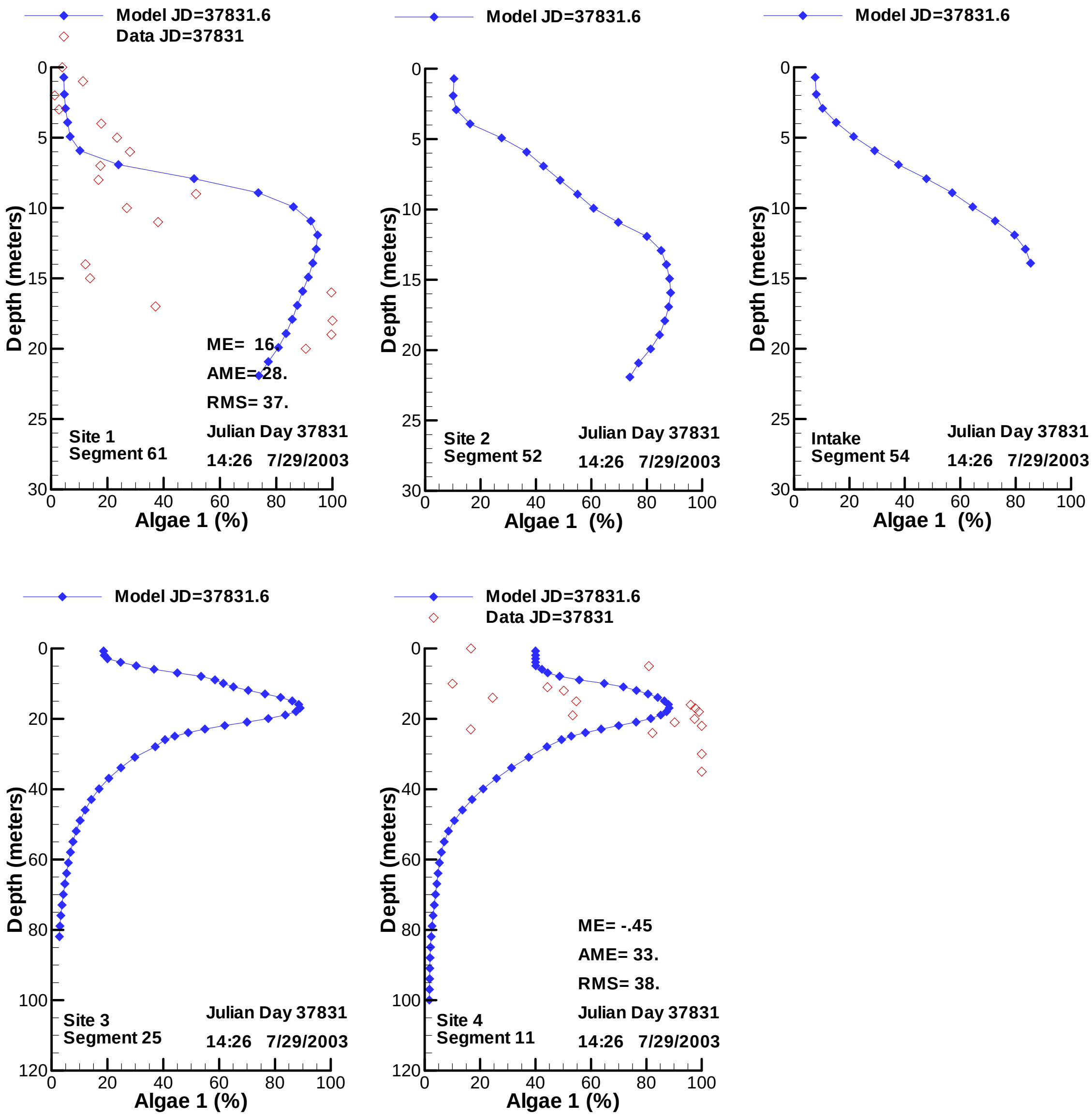

Figure 582. Vertical profiles of CHRYSOPHYTA compared with data for 7/29/2003.

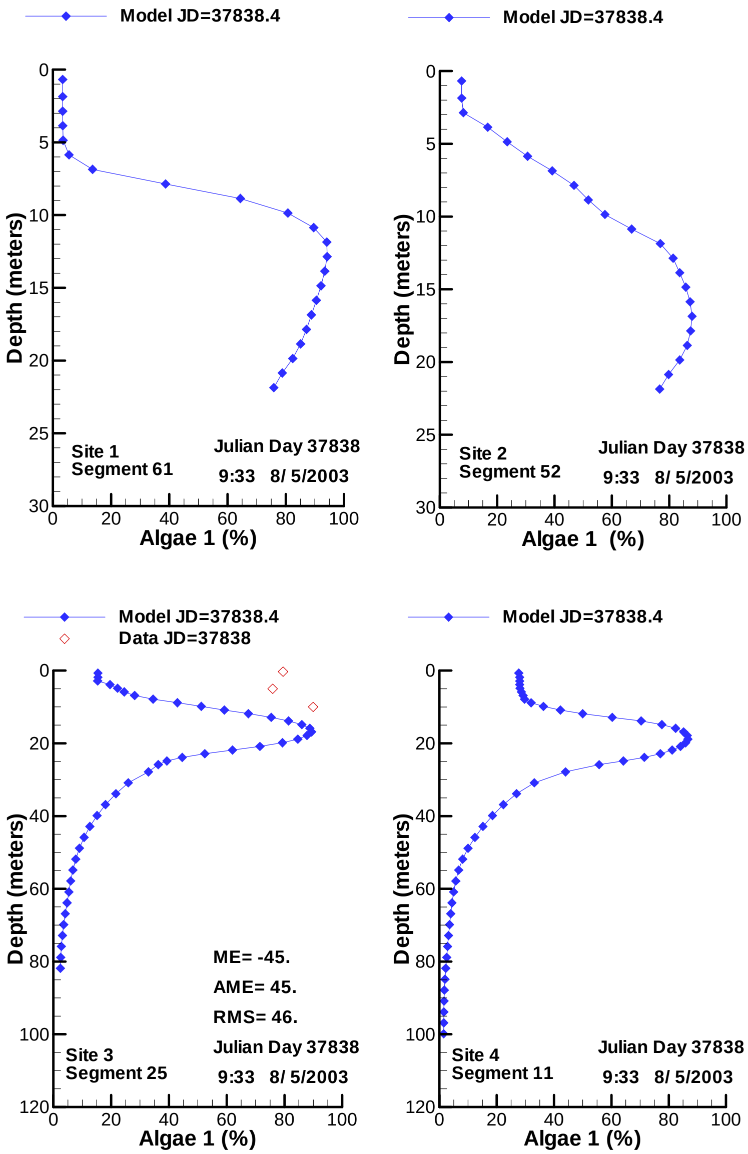

Figure 583. Vertical profiles of CHRYSOPHYTA compared with data for 8/ 5/2003.

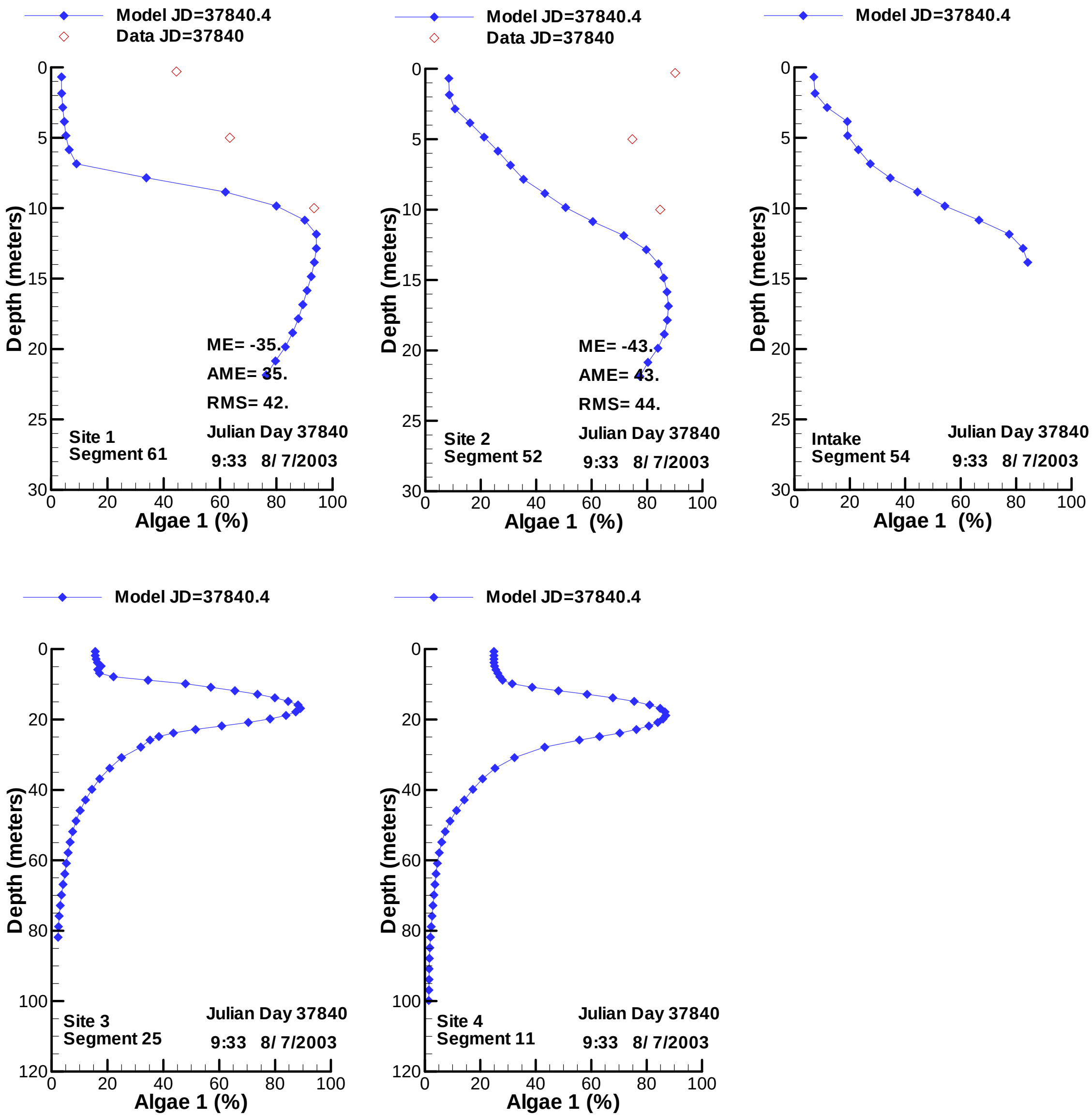

Figure 584. Vertical profiles of CHRYSOPHYTA compared with data for 8/ 7/2003.

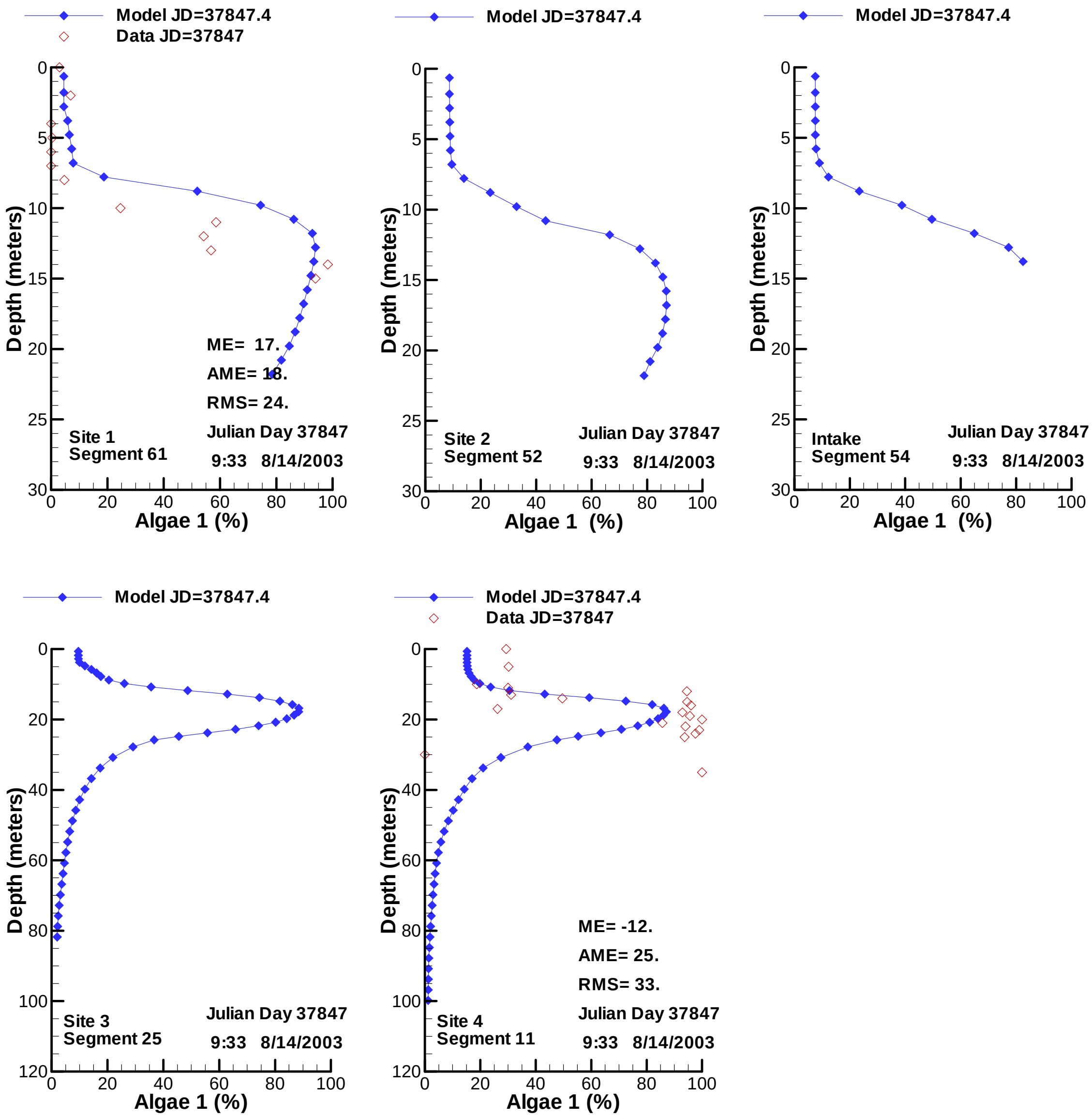

Figure 585. Vertical profiles of CHRYSOPHYTA compared with data for 8/14/2003.

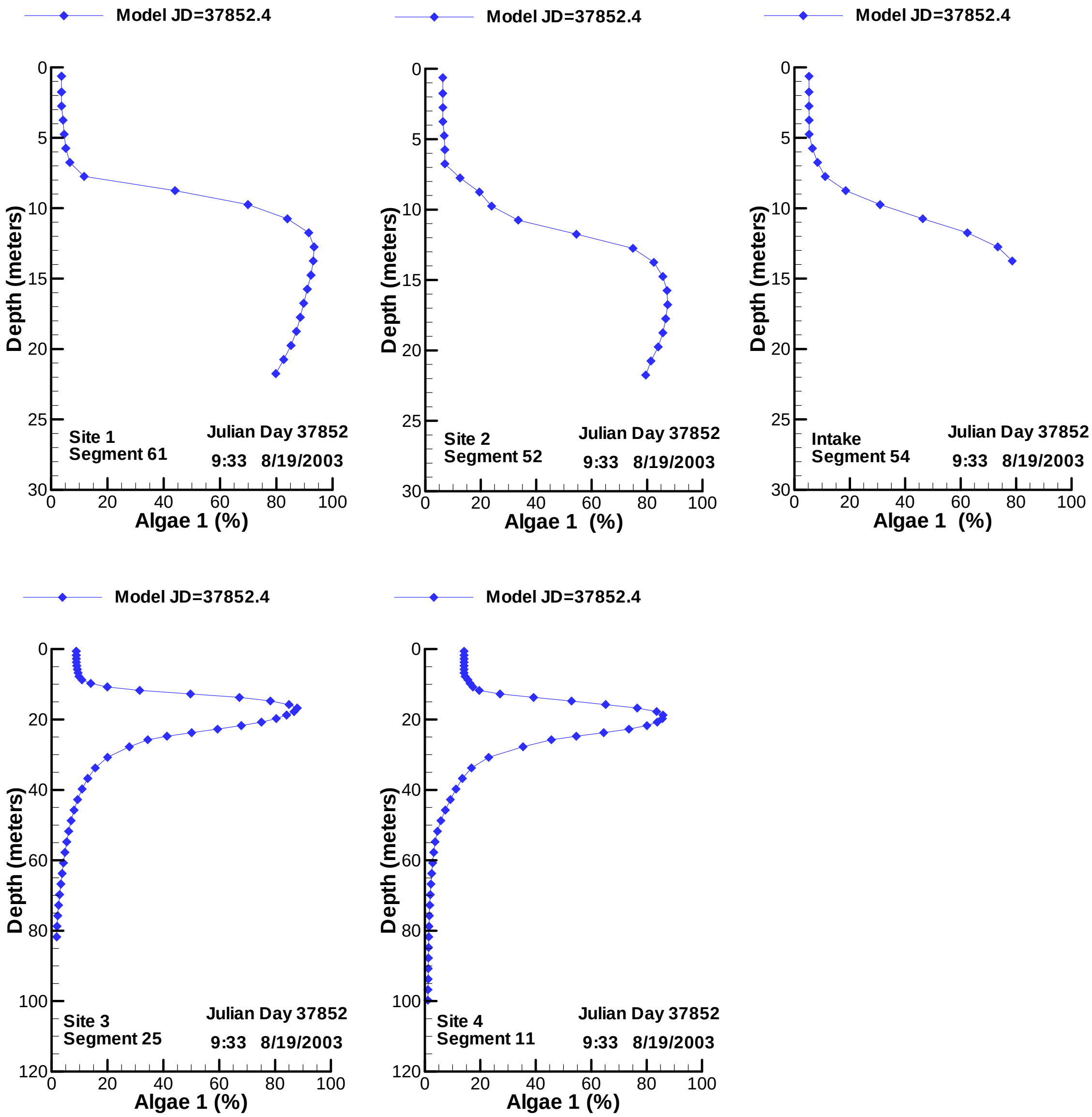

Figure 586. Vertical profiles of CHRYSOPHYTA compared with data for 8/19/2003.

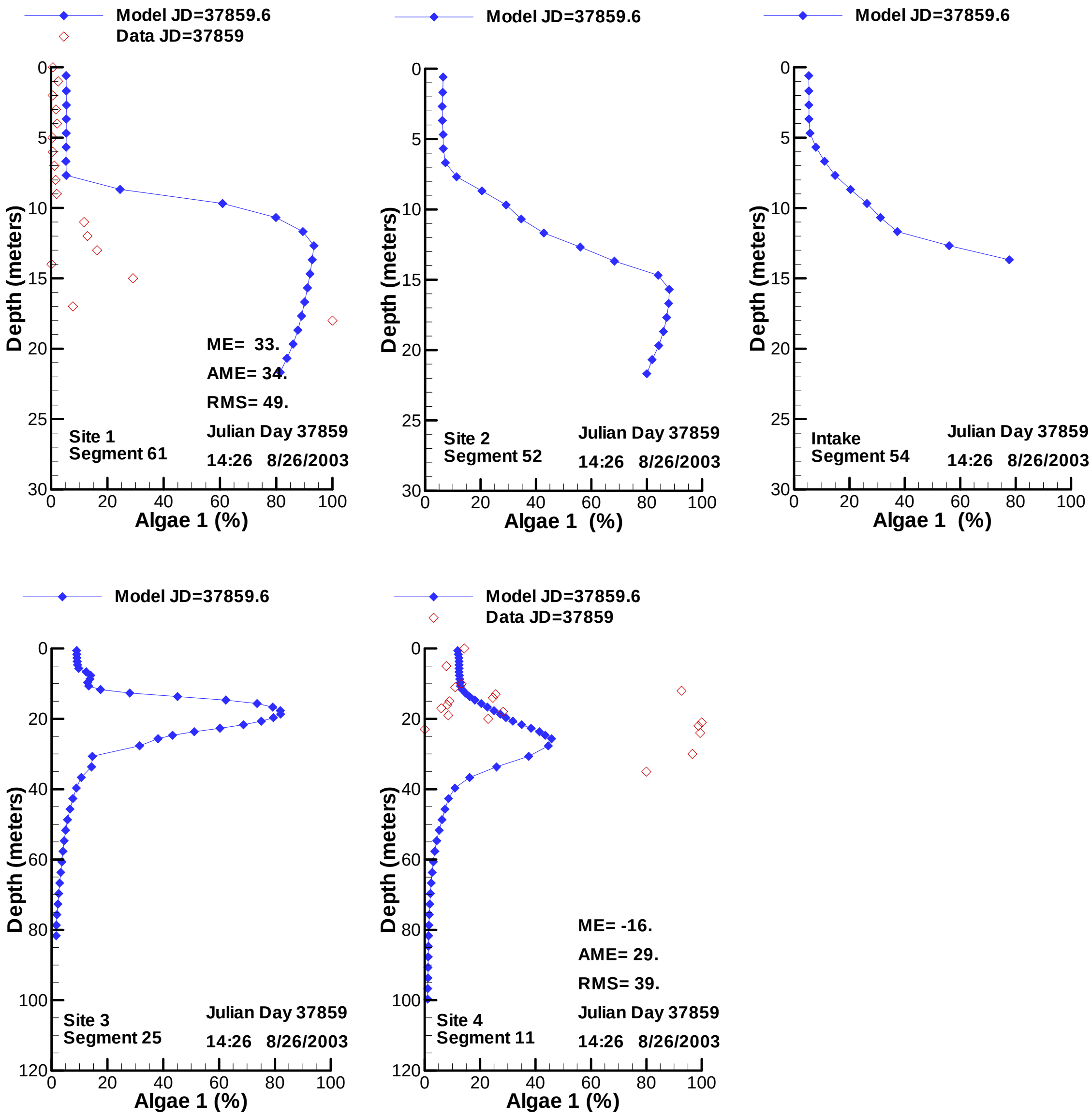

Figure 587. Vertical profiles of CHRYSOPHYTA compared with data for 8/26/2003.

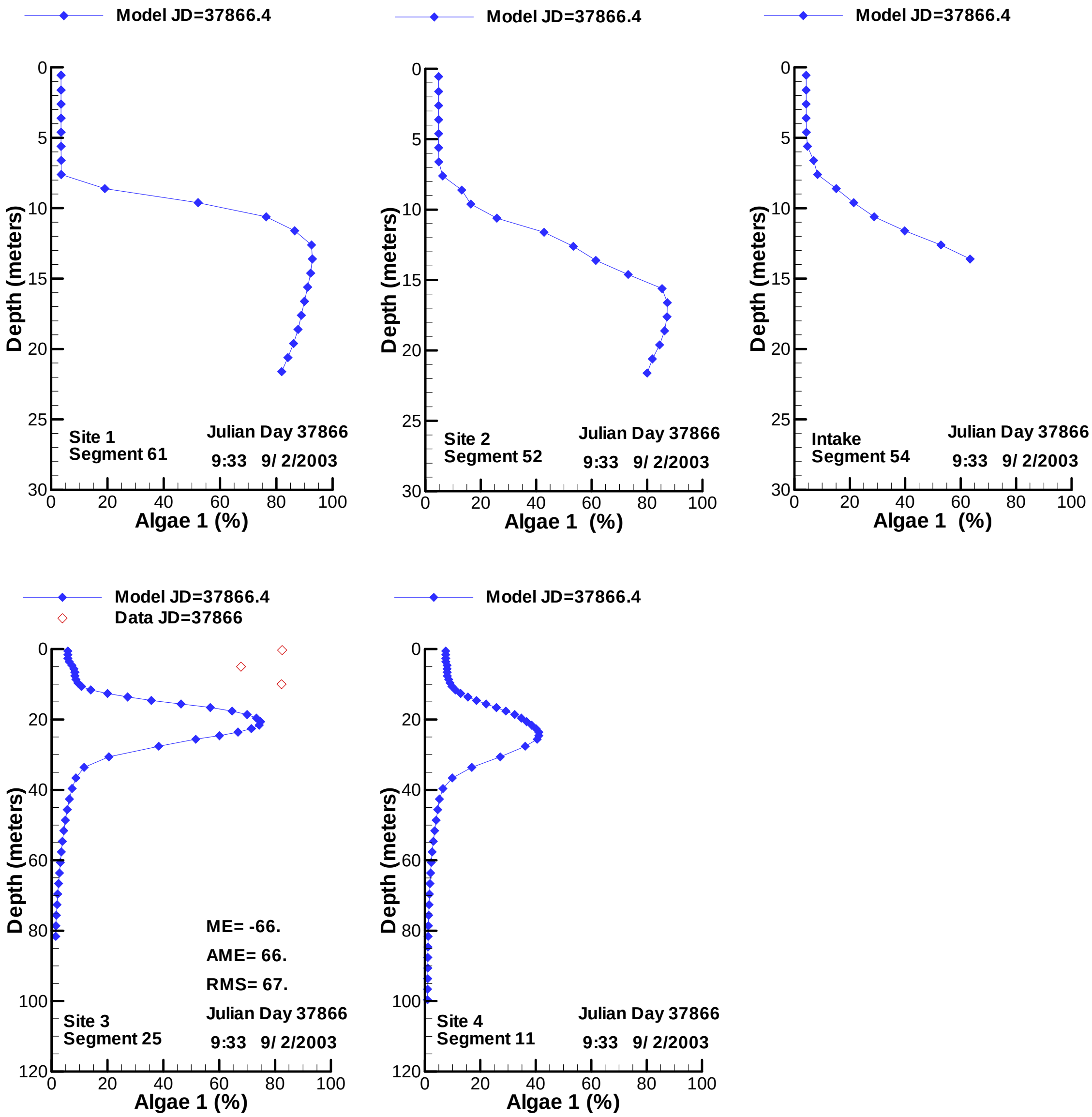

Figure 588. Vertical profiles of CHRYSOPHYTA compared with data for 9/ 2/2003.

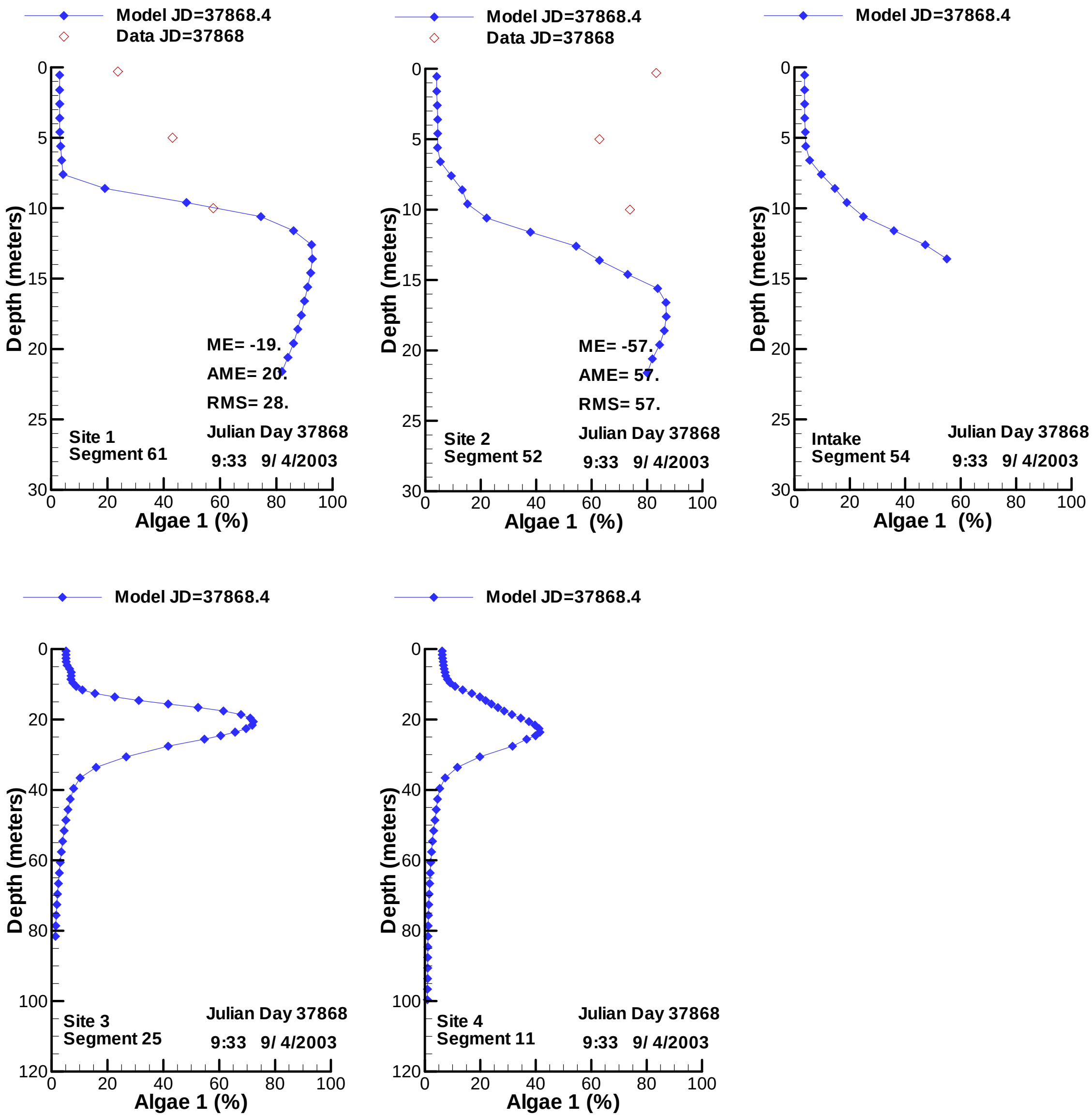

Figure 589. Vertical profiles of CHRYSOPHYTA compared with data for 9/ 4/2003.

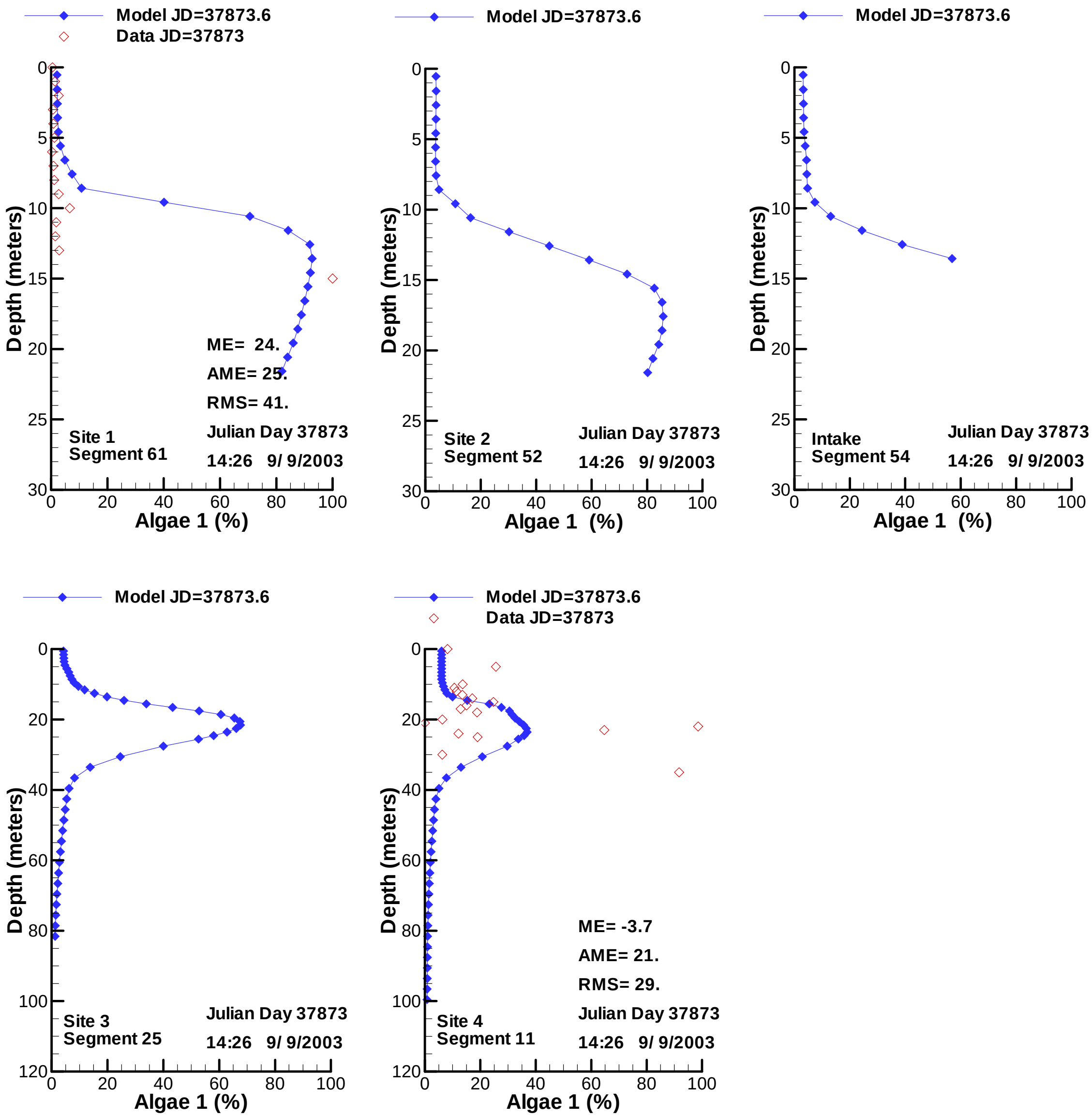

Figure 590. Vertical profiles of CHRYSOPHYTA compared with data for 9/ 9/2003.

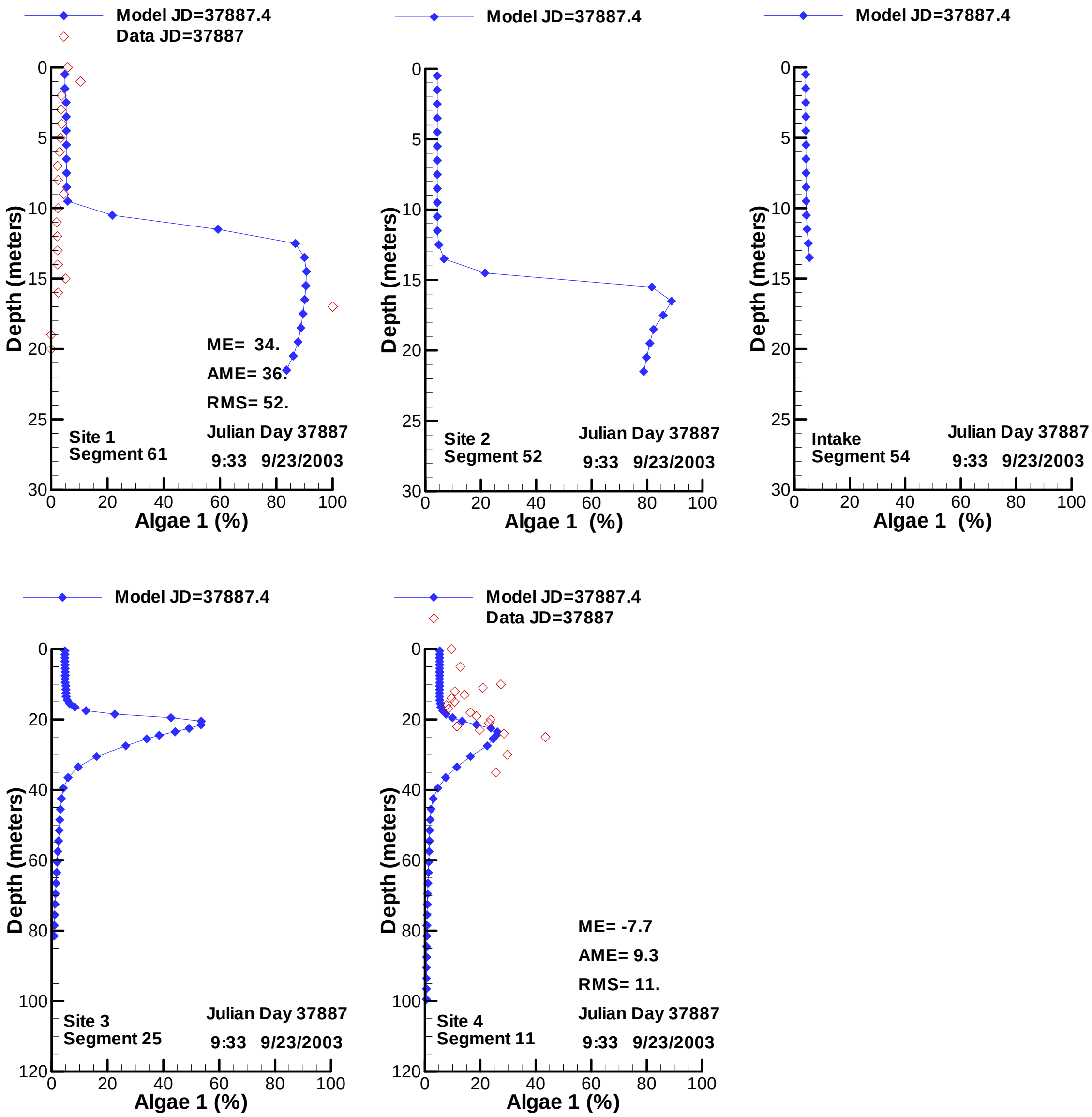

Figure 591. Vertical profiles of CHRYSOPHYTA compared with data for 9/23/2003.

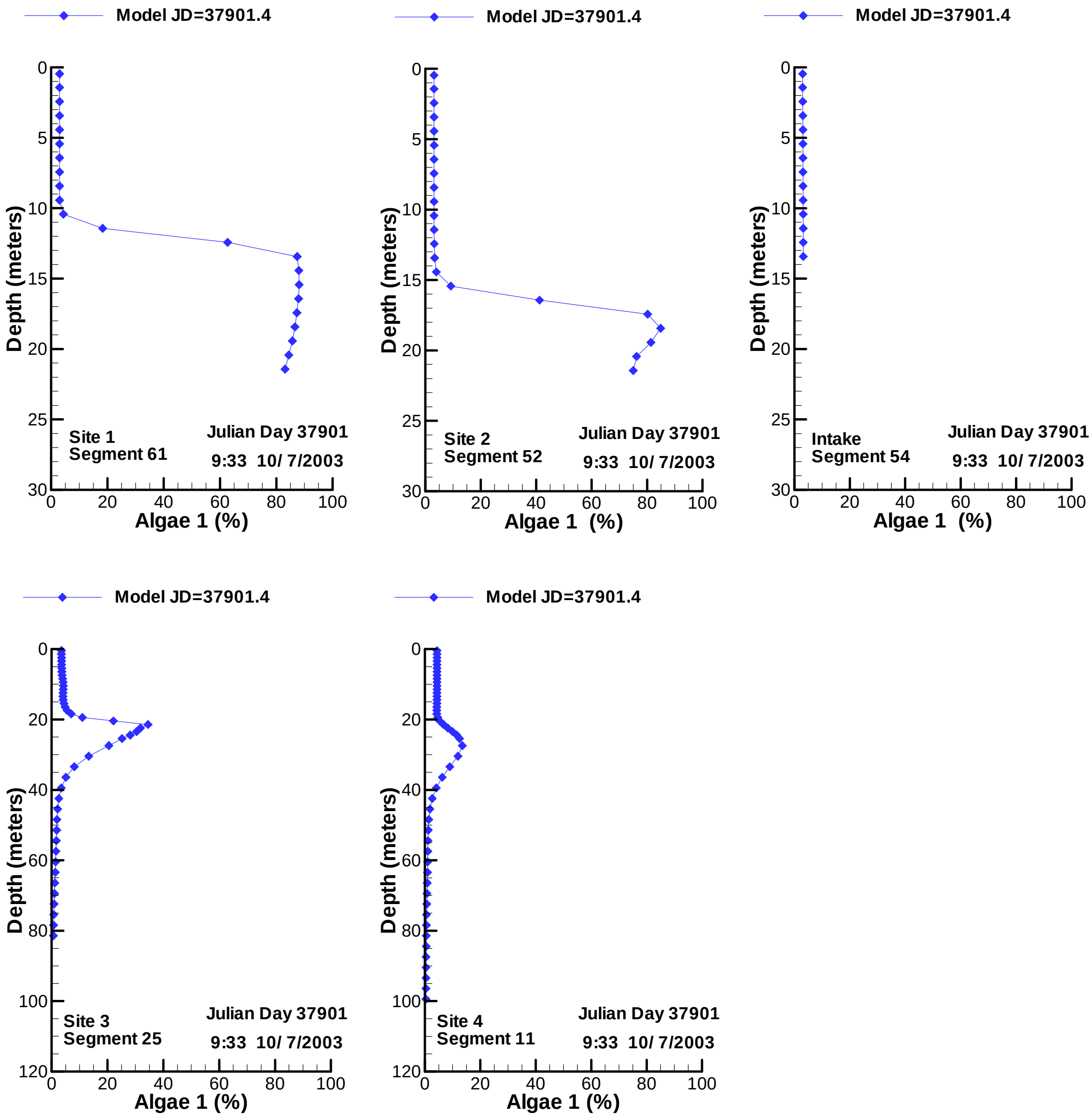

Figure 592. Vertical profiles of CHRYSOPHYTA compared with data for 10/ 7/2003.

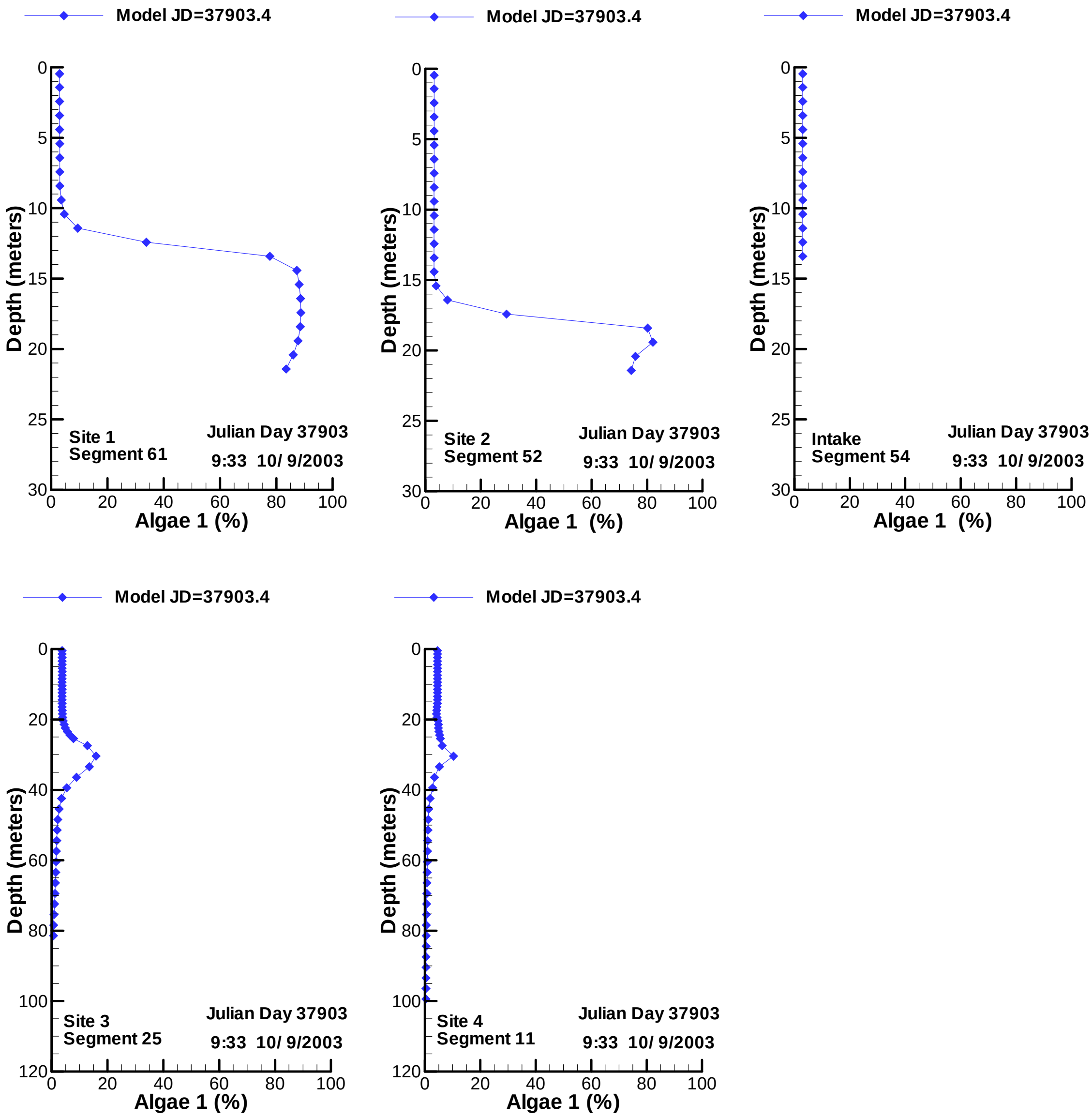

Figure 593. Vertical profiles of CHRYSOPHYTA compared with data for 10/ 9/2003.

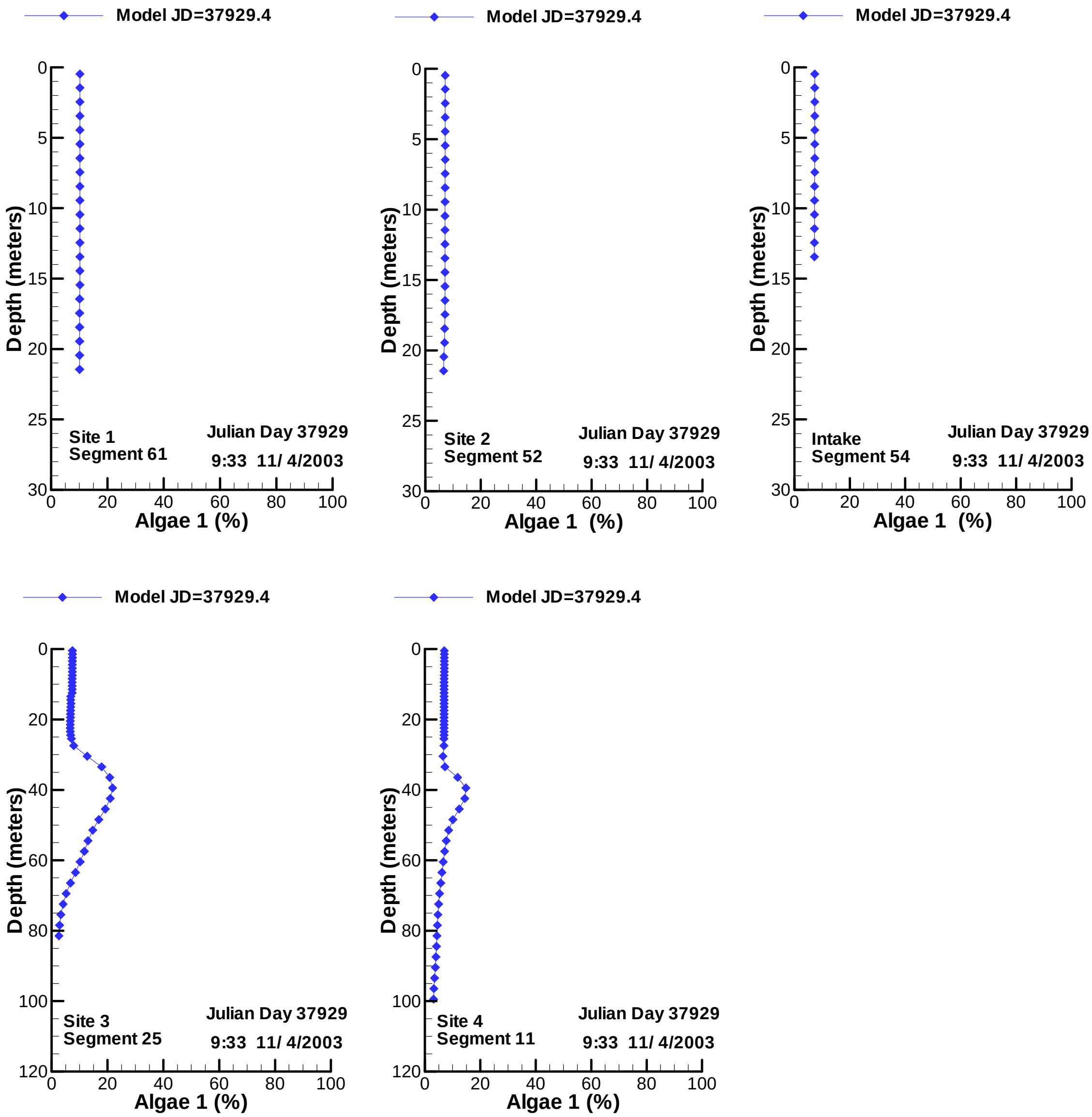

Figure 594. Vertical profiles of CHRYSOPHYTA compared with data for 11/ 4/2003.

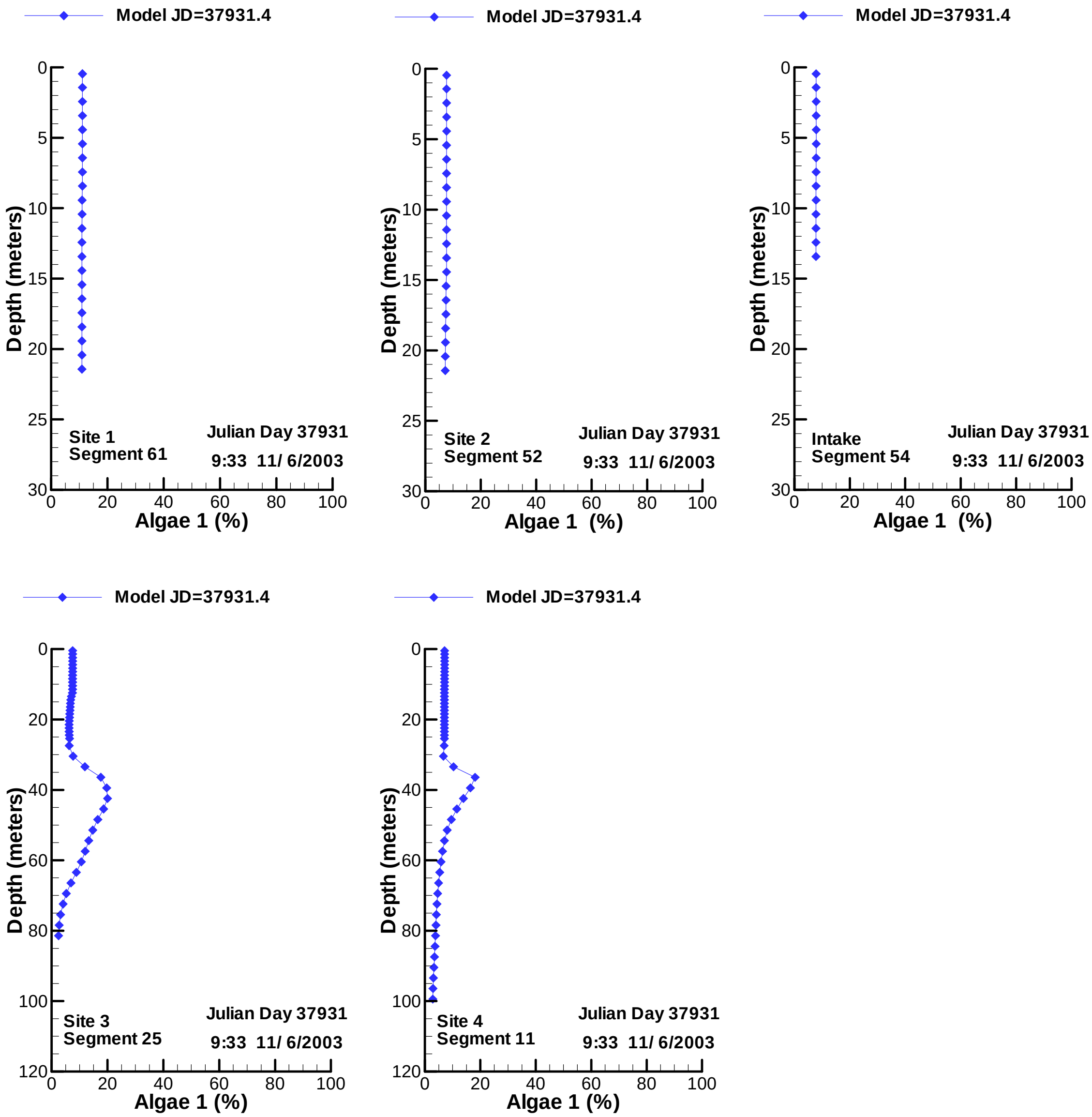

Figure 595. Vertical profiles of CHRYSOPHYTA compared with data for 11/ 6/2003.

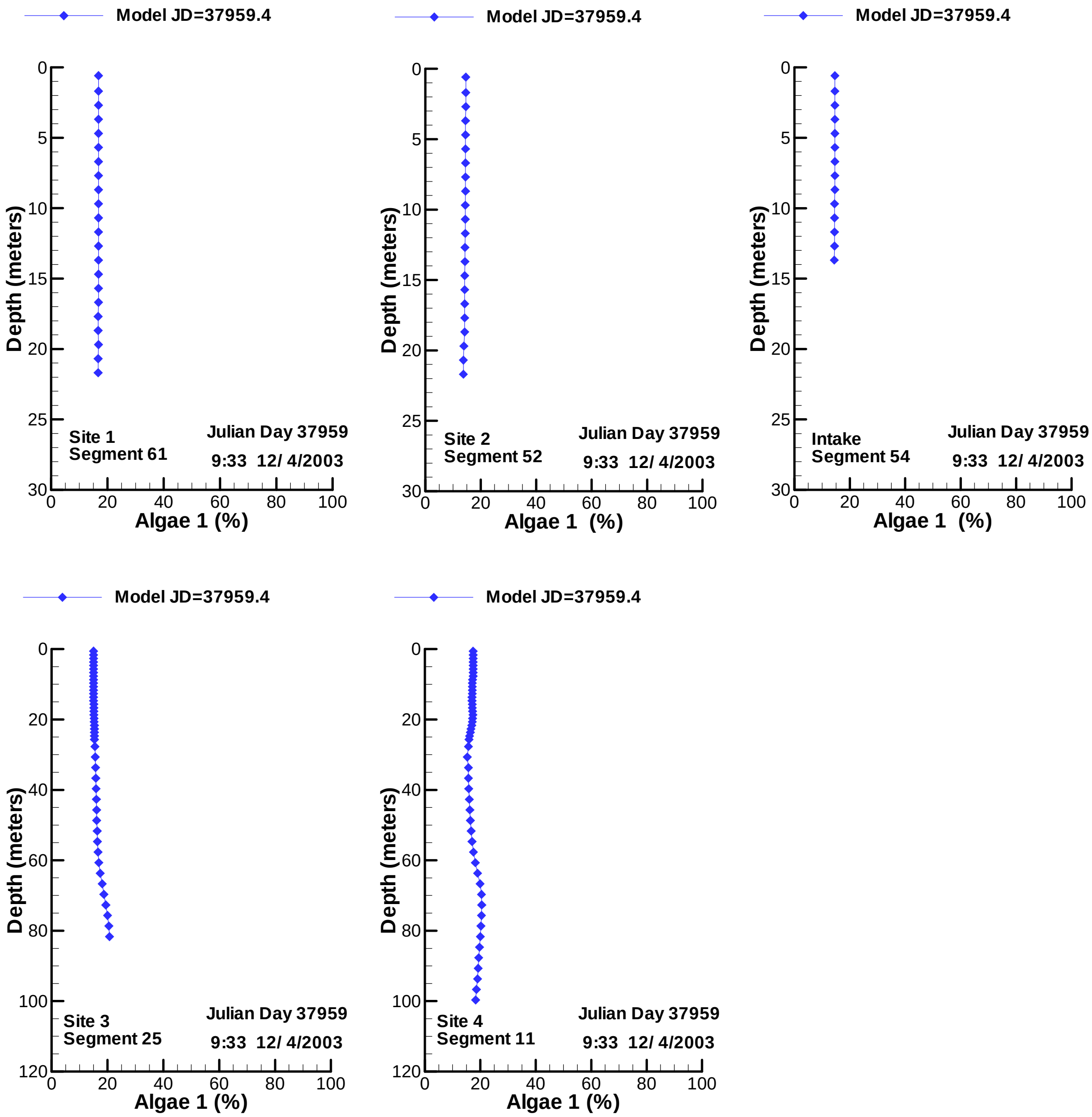

Figure 596. Vertical profiles of CHRYSOPHYTA compared with data for 12/ 4/2003.

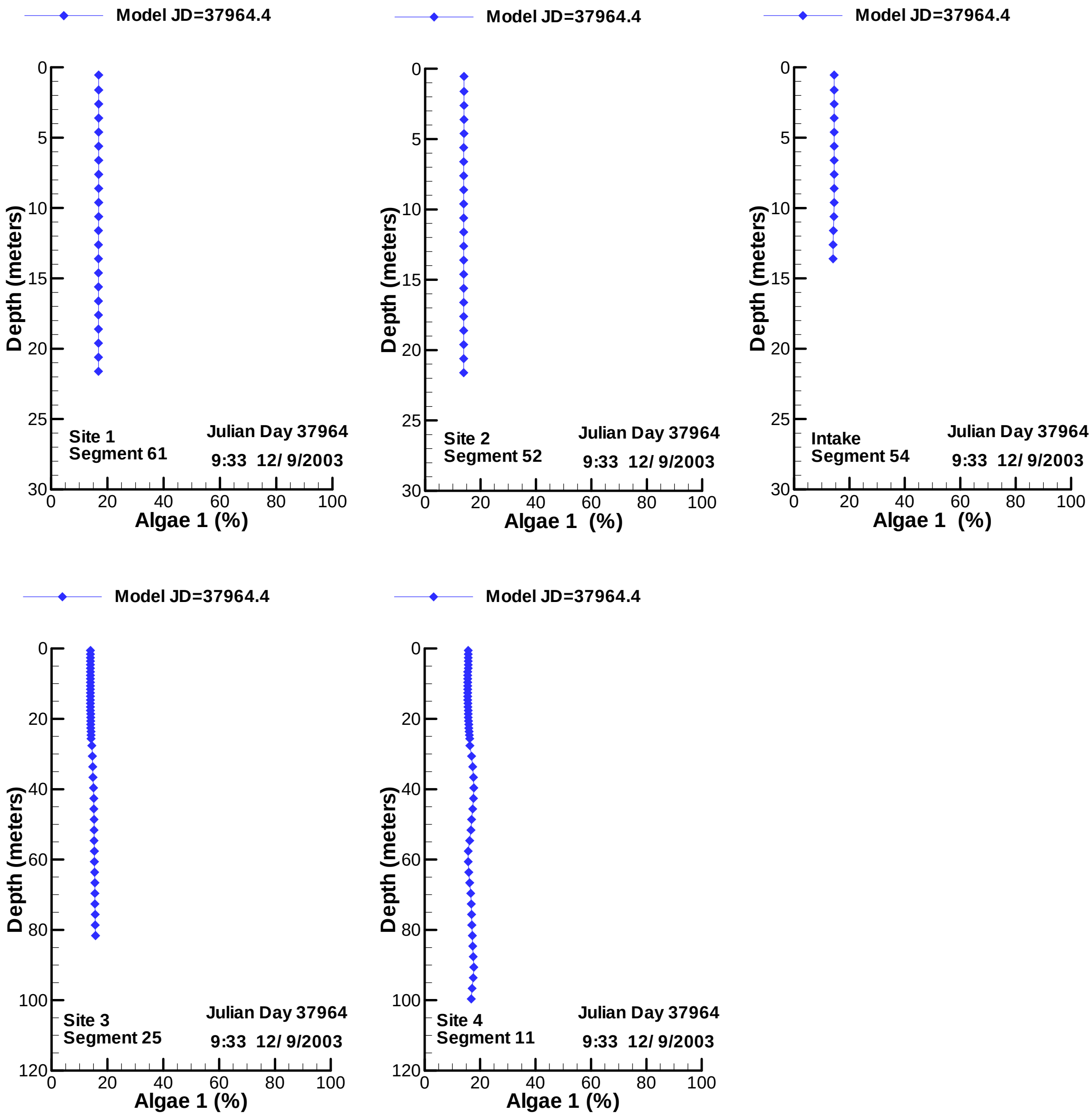

Figure 597. Vertical profiles of CHRYSOPHYTA compared with data for 12/ 9/2003.

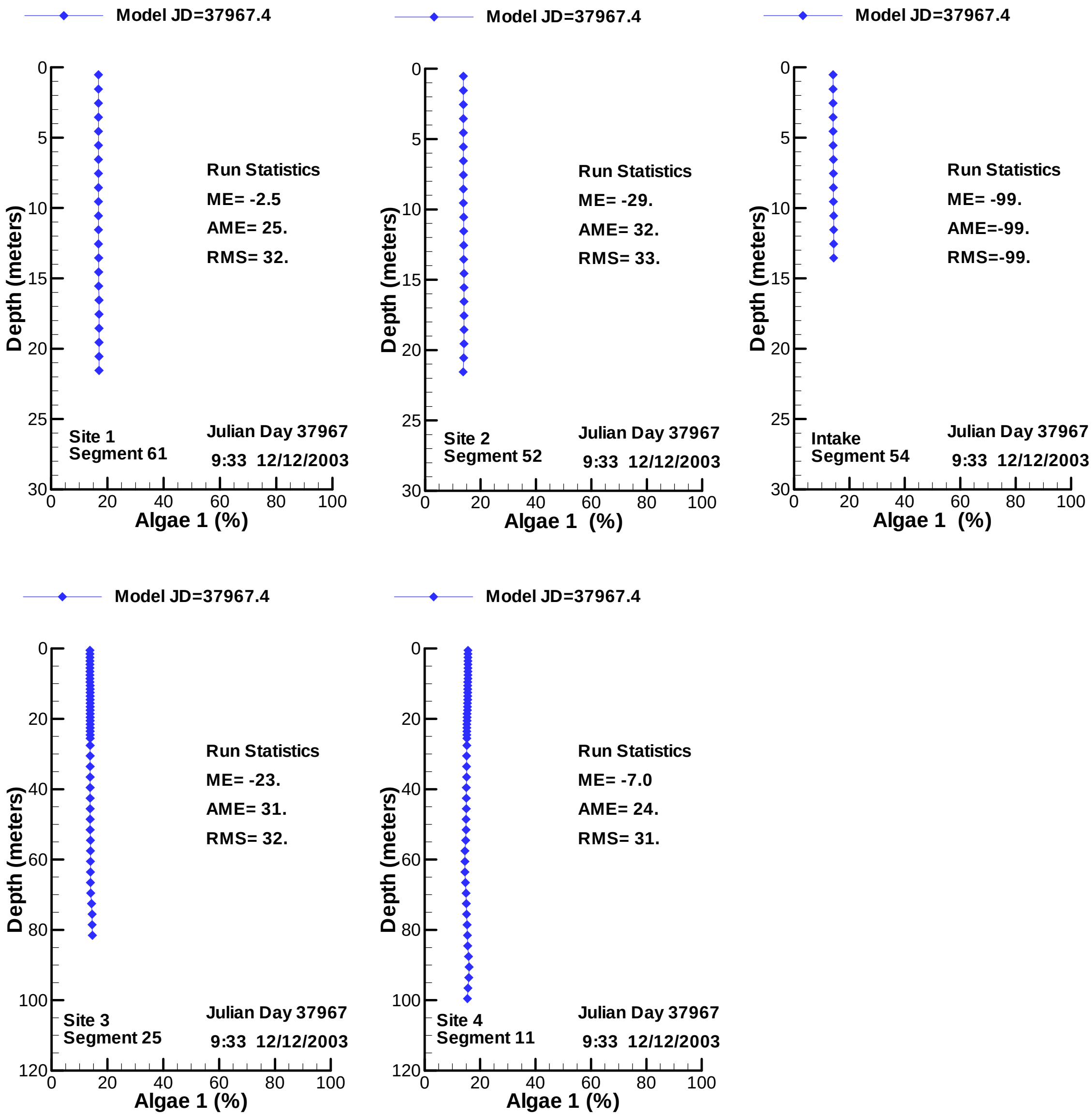

Figure 598. Vertical profiles of CHRYSOPHYTA compared with data for 12/12/2003.

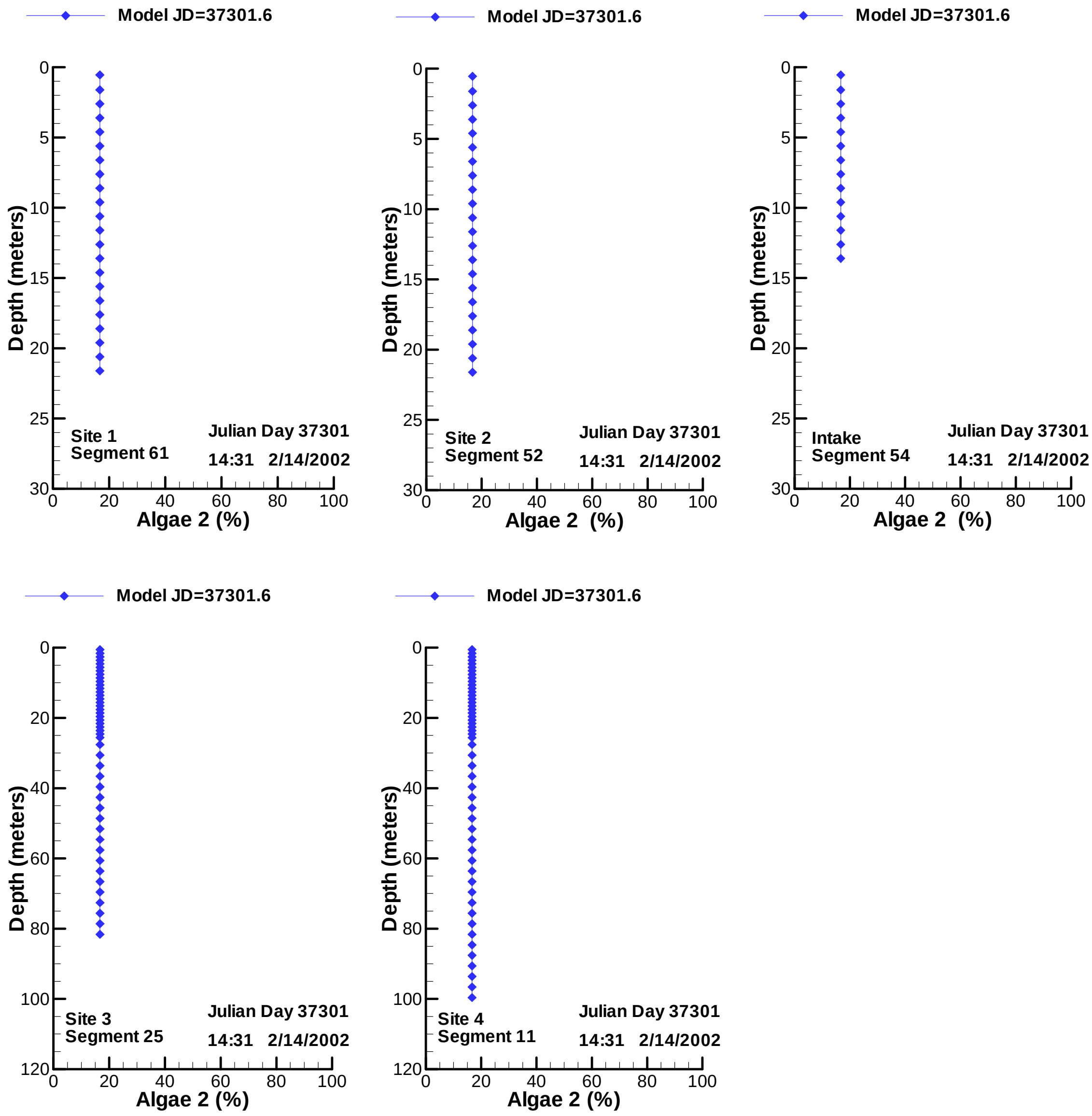

Figure 599. Vertical profiles of CHLOROPHYTA compared with data for 2/14/2002.

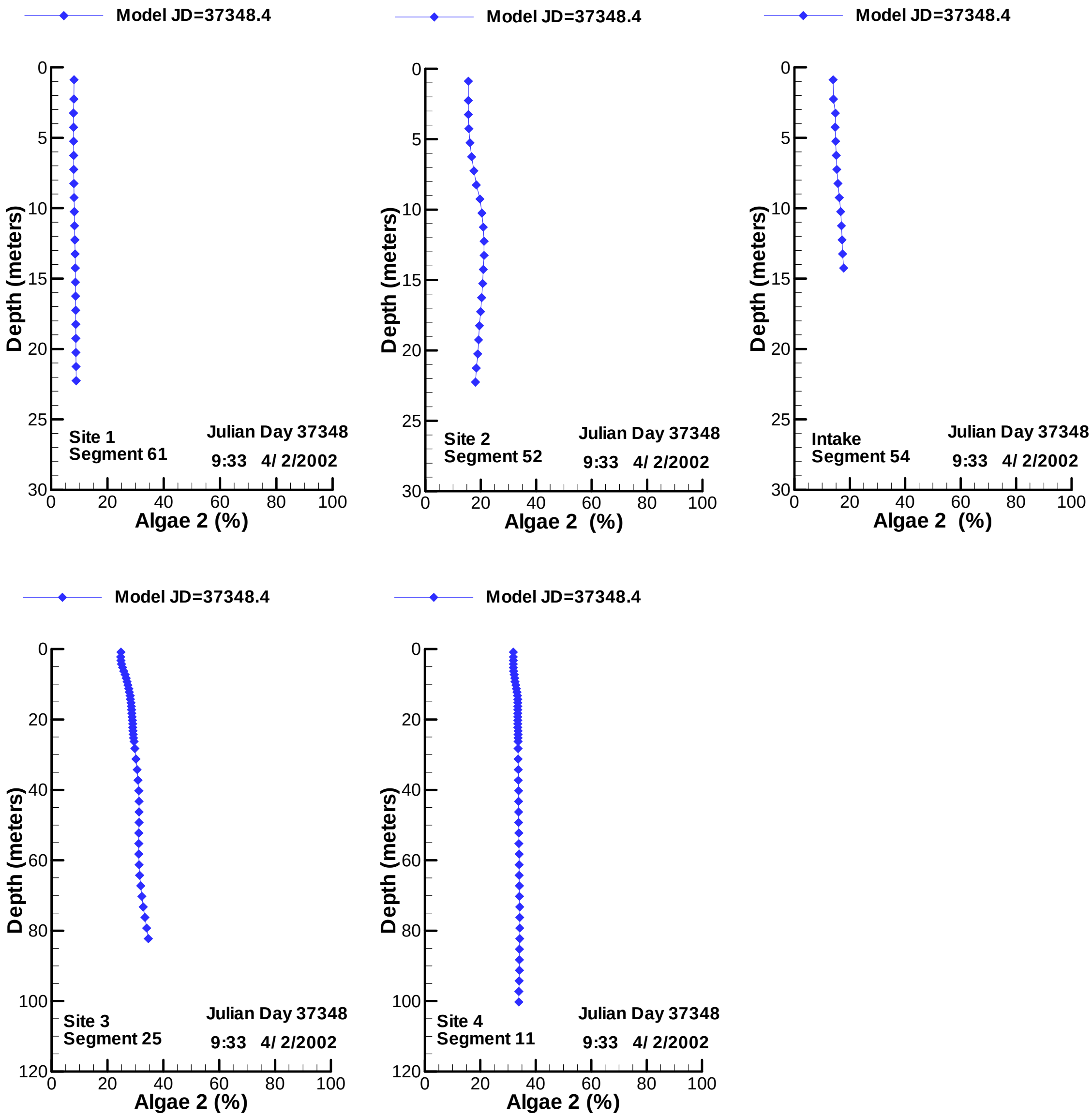

Figure 600. Vertical profiles of CHLOROPHYTA compared with data for 4/ 2/2002.

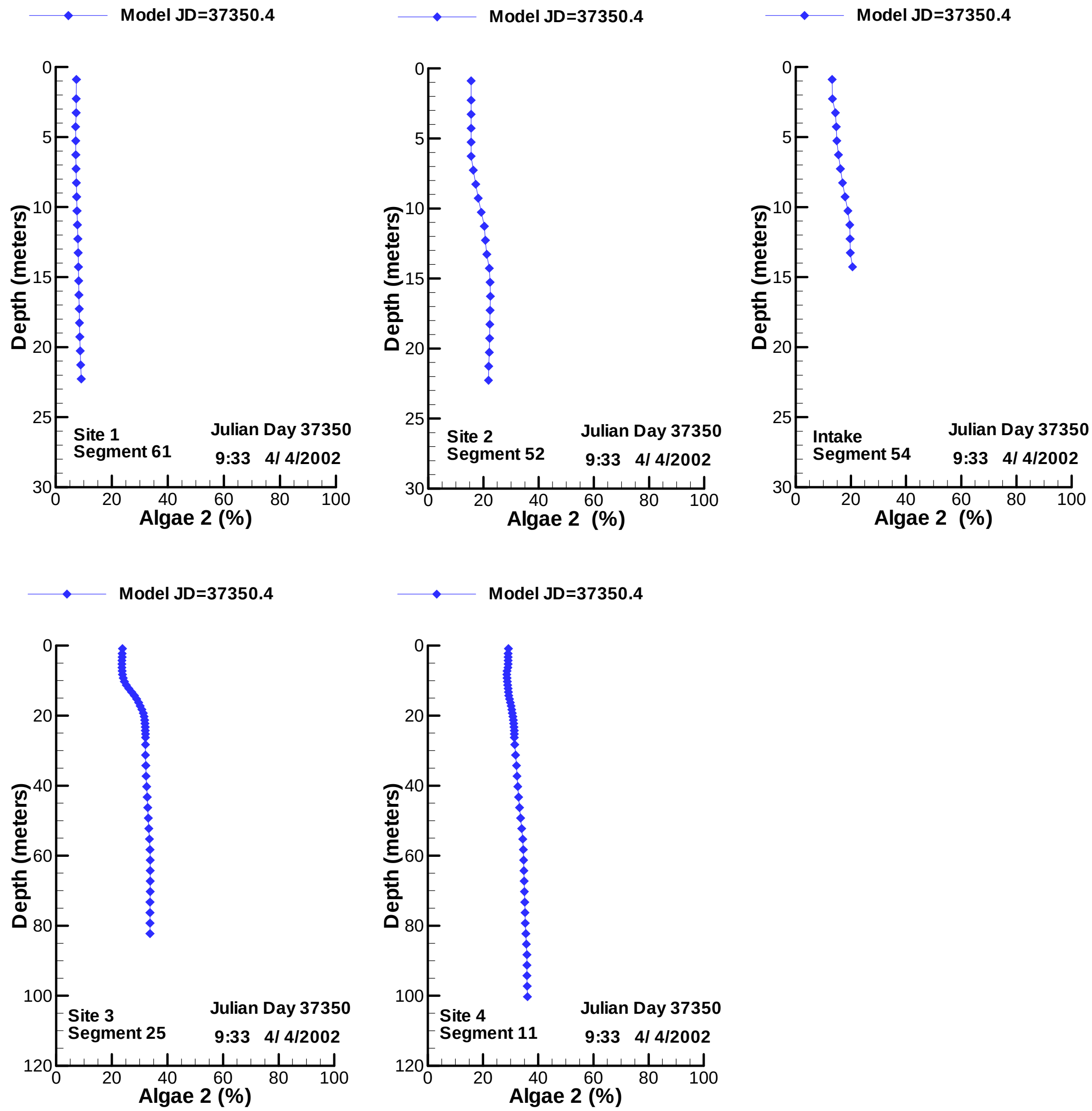

Figure 601. Vertical profiles of CHLOROPHYTA compared with data for 4/ 4/2002.

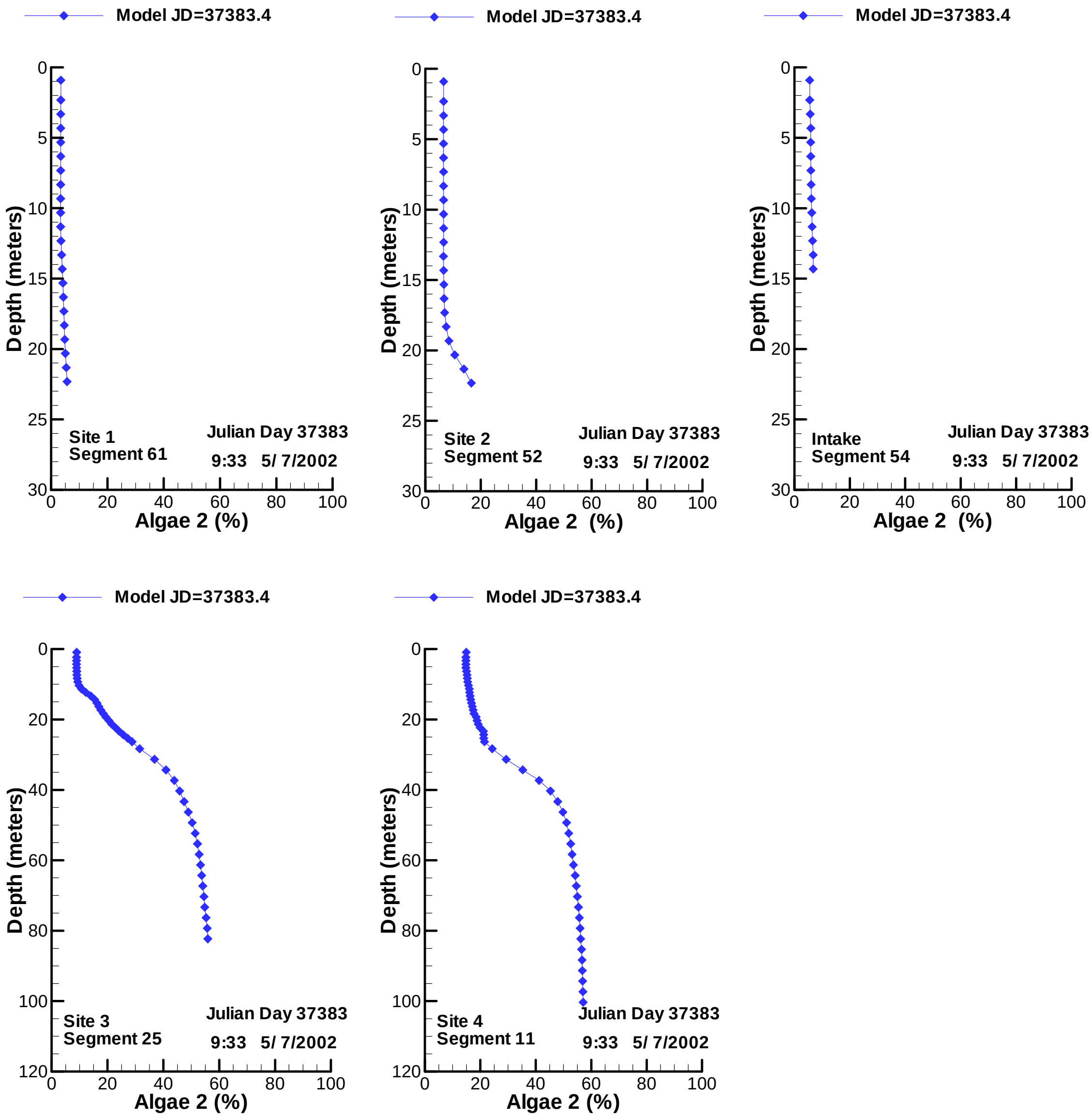

Figure 602. Vertical profiles of CHLOROPHYTA compared with data for 5/ 7/2002.

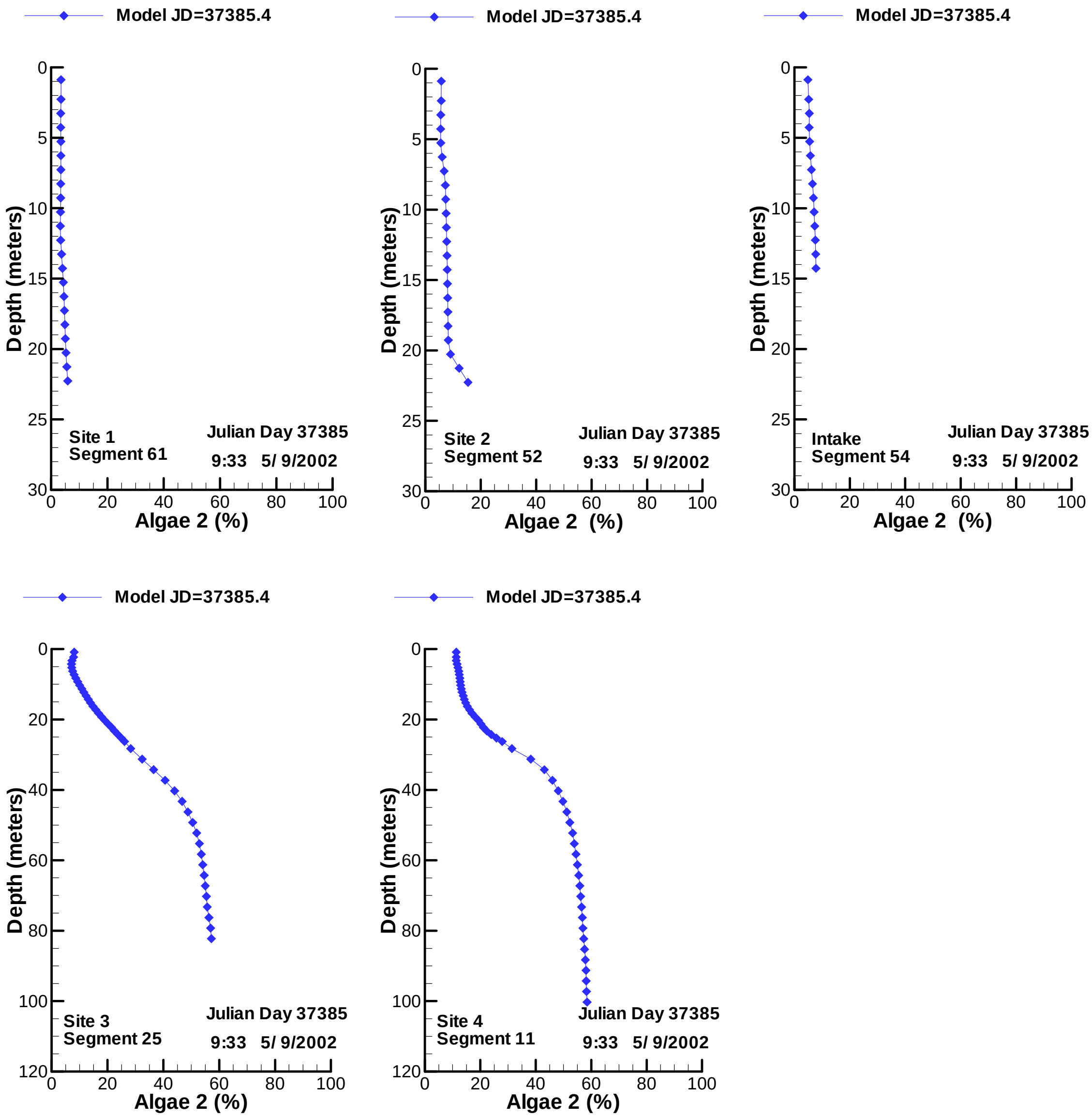

Figure 603. Vertical profiles of CHLOROPHYTA compared with data for 5/ 9/2002.

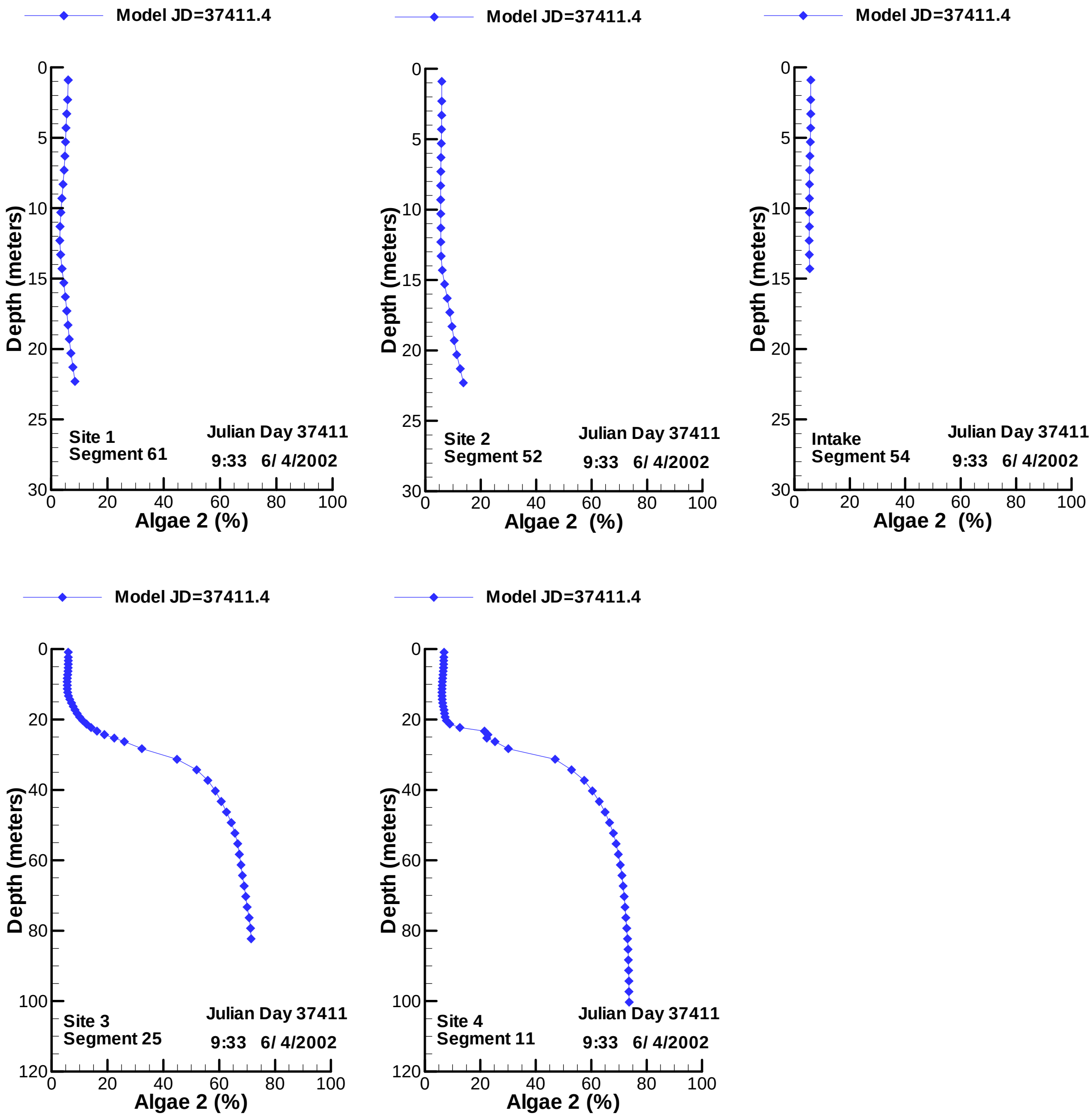

Figure 604. Vertical profiles of CHLOROPHYTA compared with data for 6/ 4/2002.

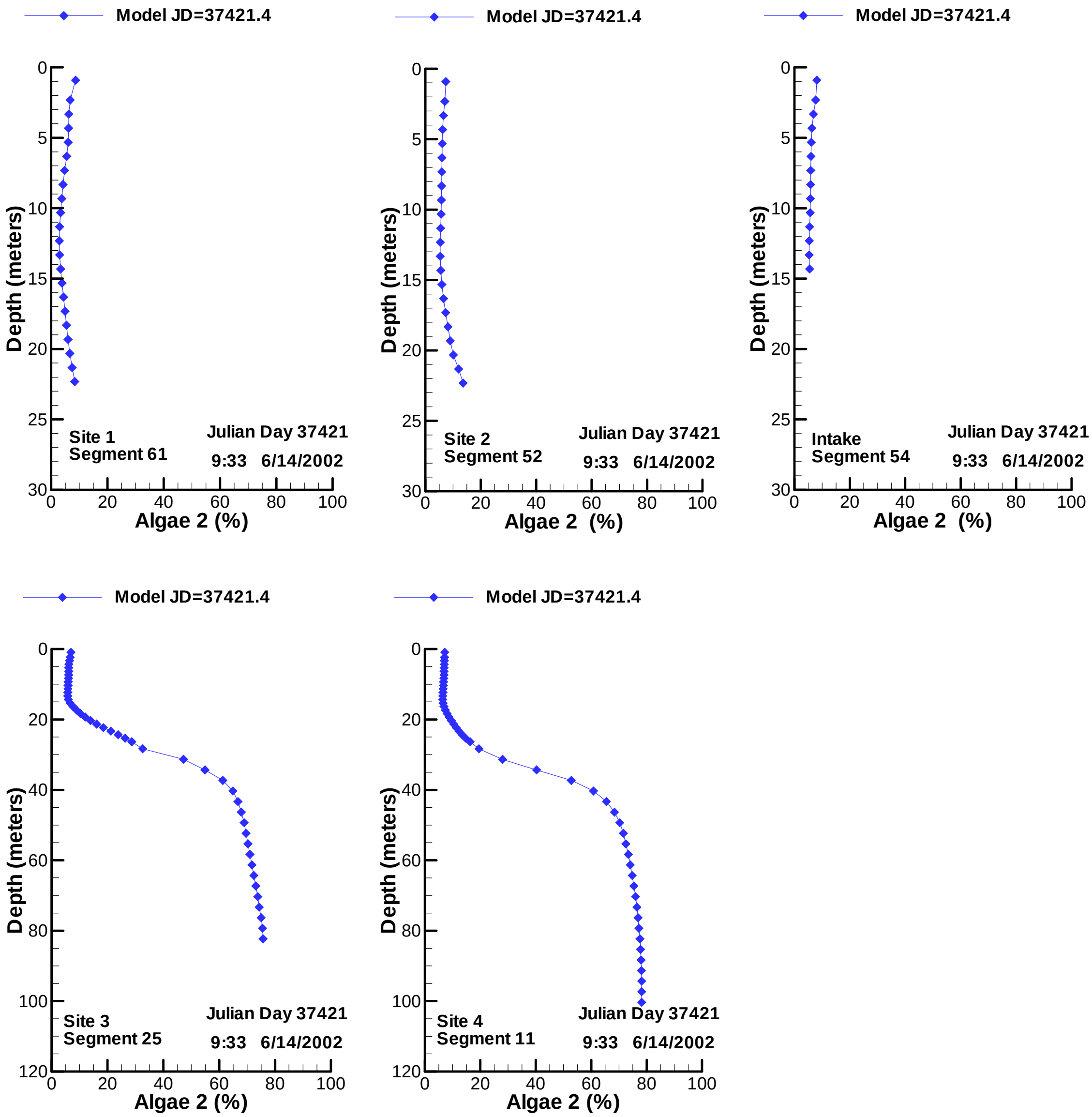

Figure 605. Vertical profiles of CHLOROPHYTA compared with data for 6/14/2002.

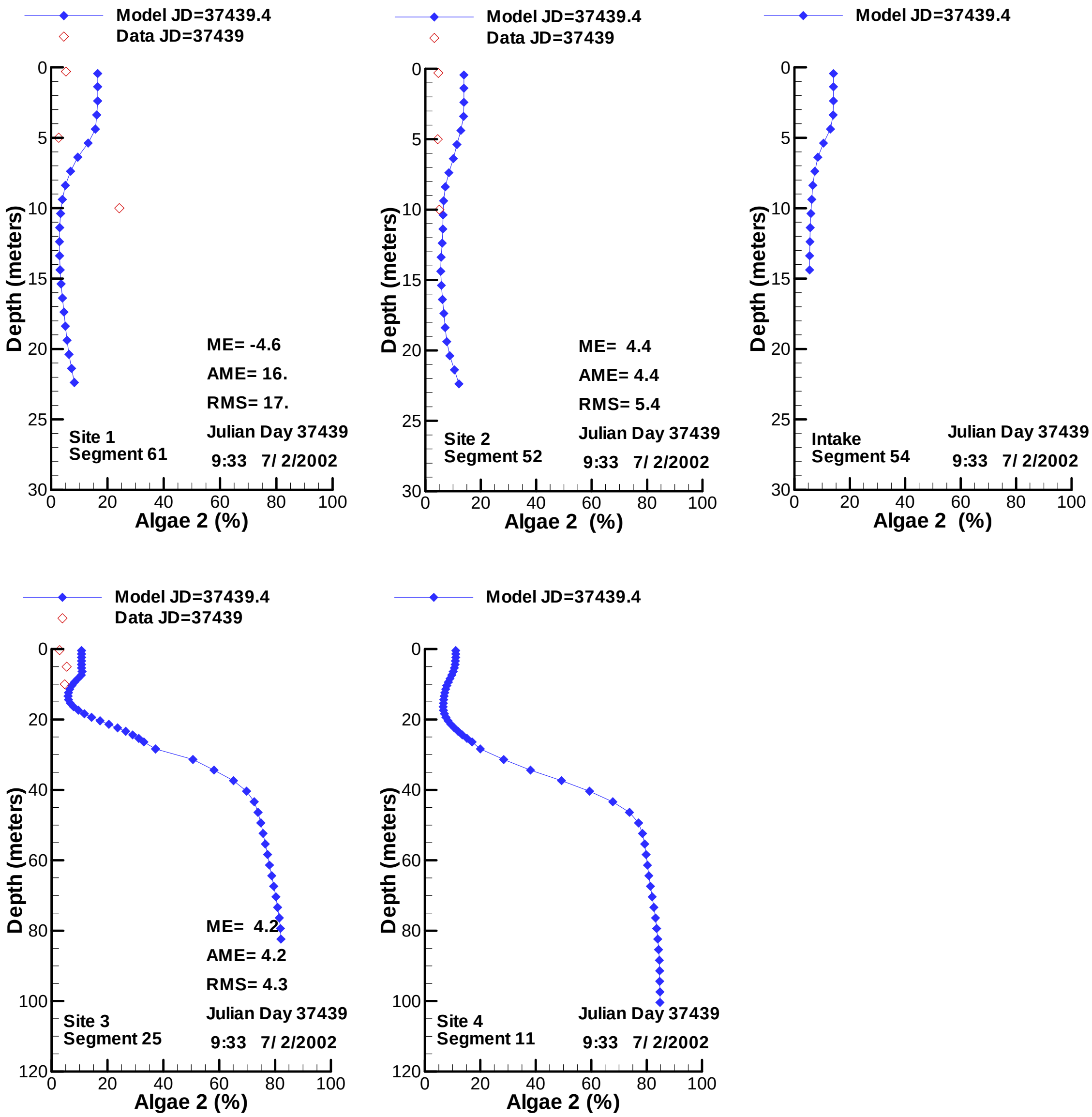

Figure 606. Vertical profiles of CHLOROPHYTA compared with data for 7/ 2/2002.

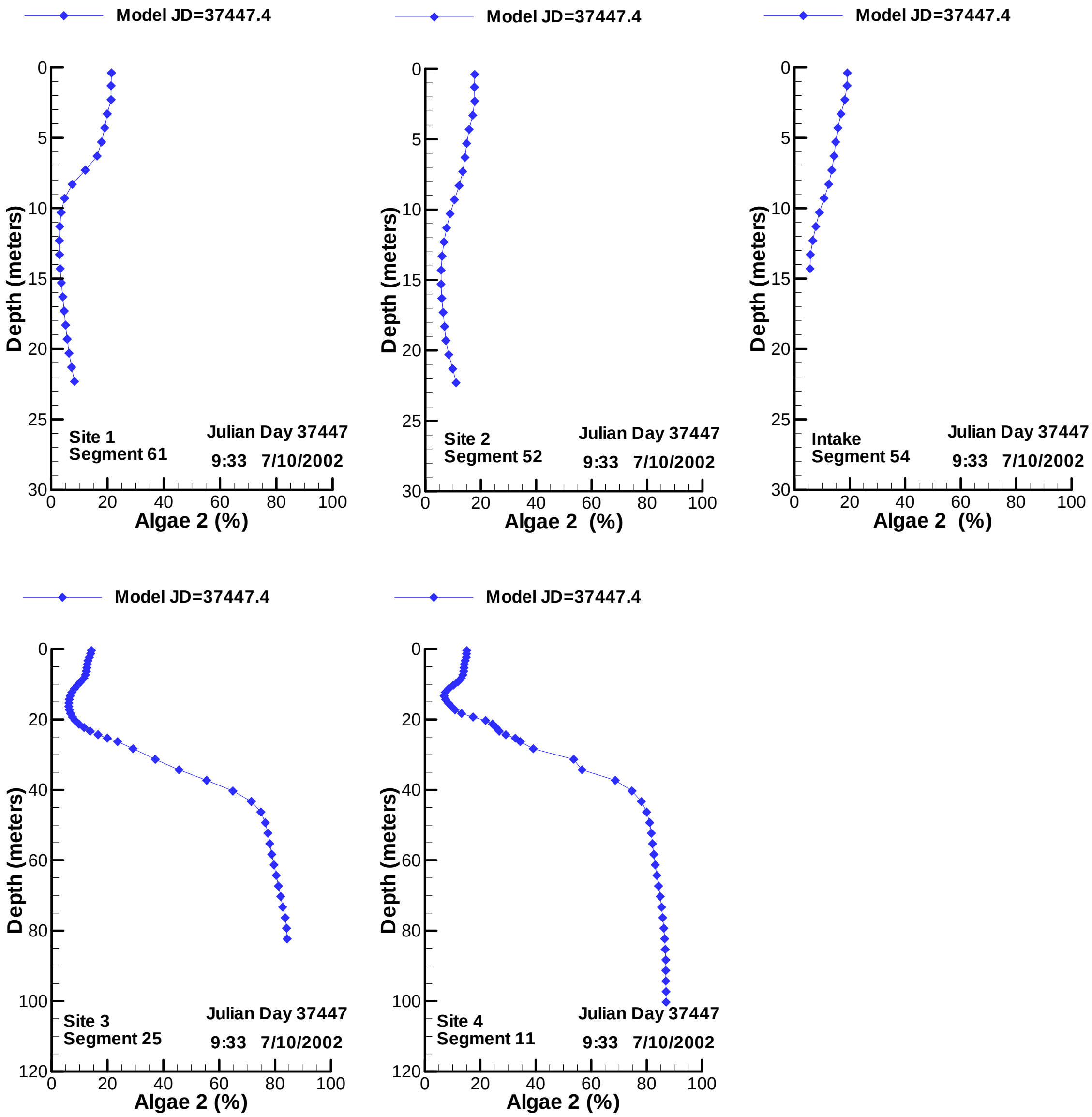

Figure 607. Vertical profiles of CHLOROPHYTA compared with data for 7/10/2002.

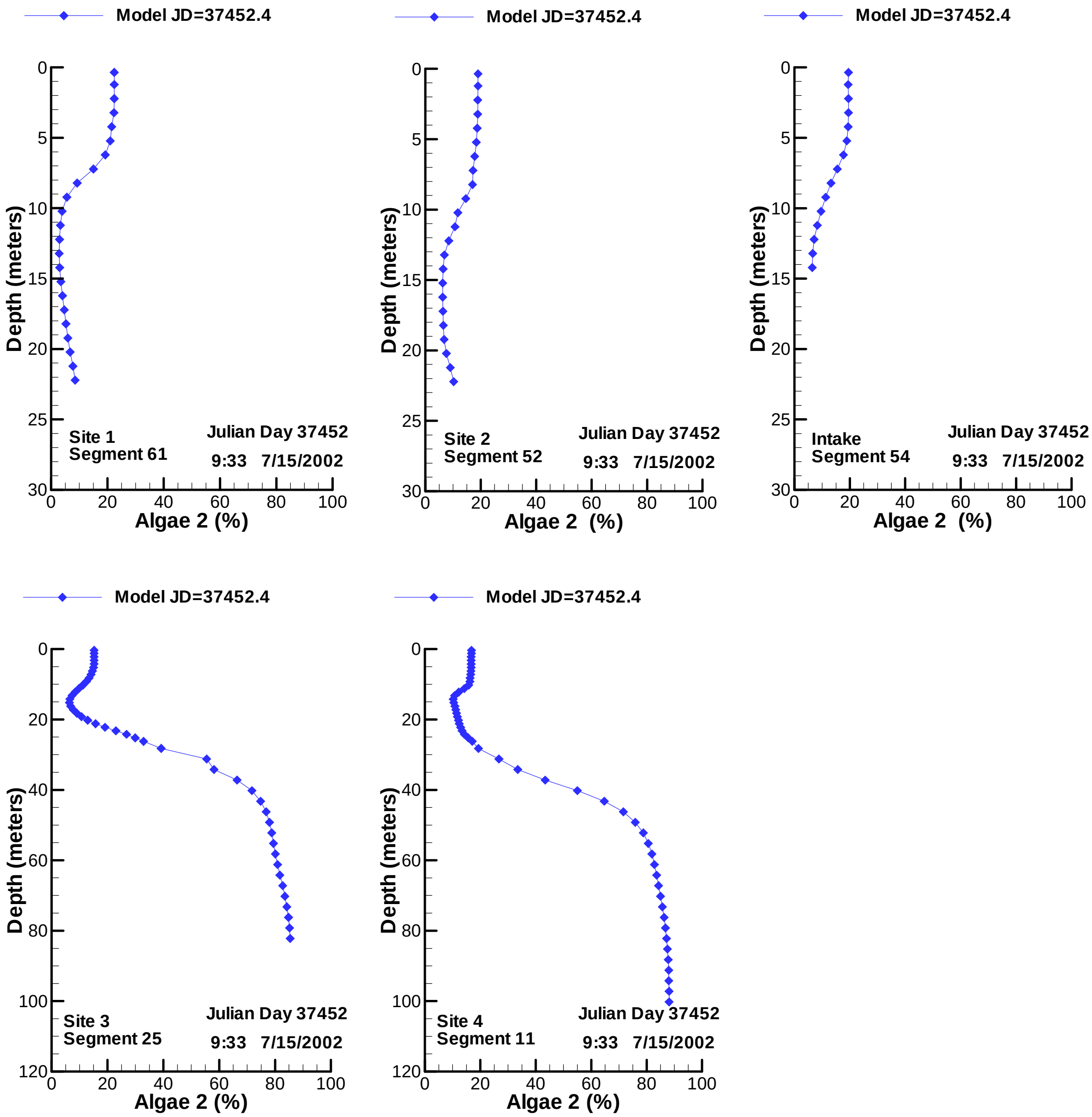

Figure 608. Vertical profiles of CHLOROPHYTA compared with data for 7/15/2002.

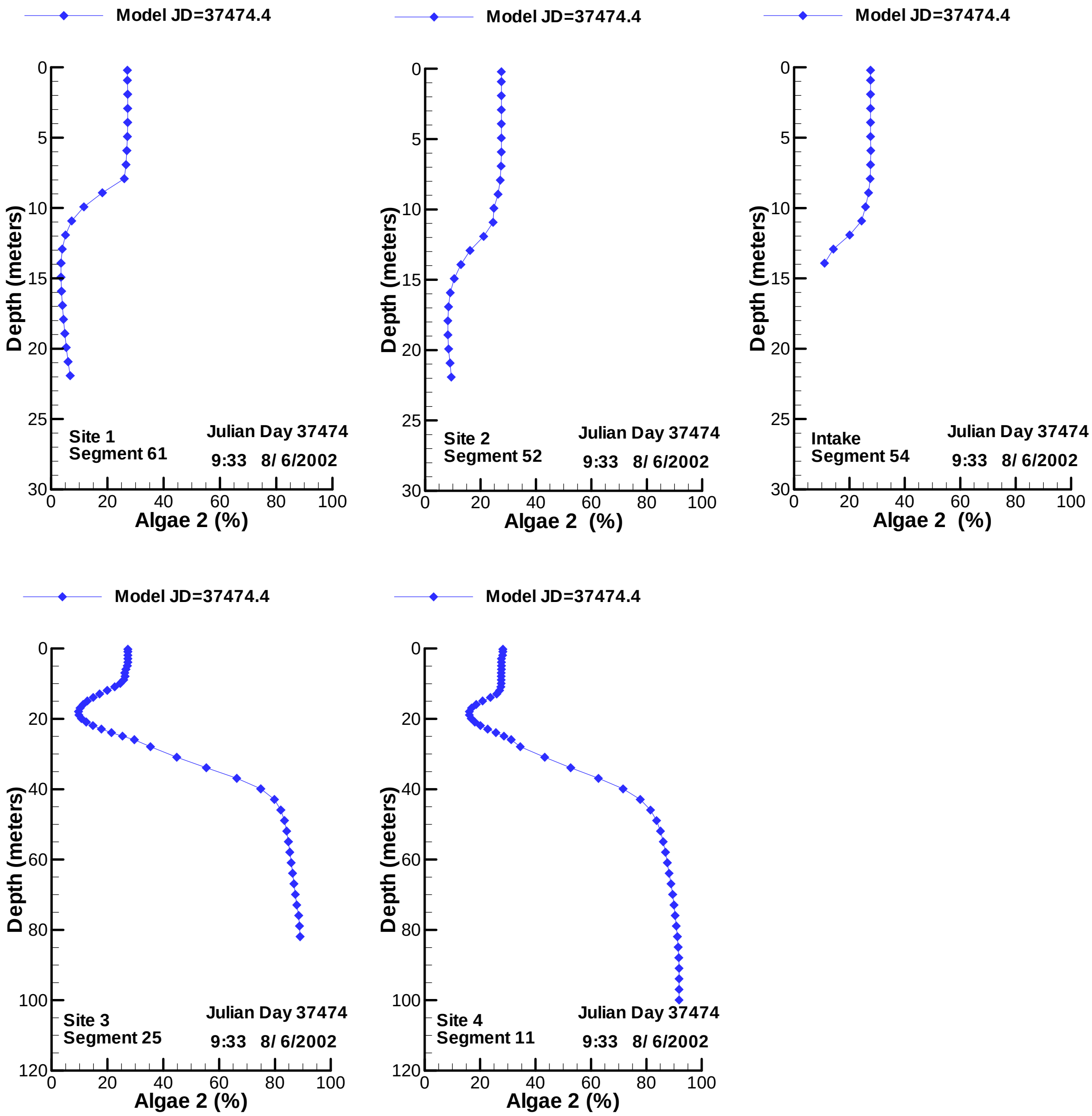

Figure 609. Vertical profiles of CHLOROPHYTA compared with data for 8/ 6/2002.

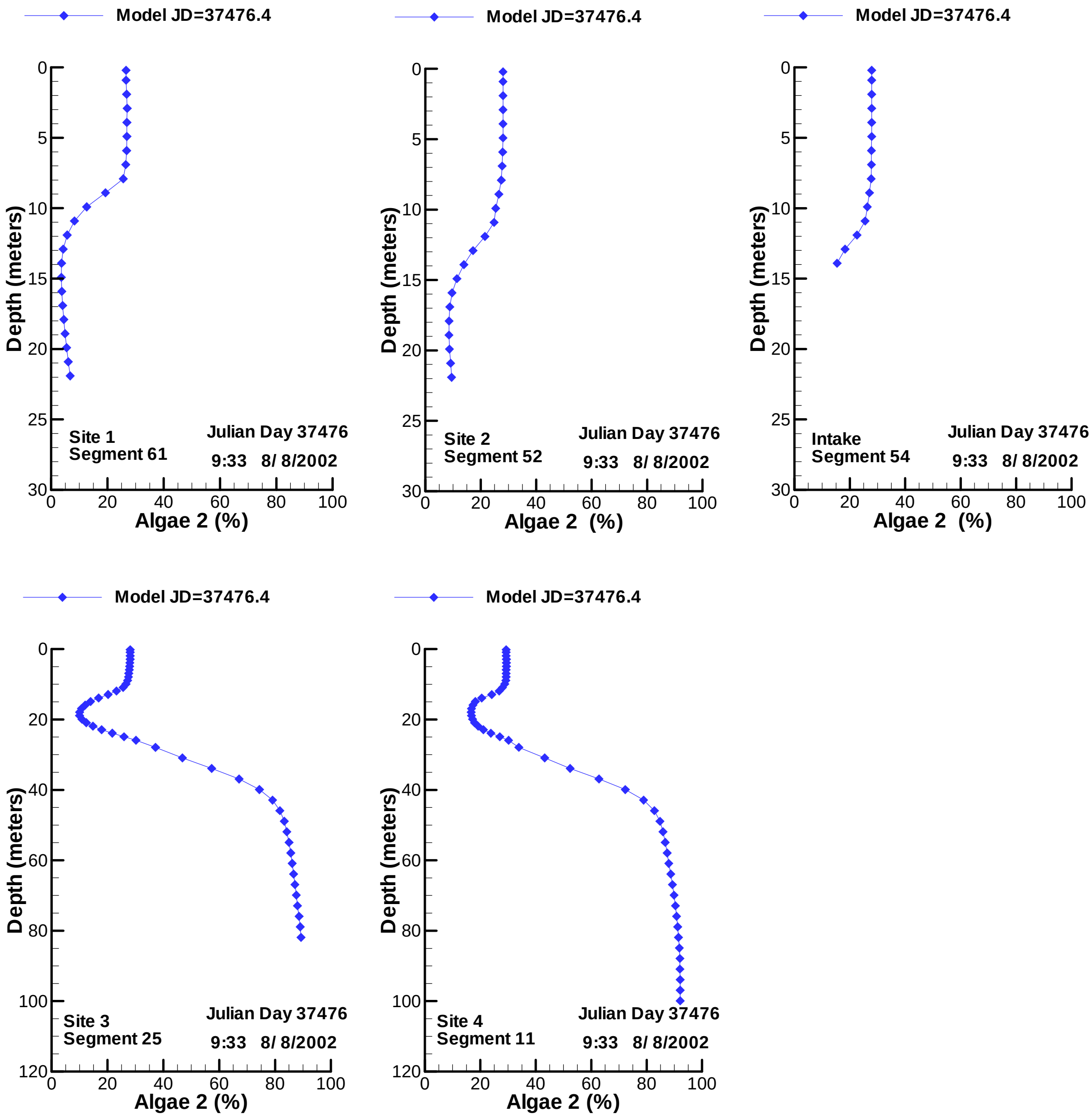

Figure 610. Vertical profiles of CHLOROPHYTA compared with data for 8/ 8/2002.

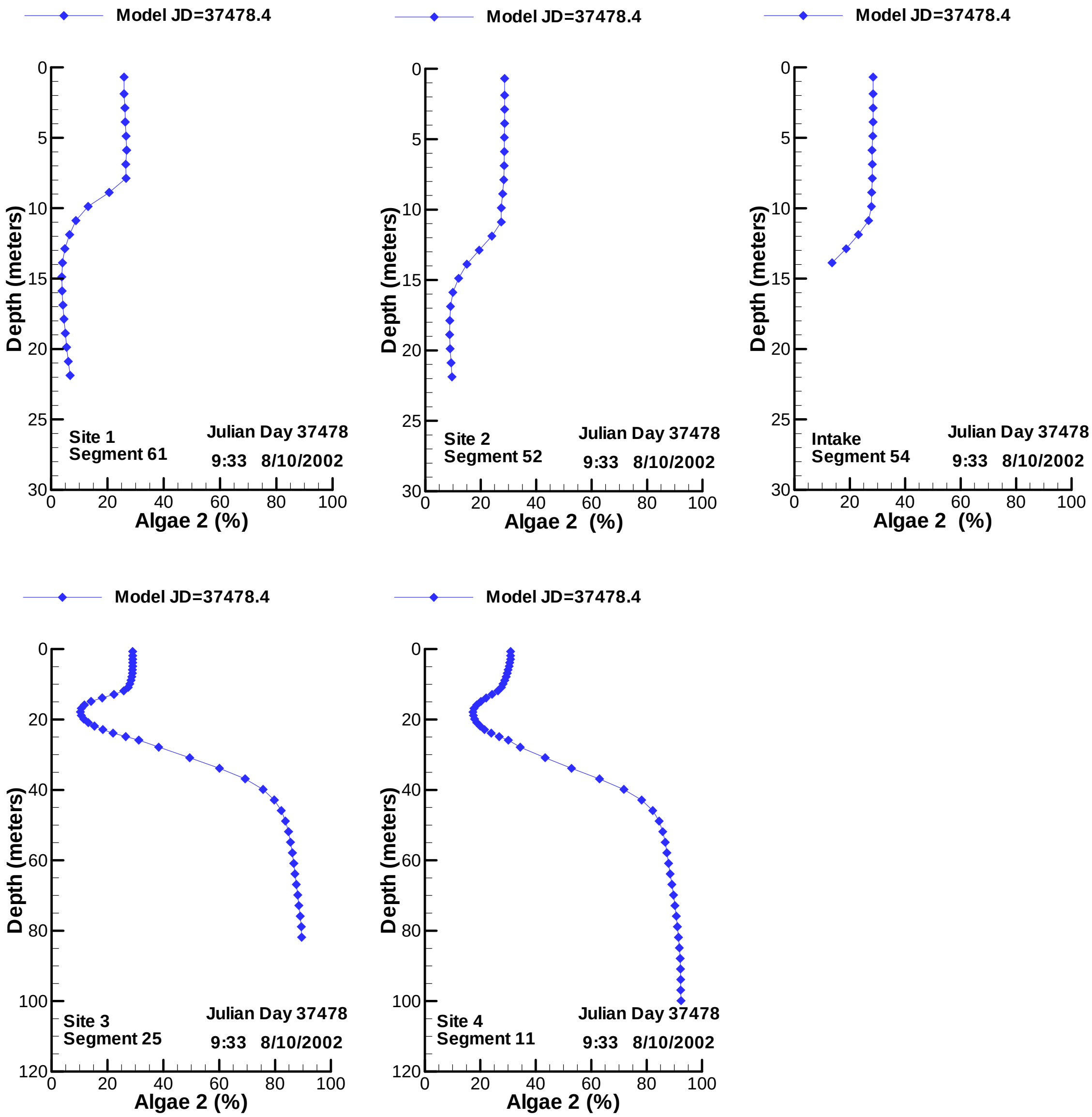

Figure 611. Vertical profiles of CHLOROPHYTA compared with data for 8/10/2002.

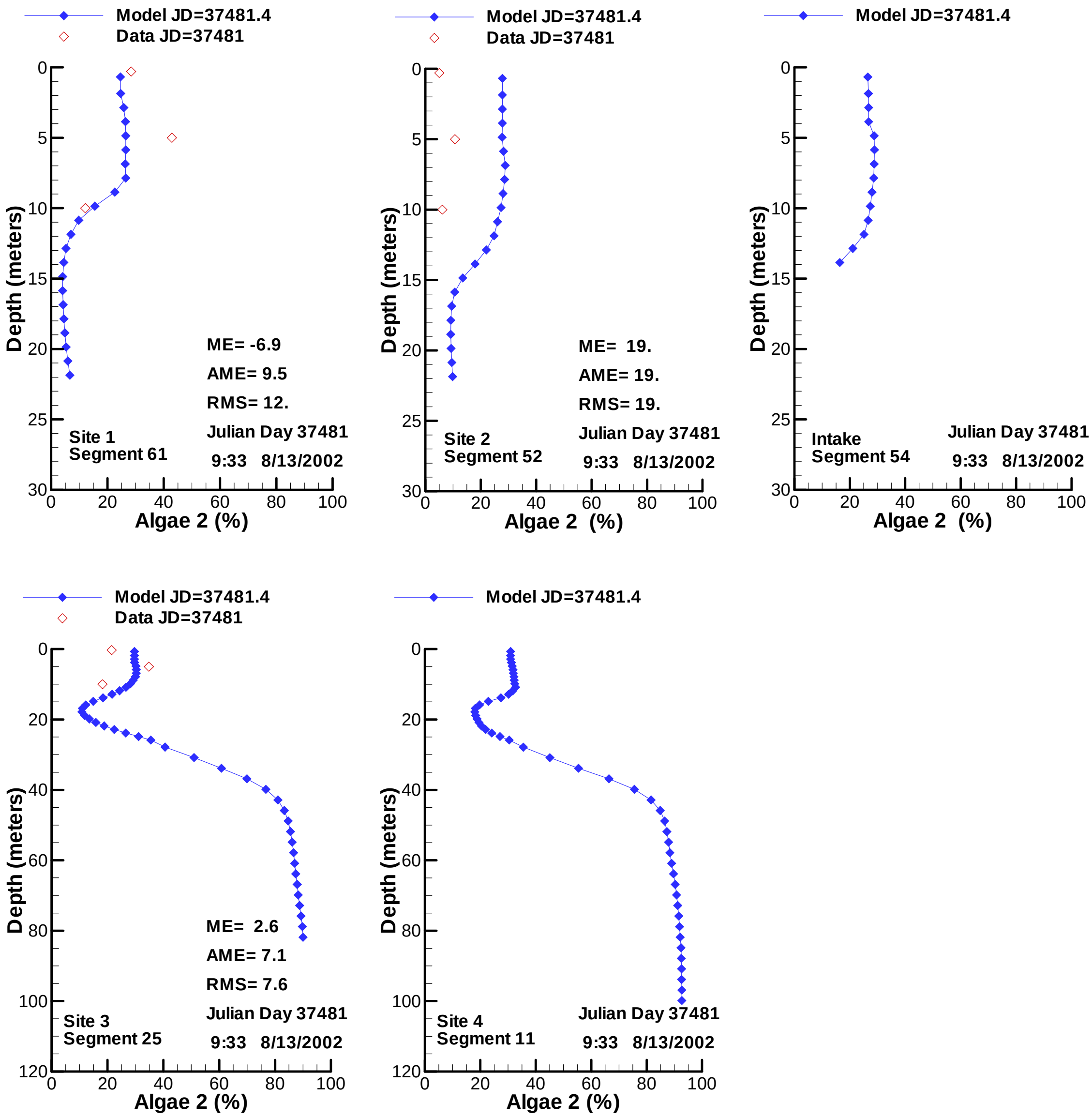

Figure 612. Vertical profiles of CHLOROPHYTA compared with data for 8/13/2002.

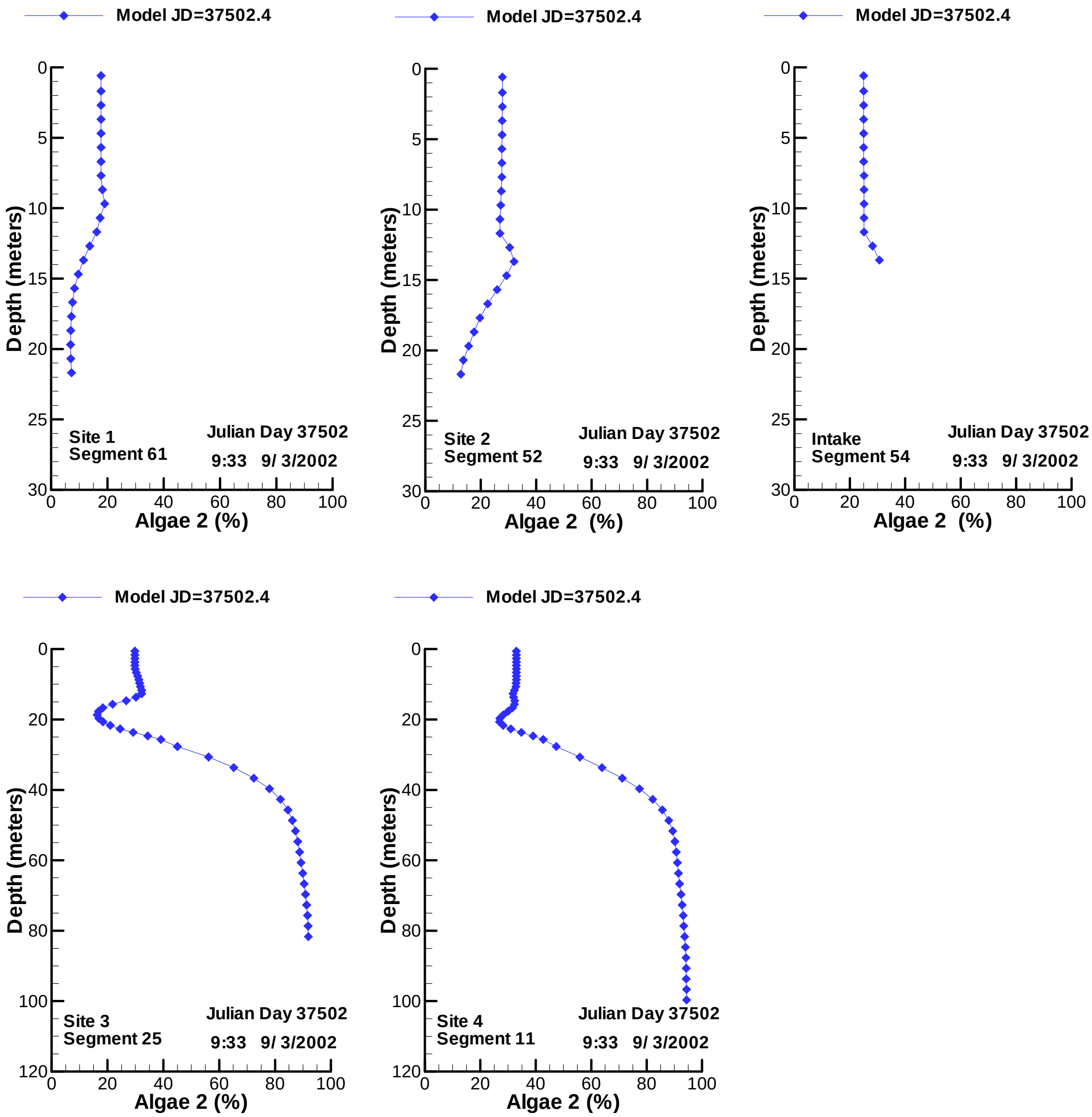

Figure 613. Vertical profiles of CHLOROPHYTA compared with data for 9/ 3/2002.

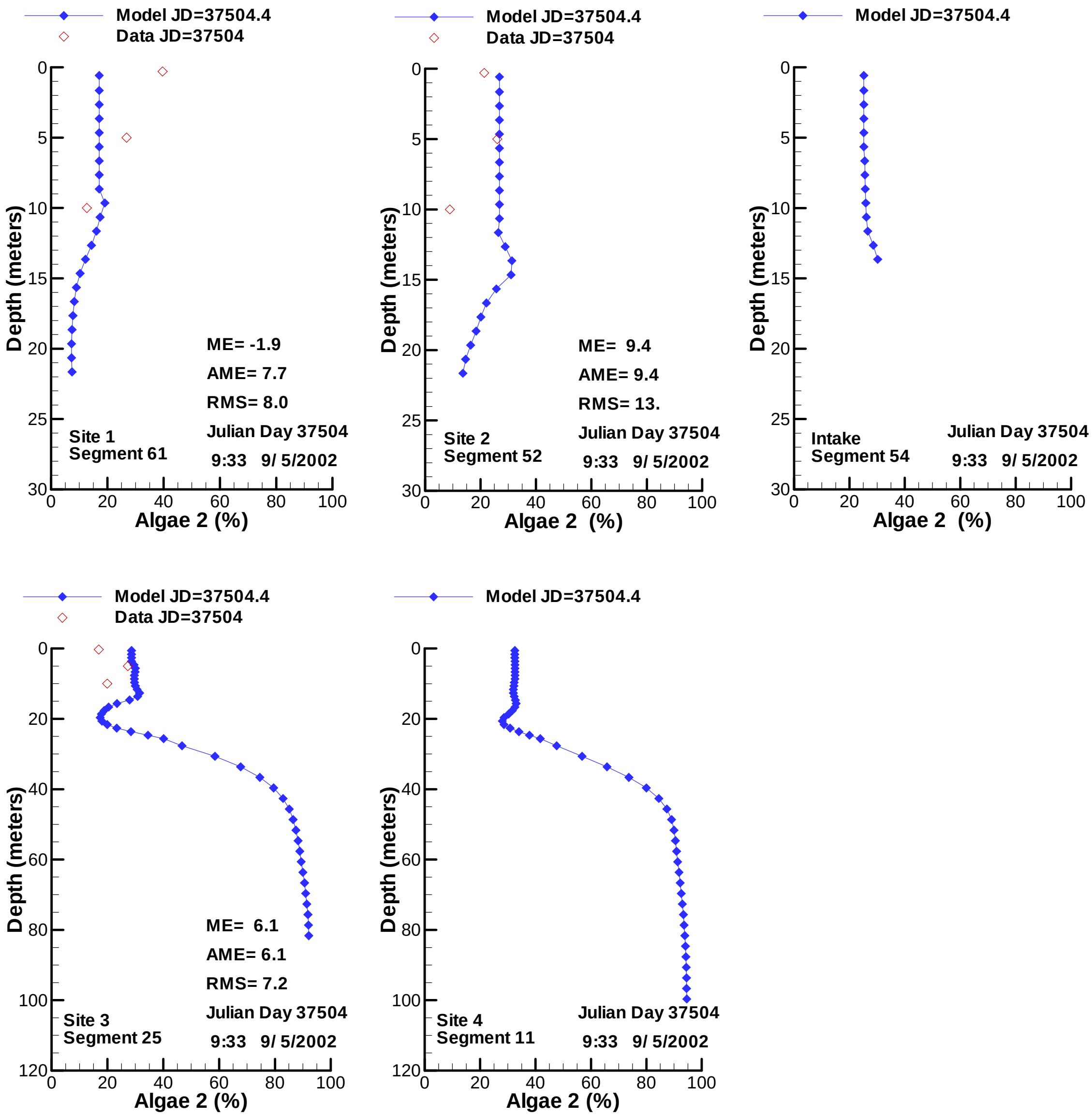

Figure 614. Vertical profiles of CHLOROPHYTA compared with data for 9/ 5/2002.

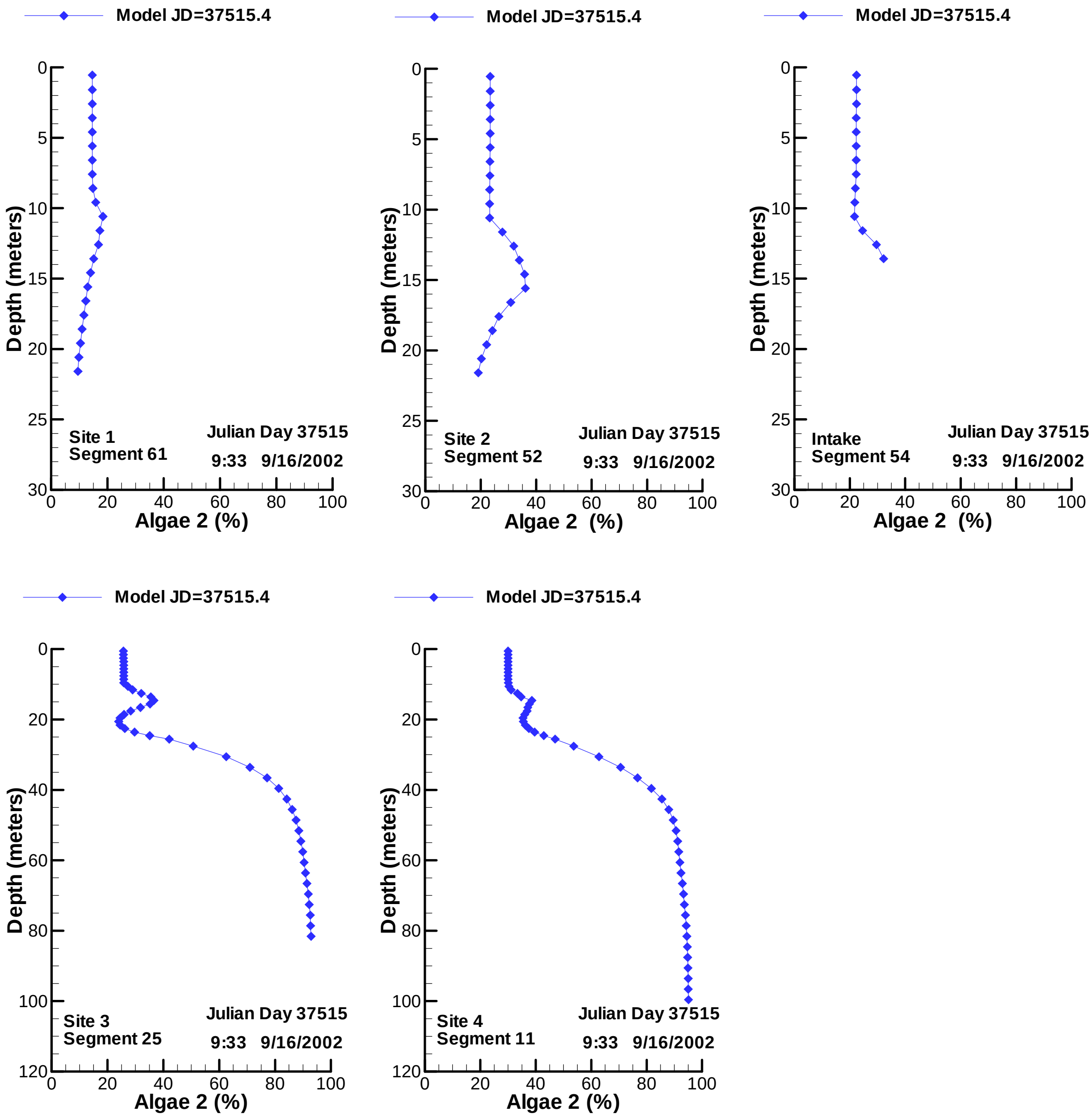

Figure 615. Vertical profiles of CHLOROPHYTA compared with data for 9/16/2002.

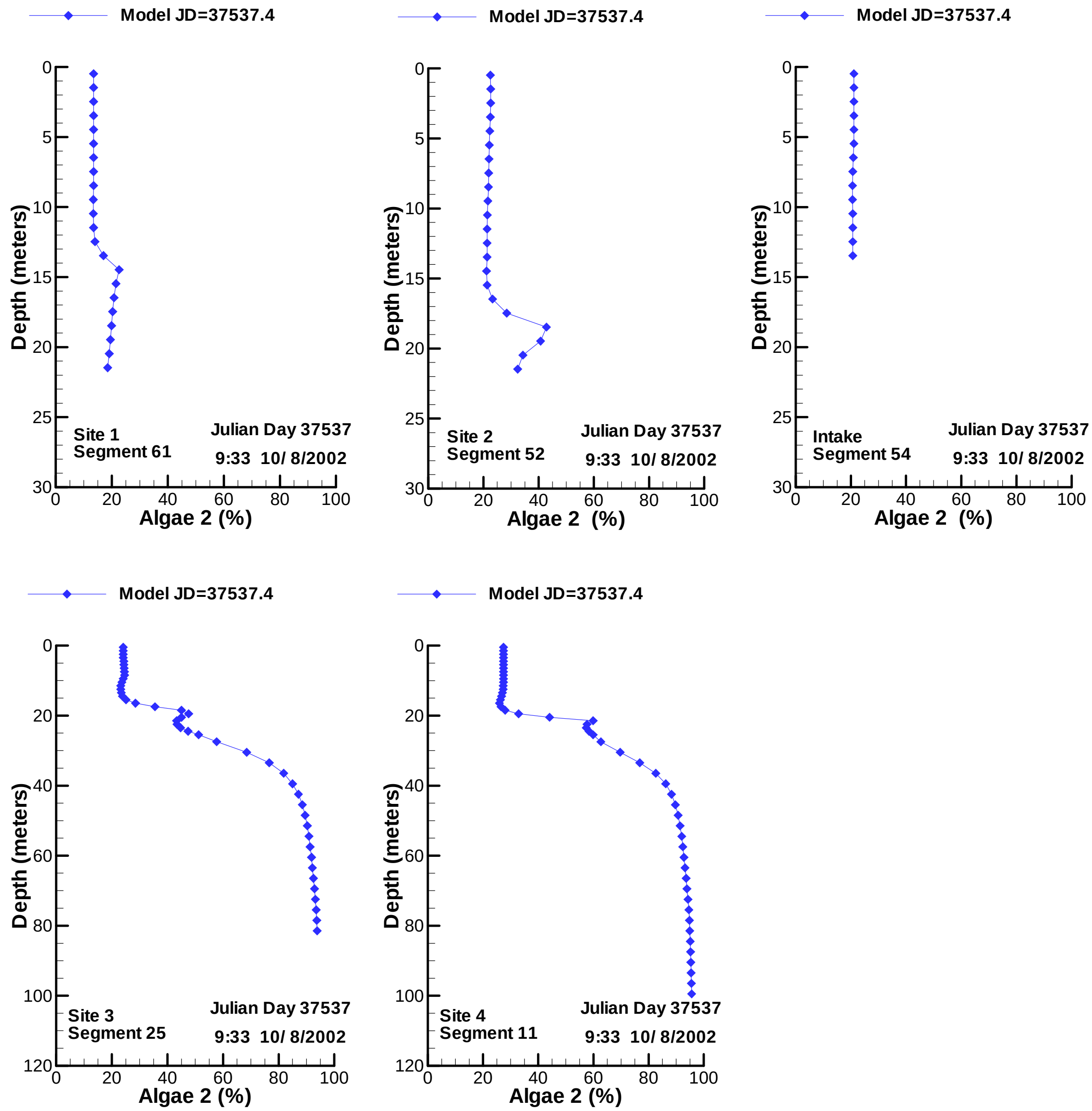

Figure 616. Vertical profiles of CHLOROPHYTA compared with data for 10/ 8/2002.

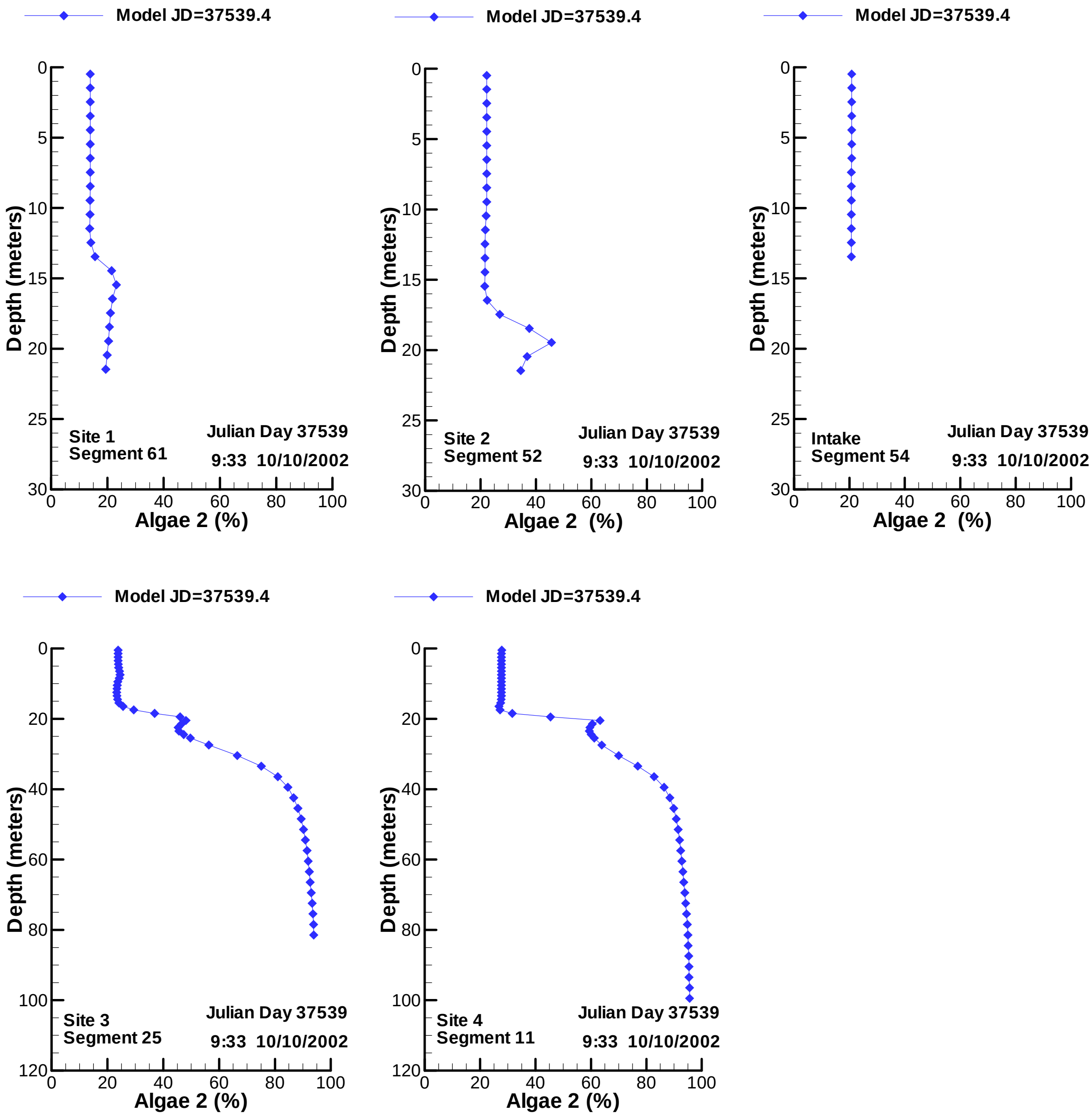

Figure 617. Vertical profiles of CHLOROPHYTA compared with data for 10/10/2002.

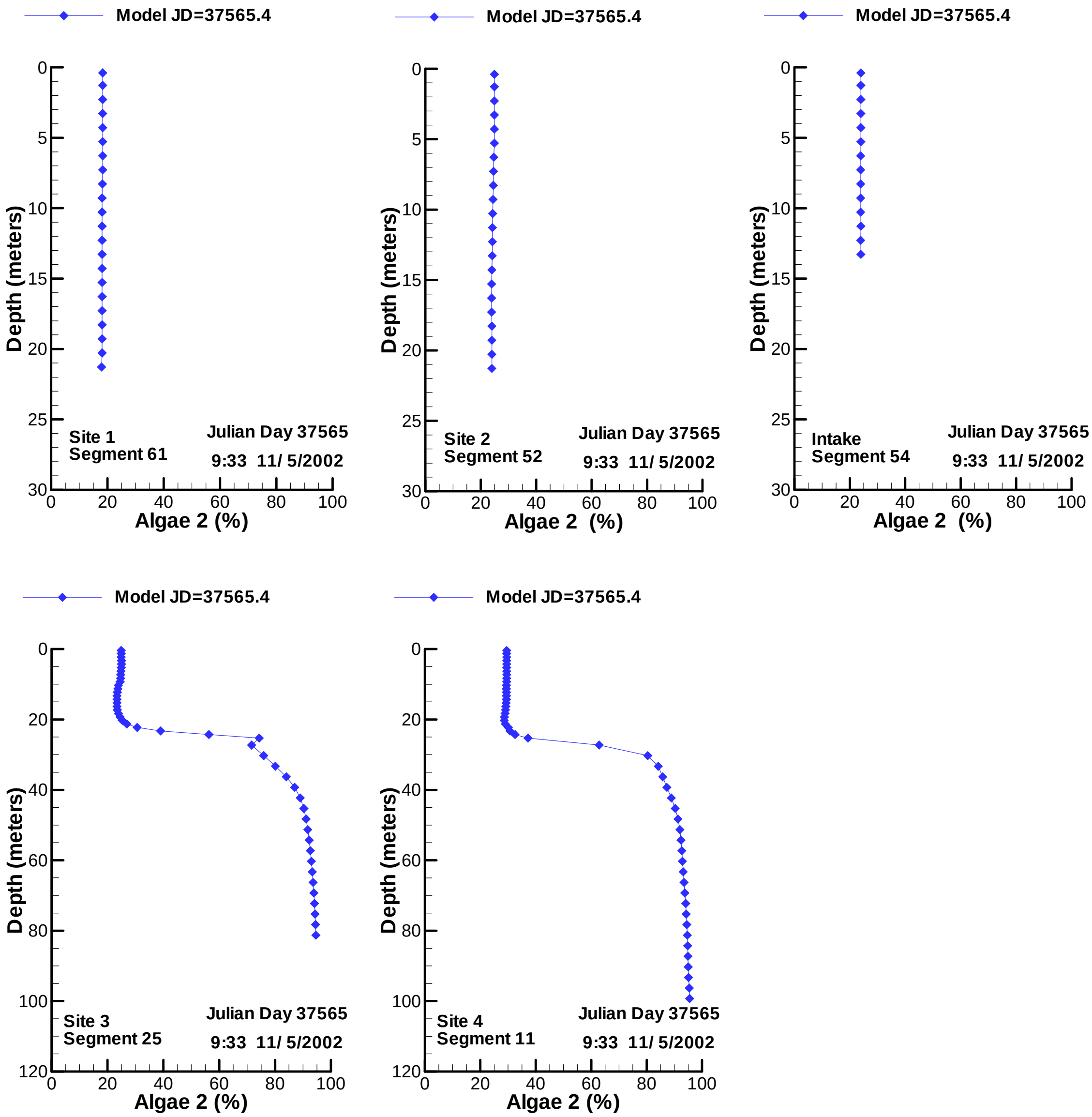

Figure 618. Vertical profiles of CHLOROPHYTA compared with data for 11/ 5/2002.

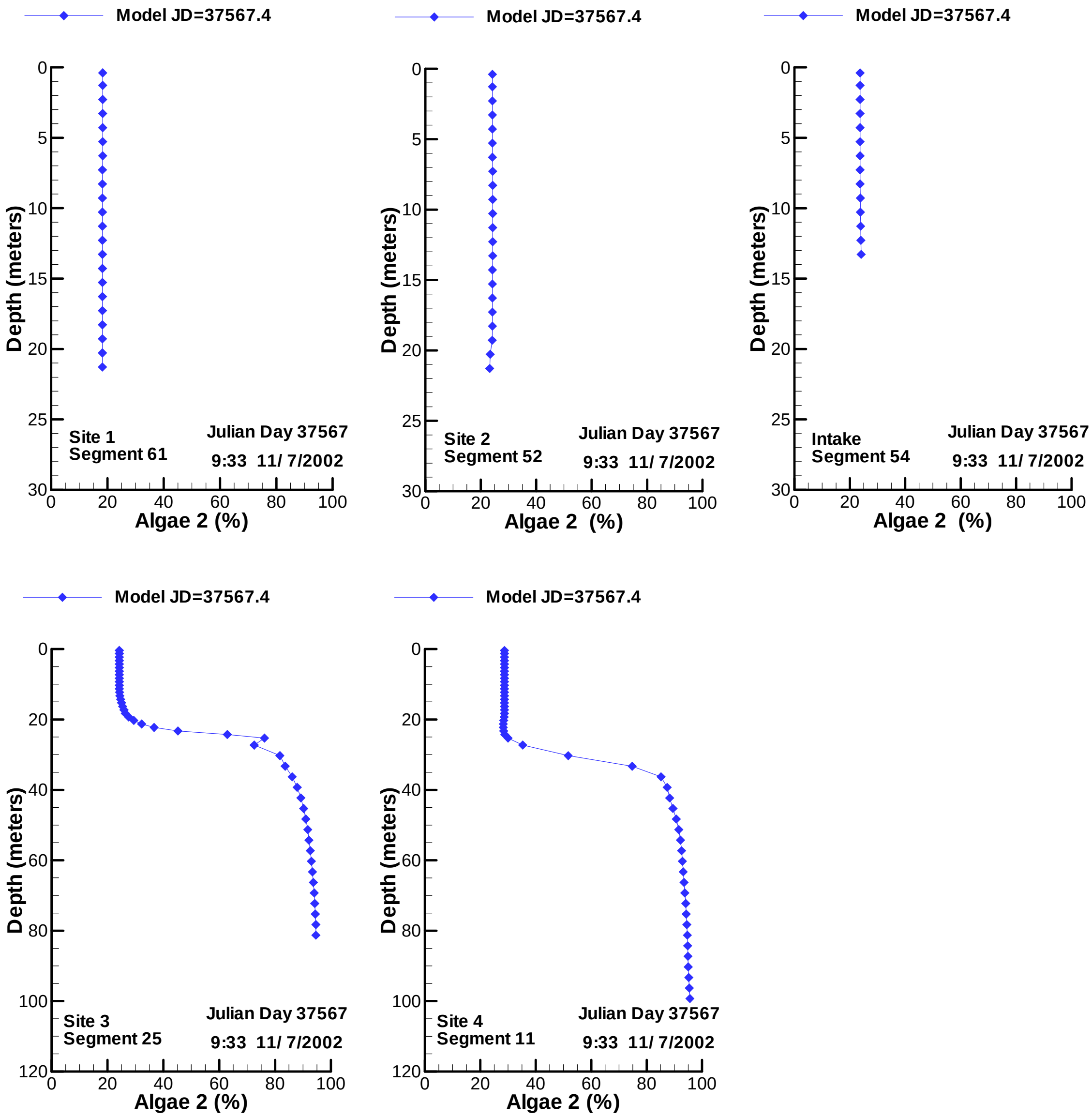

Figure 619. Vertical profiles of CHLOROPHYTA compared with data for 11/ 7/2002.

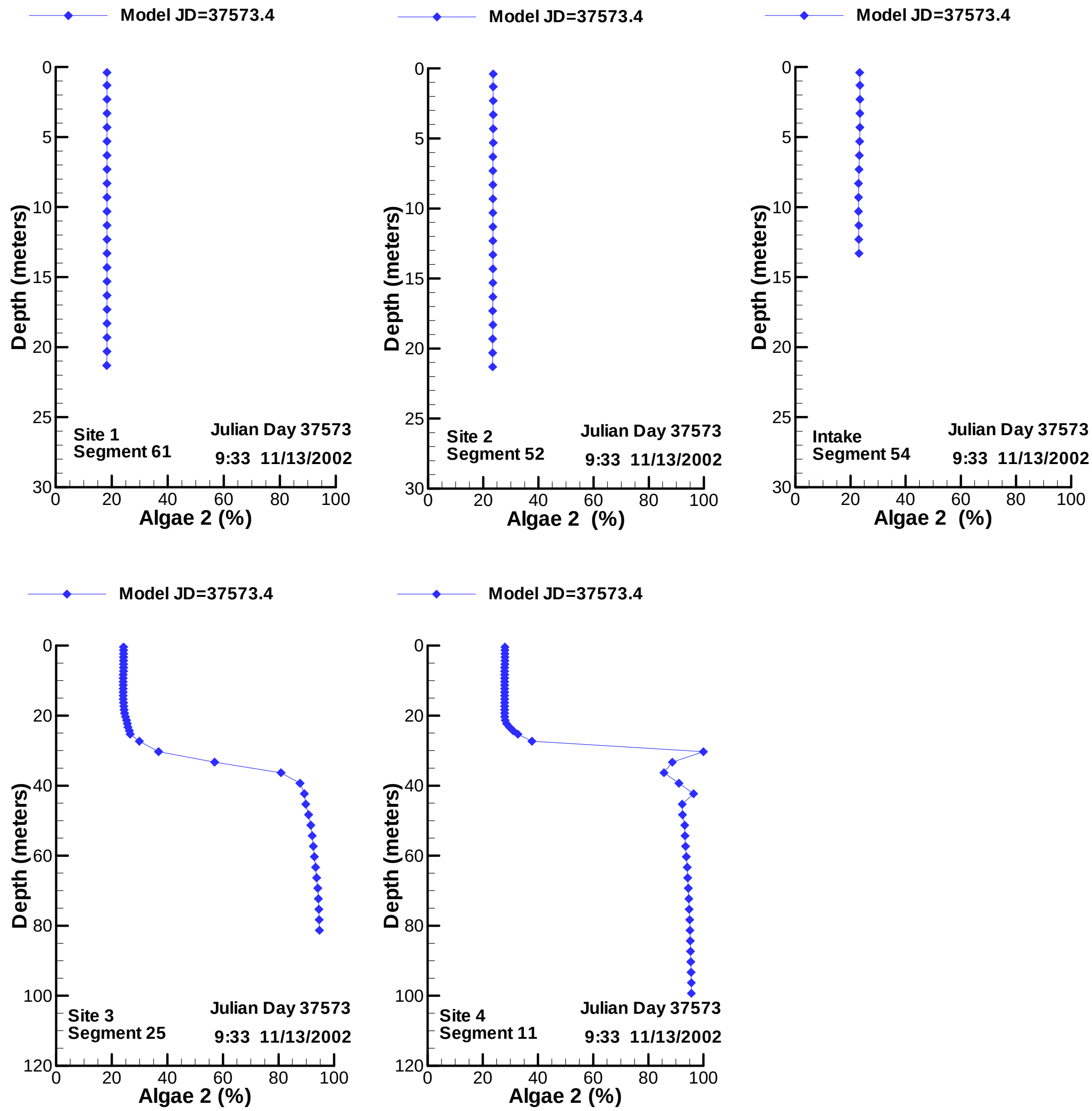

Figure 620. Vertical profiles of CHLOROPHYTA compared with data for 11/13/2002.

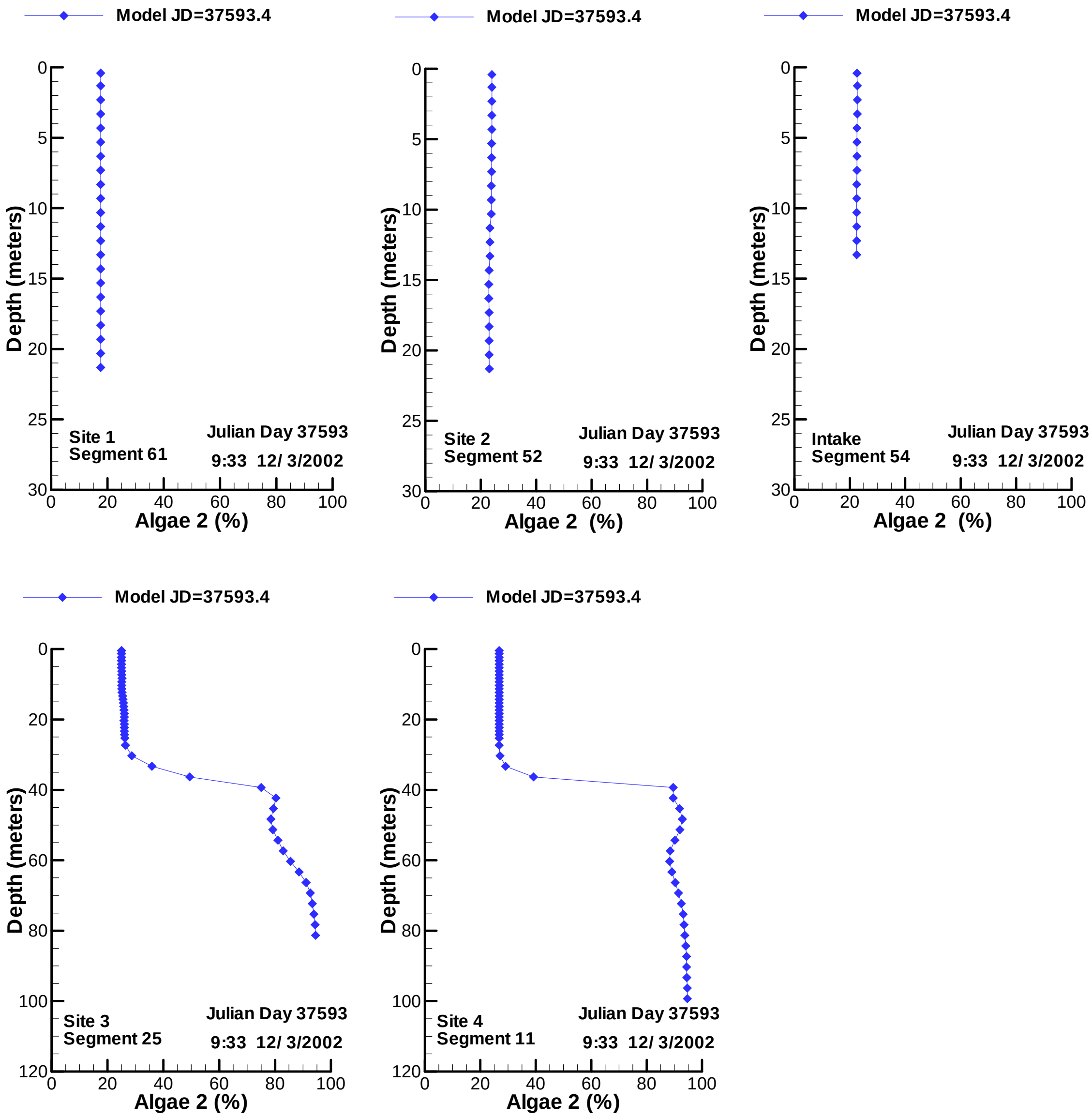

Figure 621. Vertical profiles of CHLOROPHYTA compared with data for 12/ 3/2002.

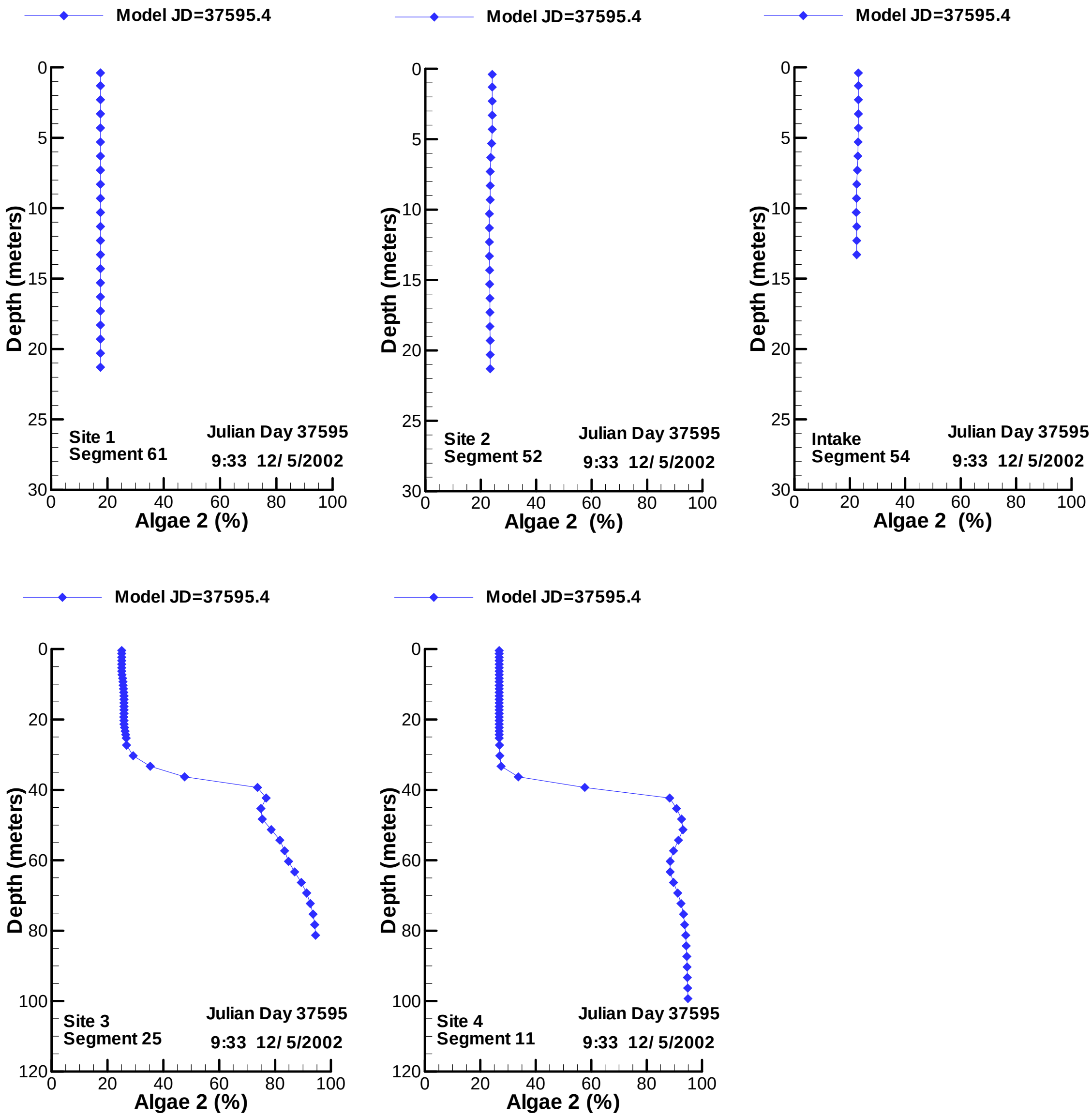

Figure 622. Vertical profiles of CHLOROPHYTA compared with data for 12/ 5/2002.

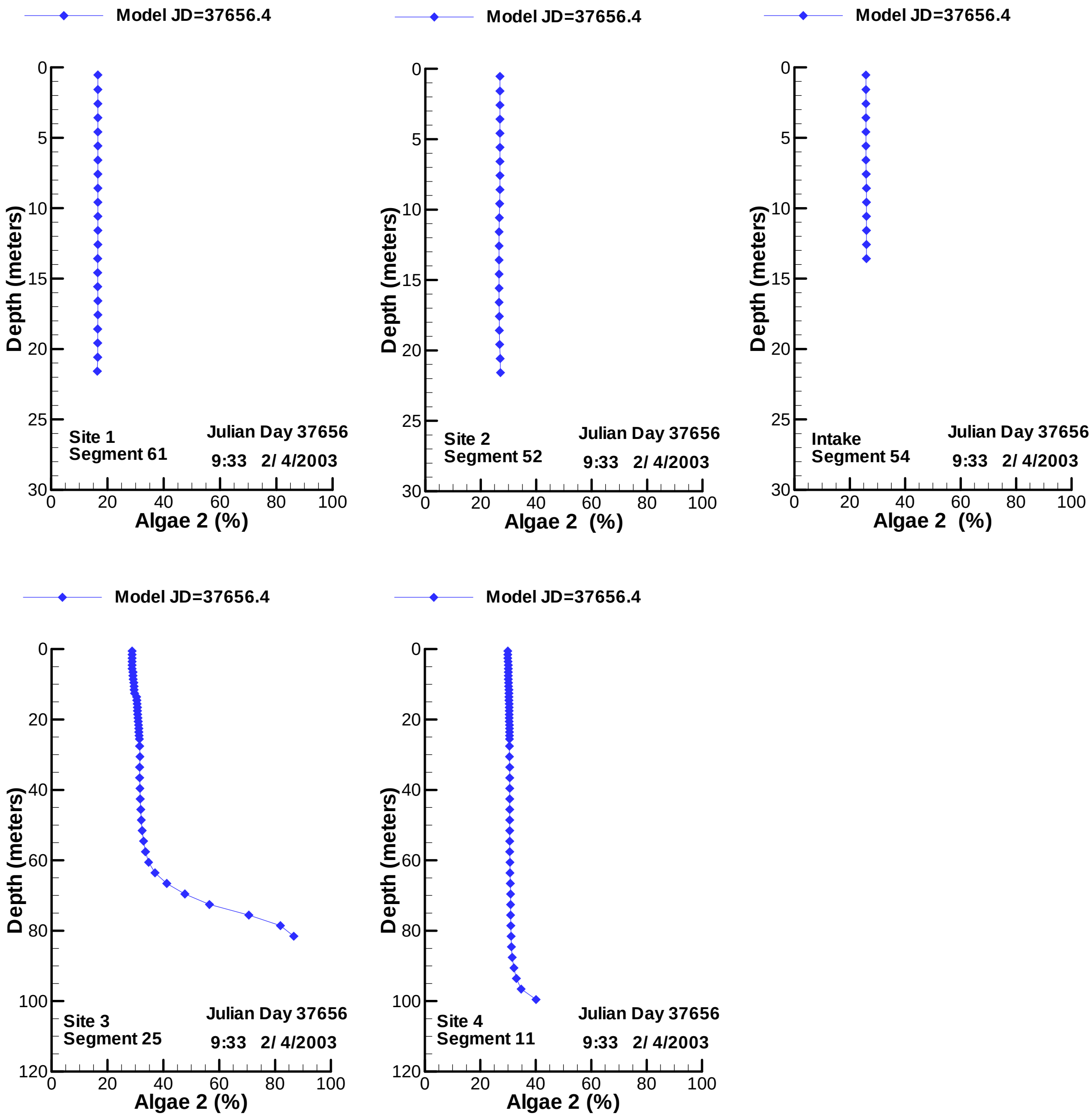

Figure 623. Vertical profiles of CHLOROPHYTA compared with data for 2/ 4/2003.

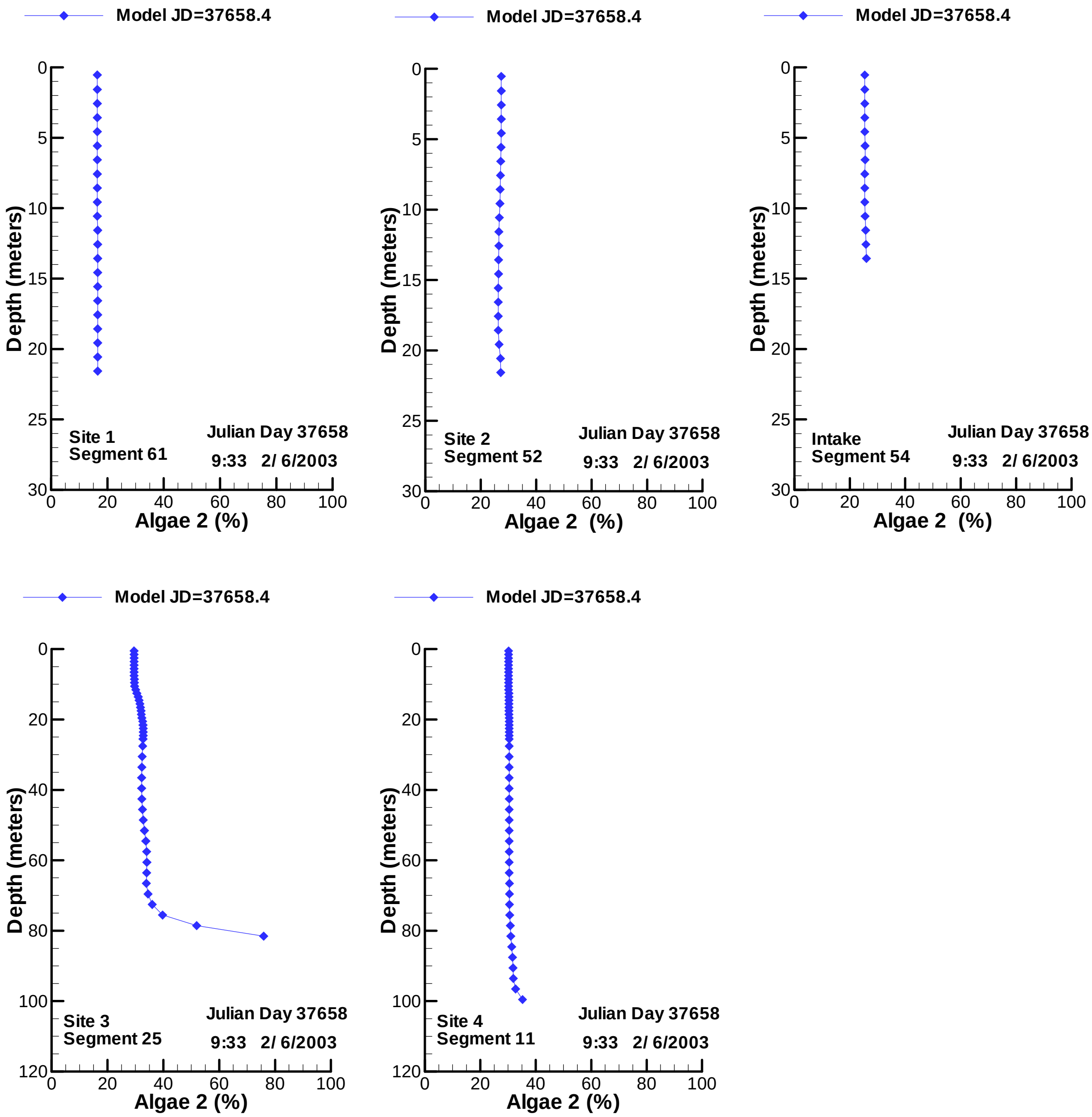

Figure 624. Vertical profiles of CHLOROPHYTA compared with data for 2/ 6/2003.

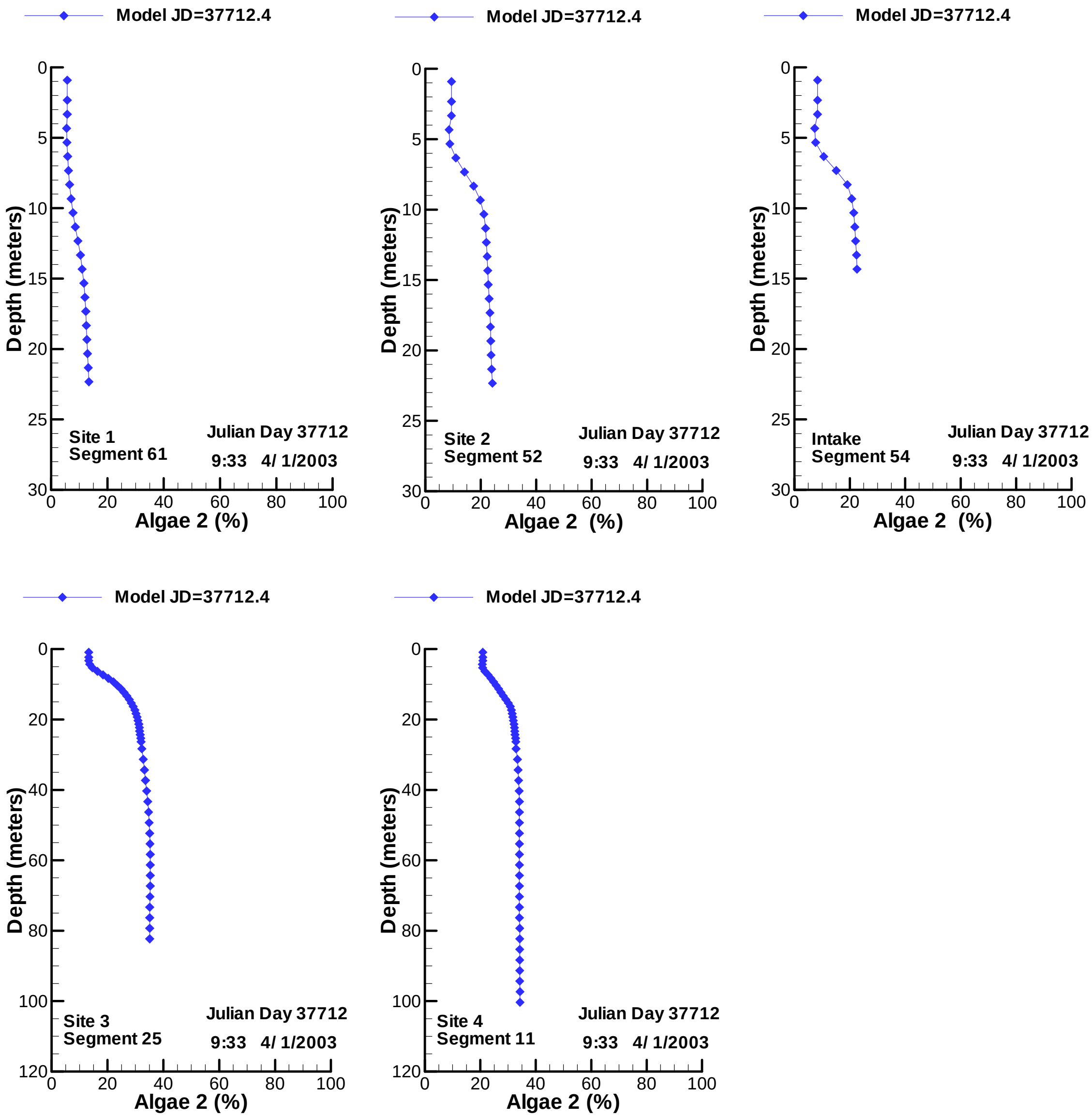

Figure 625. Vertical profiles of CHLOROPHYTA compared with data for 4/ 1/2003.

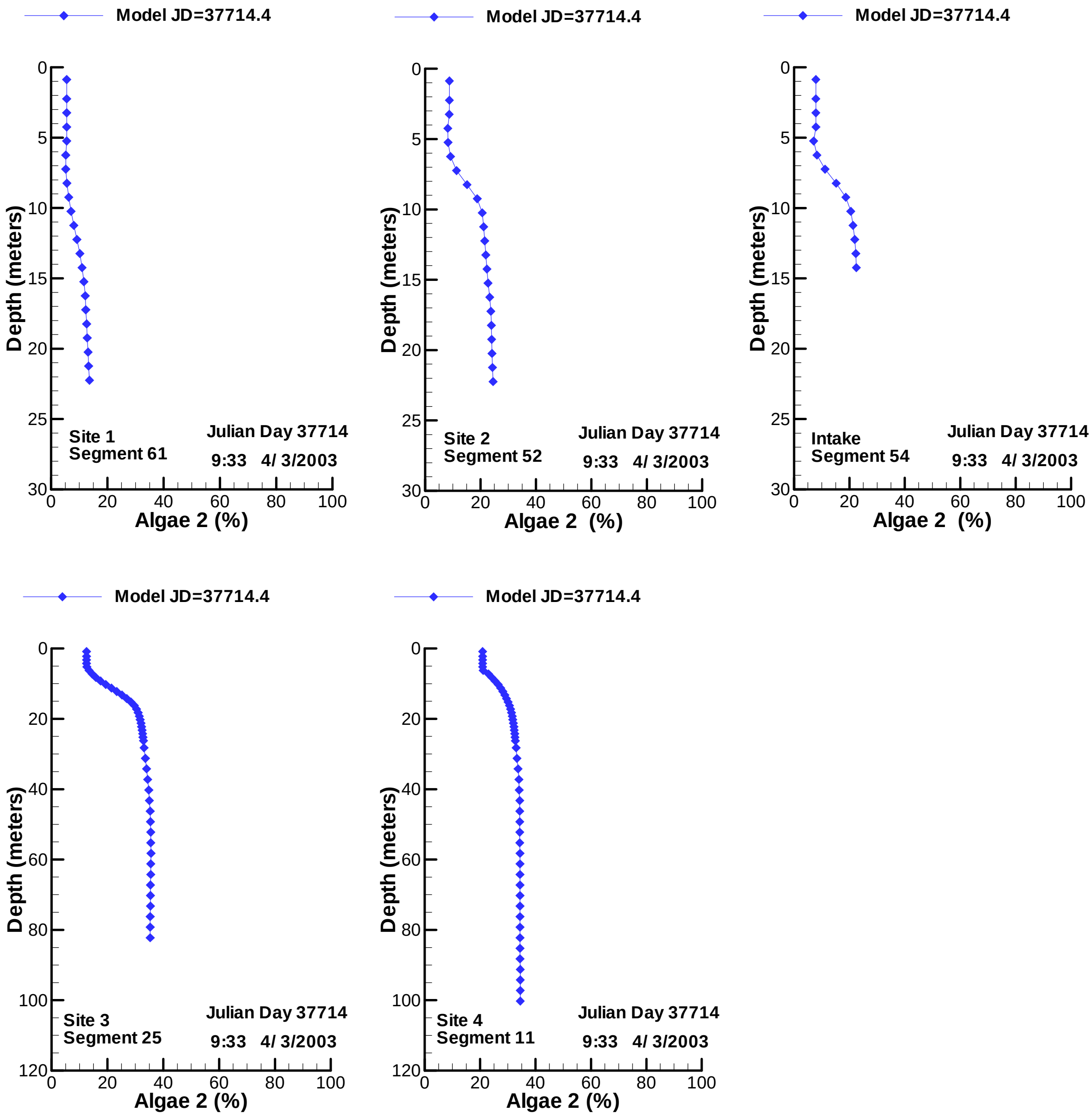

Figure 626. Vertical profiles of CHLOROPHYTA compared with data for 4/ 3/2003.

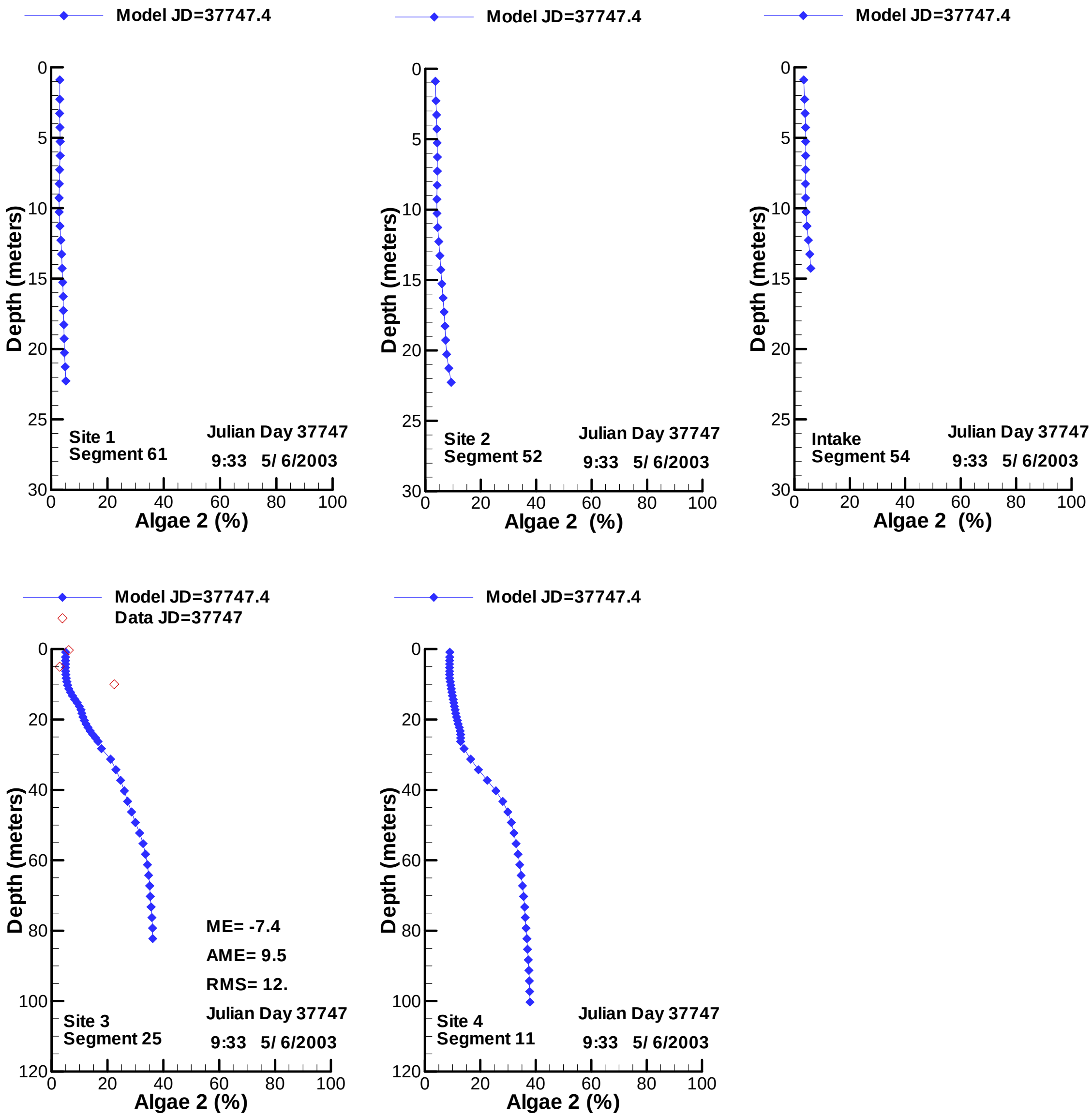

Figure 627. Vertical profiles of CHLOROPHYTA compared with data for 5/ 6/2003.

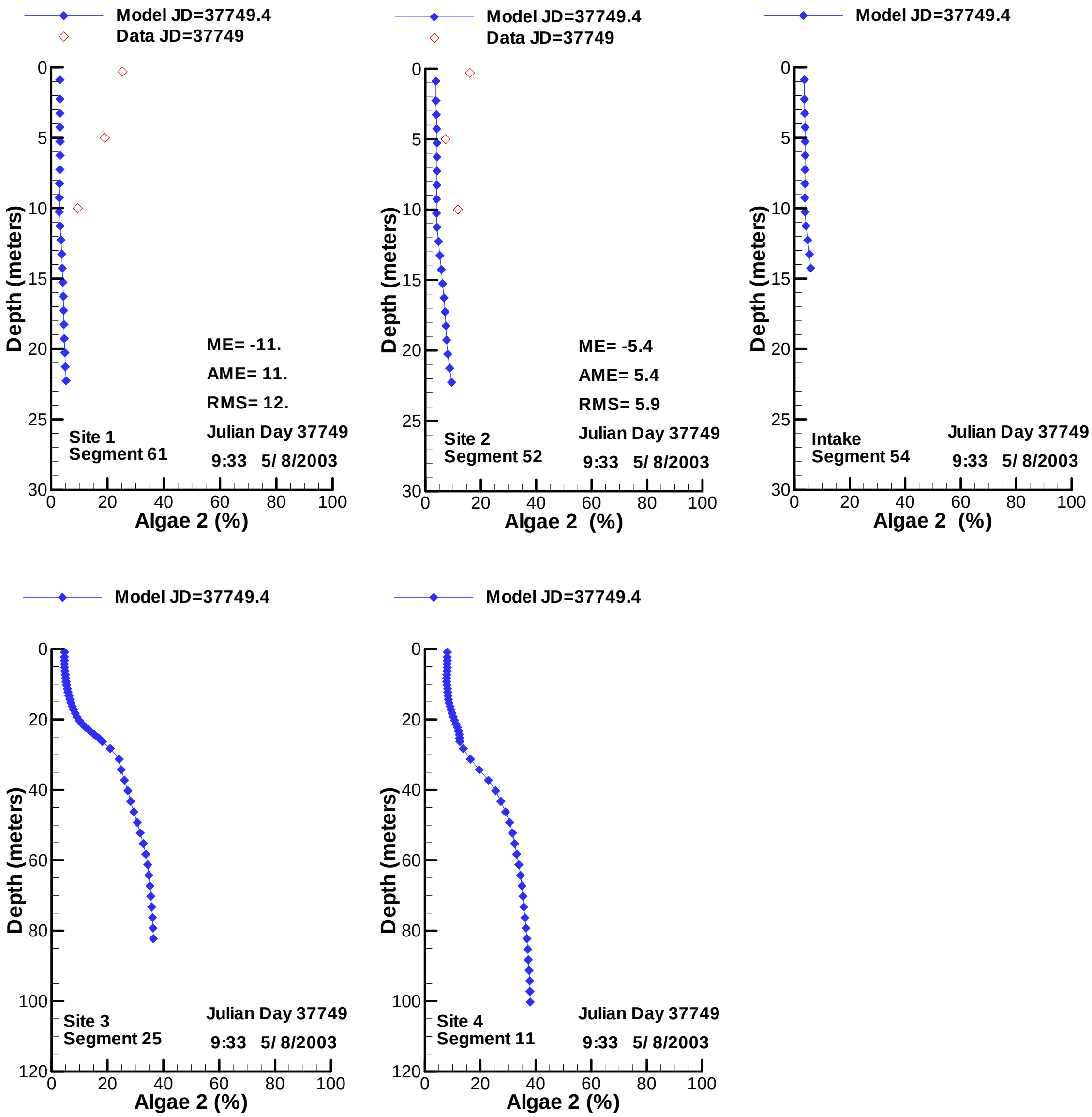

Figure 628. Vertical profiles of CHLOROPHYTA compared with data for 5/ 8/2003.

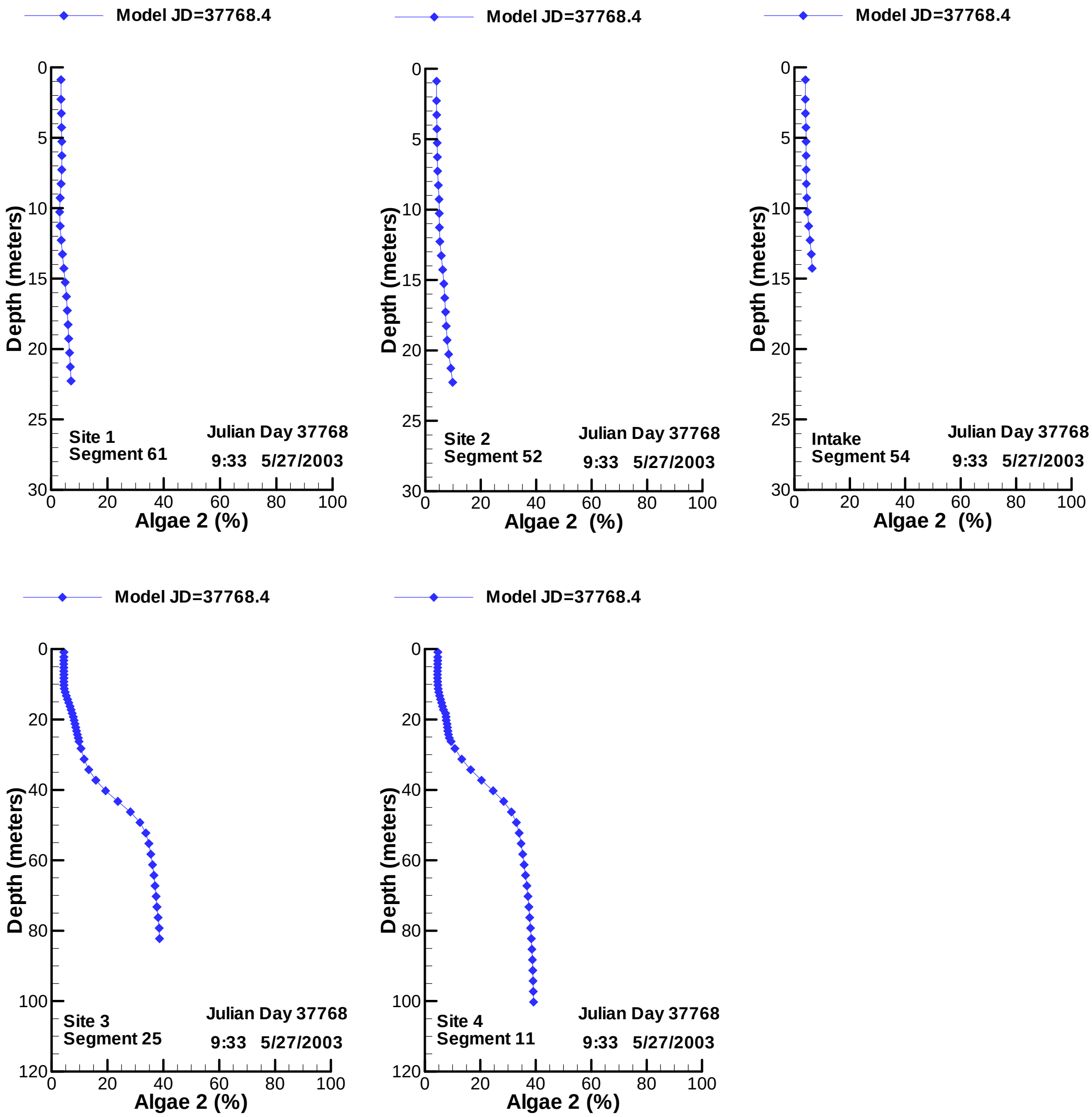

Figure 629. Vertical profiles of CHLOROPHYTA compared with data for 5/27/2003.

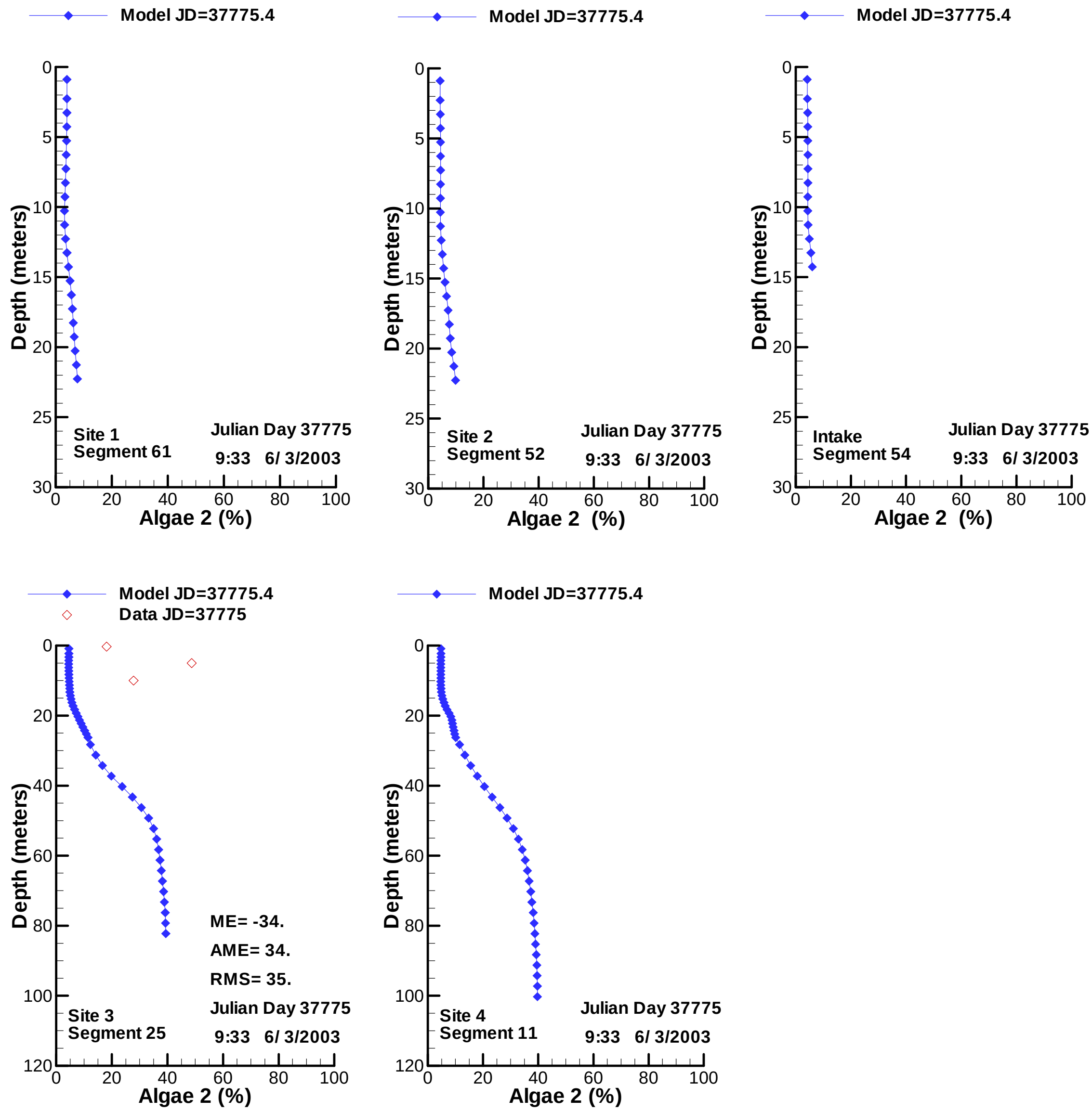

Figure 630. Vertical profiles of CHLOROPHYTA compared with data for 6/ 3/2003.

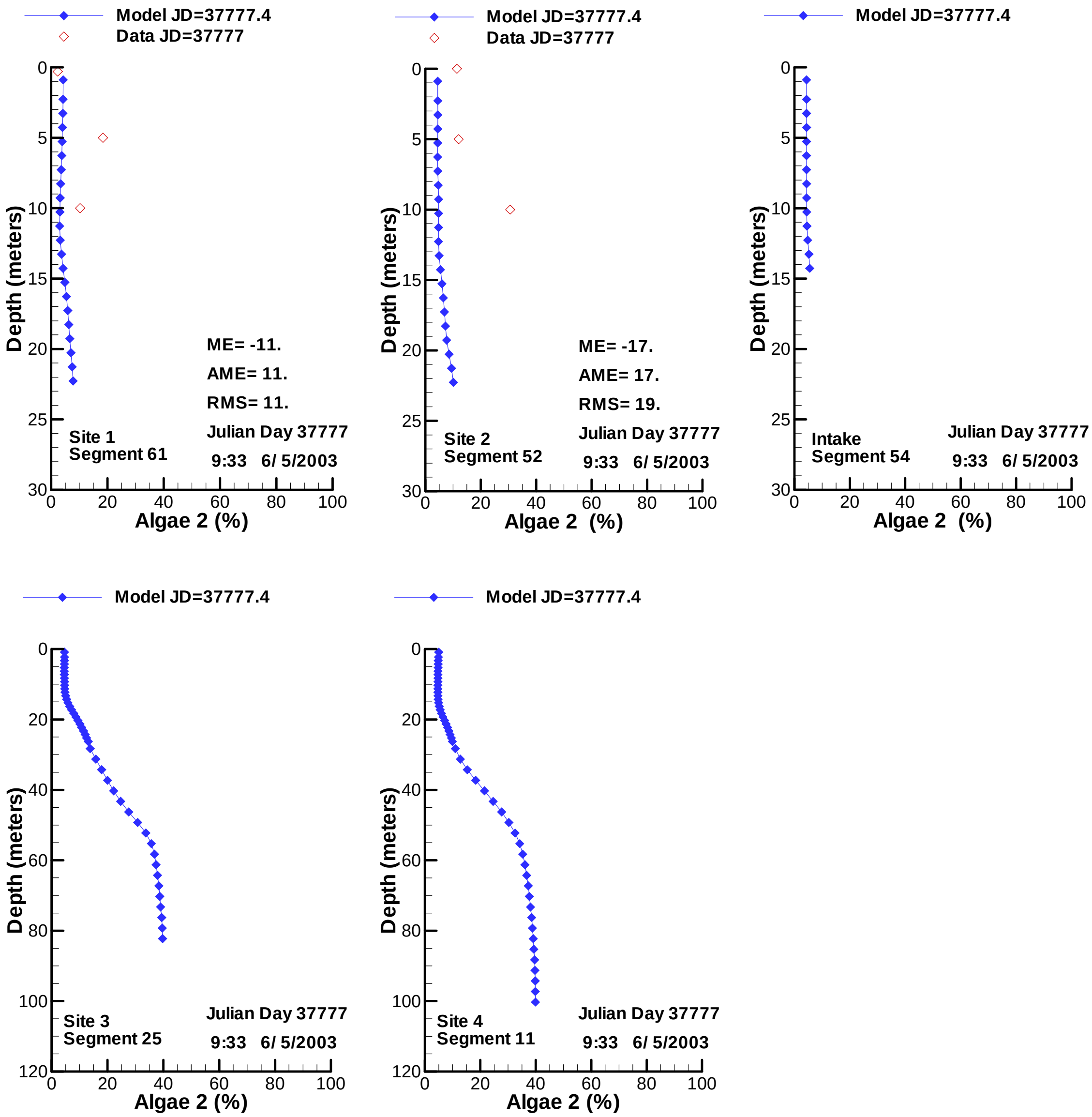

Figure 631. Vertical profiles of CHLOROPHYTA compared with data for 6/ 5/2003.

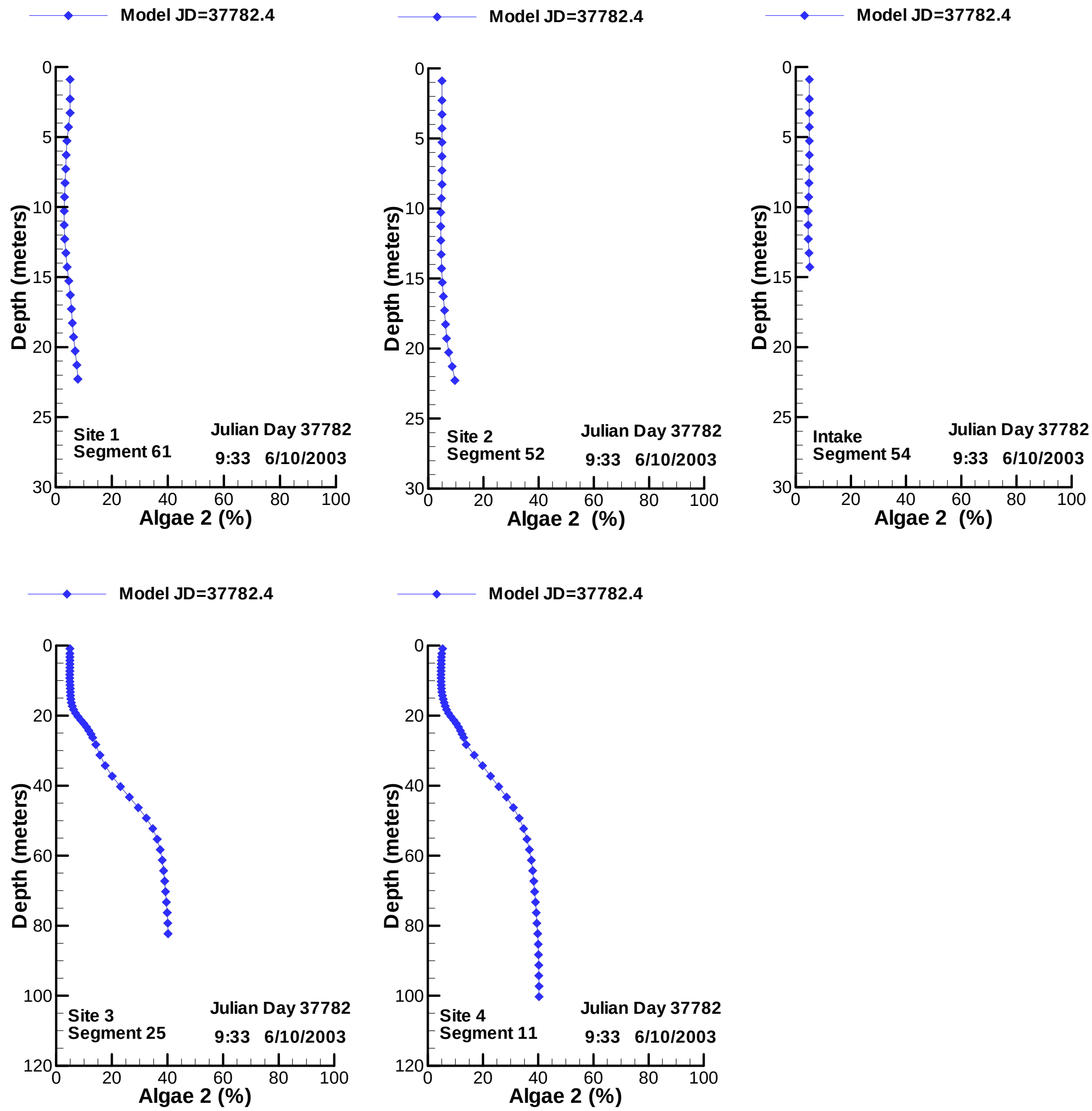

Figure 632. Vertical profiles of CHLOROPHYTA compared with data for 6/10/2003.

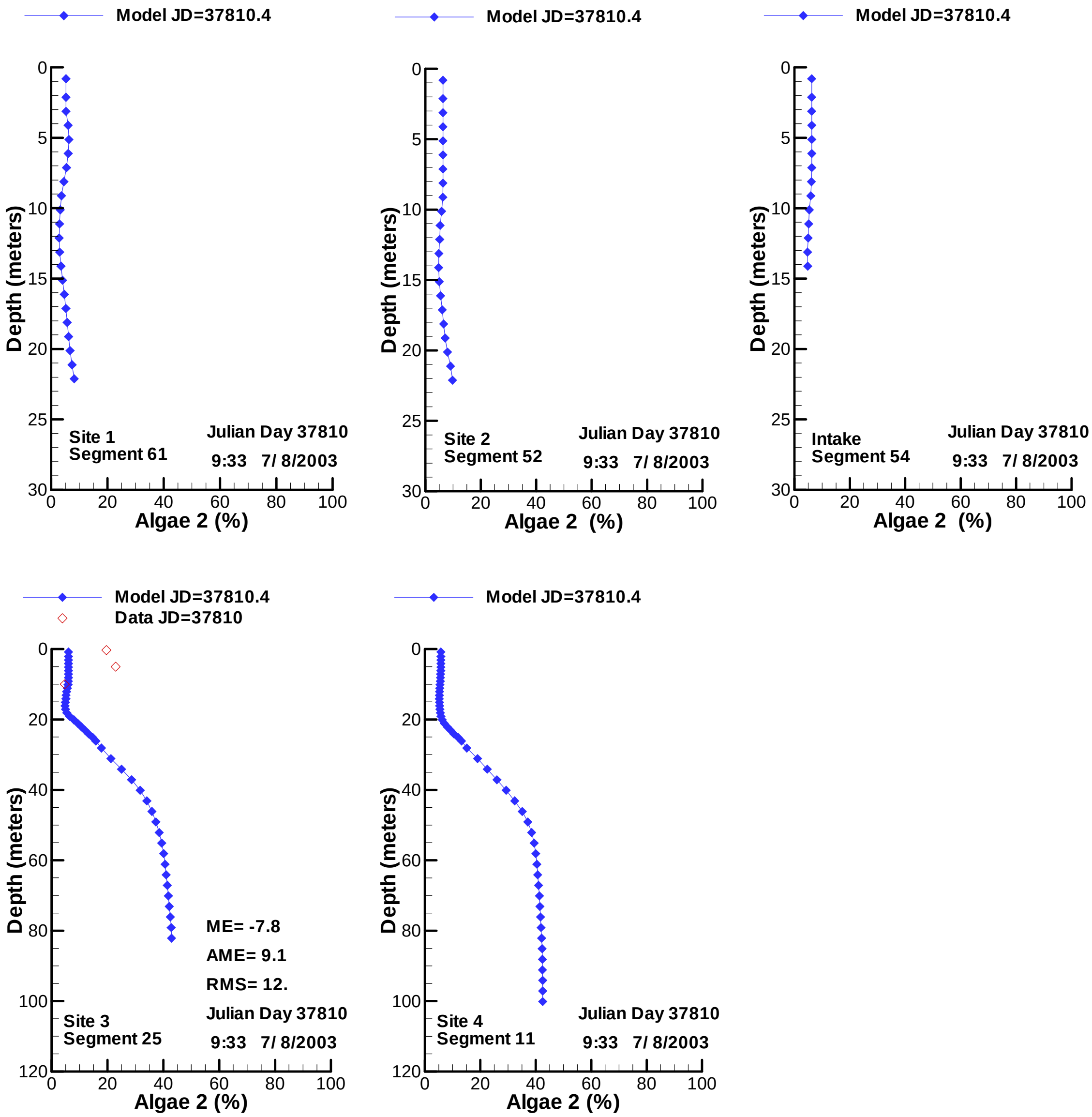

Figure 633. Vertical profiles of CHLOROPHYTA compared with data for 7/ 8/2003.

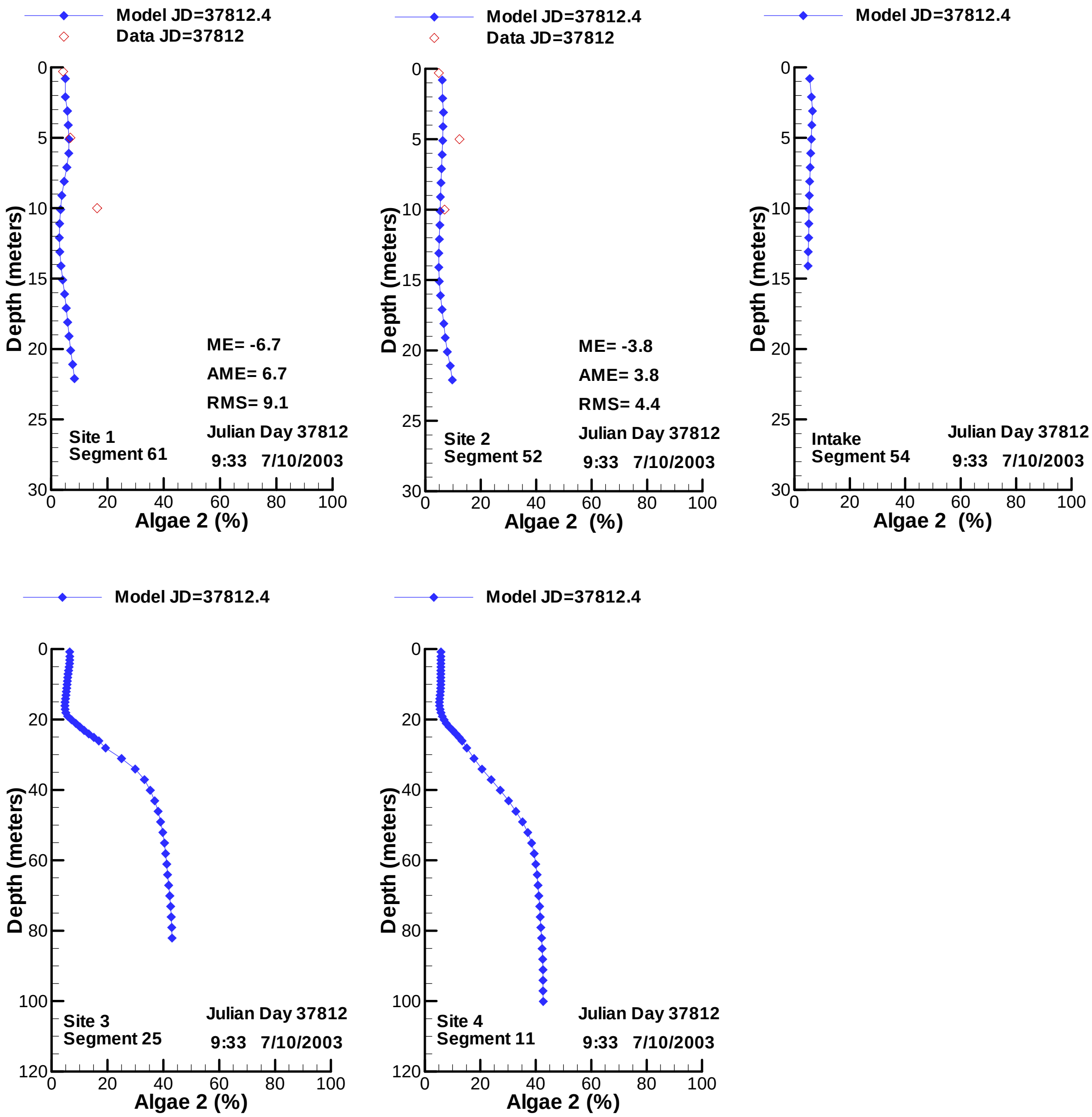

Figure 634. Vertical profiles of CHLOROPHYTA compared with data for 7/10/2003.

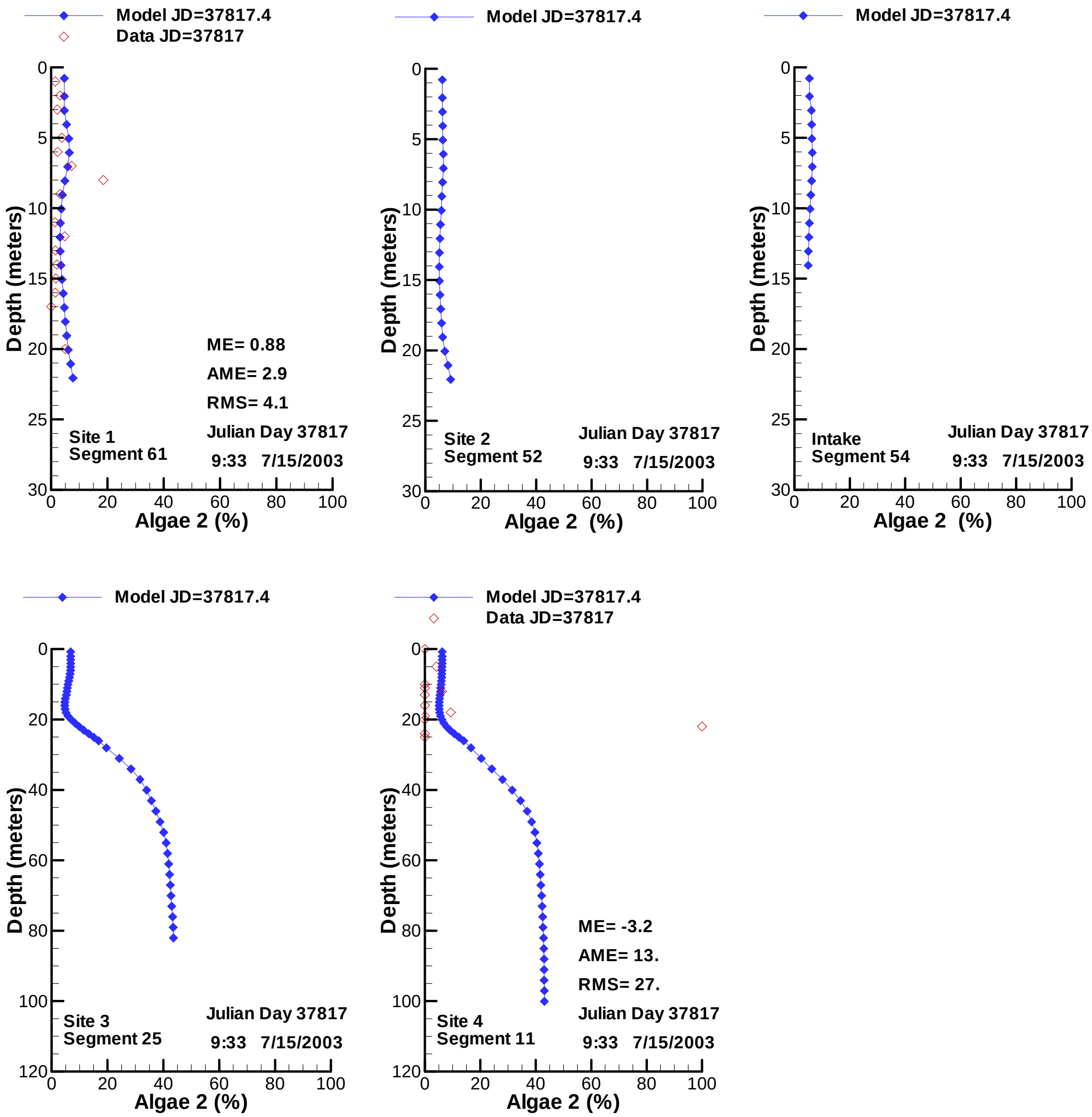

Figure 635. Vertical profiles of CHLOROPHYTA compared with data for 7/15/2003.

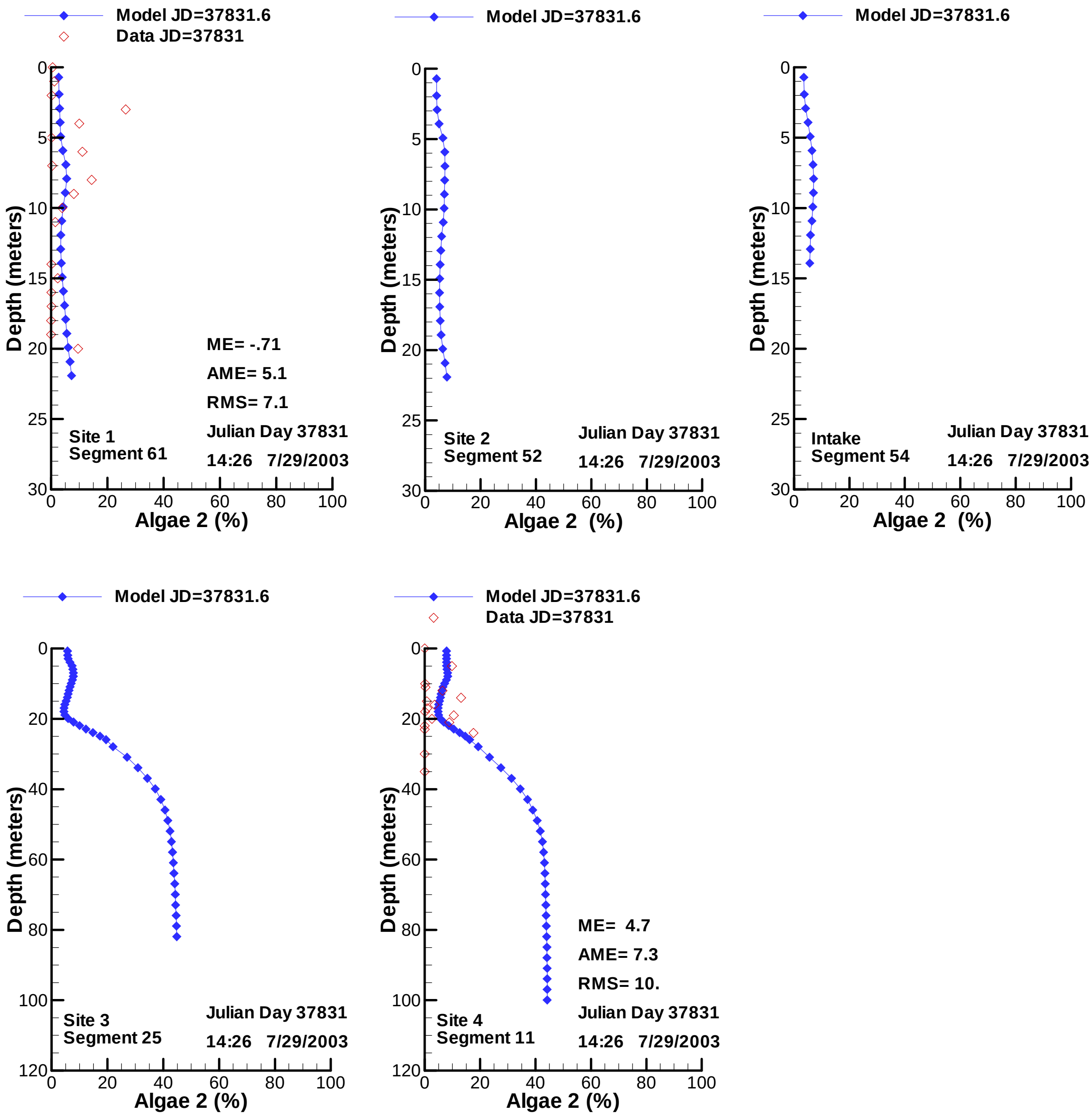

Figure 636. Vertical profiles of CHLOROPHYTA compared with data for 7/29/2003.

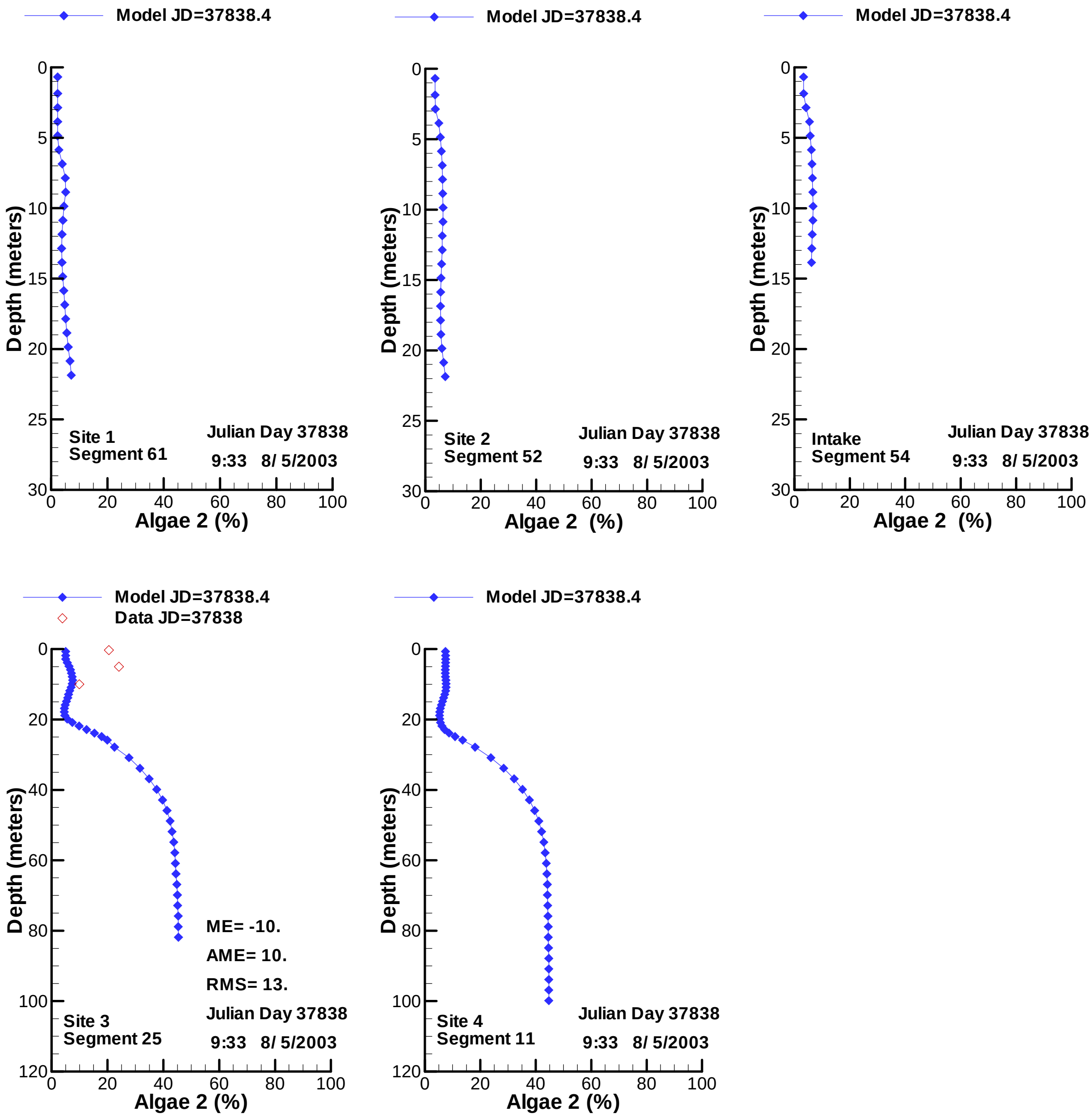

Figure 637. Vertical profiles of CHLOROPHYTA compared with data for 8/ 5/2003.

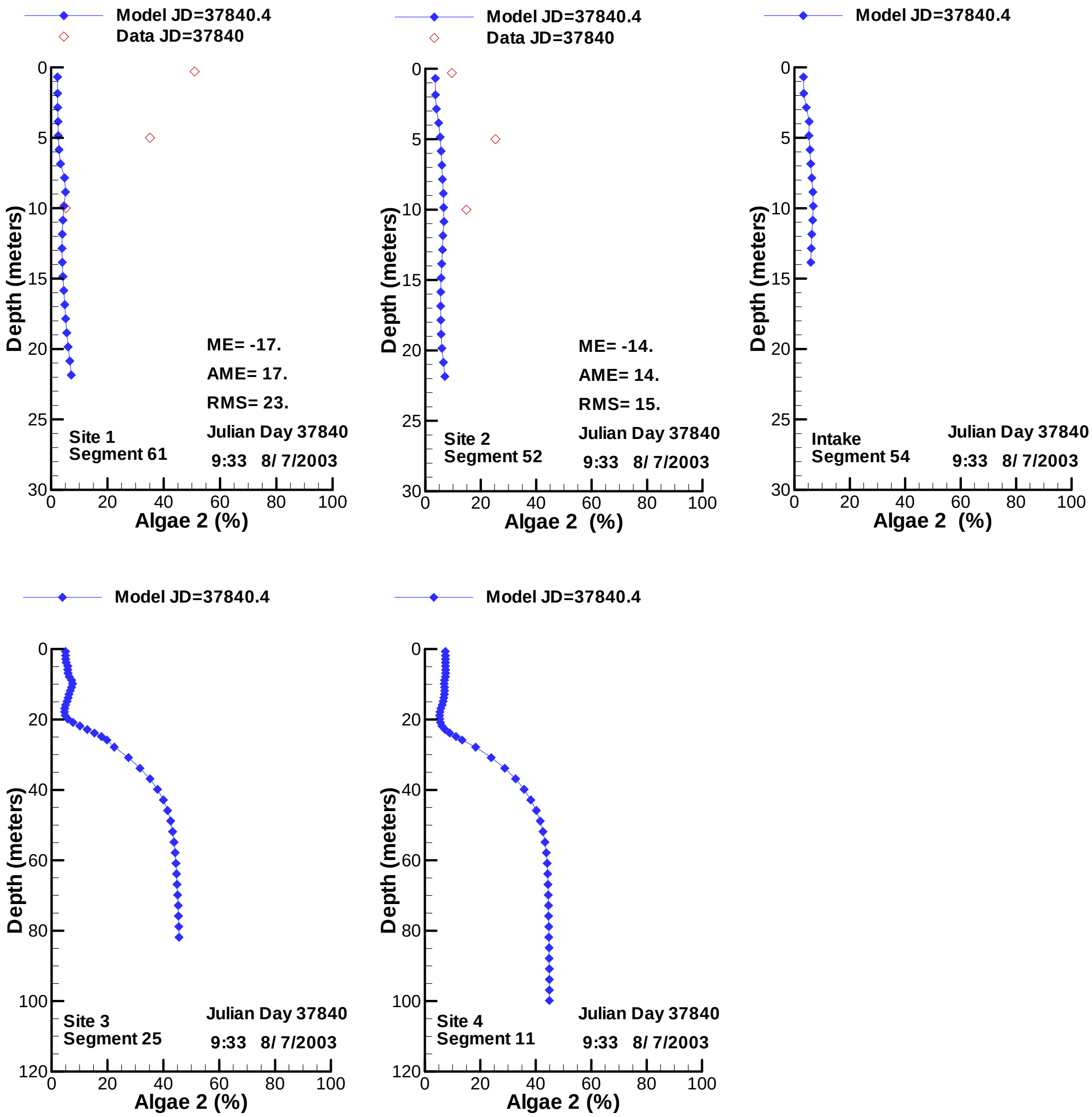

Figure 638. Vertical profiles of CHLOROPHYTA compared with data for 8/ 7/2003.

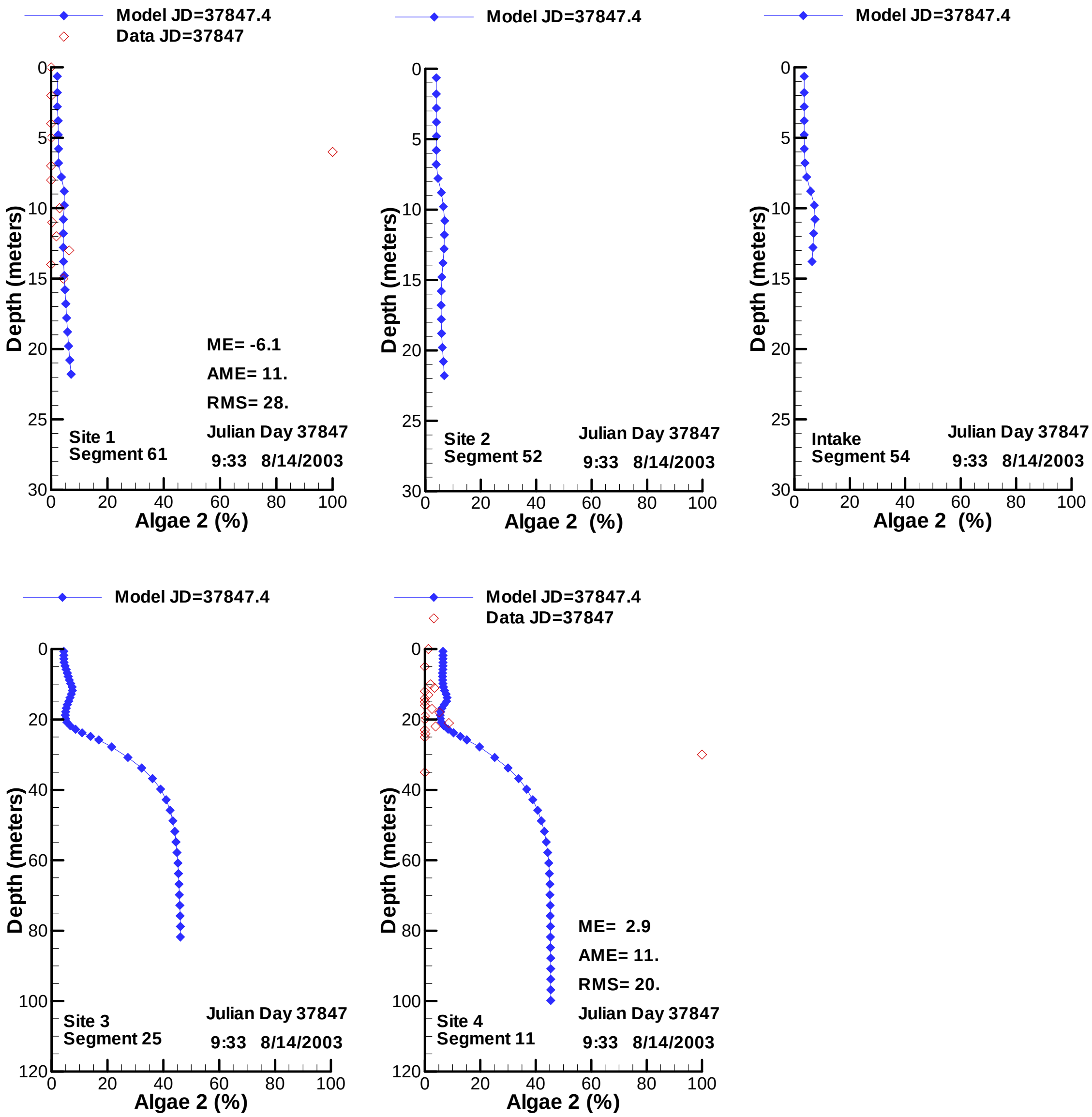

Figure 639. Vertical profiles of CHLOROPHYTA compared with data for 8/14/2003.

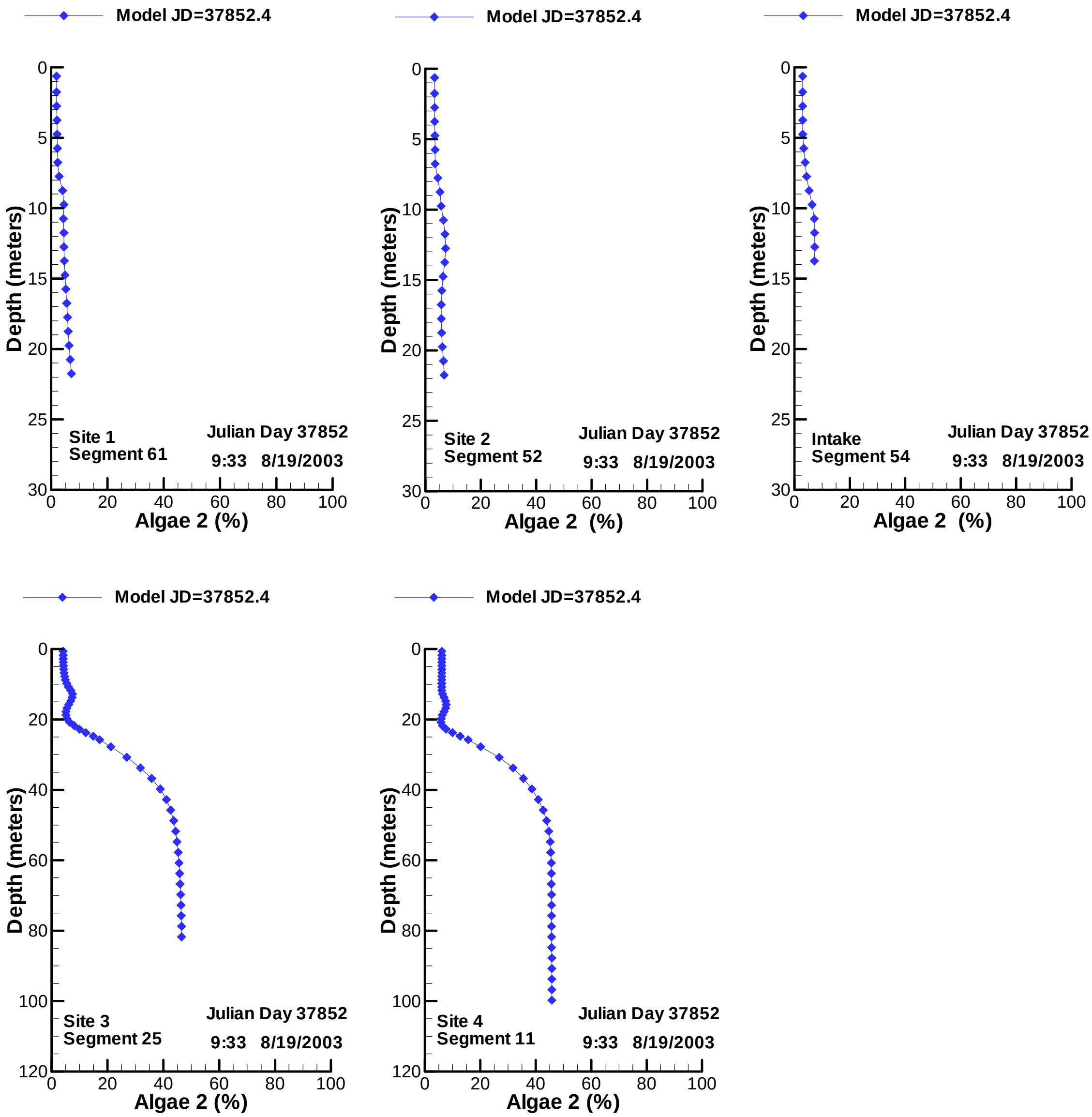

Figure 640. Vertical profiles of CHLOROPHYTA compared with data for 8/19/2003.

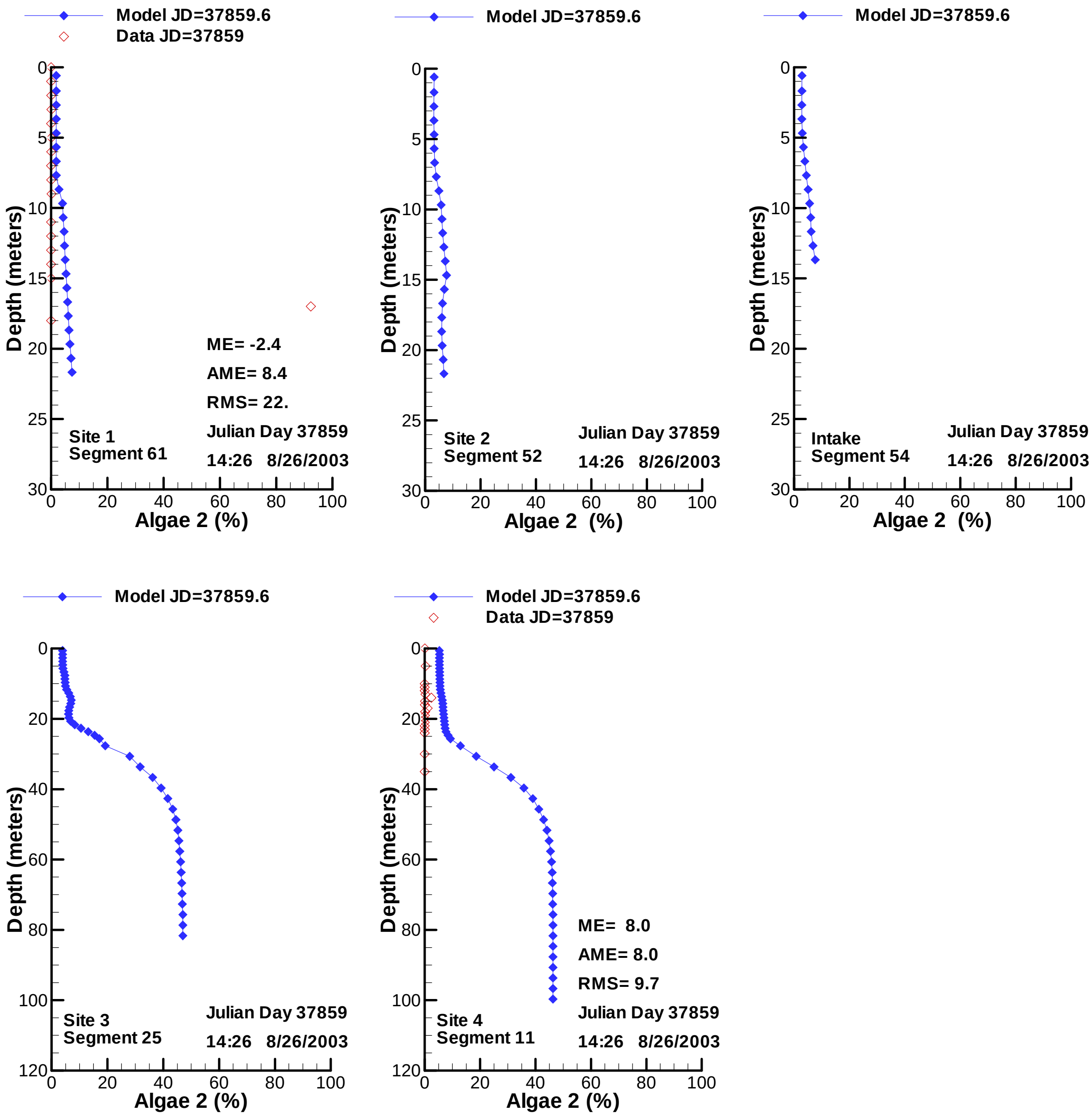

Figure 641. Vertical profiles of CHLOROPHYTA compared with data for 8/26/2003.

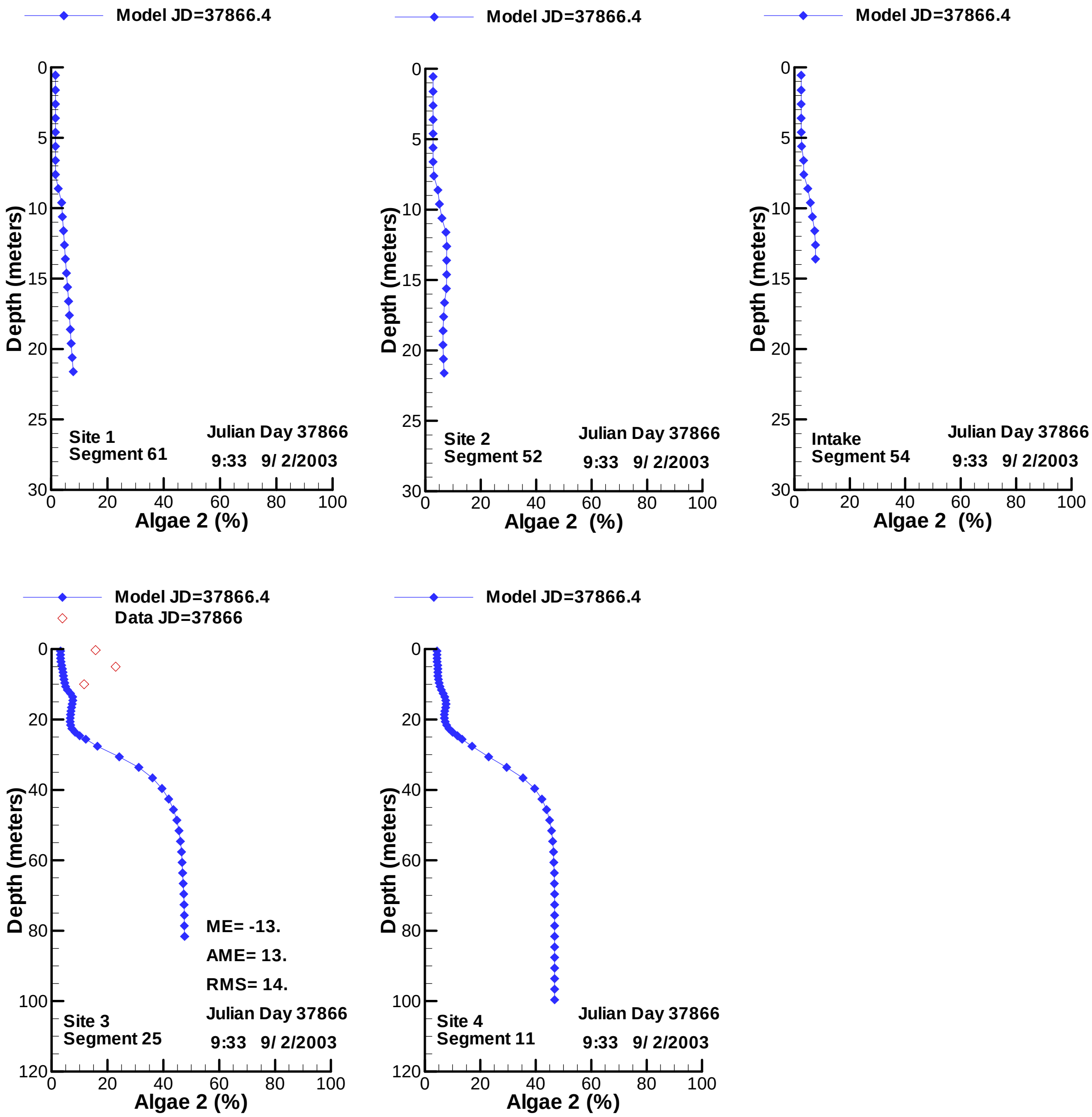

Figure 642. Vertical profiles of CHLOROPHYTA compared with data for 9/ 2/2003.

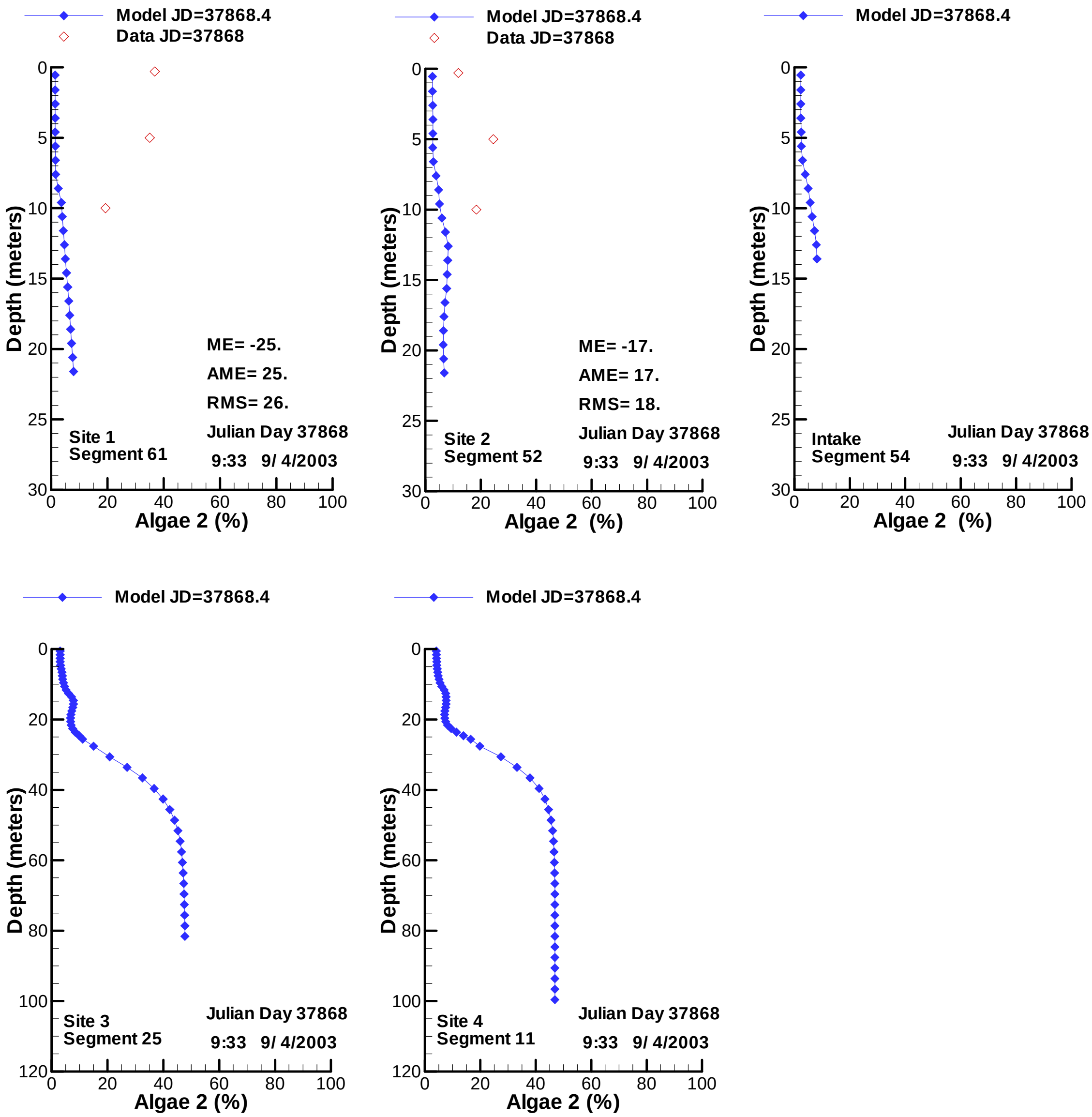

Figure 643. Vertical profiles of CHLOROPHYTA compared with data for 9/ 4/2003.

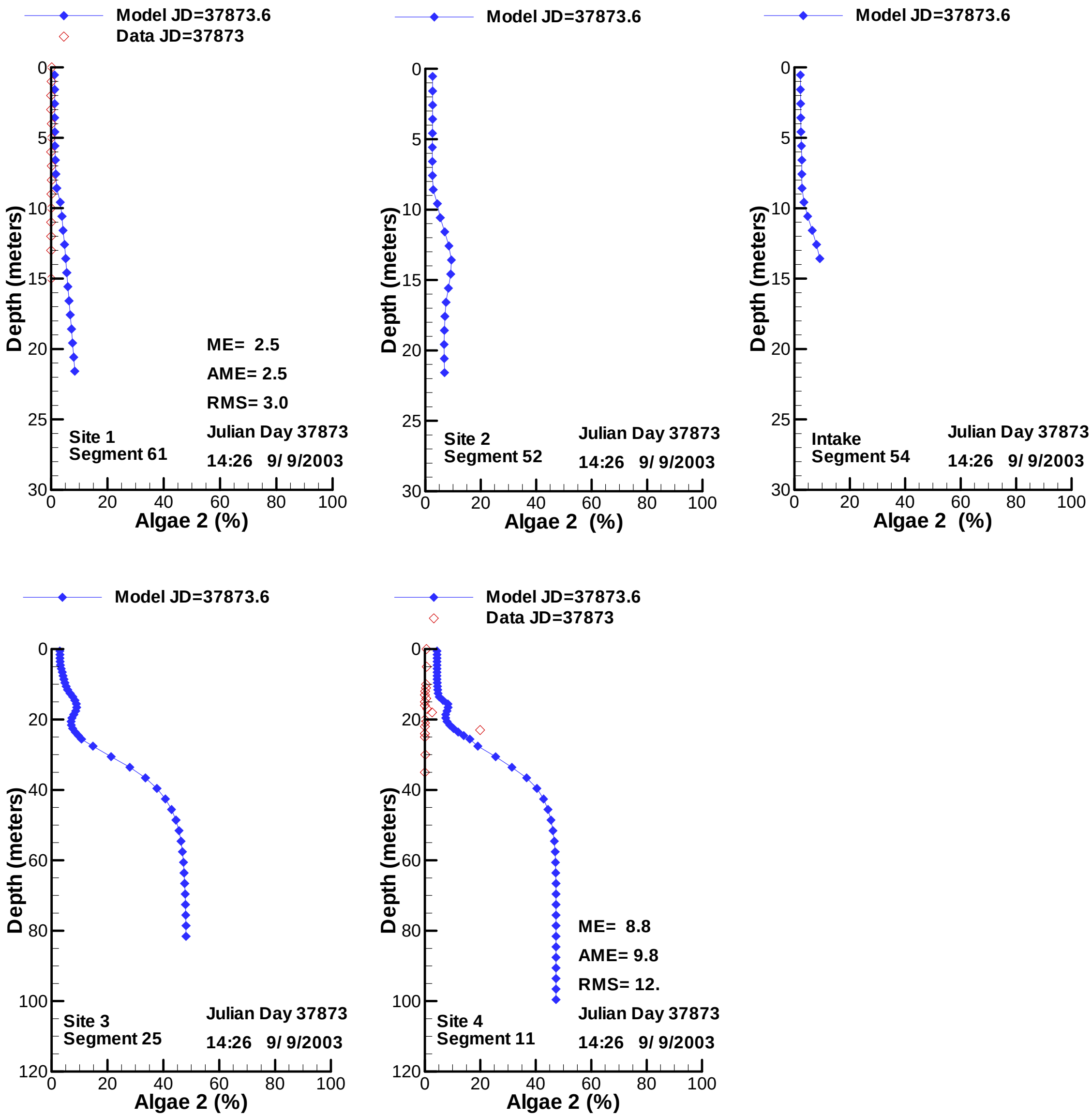

Figure 644. Vertical profiles of CHLOROPHYTA compared with data for 9/ 9/2003.

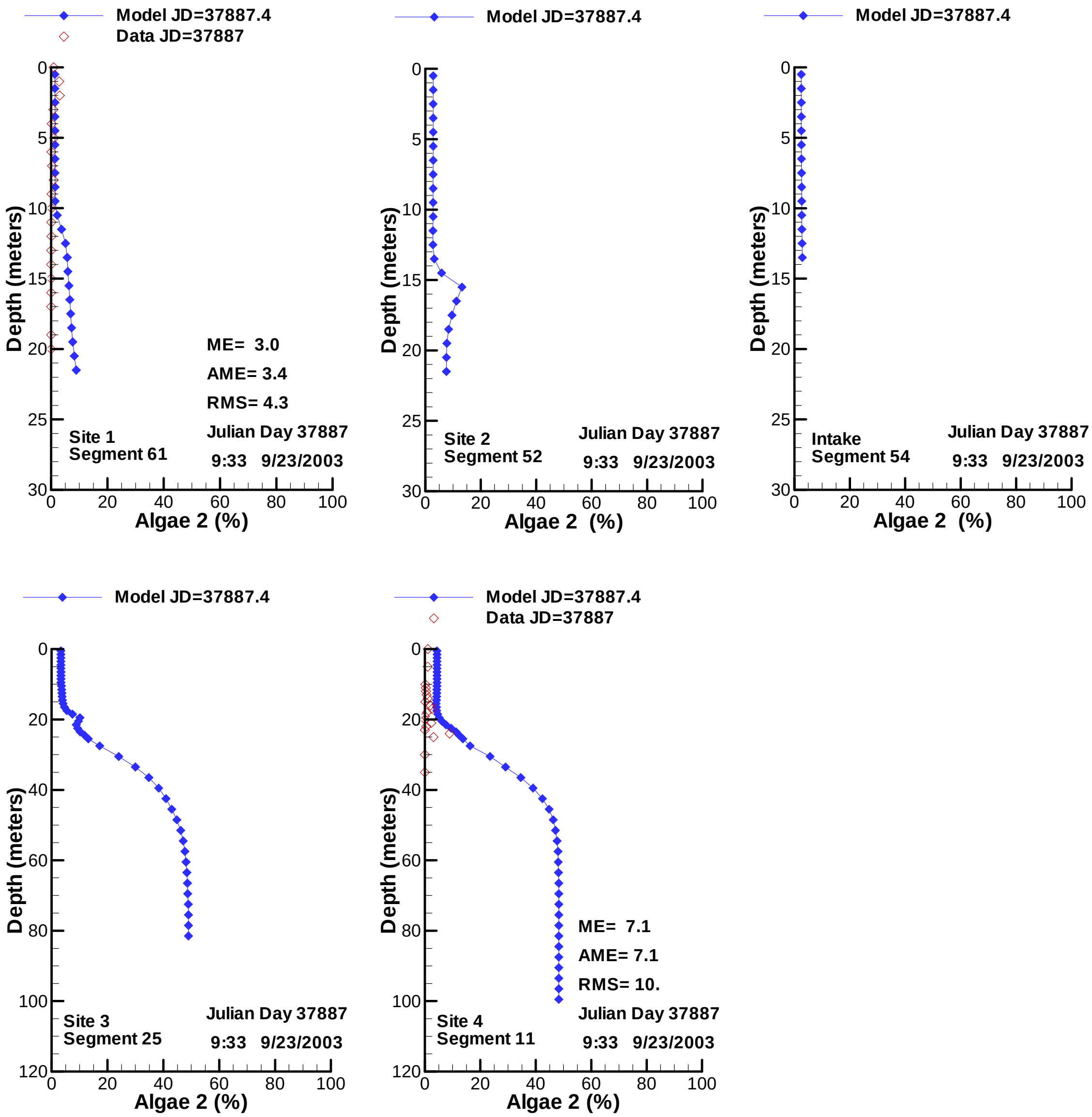

Figure 645. Vertical profiles of CHLOROPHYTA compared with data for 9/23/2003.

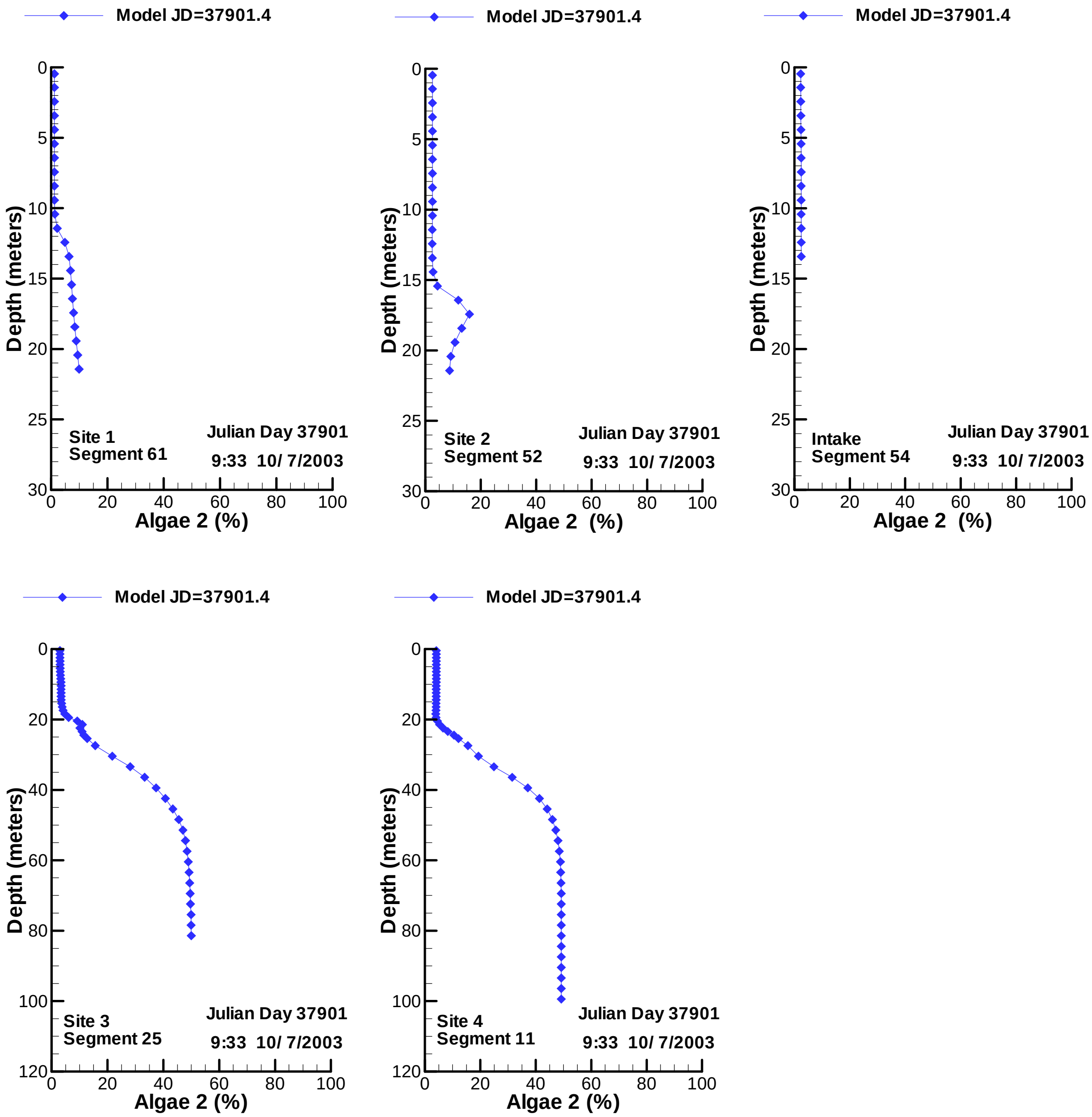

Figure 646. Vertical profiles of CHLOROPHYTA compared with data for 10/ 7/2003.

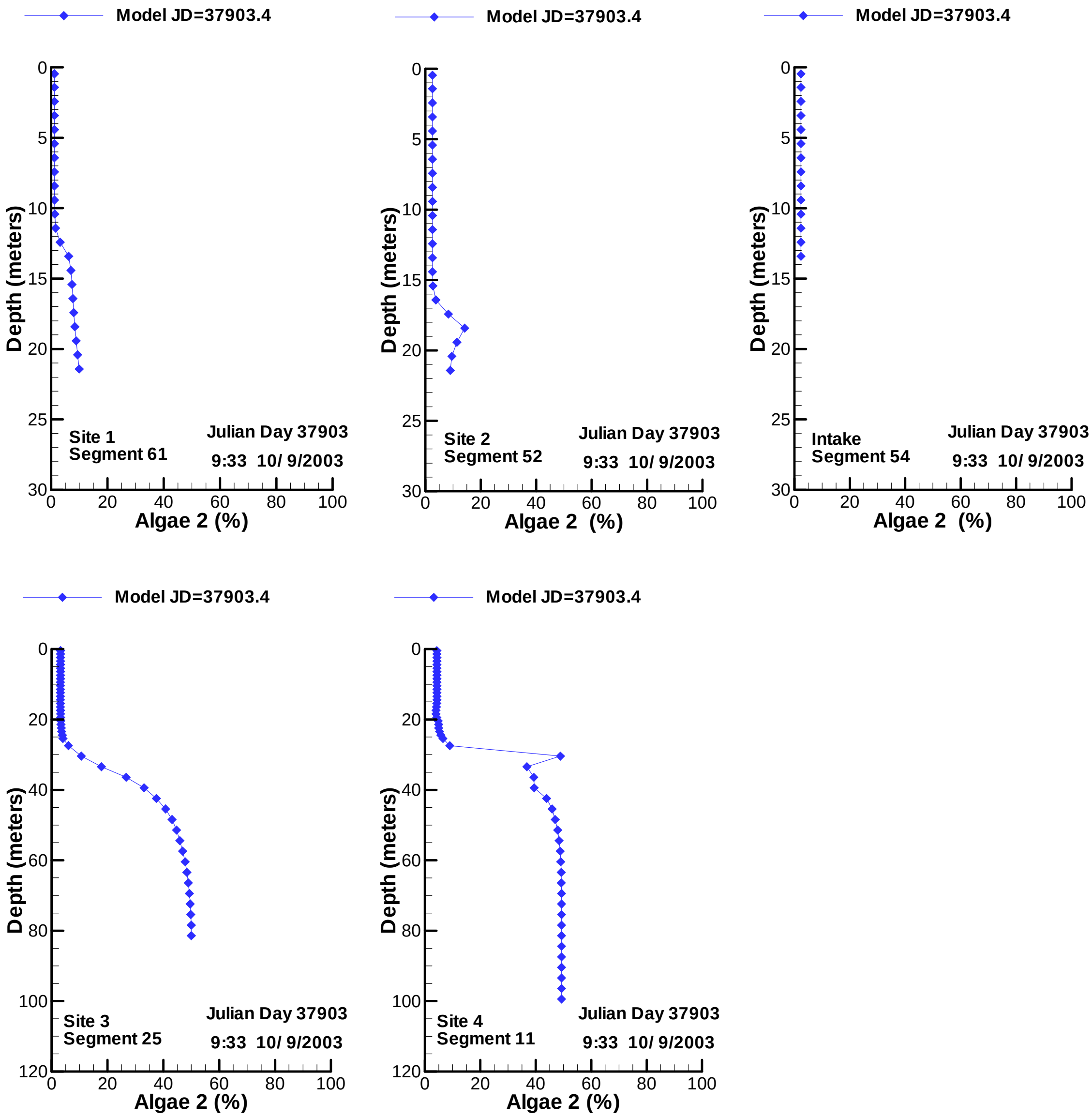

Figure 647. Vertical profiles of CHLOROPHYTA compared with data for 10/ 9/2003.

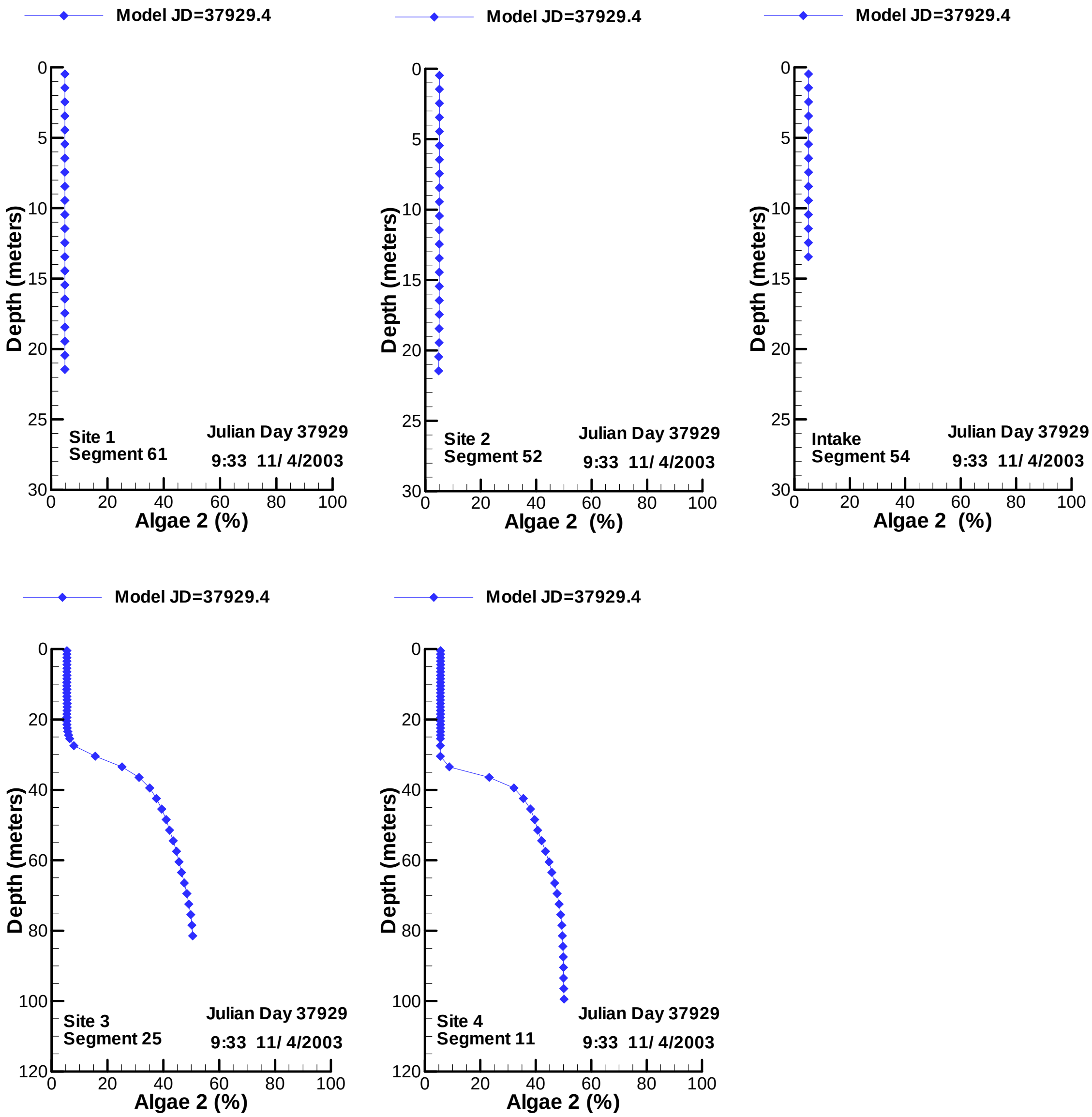

Figure 648. Vertical profiles of CHLOROPHYTA compared with data for 11/ 4/2003.

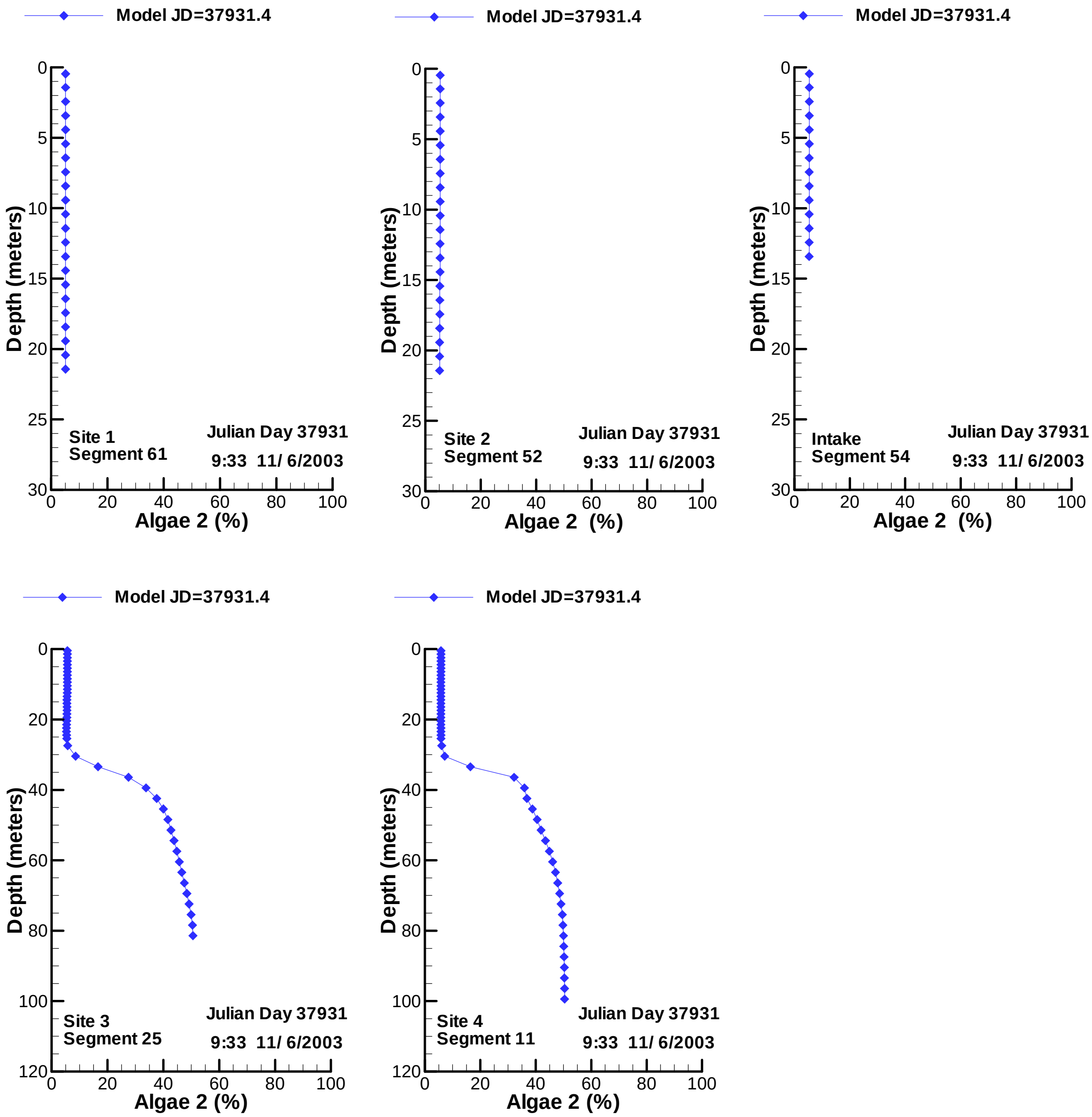

Figure 649. Vertical profiles of CHLOROPHYTA compared with data for 11/ 6/2003.

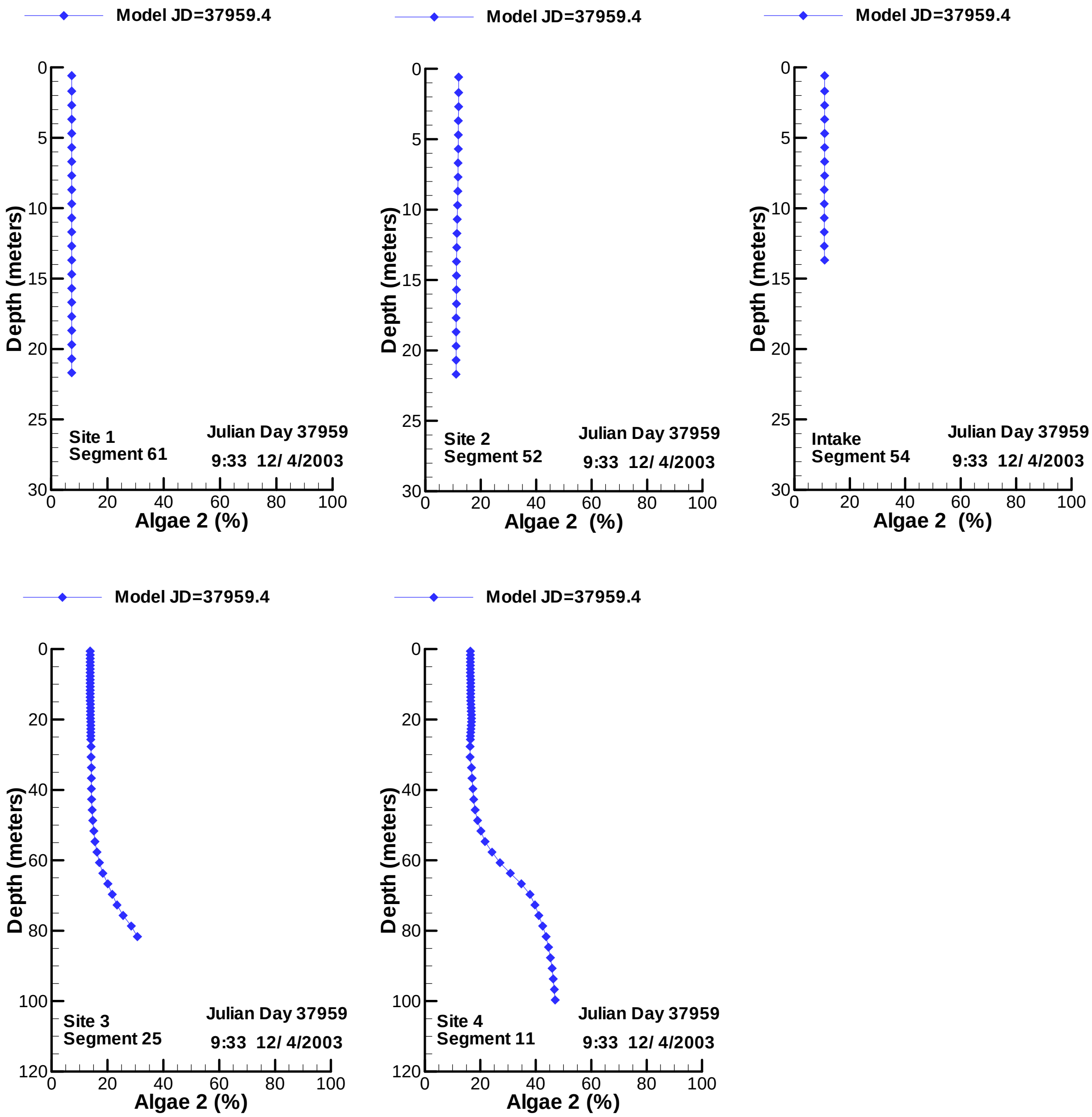

Figure 650. Vertical profiles of CHLOROPHYTA compared with data for 12/ 4/2003.

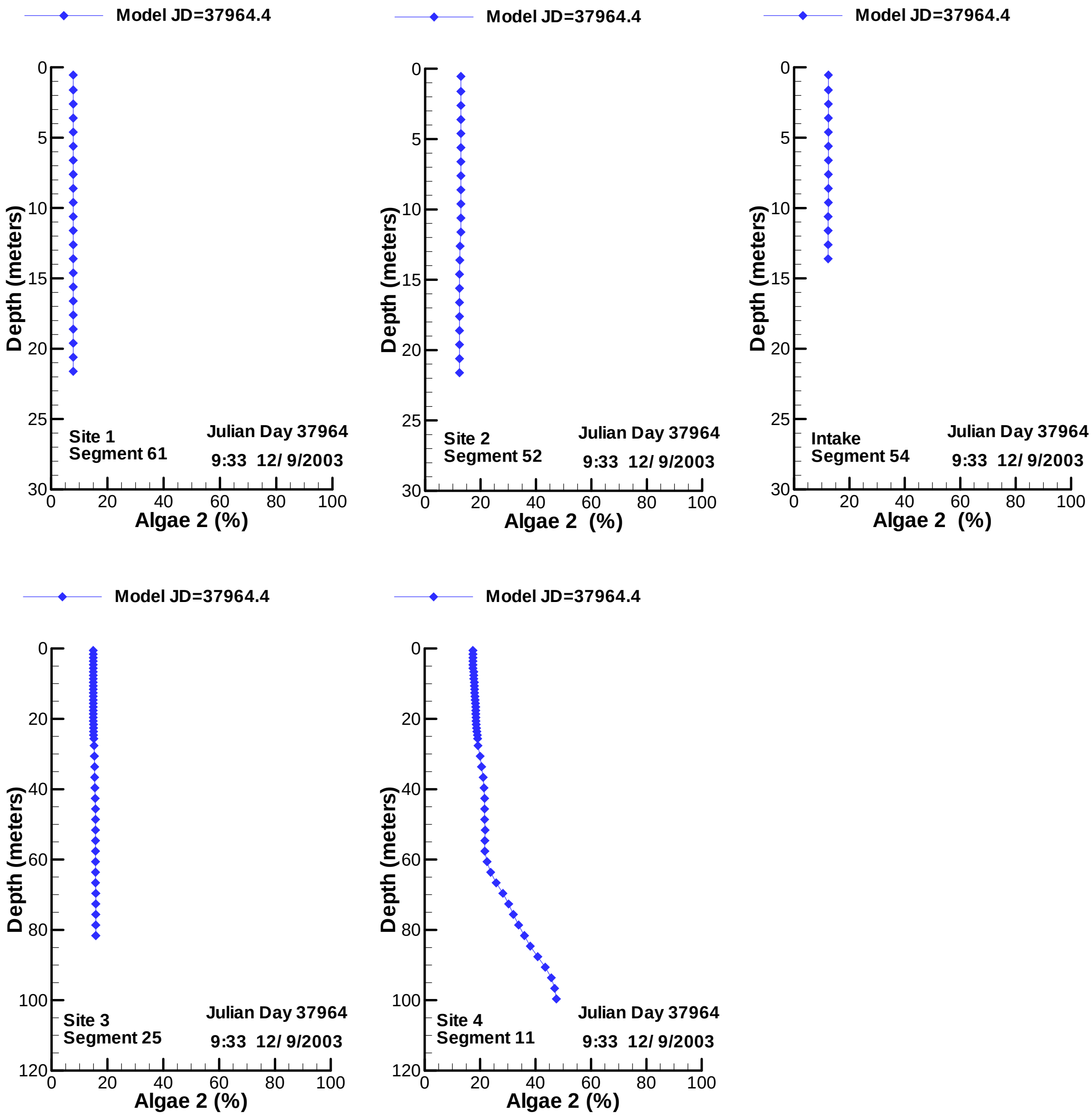

Figure 651. Vertical profiles of CHLOROPHYTA compared with data for 12/ 9/2003.

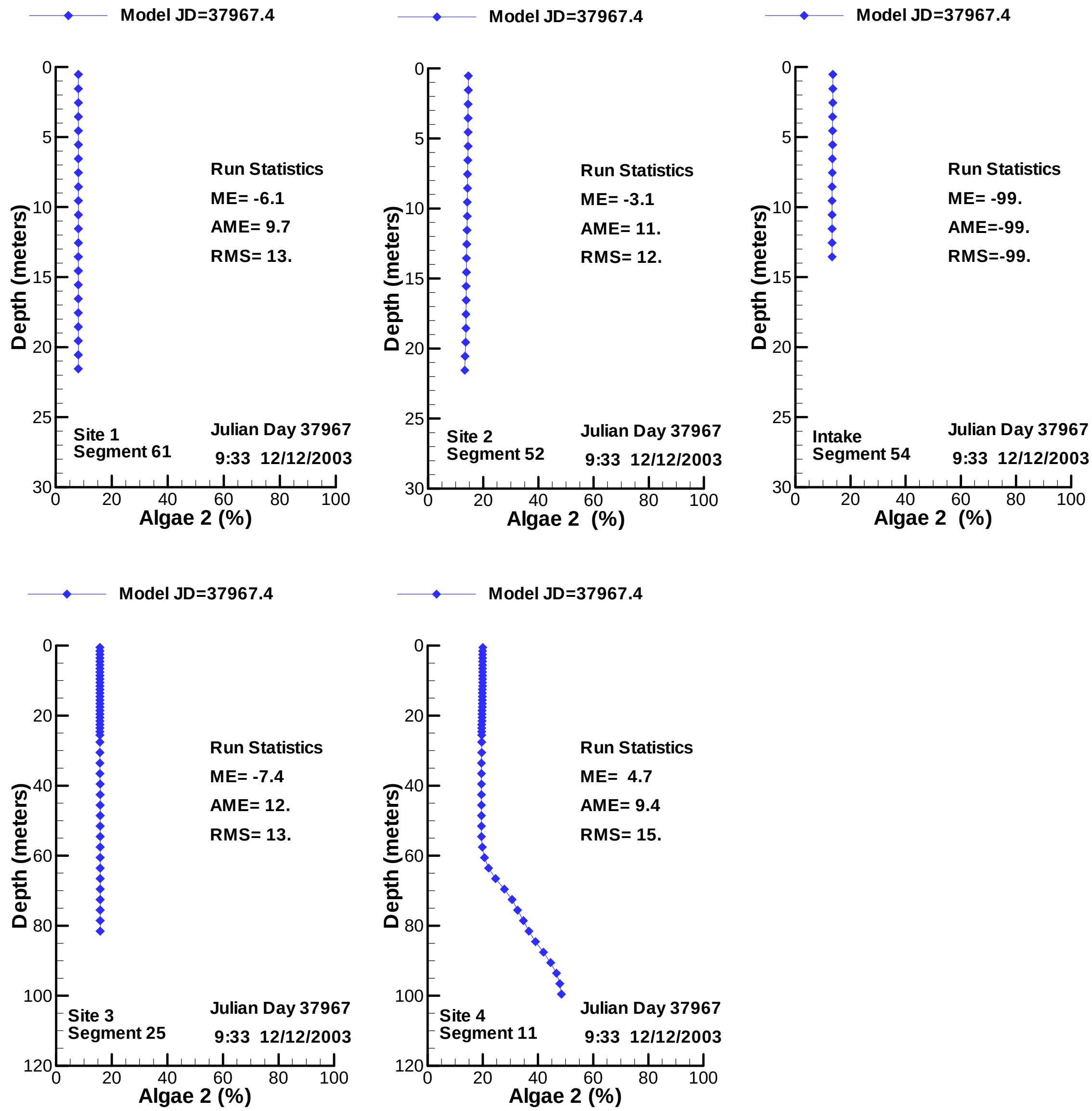

Figure 652. Vertical profiles of CHLOROPHYTA compared with data for 12/12/2003.

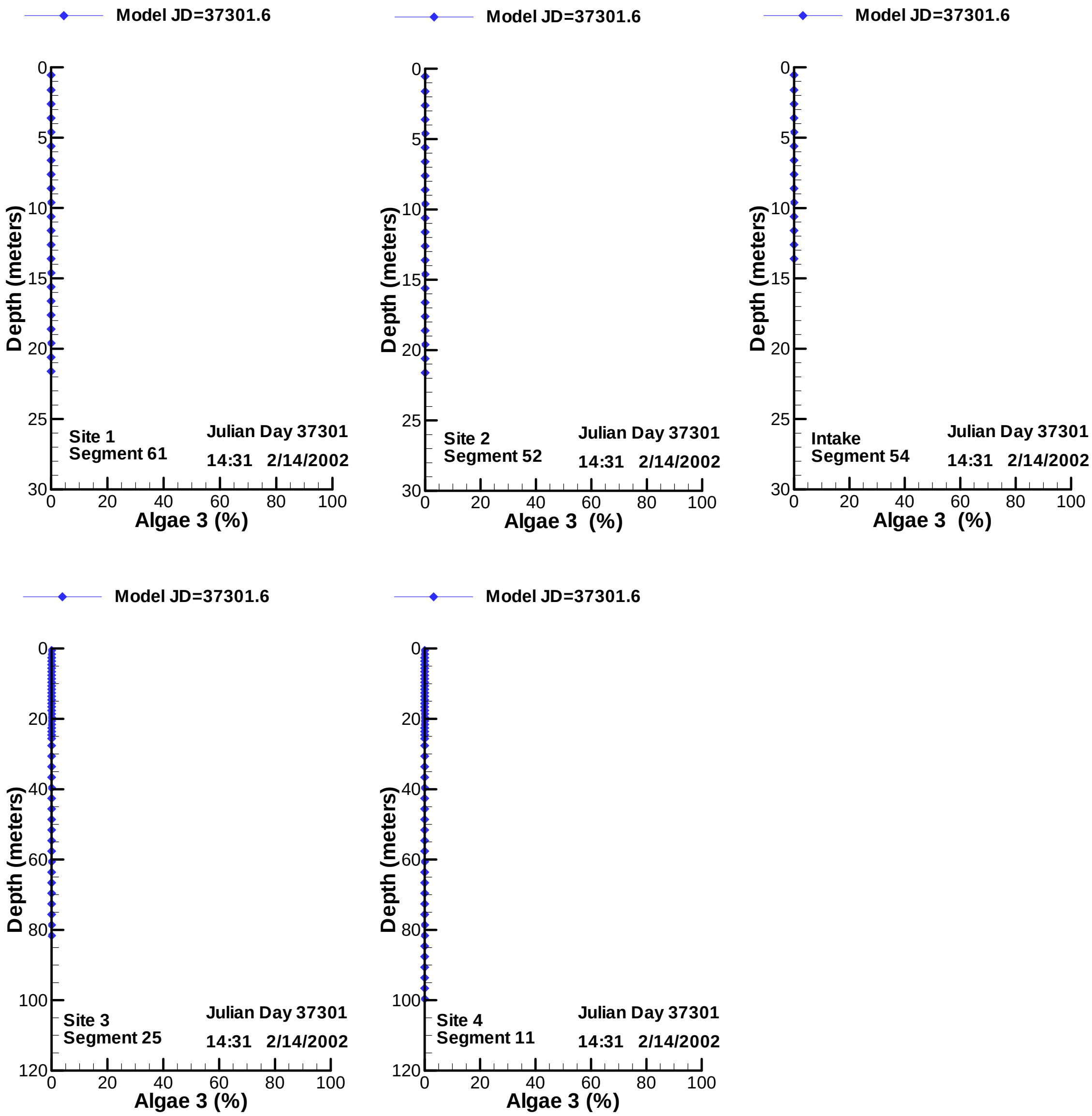

Figure 653. Vertical profiles of CYANOBACTERIA compared with data for 2/14/2002.

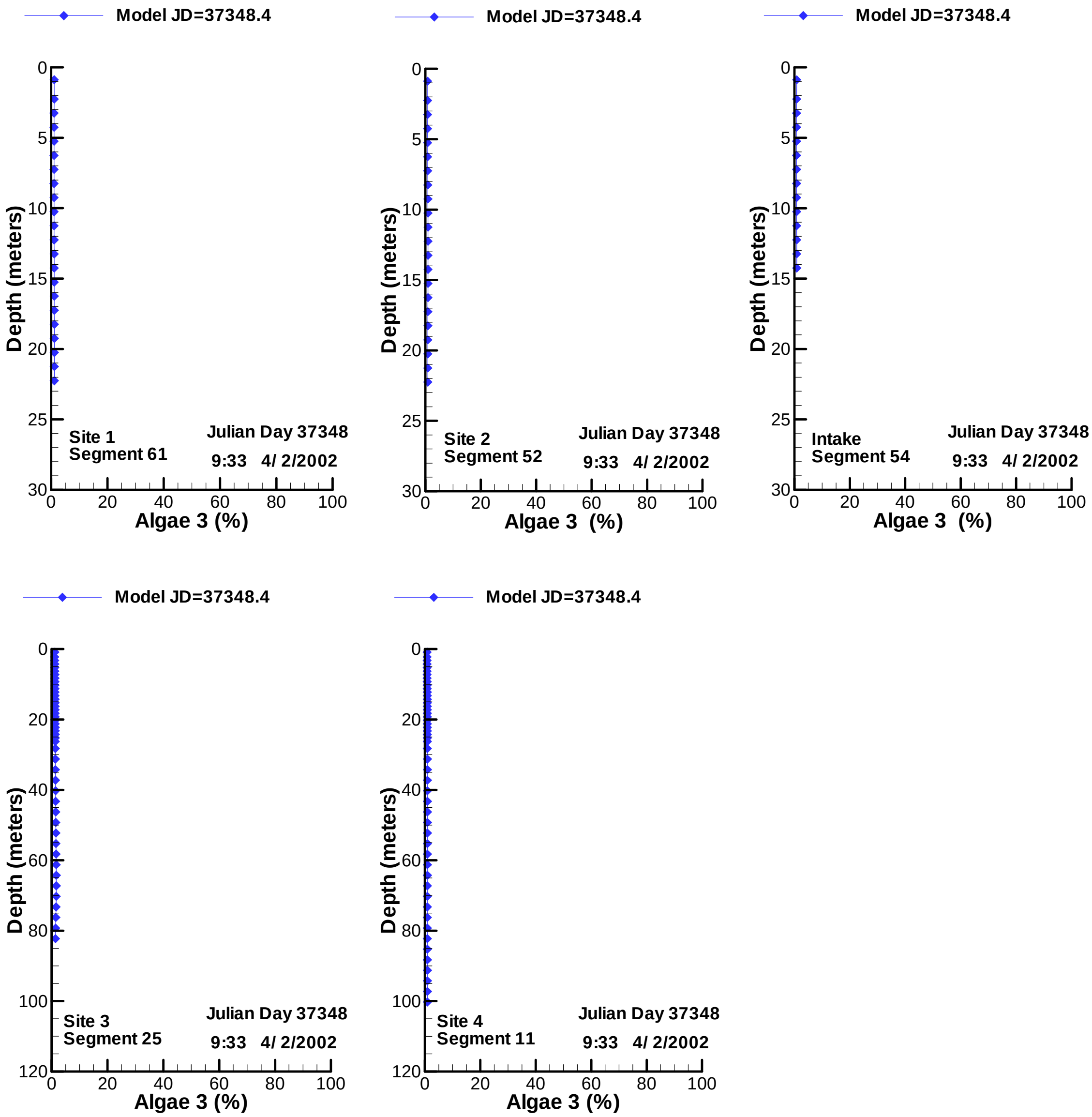

Figure 654. Vertical profiles of CYANOBACTERIA compared with data for 4/ 2/2002.

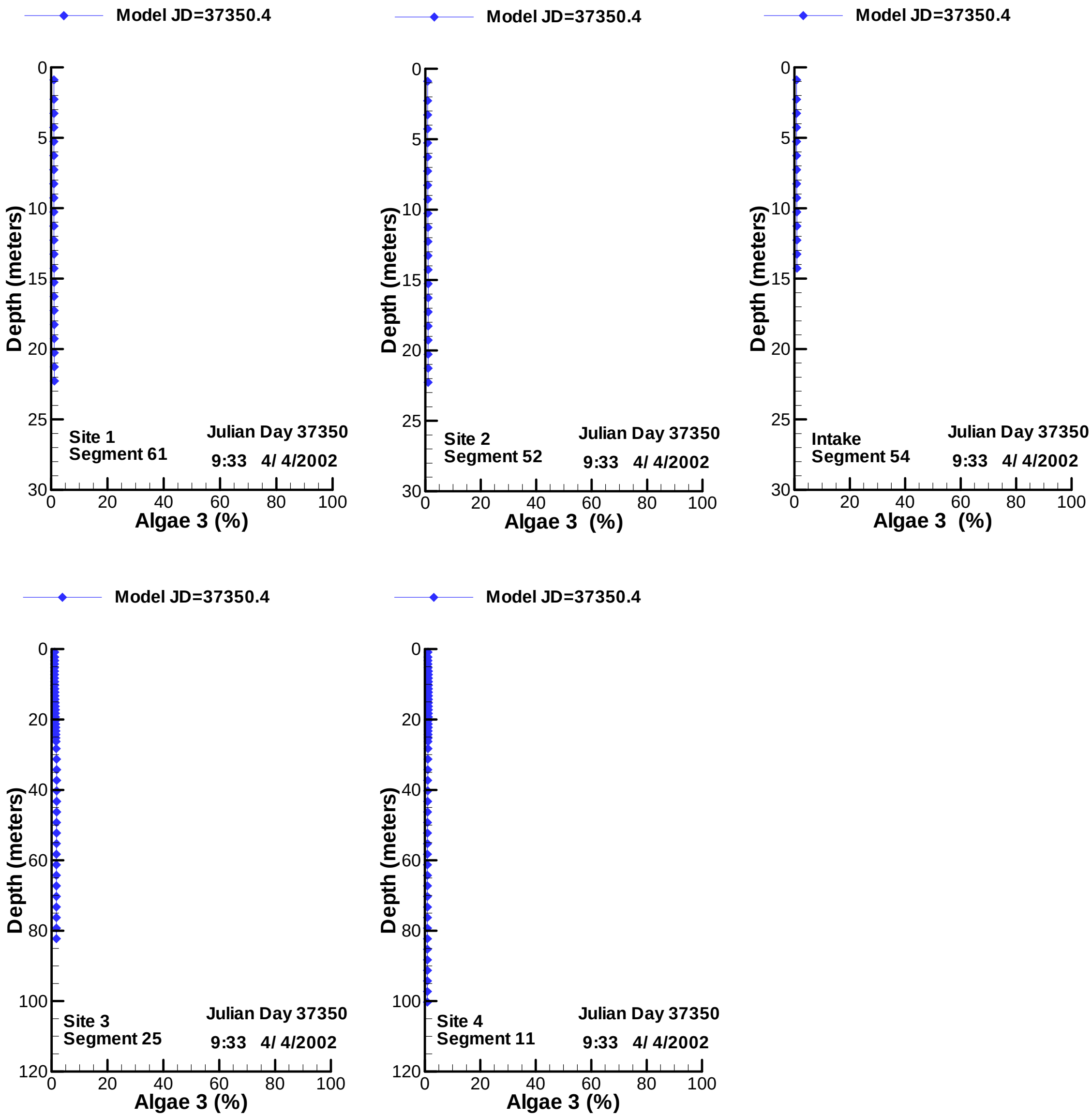

Figure 655. Vertical profiles of CYANOBACTERIA compared with data for 4/ 4/2002.

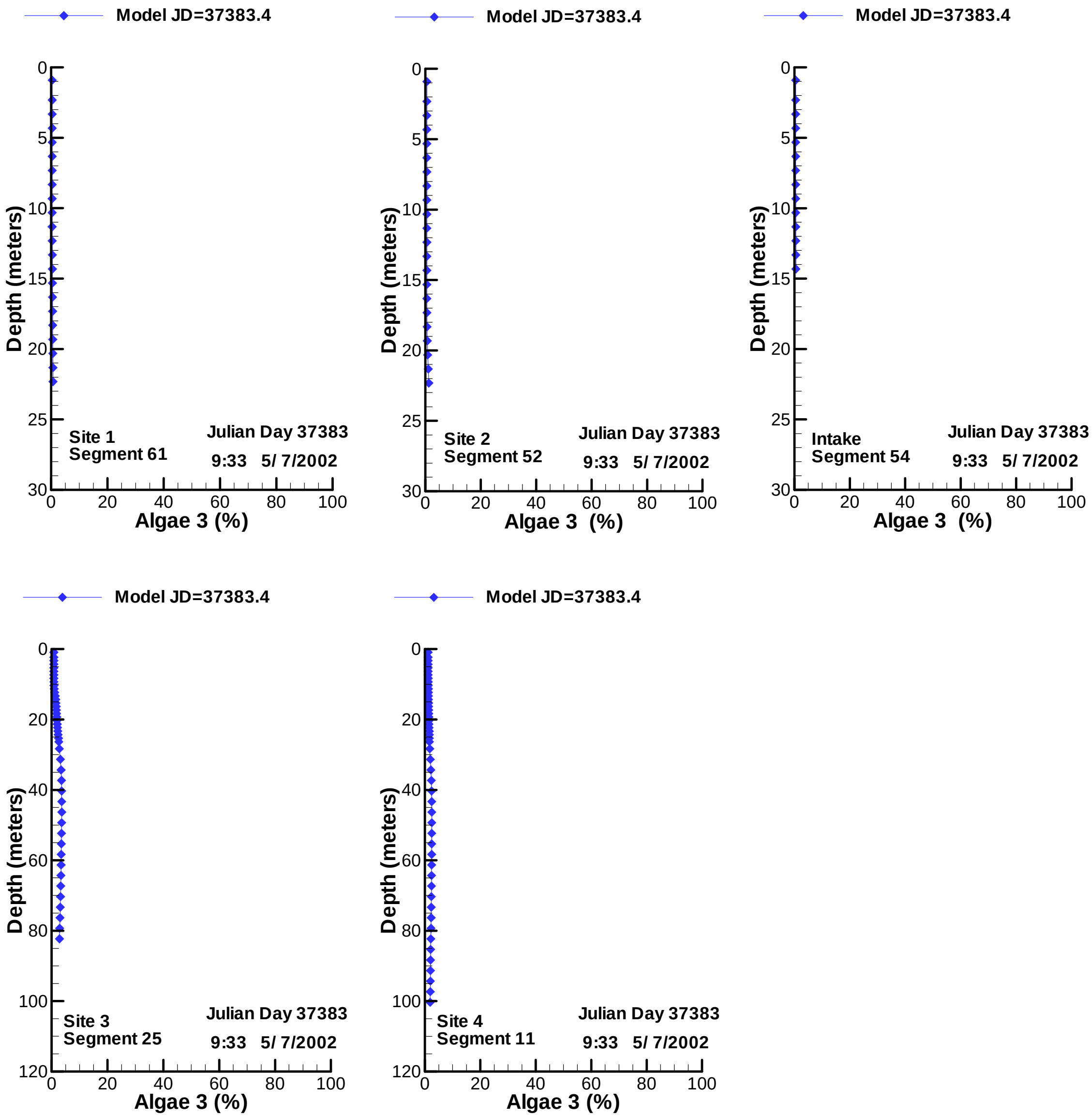

Figure 656. Vertical profiles of CYANOBACTERIA compared with data for 5/ 7/2002.

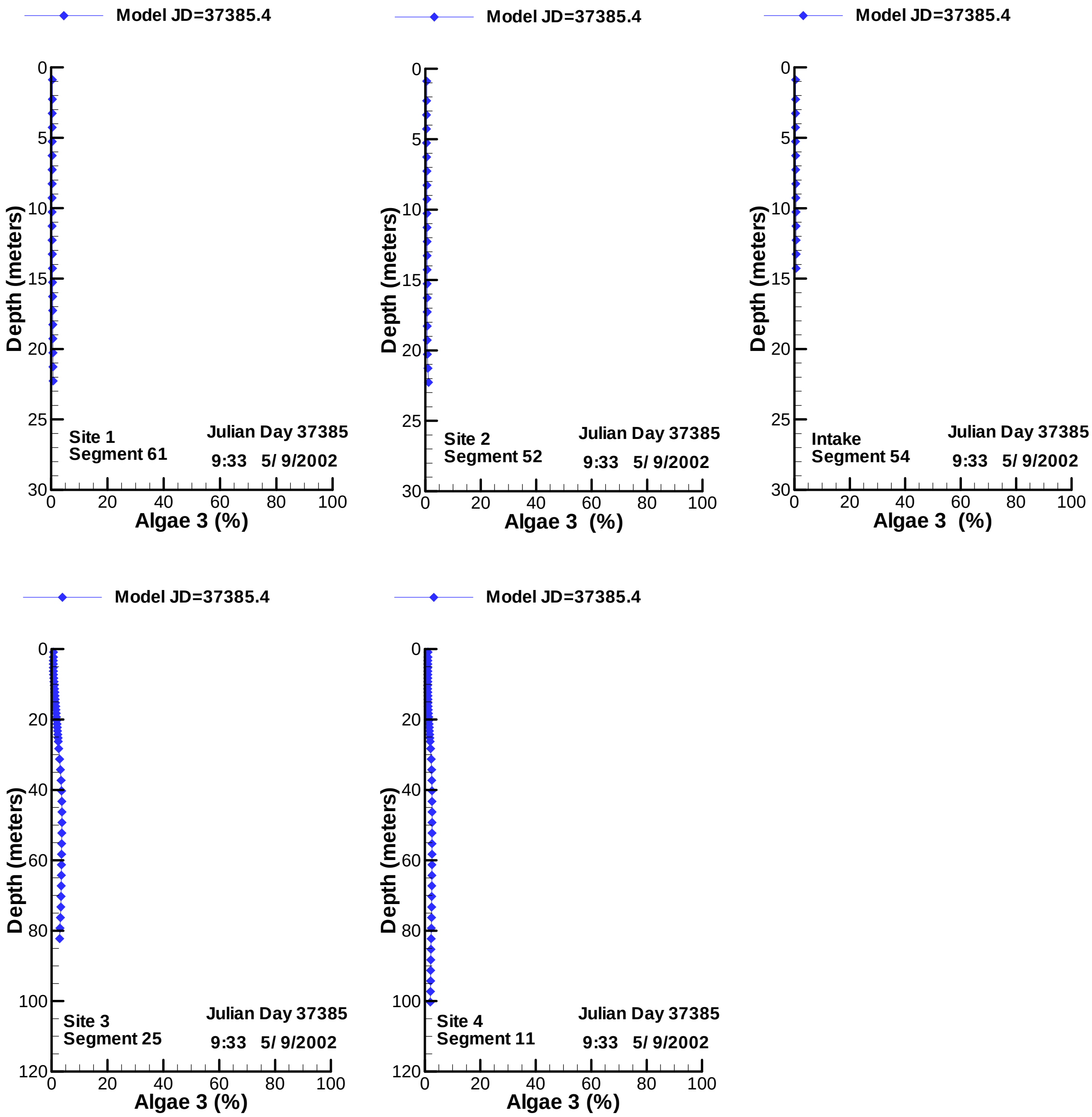

Figure 657. Vertical profiles of CYANOBACTERIA compared with data for 5/ 9/2002.

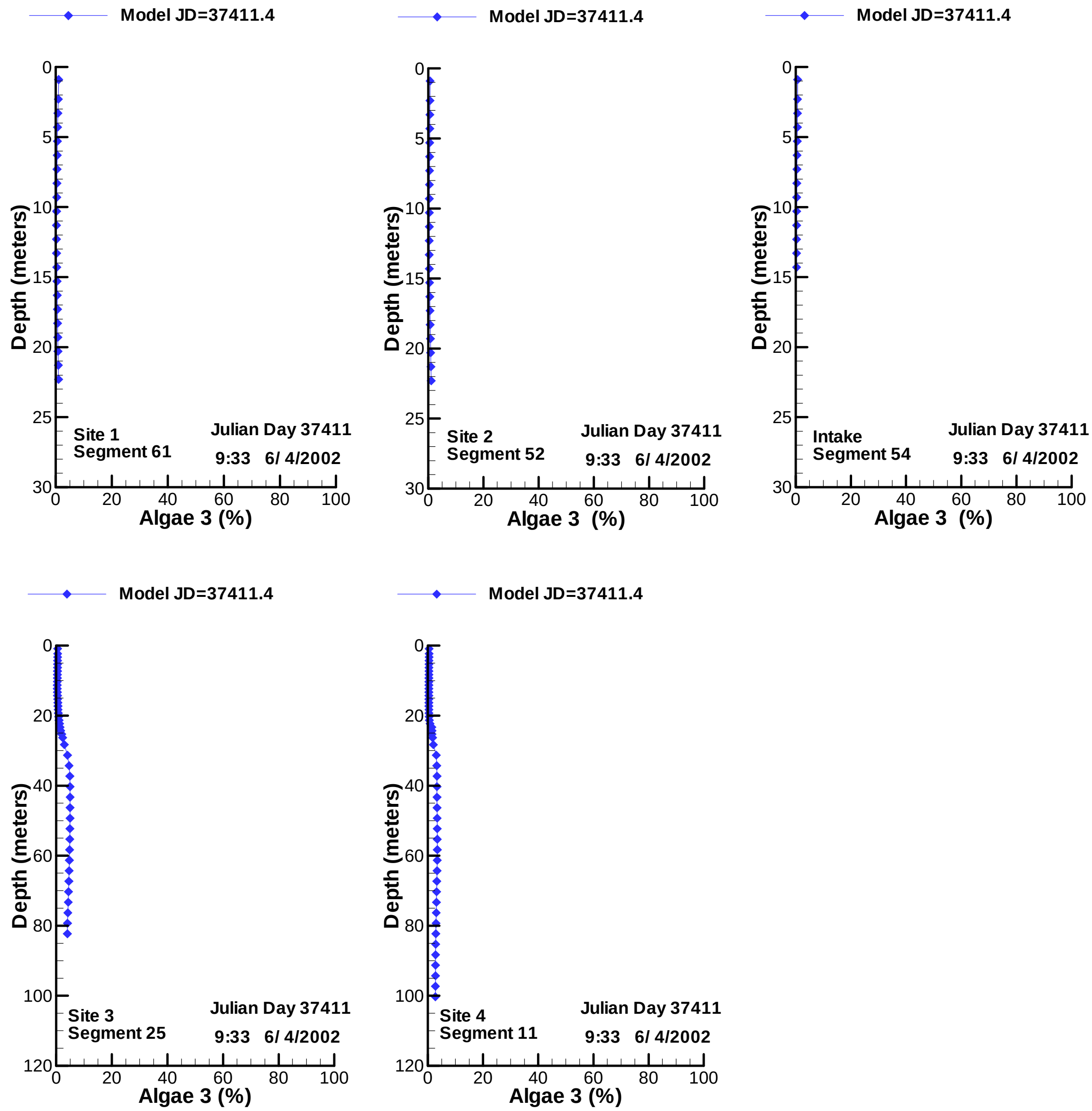

Figure 658. Vertical profiles of CYANOBACTERIA compared with data for 6/ 4/2002.

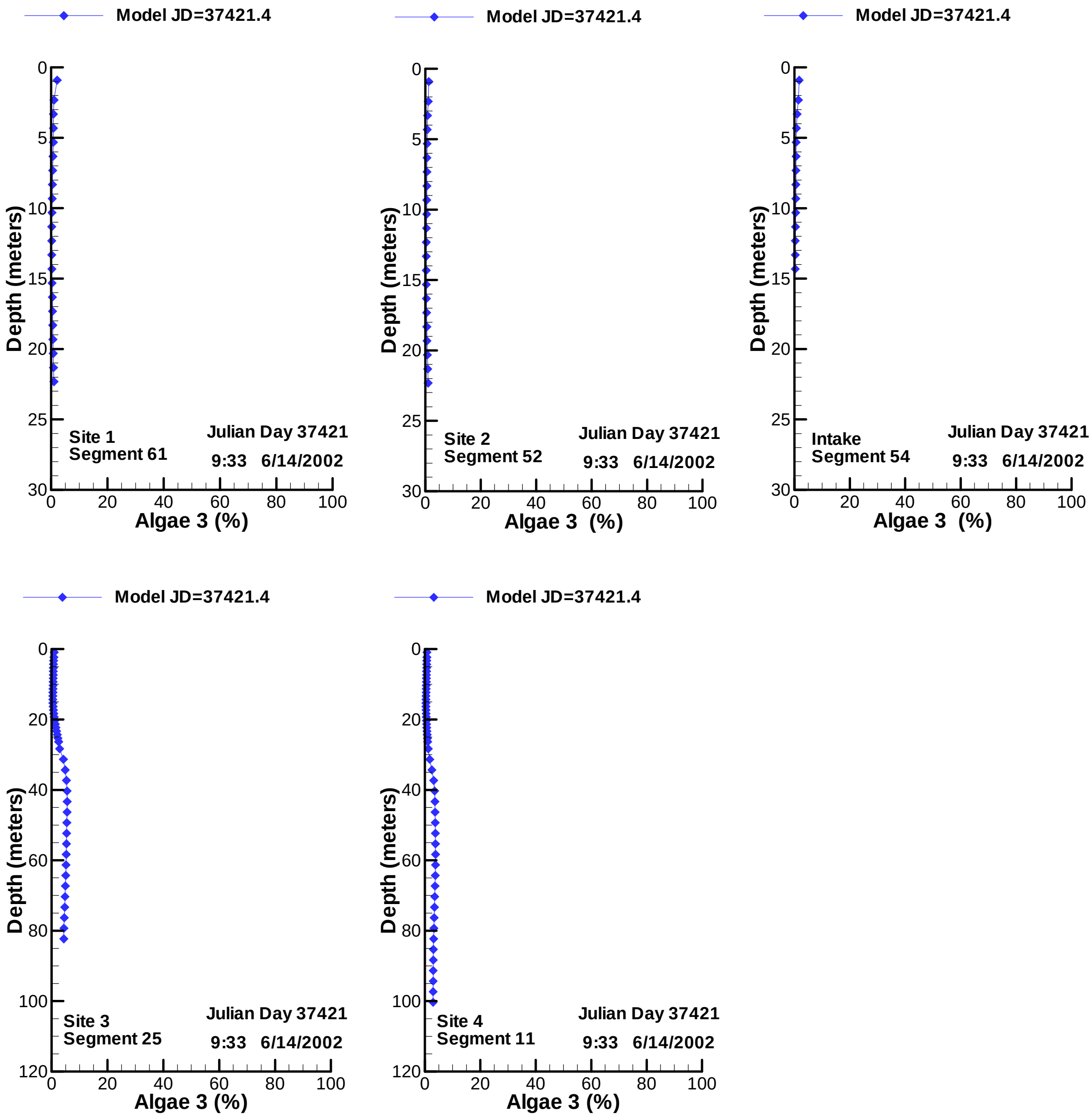

Figure 659. Vertical profiles of CYANOBACTERIA compared with data for 6/14/2002.

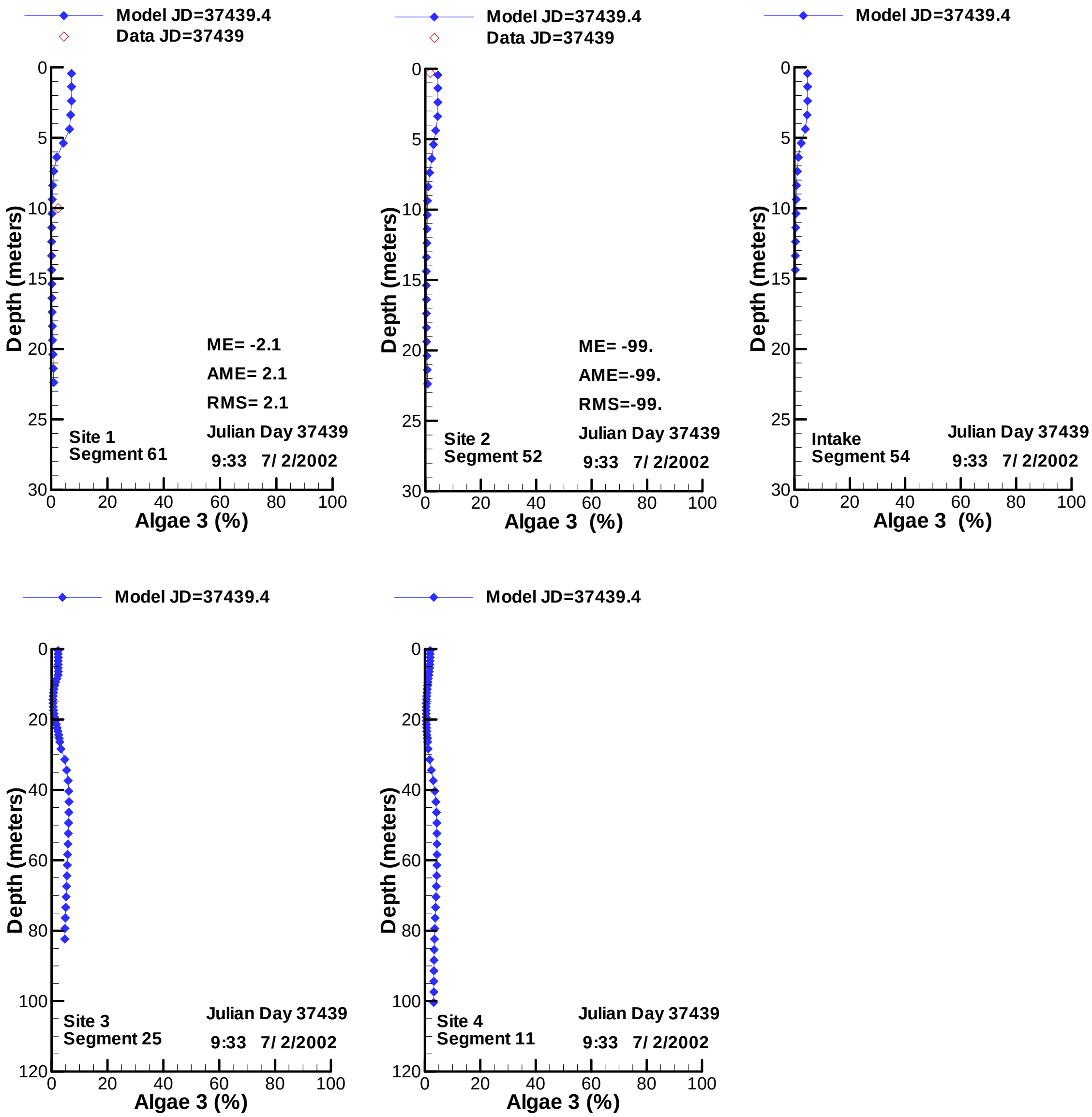

Figure 660. Vertical profiles of CYANOBACTERIA compared with data for 7/ 2/2002.

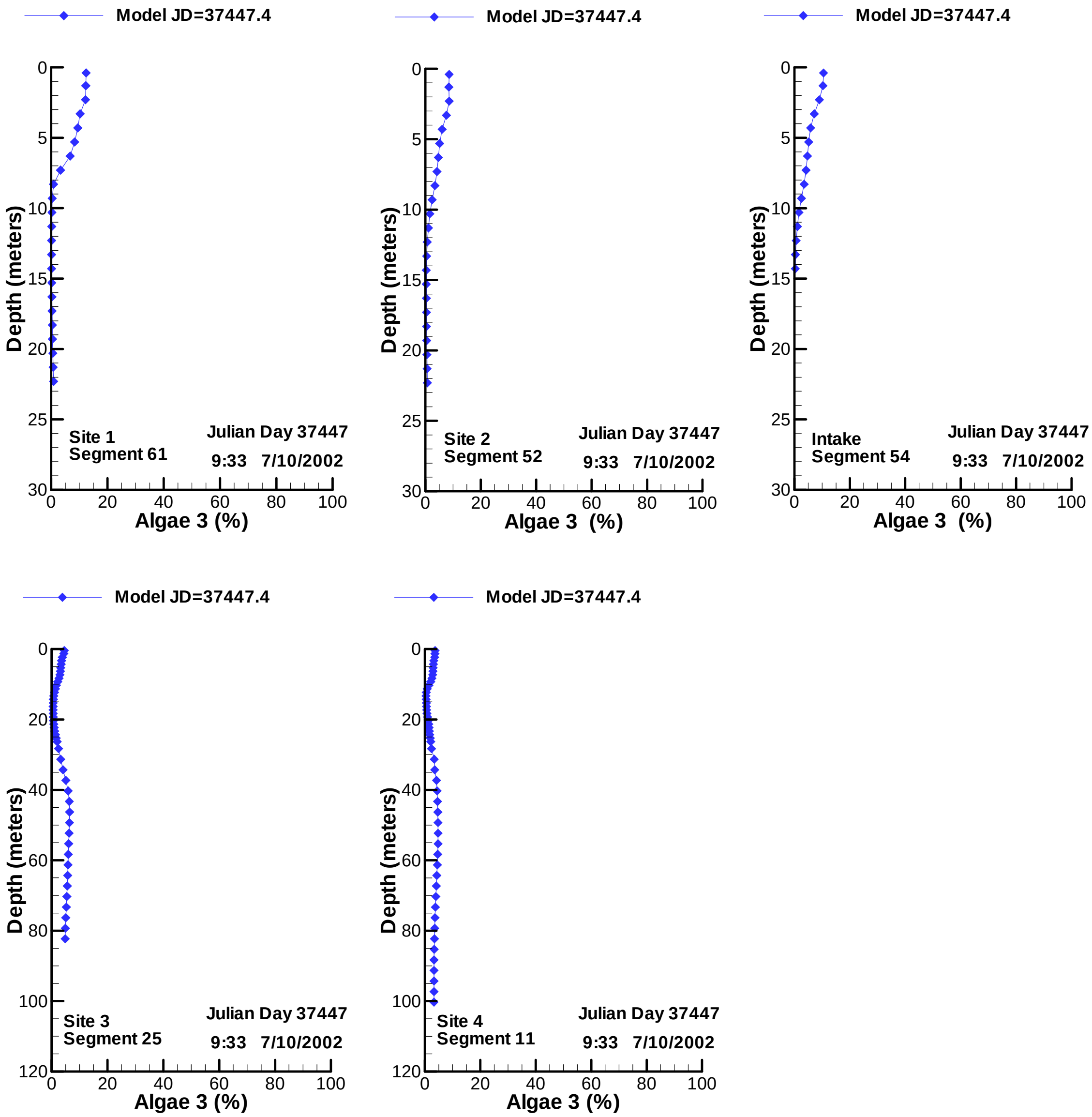

Figure 661. Vertical profiles of CYANOBACTERIA compared with data for 7/10/2002.

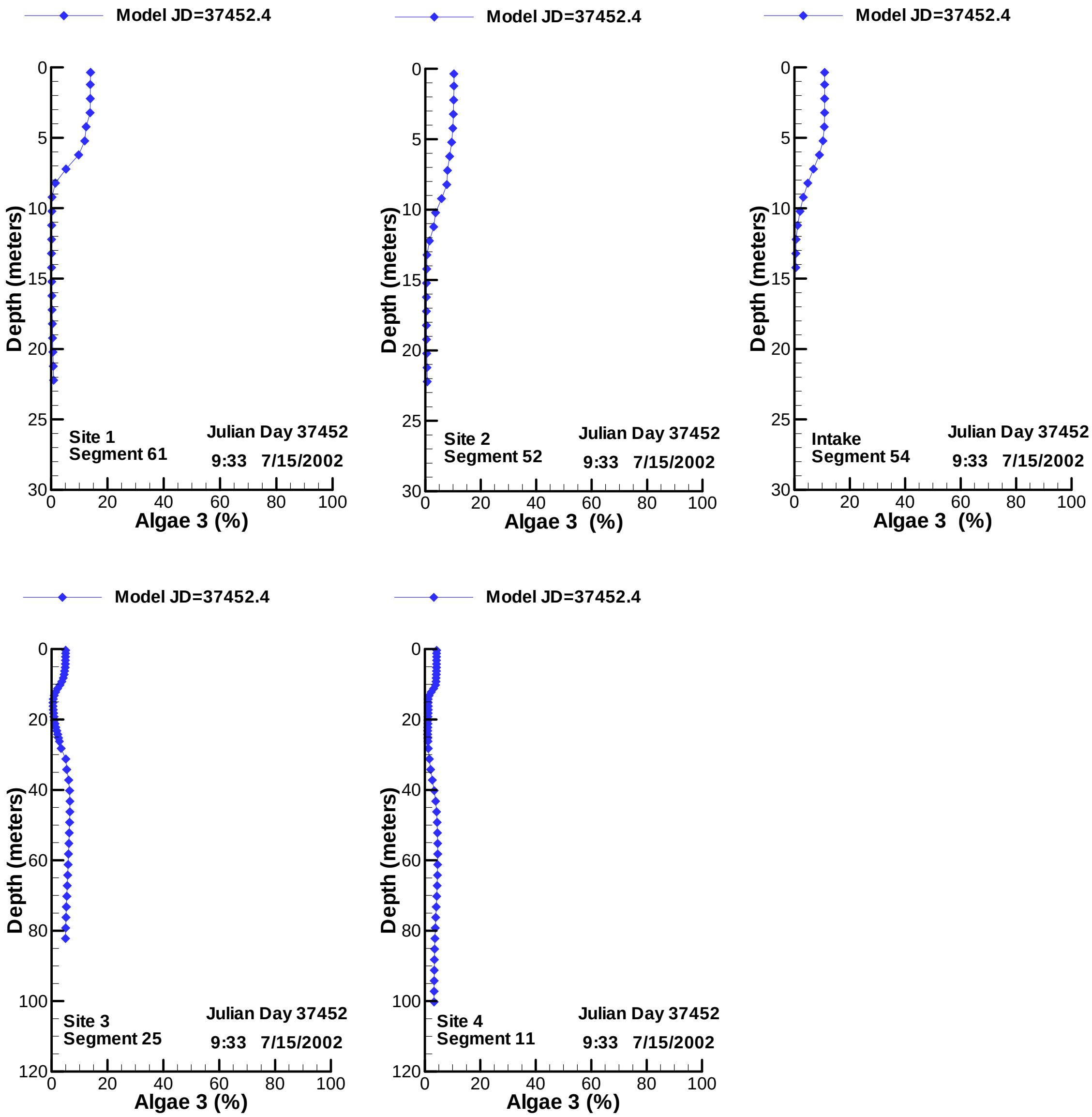

Figure 662. Vertical profiles of CYANOBACTERIA compared with data for 7/15/2002.

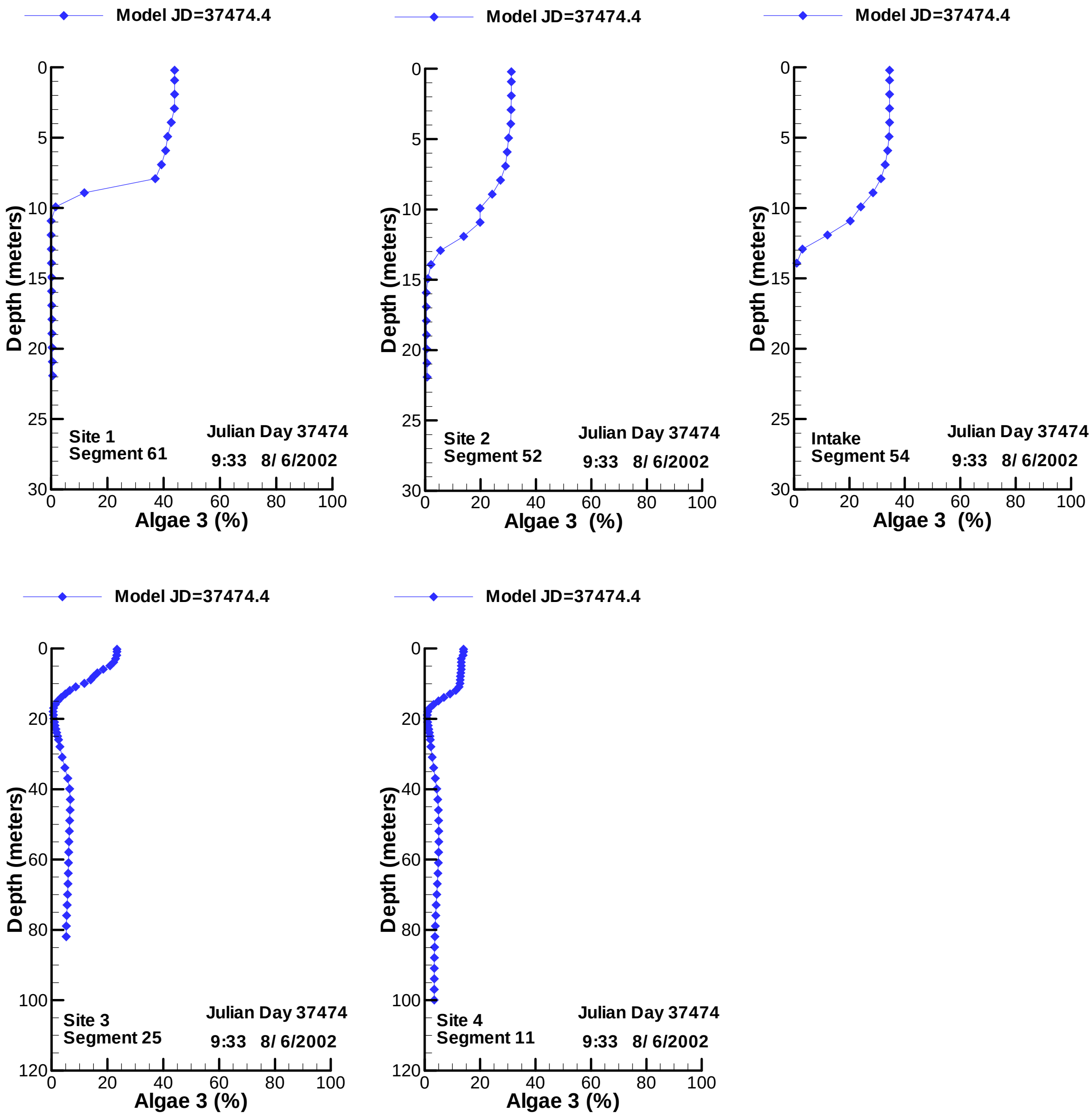

Figure 663. Vertical profiles of CYANOBACTERIA compared with data for 8/ 6/2002.

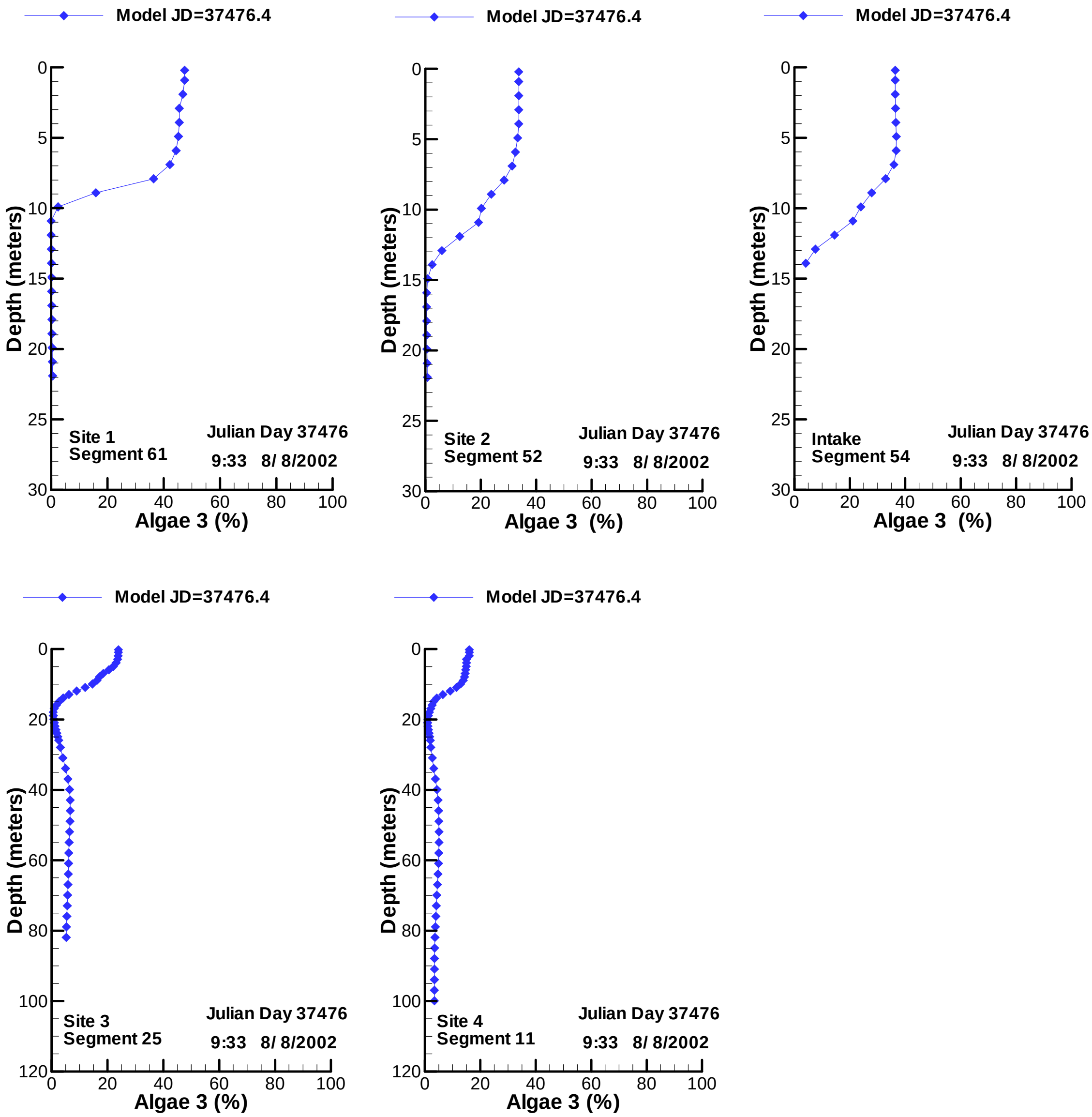

Figure 664. Vertical profiles of CYANOBACTERIA compared with data for 8/ 8/2002.

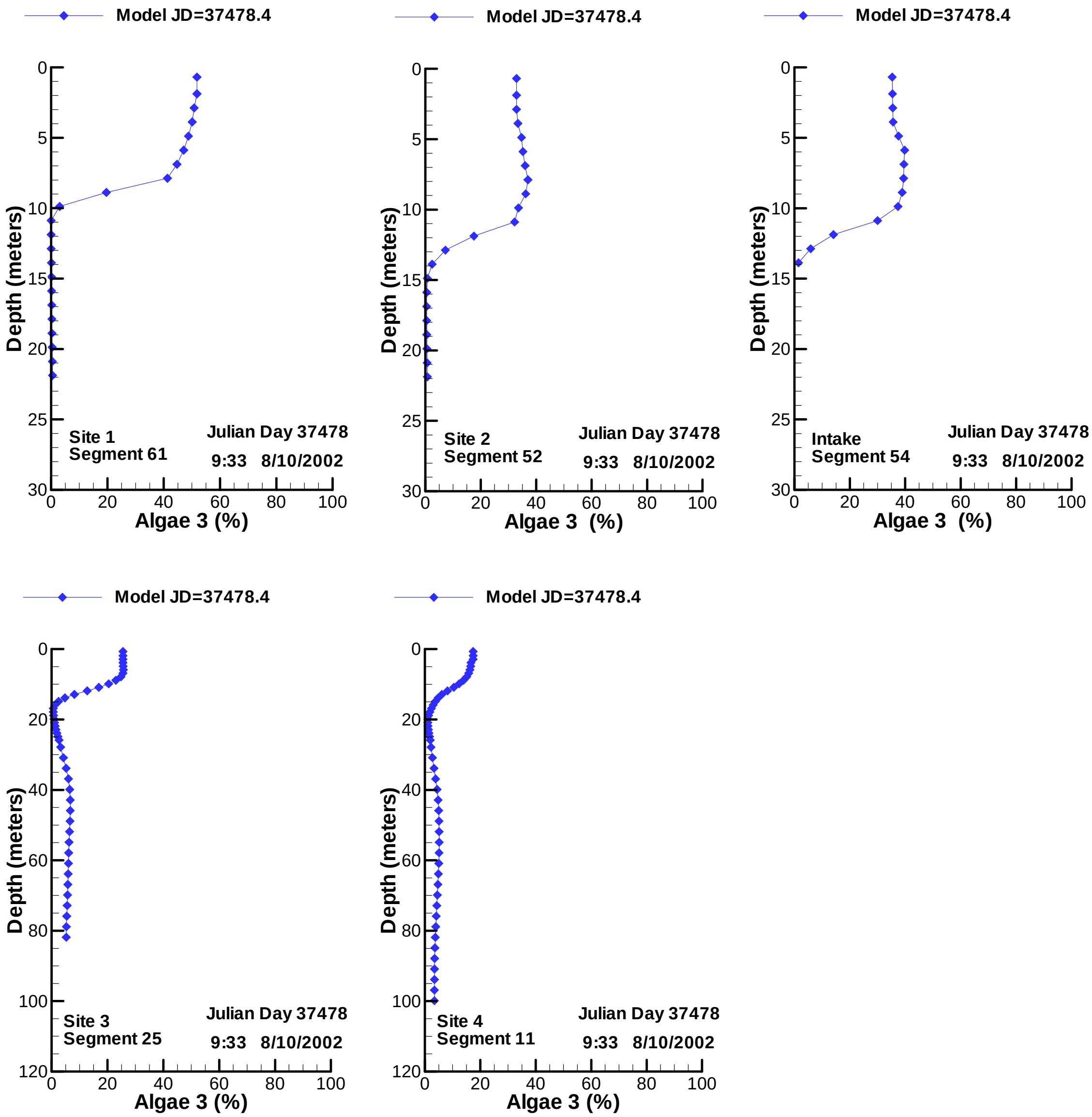

Figure 665. Vertical profiles of CYANOBACTERIA compared with data for 8/10/2002.

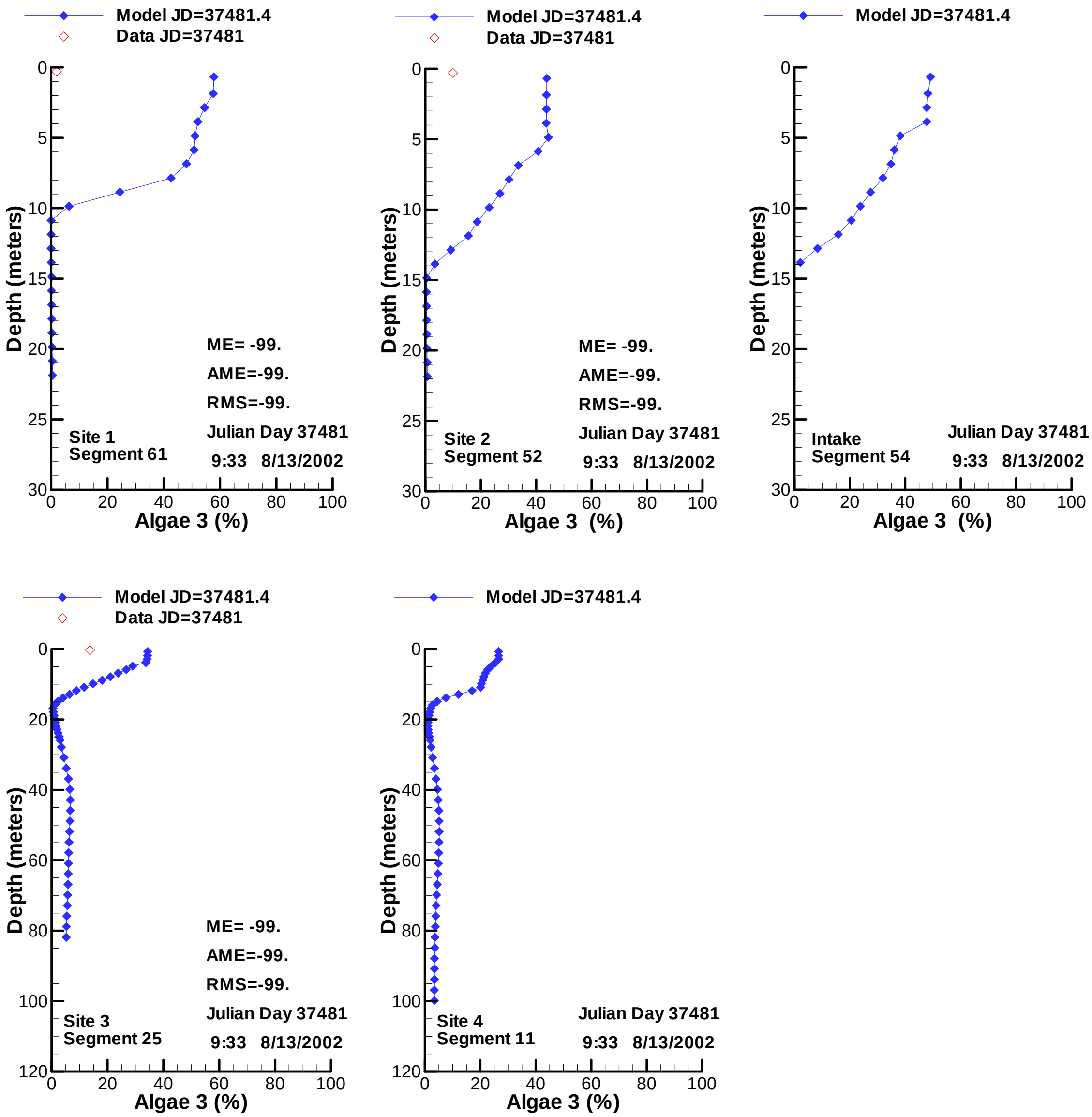

Figure 666. Vertical profiles of CYANOBACTERIA compared with data for 8/13/2002.

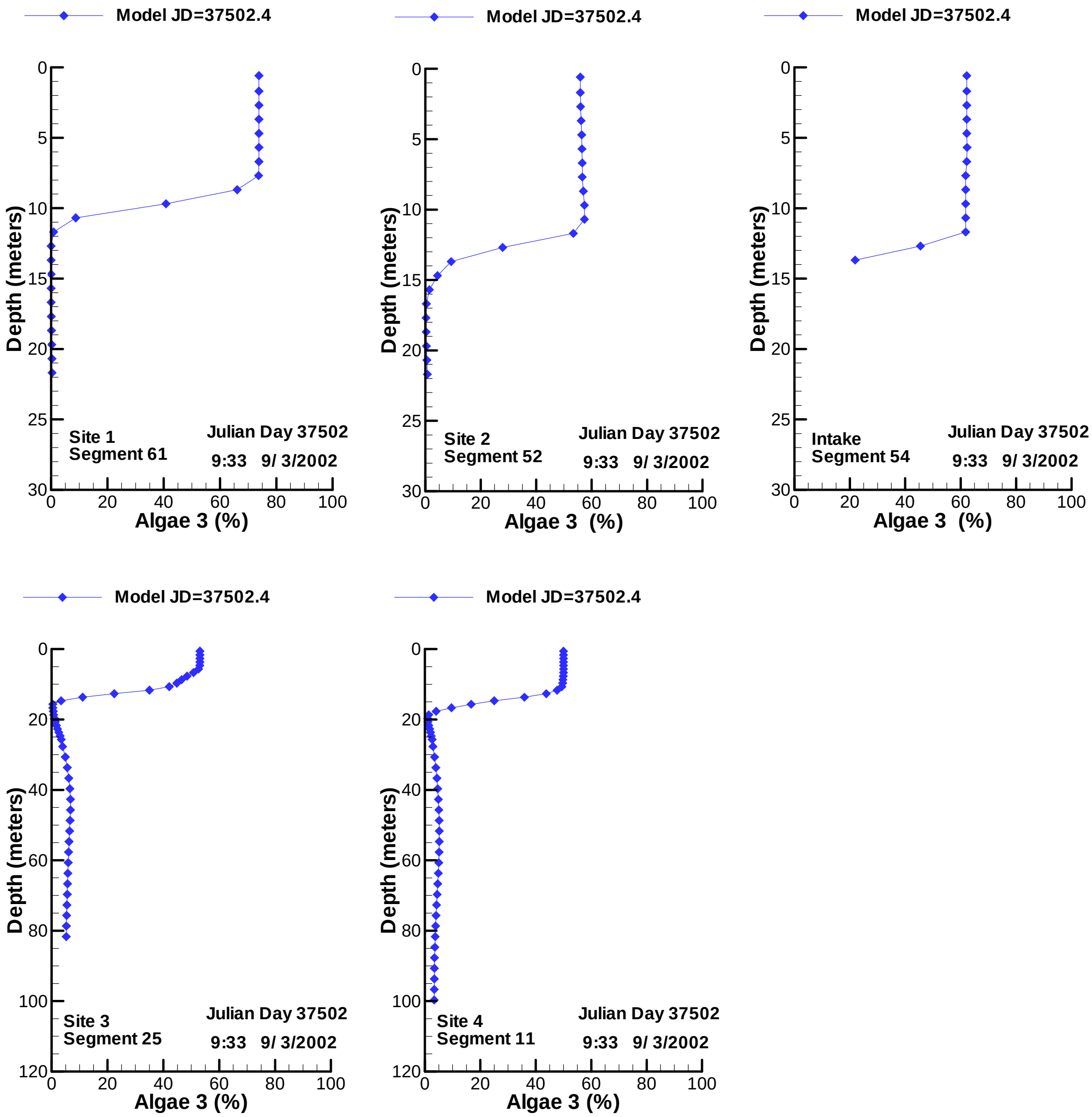

Figure 667. Vertical profiles of CYANOBACTERIA compared with data for 9/ 3/2002.

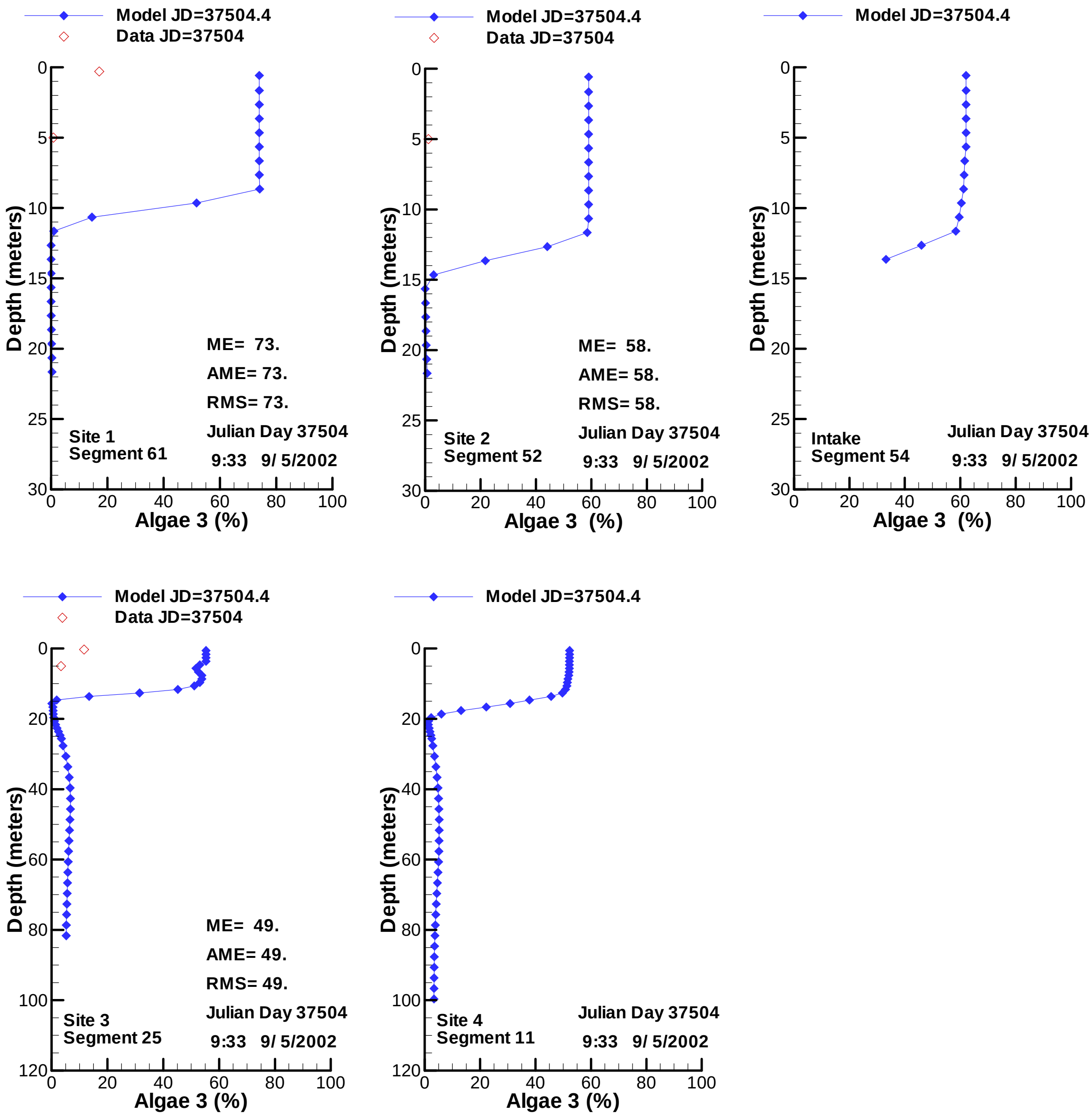

Figure 668. Vertical profiles of CYANOBACTERIA compared with data for 9/ 5/2002.

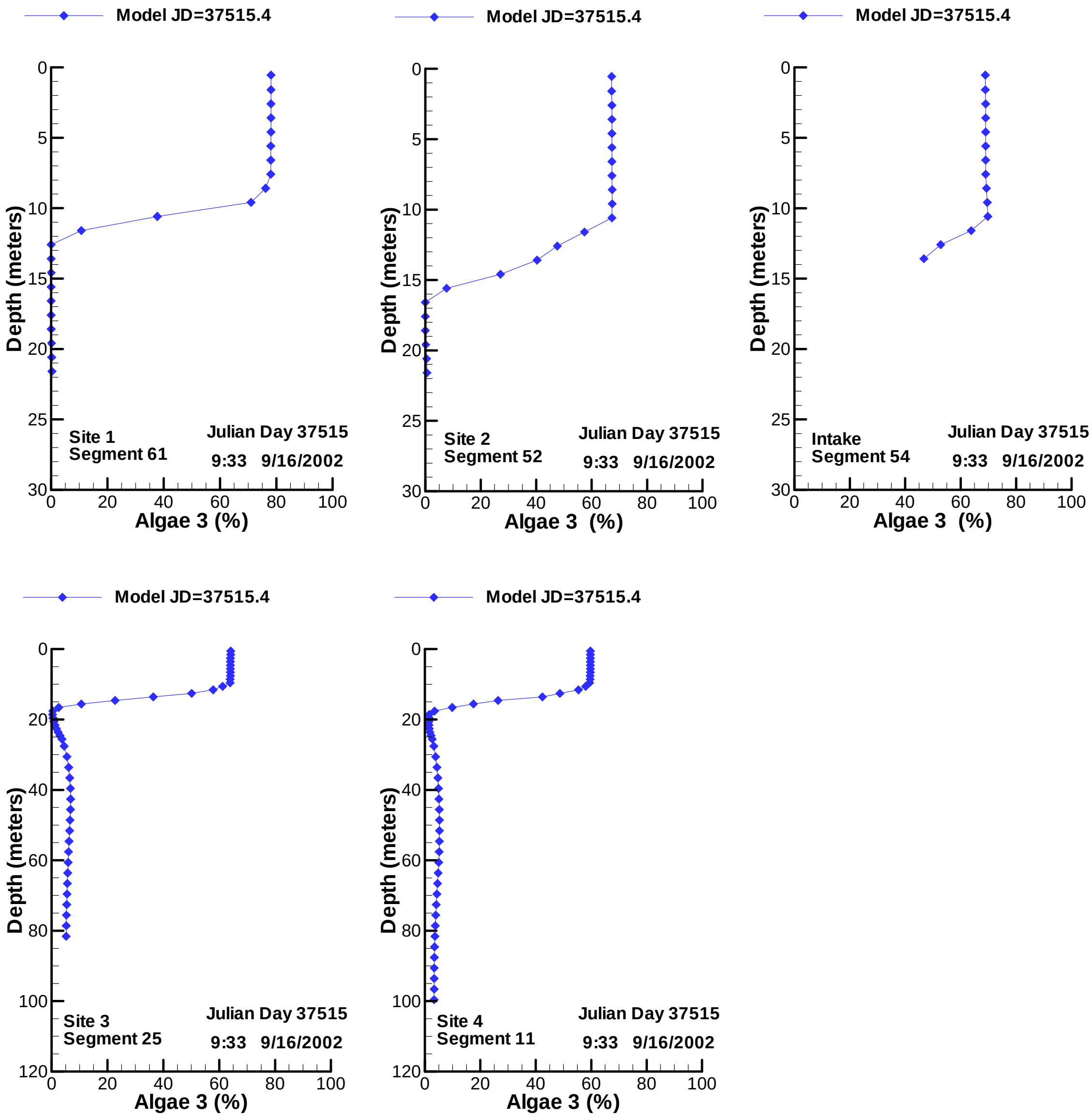

Figure 669. Vertical profiles of CYANOBACTERIA compared with data for 9/16/2002.

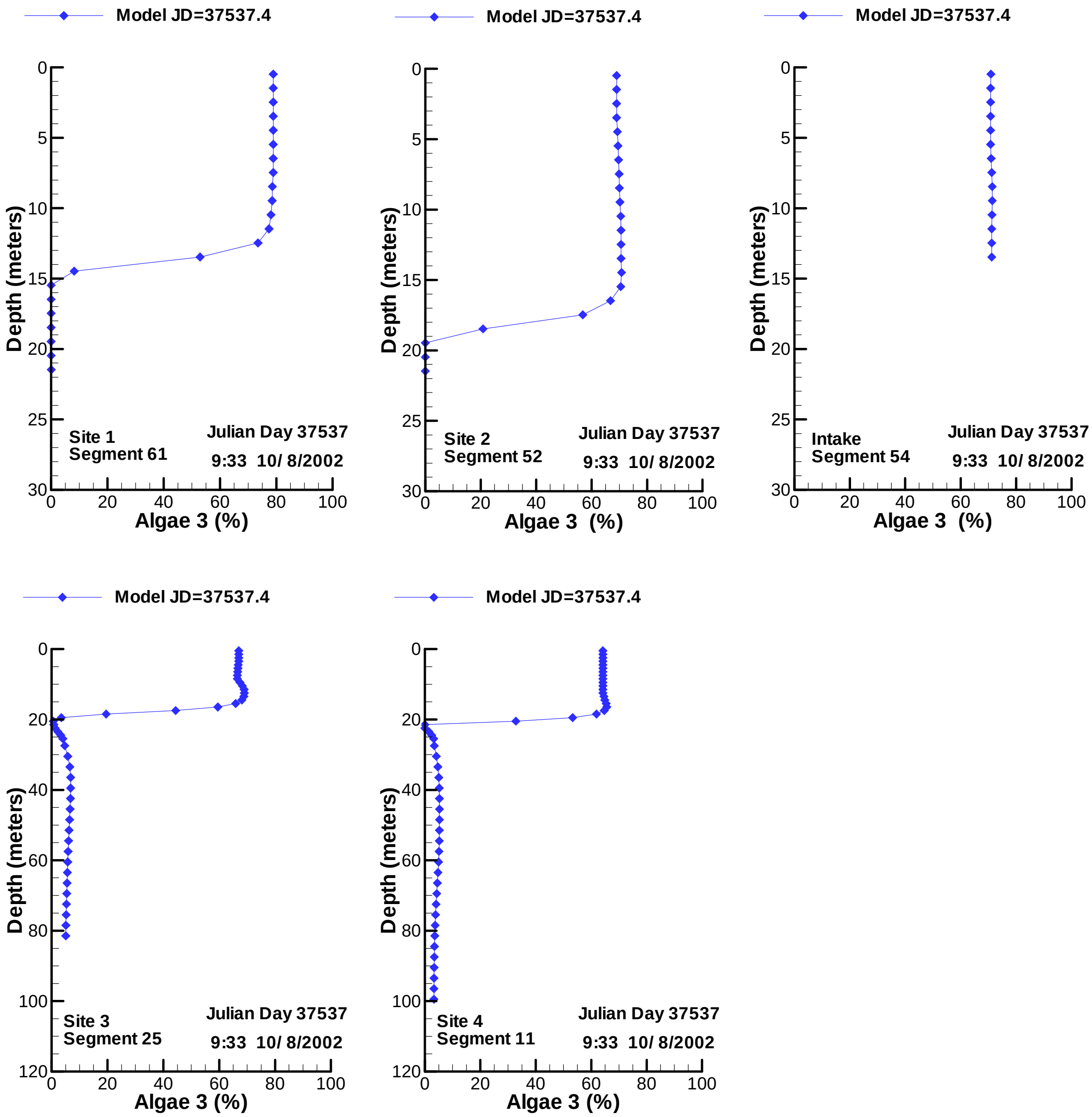

Figure 670. Vertical profiles of CYANOBACTERIA compared with data for 10/ 8/2002.

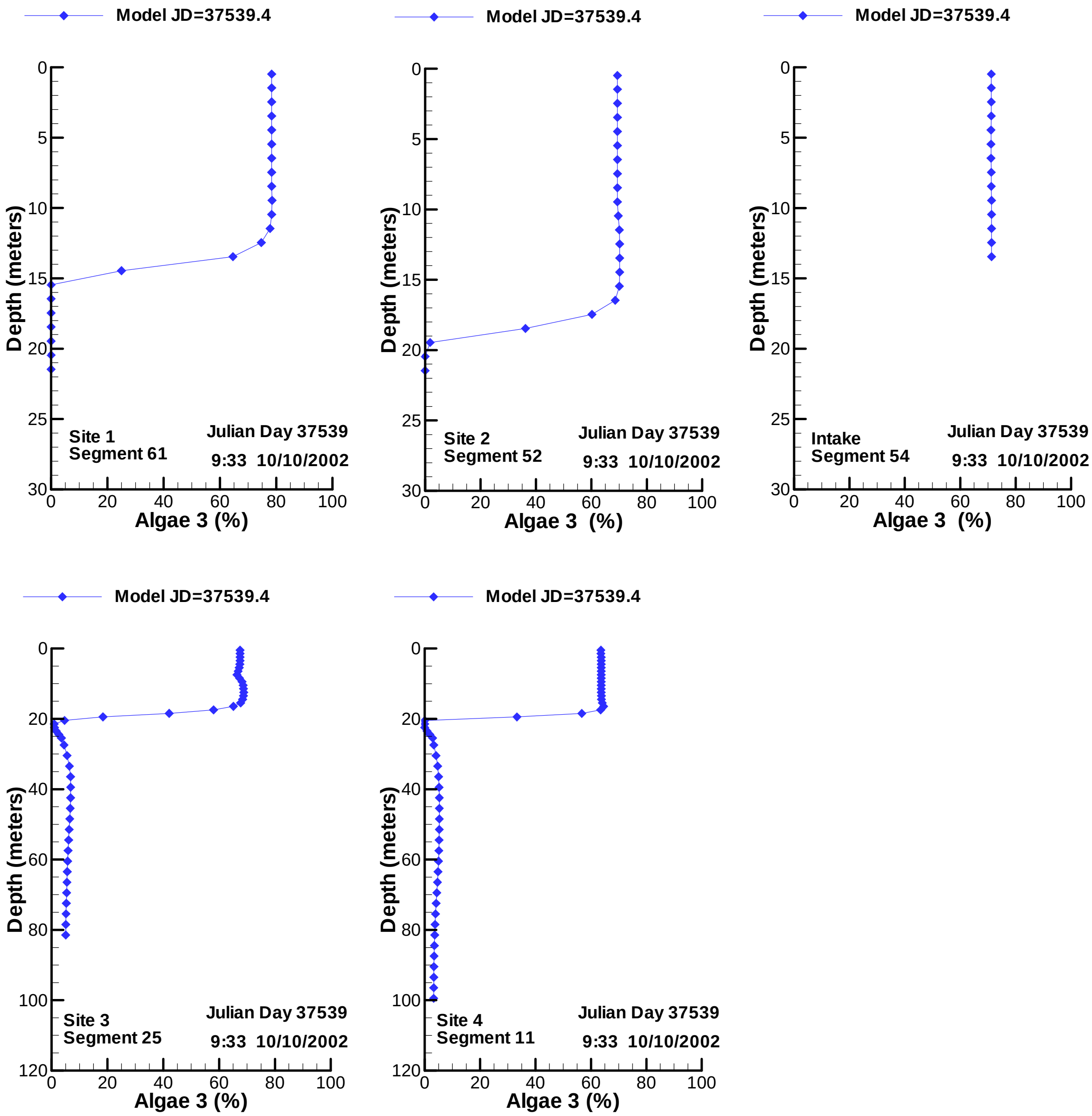

Figure 671. Vertical profiles of CYANOBACTERIA compared with data for 10/10/2002.

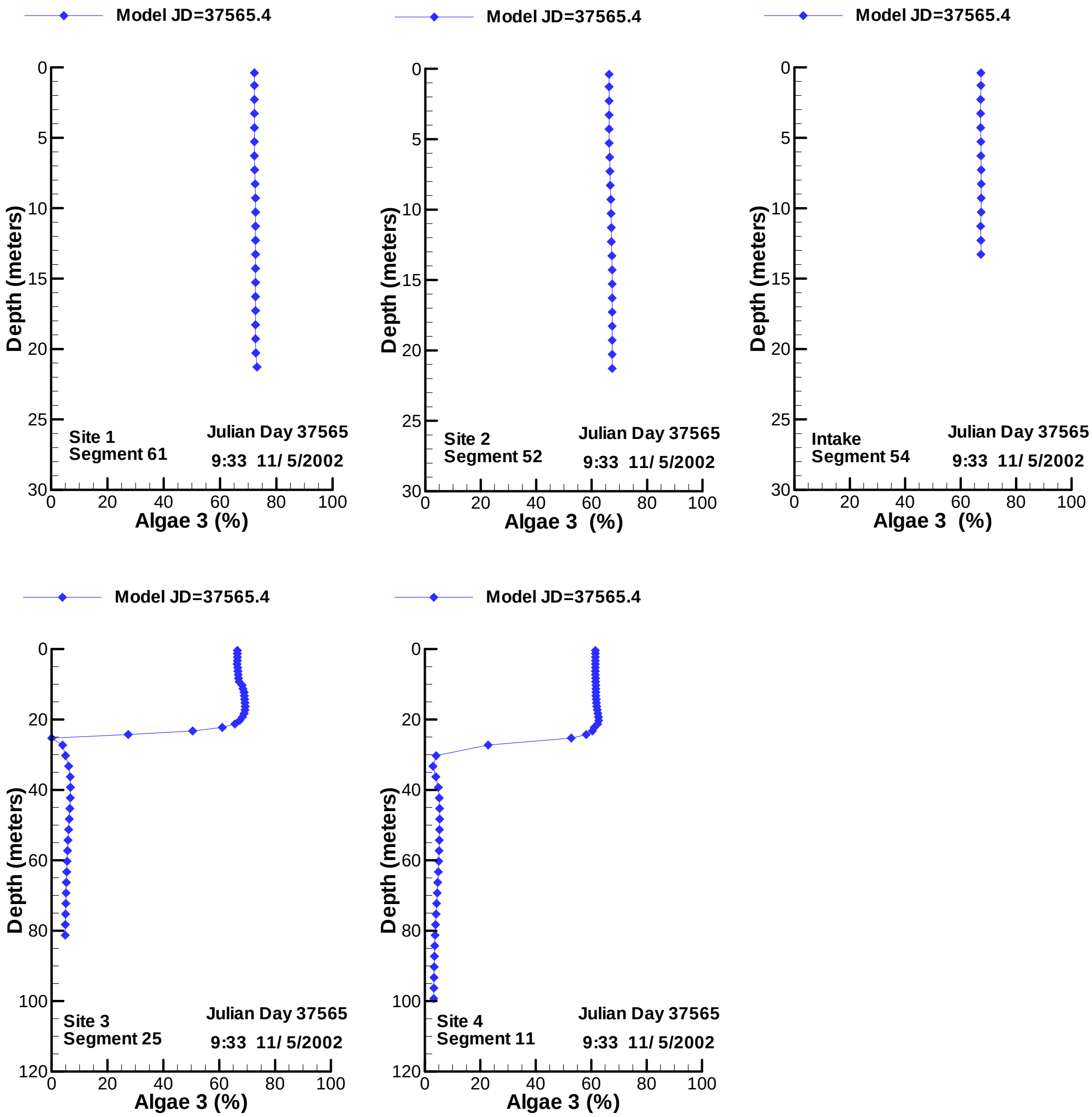

Figure 672. Vertical profiles of CYANOBACTERIA compared with data for 11/ 5/2002.

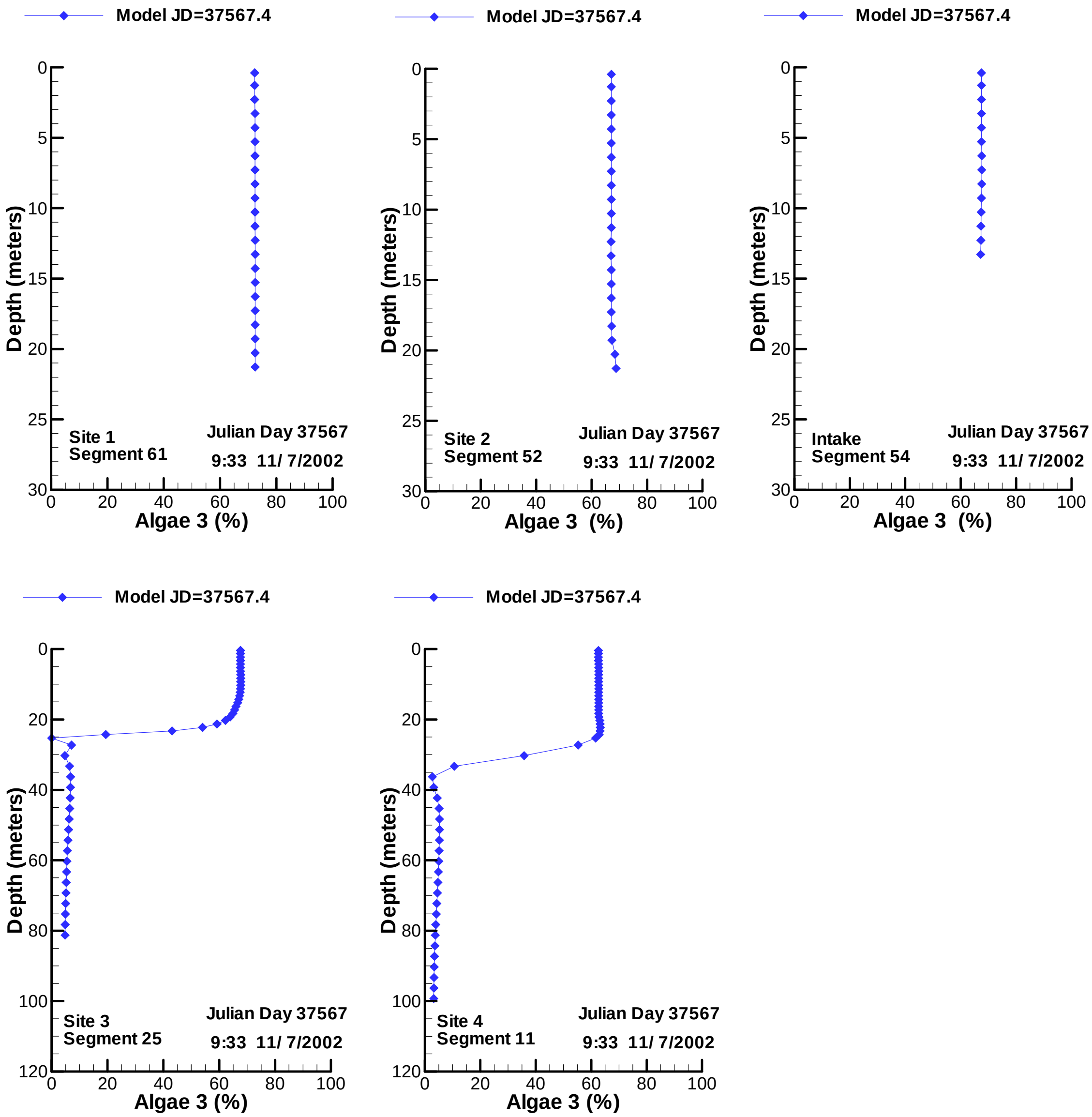

Figure 673. Vertical profiles of CYANOBACTERIA compared with data for 11/ 7/2002.

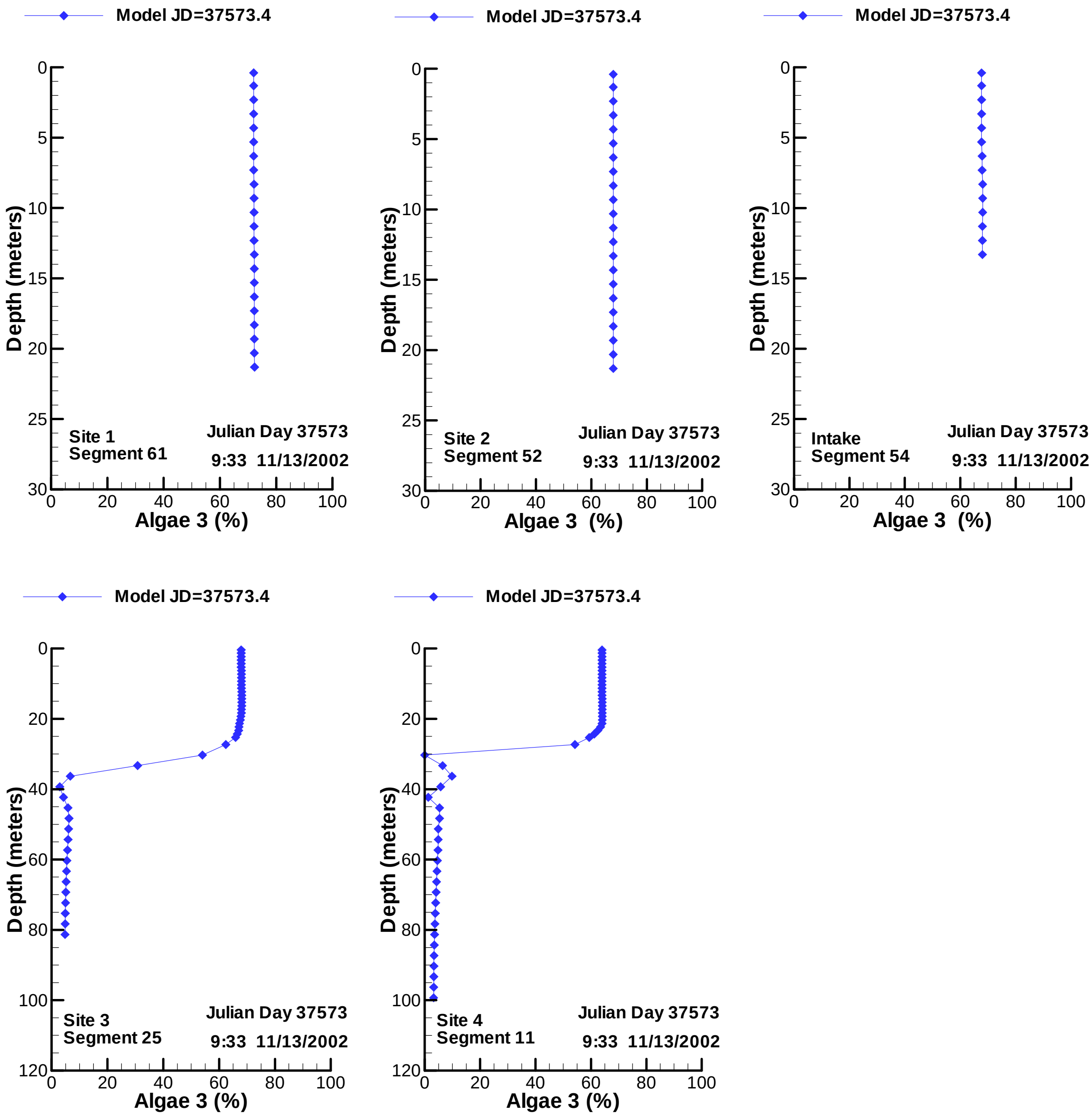

Figure 674. Vertical profiles of CYANOBACTERIA compared with data for 11/13/2002.

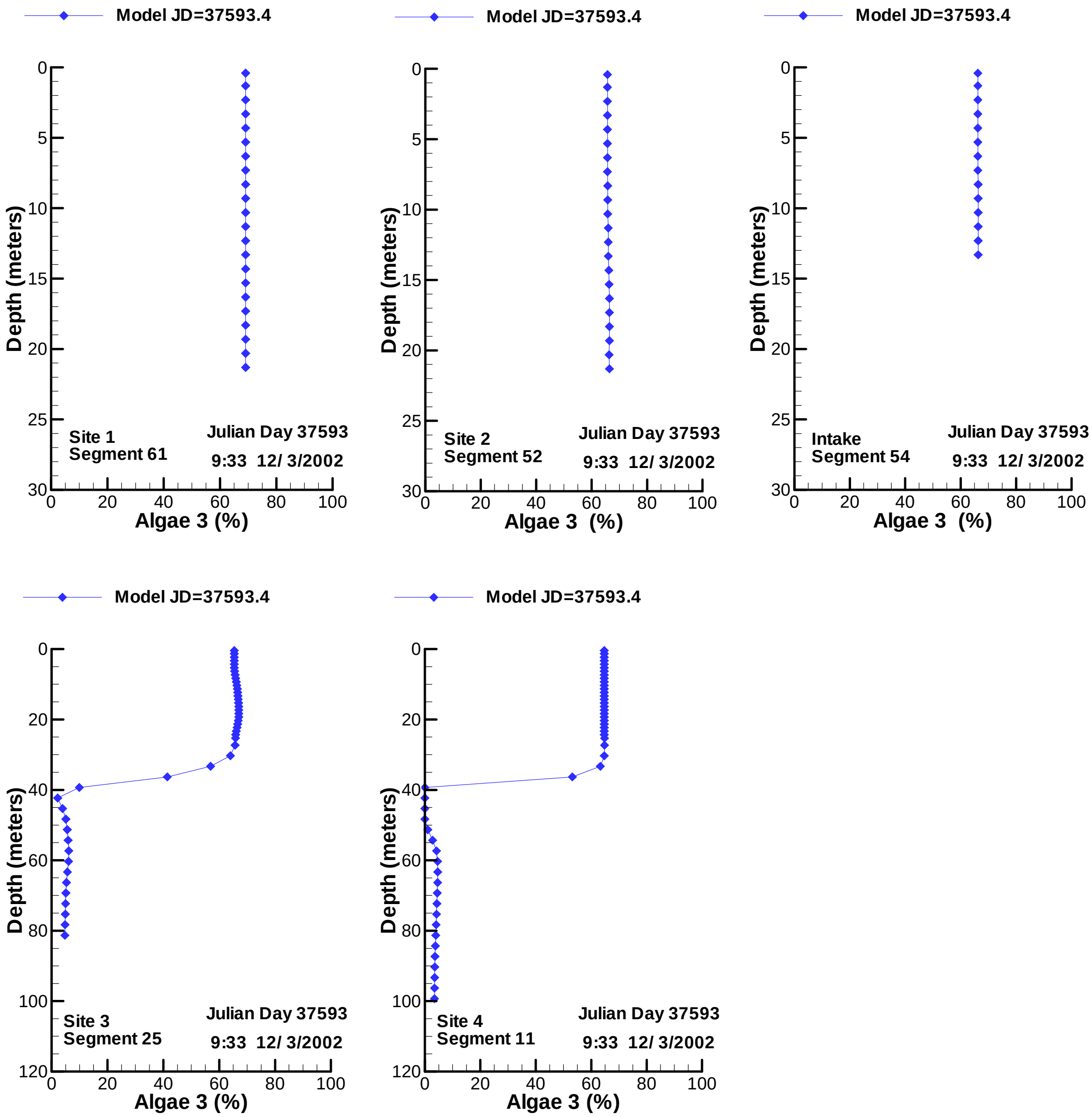

Figure 675. Vertical profiles of CYANOBACTERIA compared with data for 12/ 3/2002.

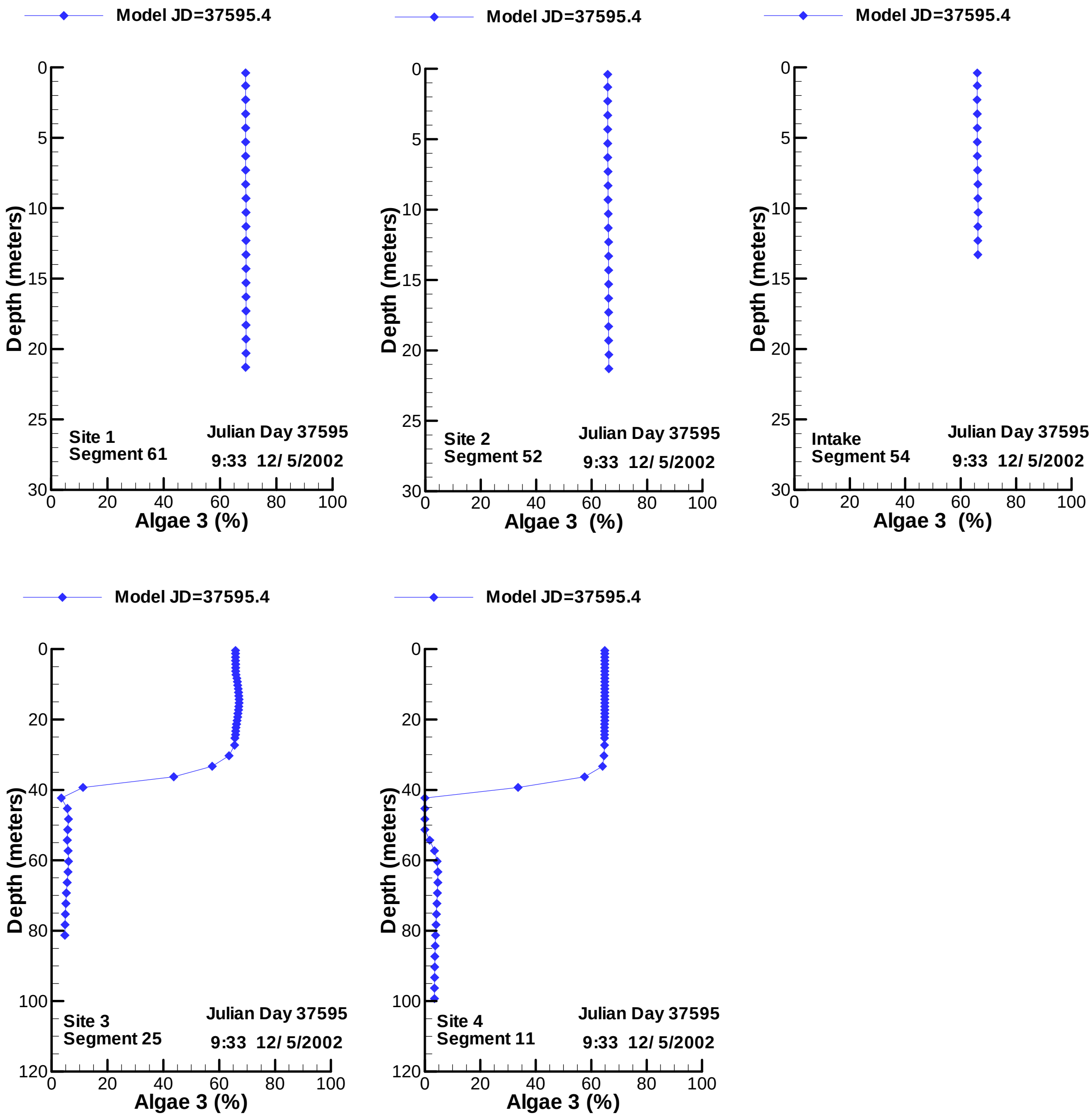

Figure 676. Vertical profiles of CYANOBACTERIA compared with data for 12/ 5/2002.

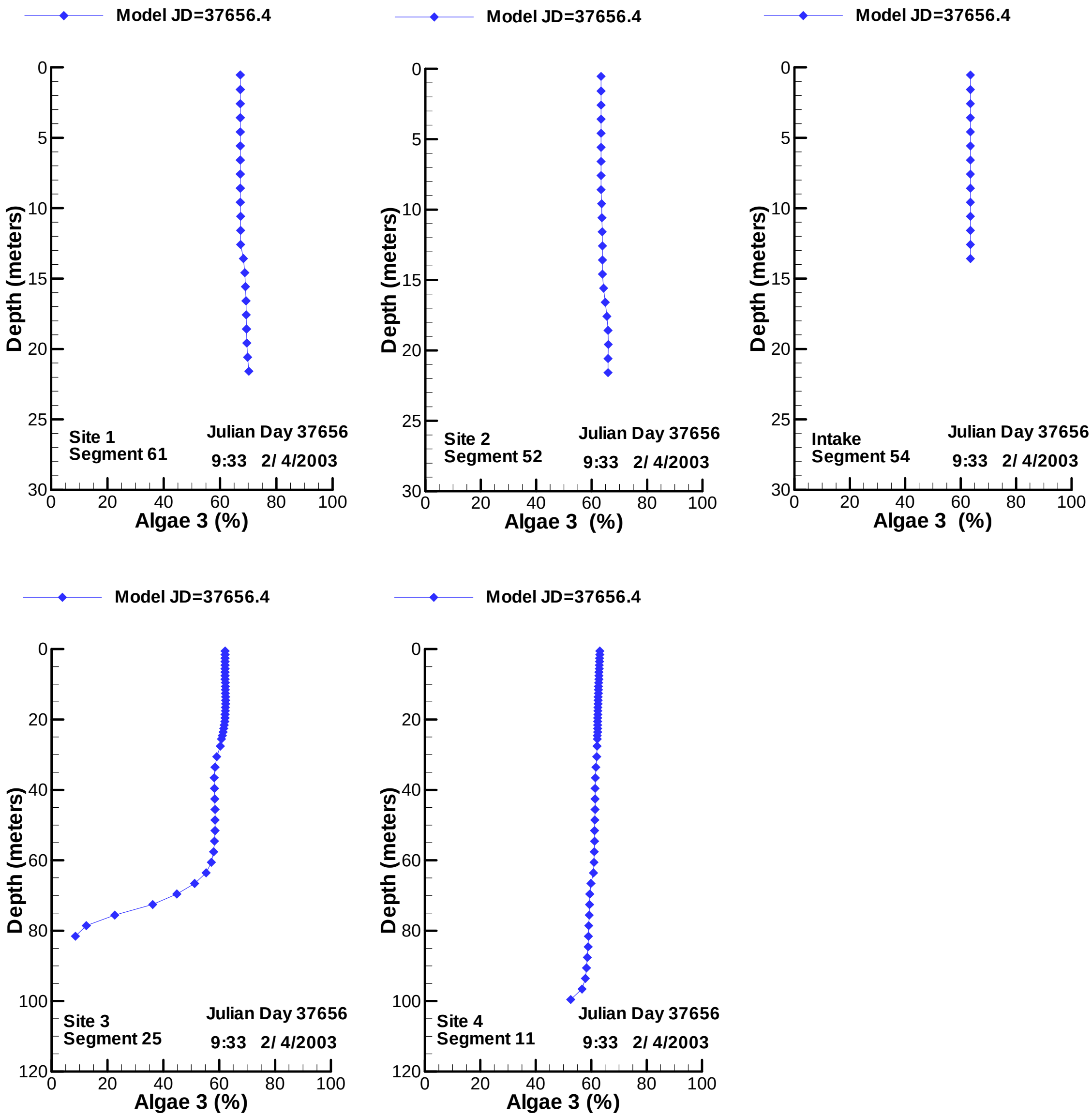

Figure 677. Vertical profiles of CYANOBACTERIA compared with data for 2/ 4/2003.

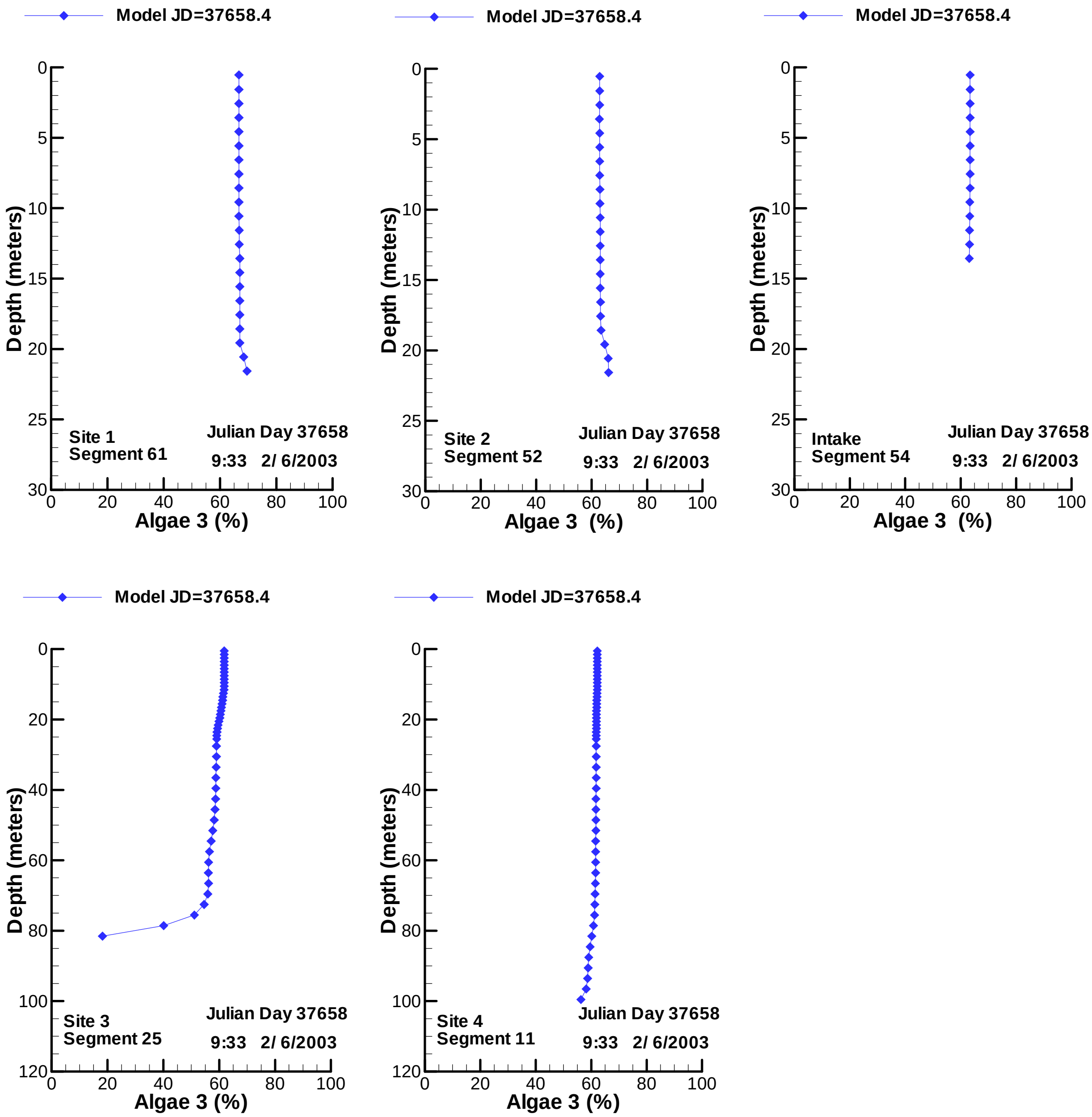

Figure 678. Vertical profiles of CYANOBACTERIA compared with data for 2/ 6/2003.

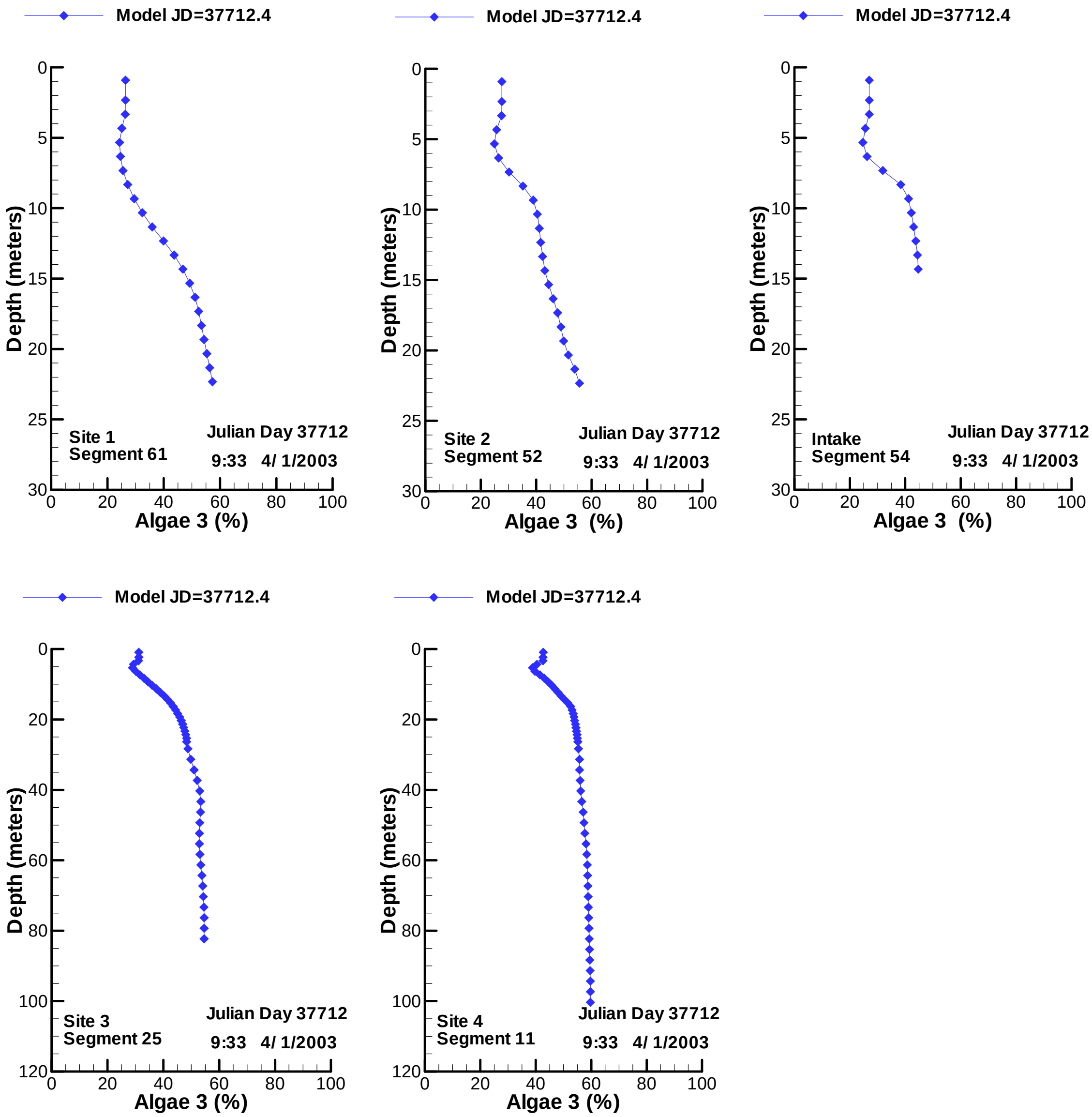

Figure 679. Vertical profiles of CYANOBACTERIA compared with data for 4/ 1/2003.

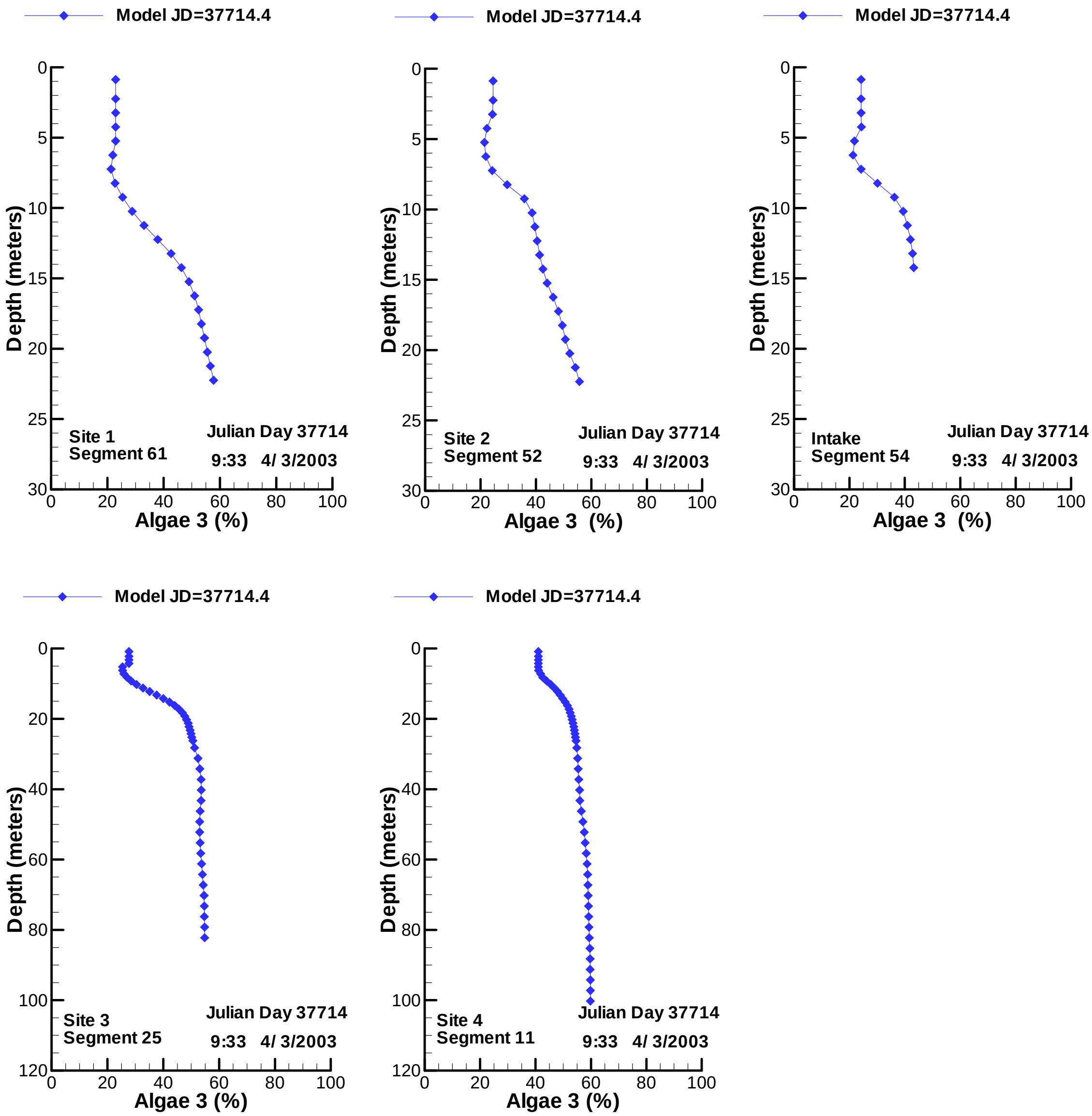

Figure 680. Vertical profiles of CYANOBACTERIA compared with data for 4/ 3/2003.

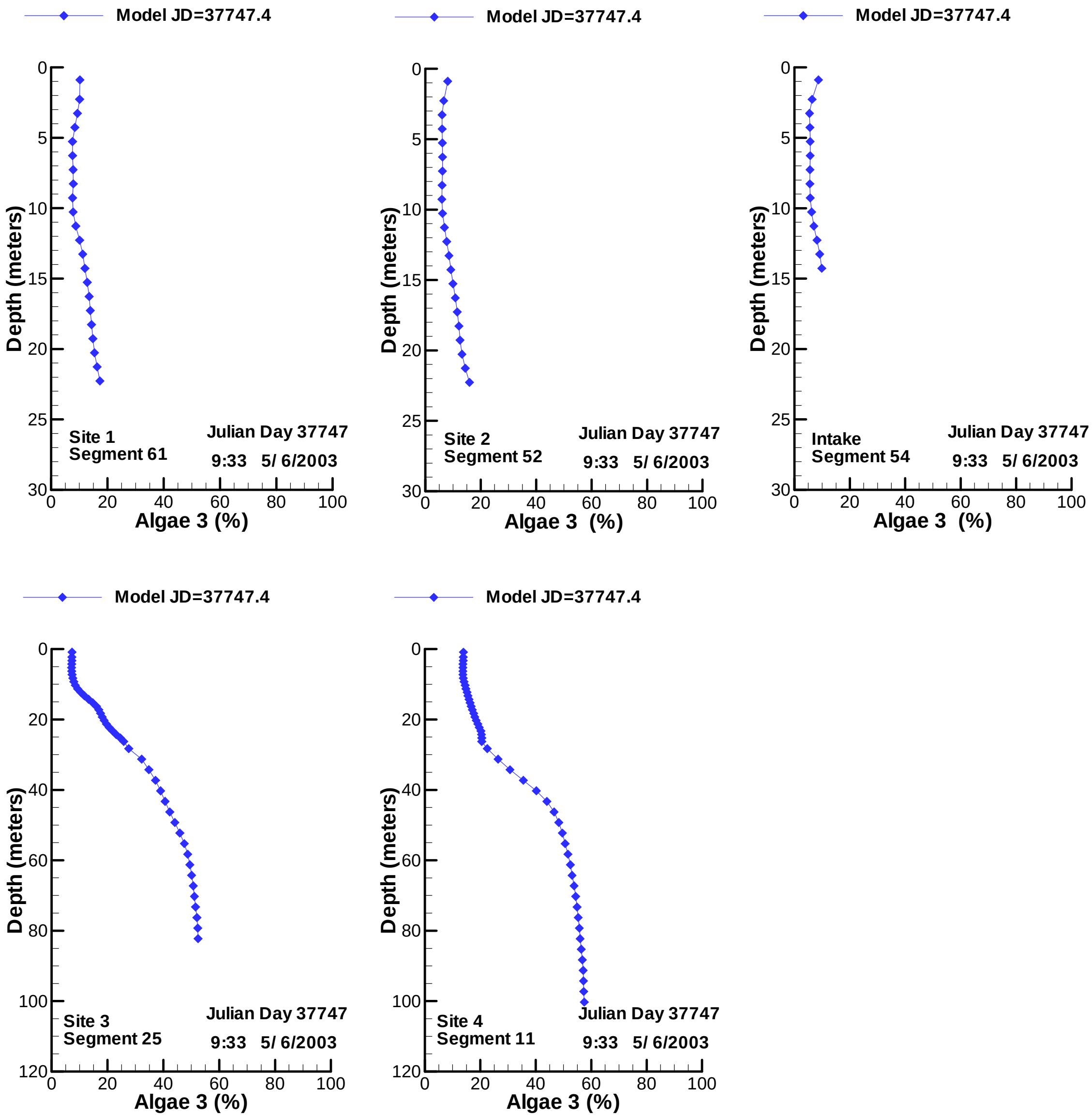

Figure 681. Vertical profiles of CYANOBACTERIA compared with data for 5/ 6/2003.

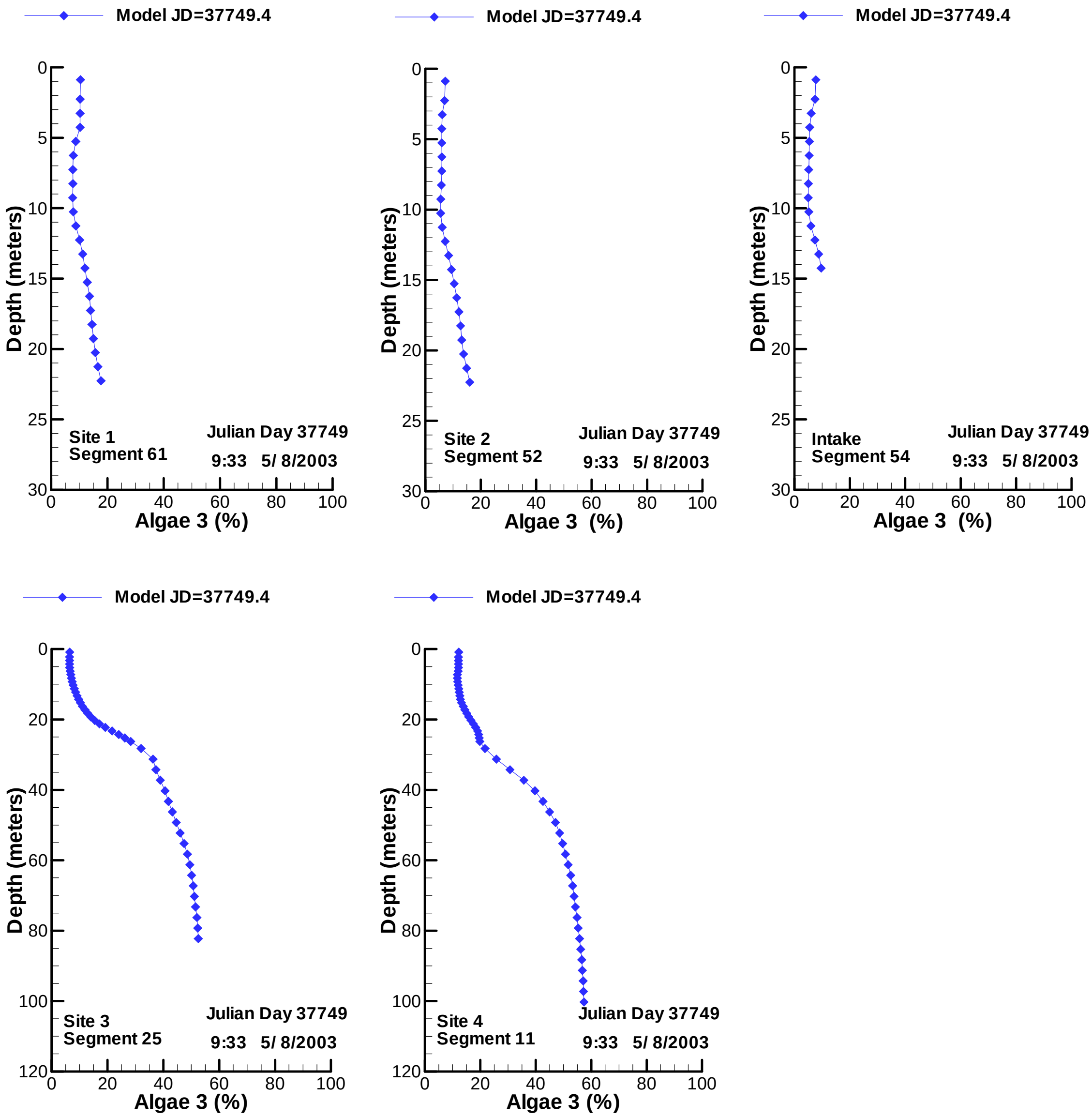

Figure 682. Vertical profiles of CYANOBACTERIA compared with data for 5/ 8/2003.

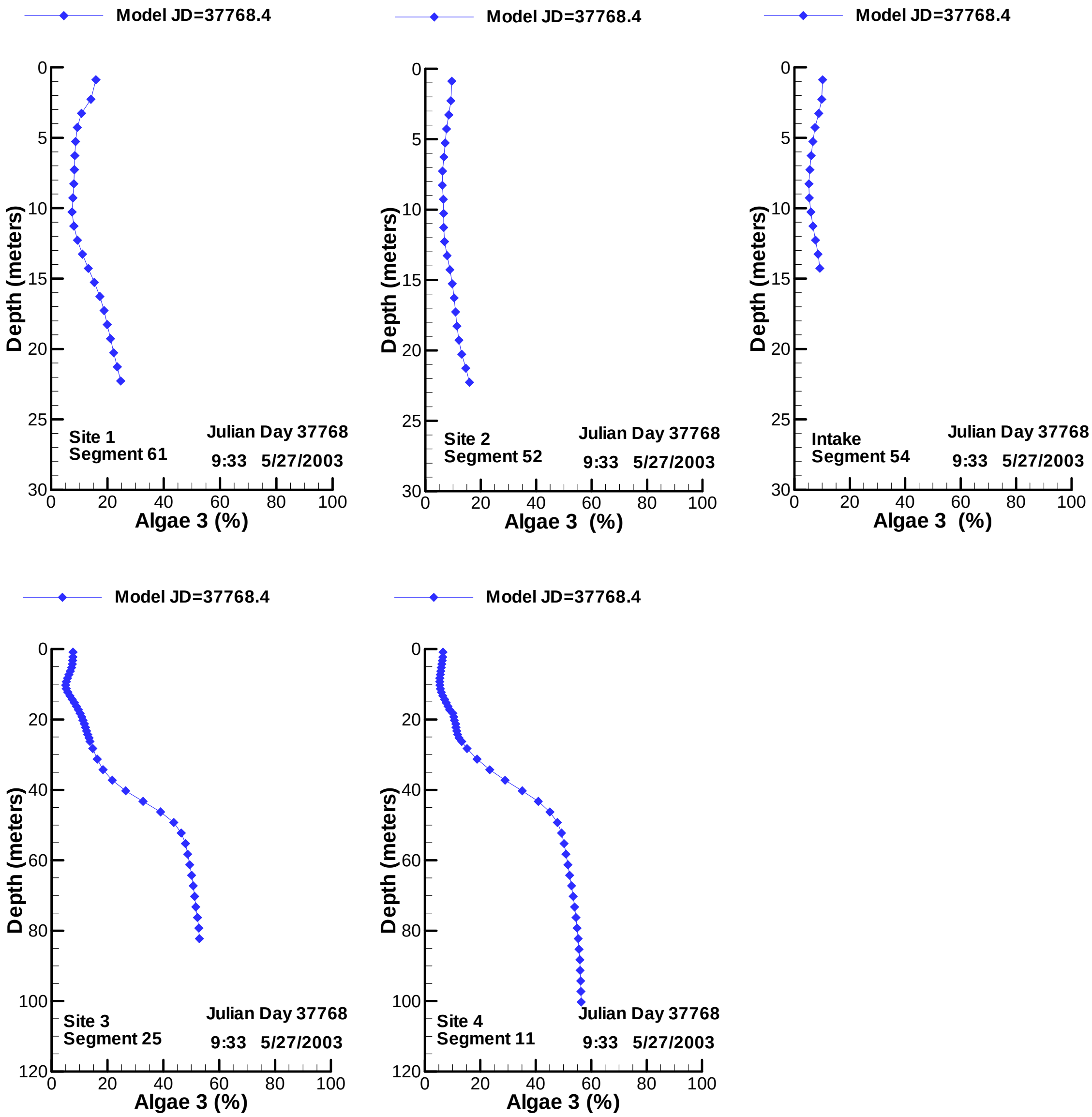

Figure 683. Vertical profiles of CYANOBACTERIA compared with data for 5/27/2003.

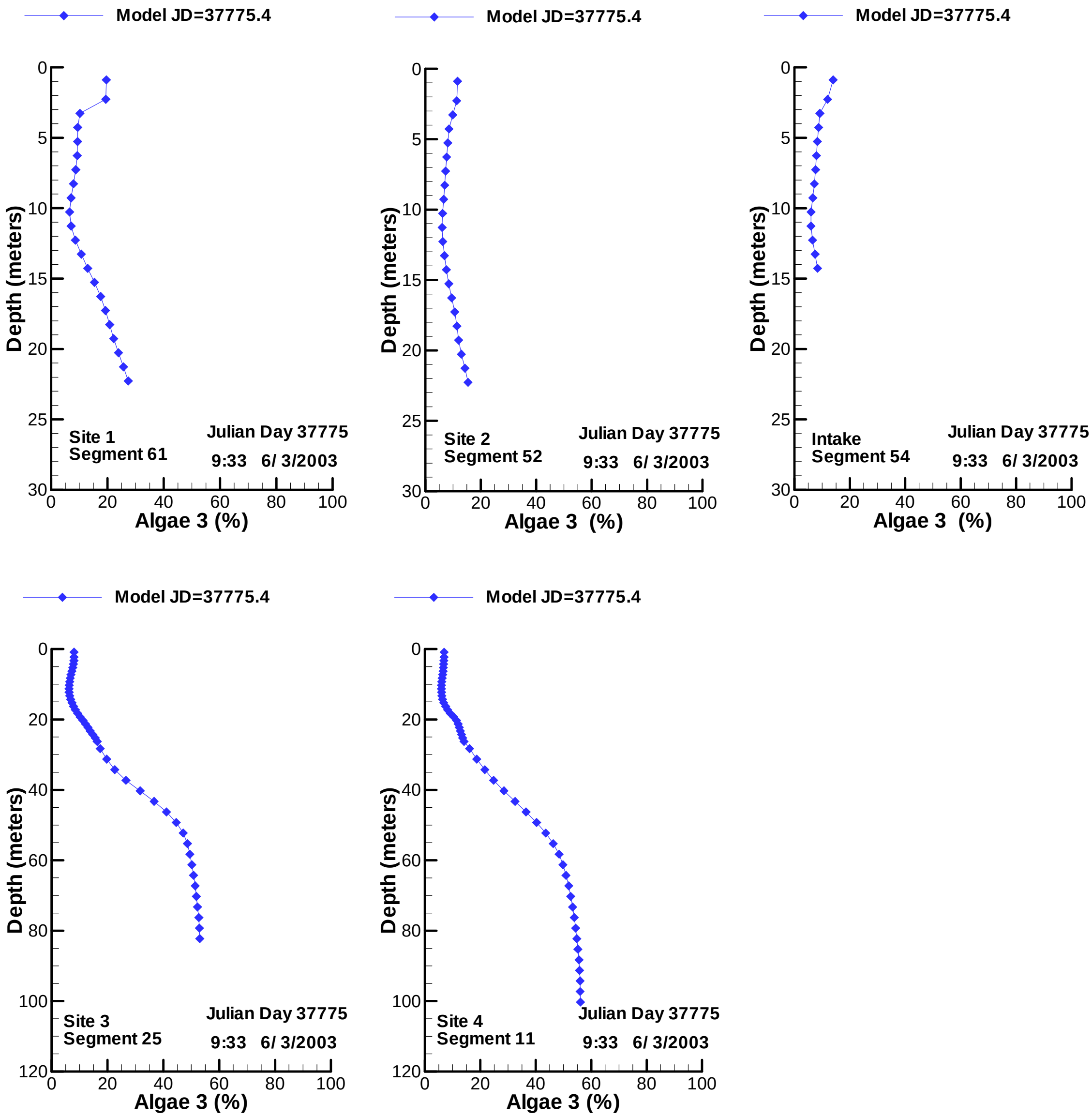

Figure 684. Vertical profiles of CYANOBACTERIA compared with data for 6/ 3/2003.

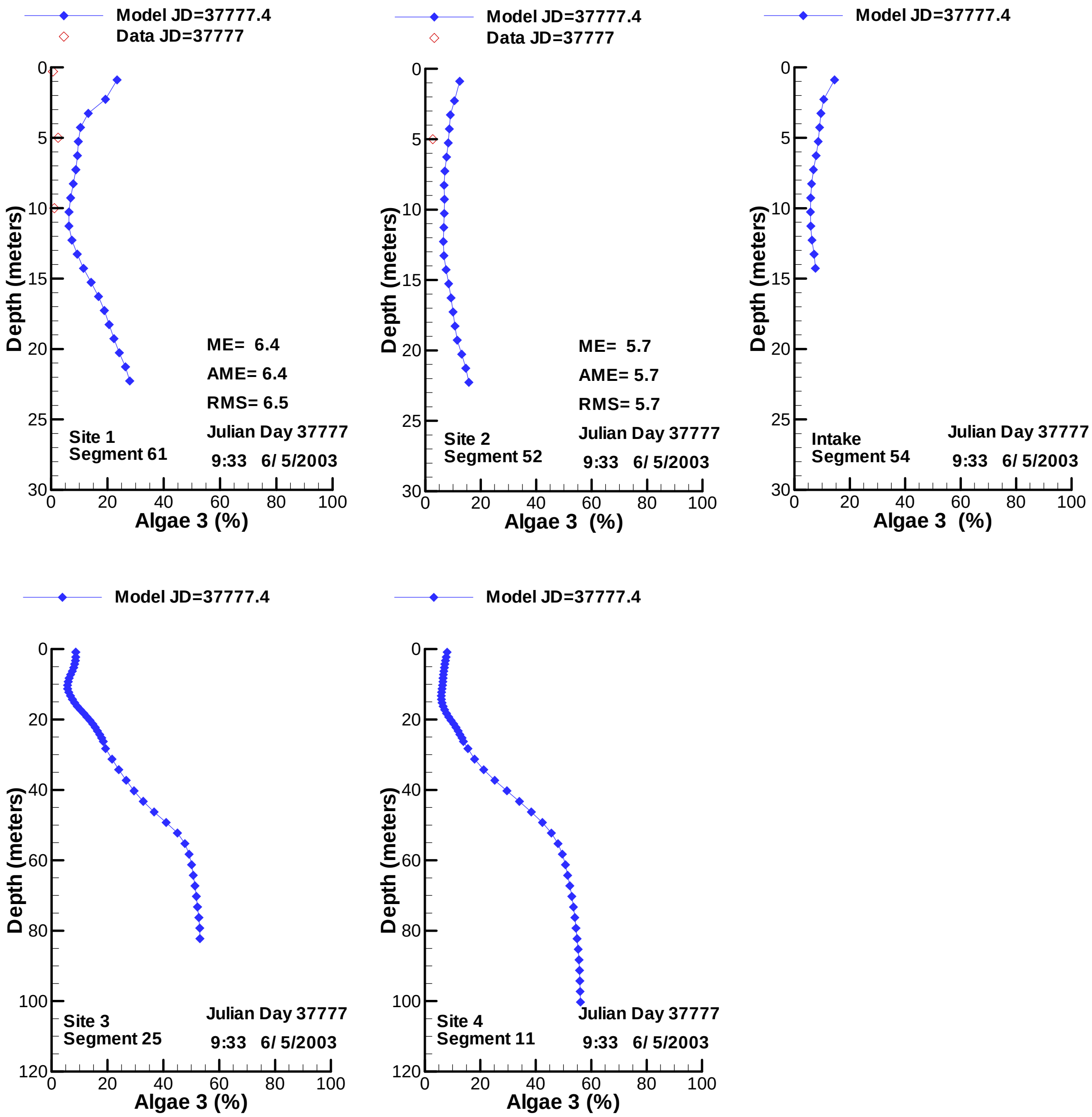

Figure 685. Vertical profiles of CYANOBACTERIA compared with data for 6/ 5/2003.

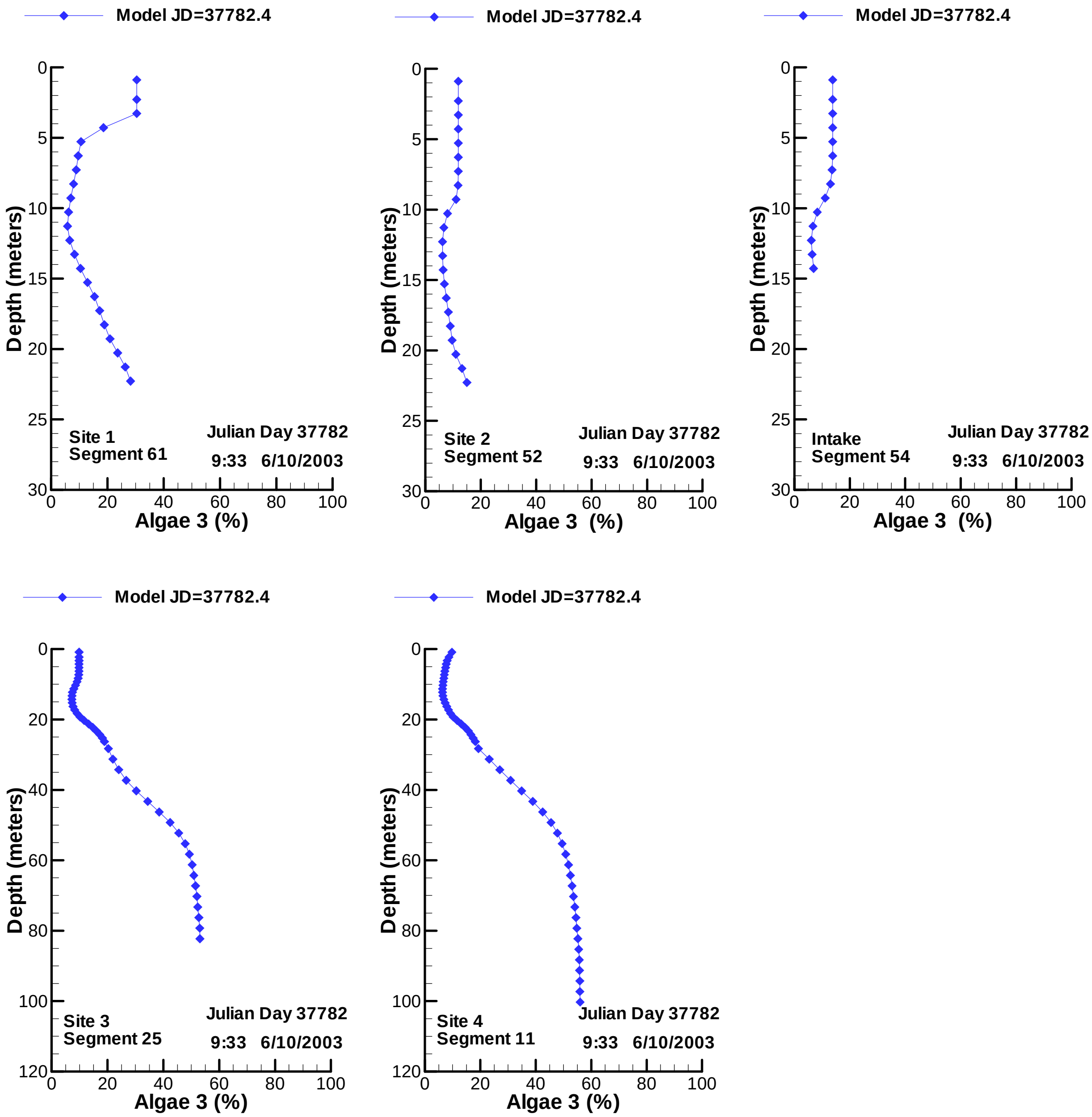

Figure 686. Vertical profiles of CYANOBACTERIA compared with data for 6/10/2003.

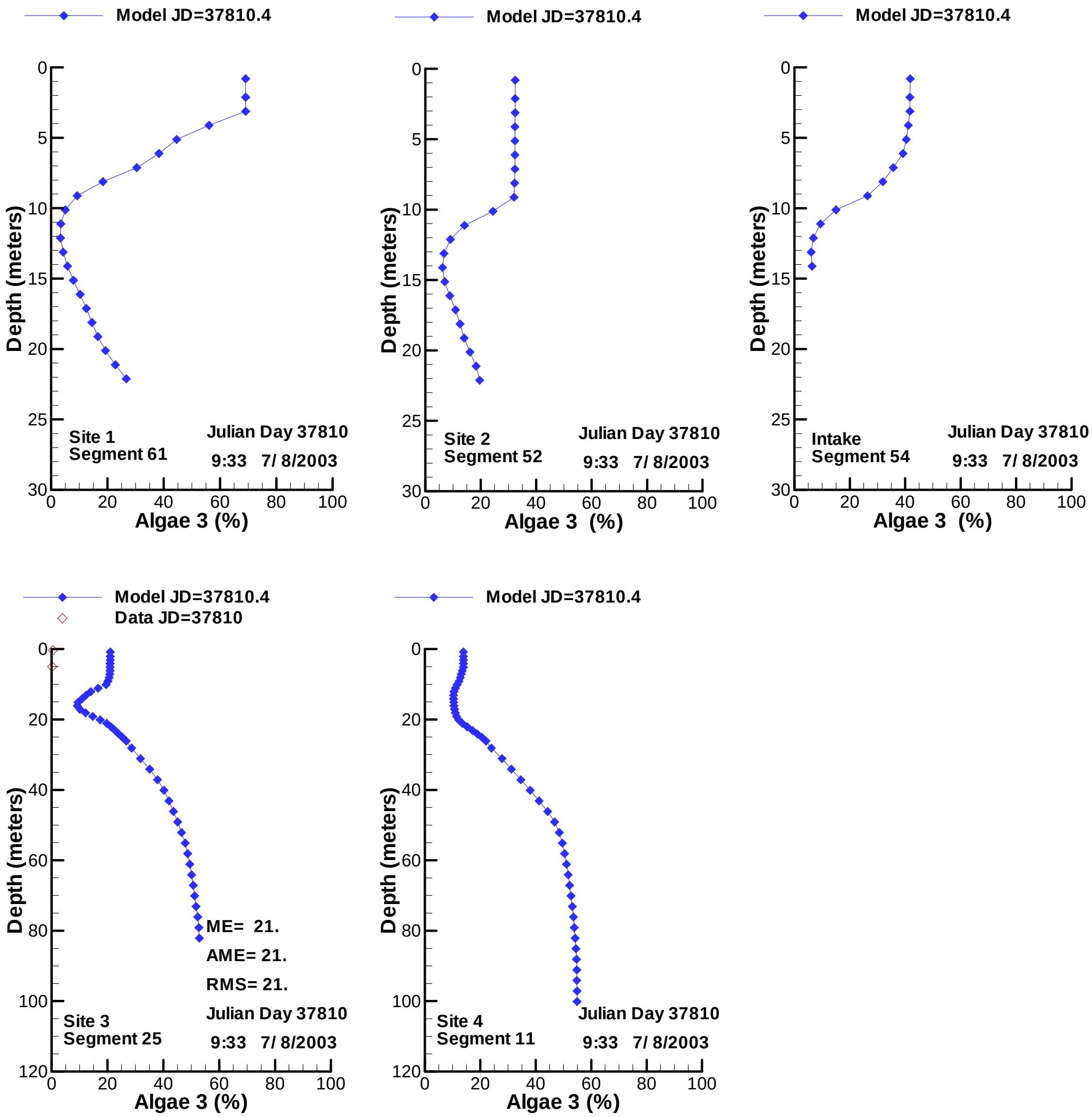

Figure 687. Vertical profiles of CYANOBACTERIA compared with data for 7/ 8/2003.

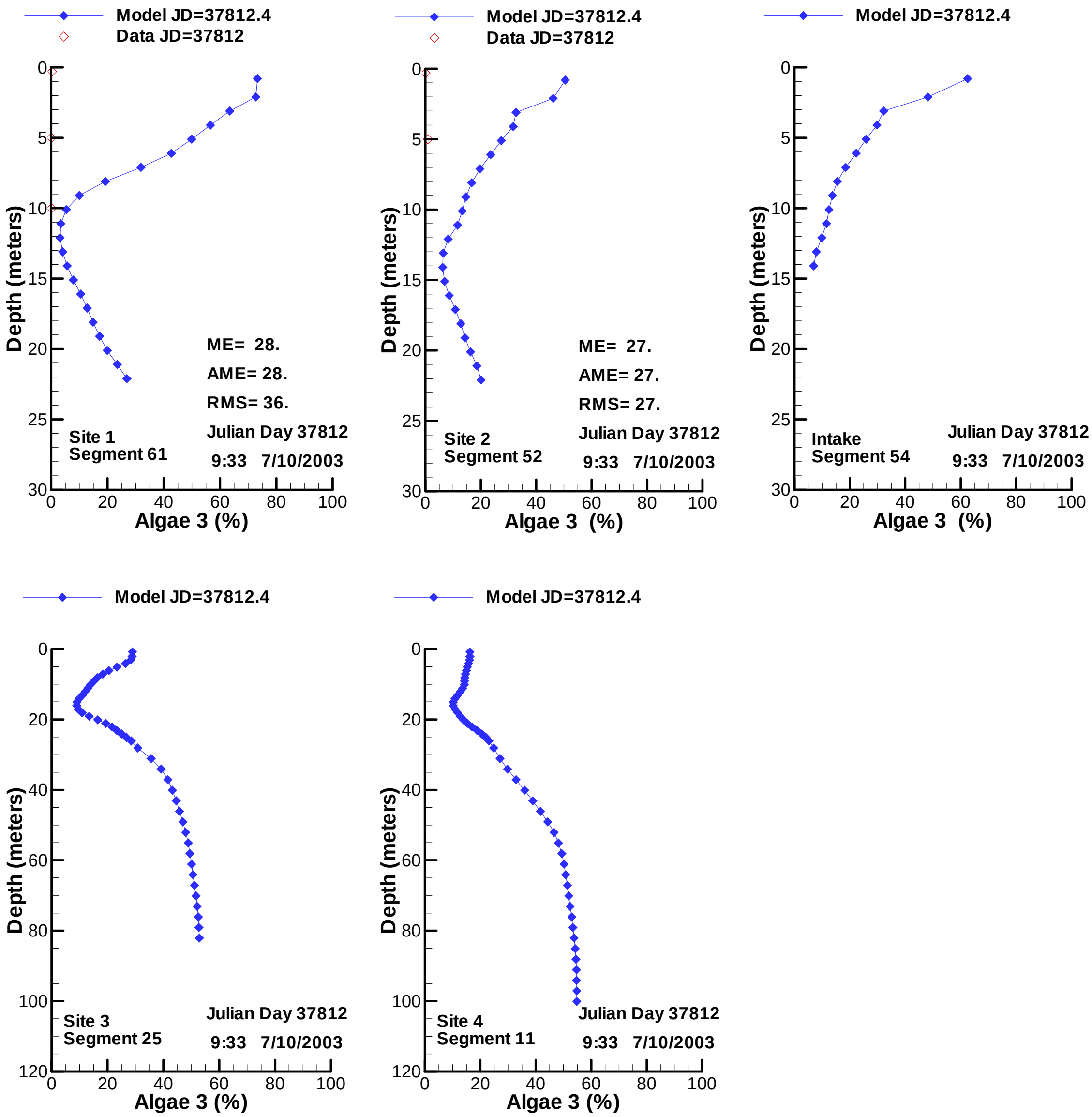

Figure 688. Vertical profiles of CYANOBACTERIA compared with data for 7/10/2003.

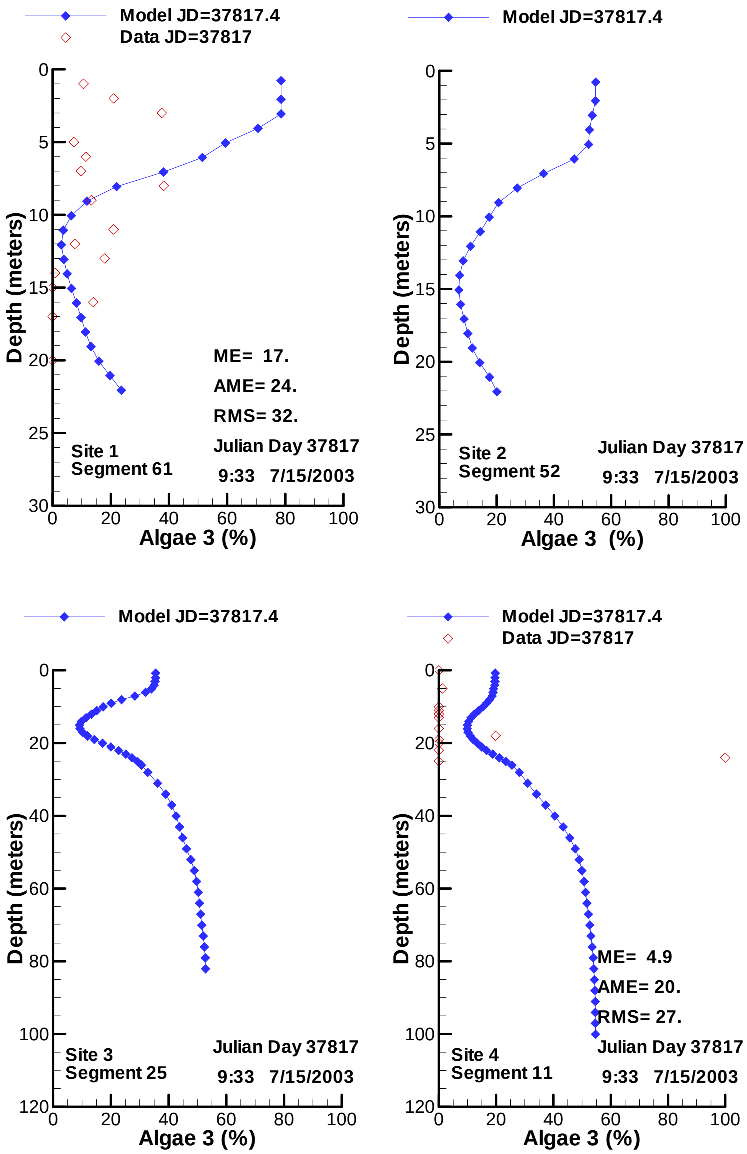

Figure 689. Vertical profiles of CYANOBACTERIA compared with data for 7/15/2003.

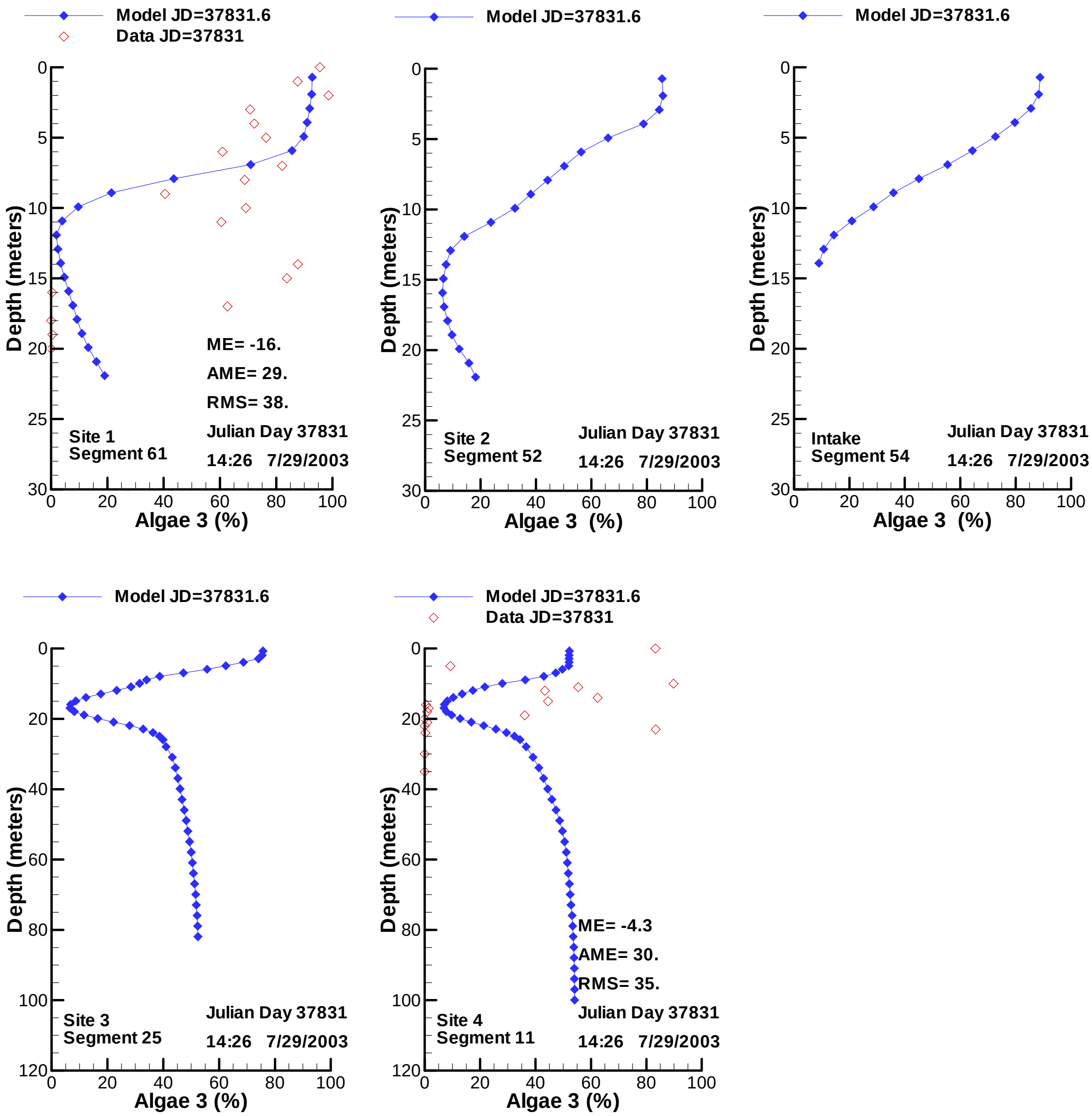

Figure 690. Vertical profiles of CYANOBACTERIA compared with data for 7/29/2003.

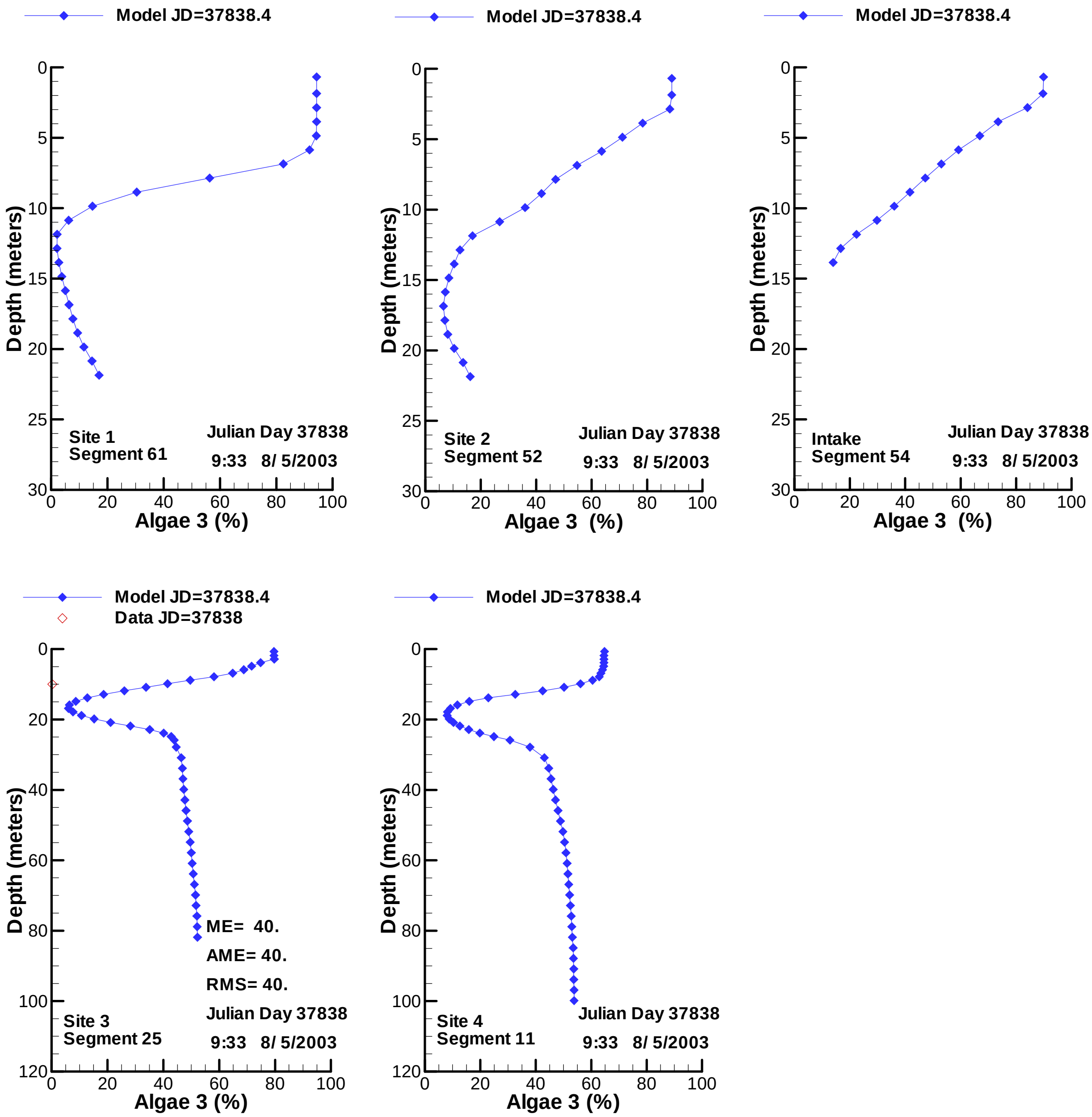

Figure 691. Vertical profiles of CYANOBACTERIA compared with data for 8/ 5/2003.

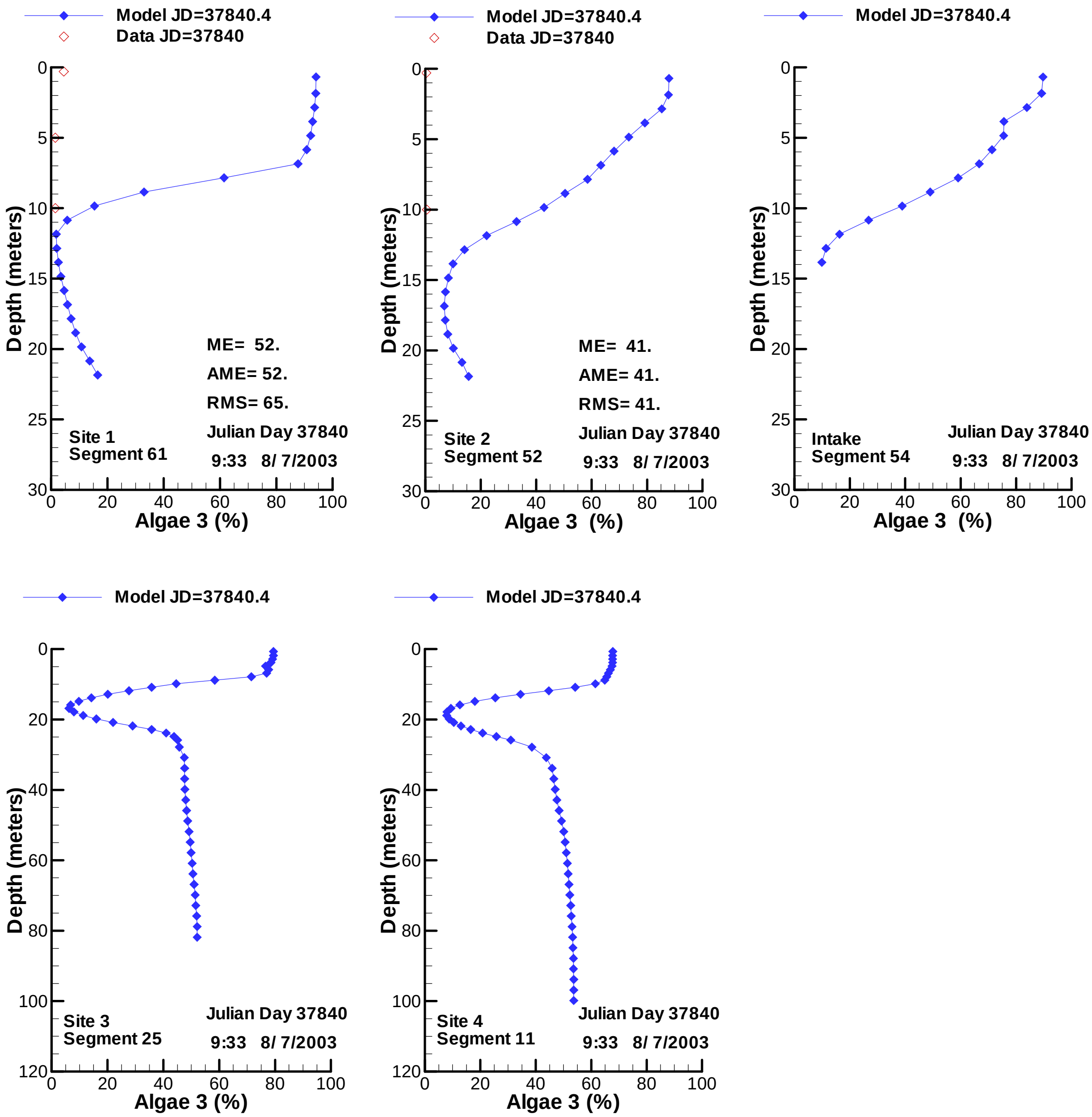

Figure 692. Vertical profiles of CYANOBACTERIA compared with data for 8/ 7/2003.

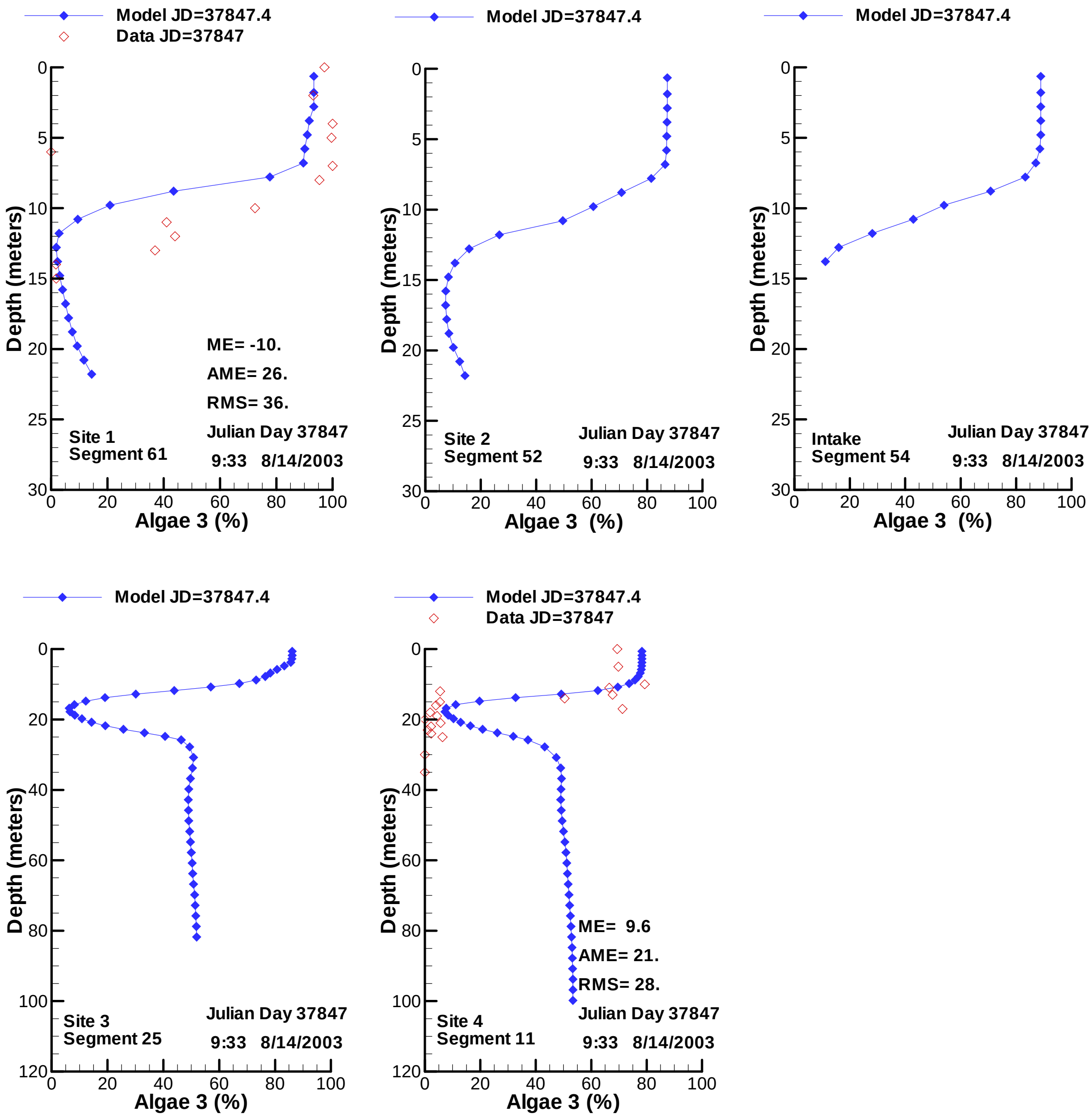

Figure 693. Vertical profiles of CYANOBACTERIA compared with data for 8/14/2003.

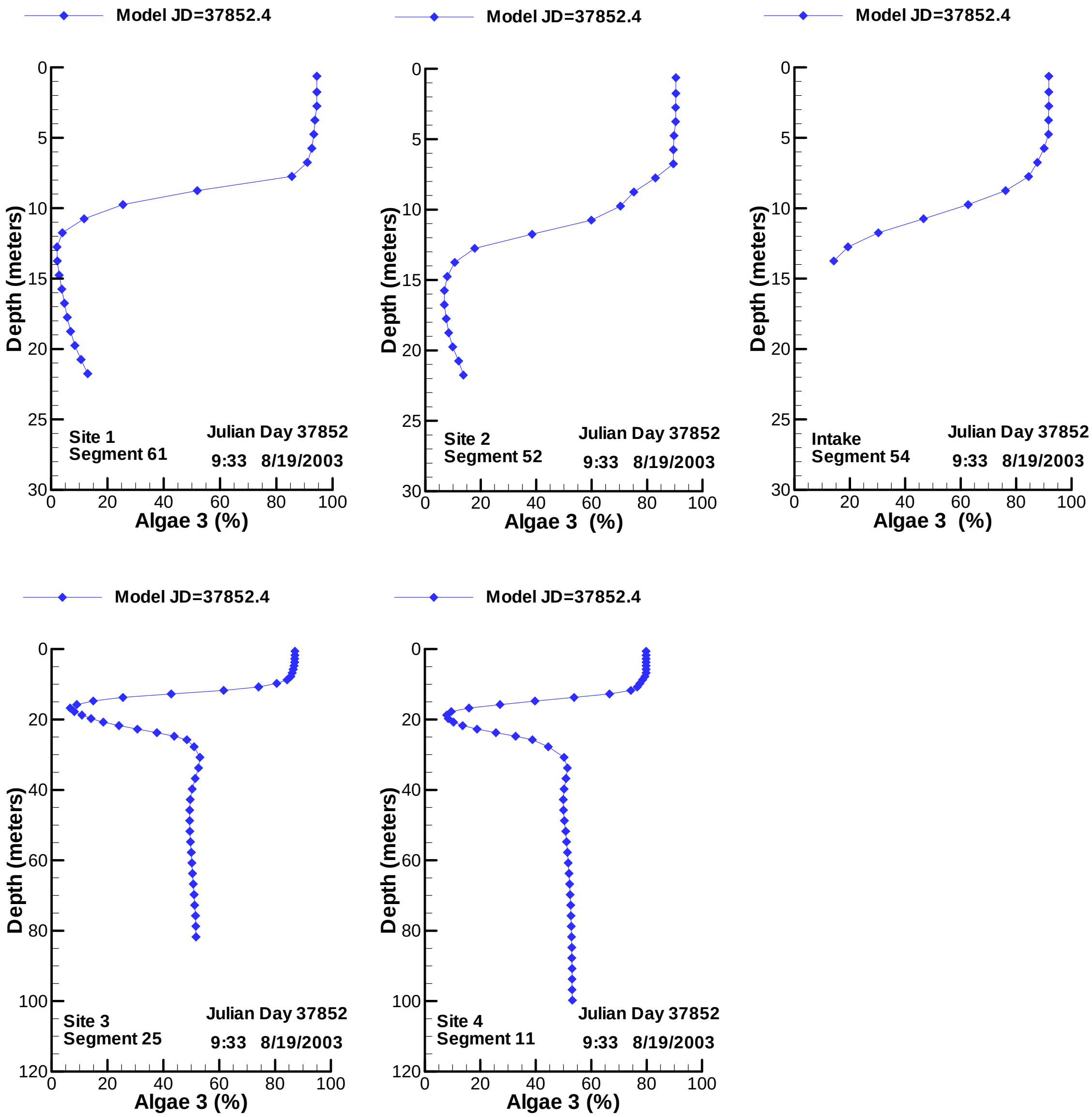

Figure 694. Vertical profiles of CYANOBACTERIA compared with data for 8/19/2003.

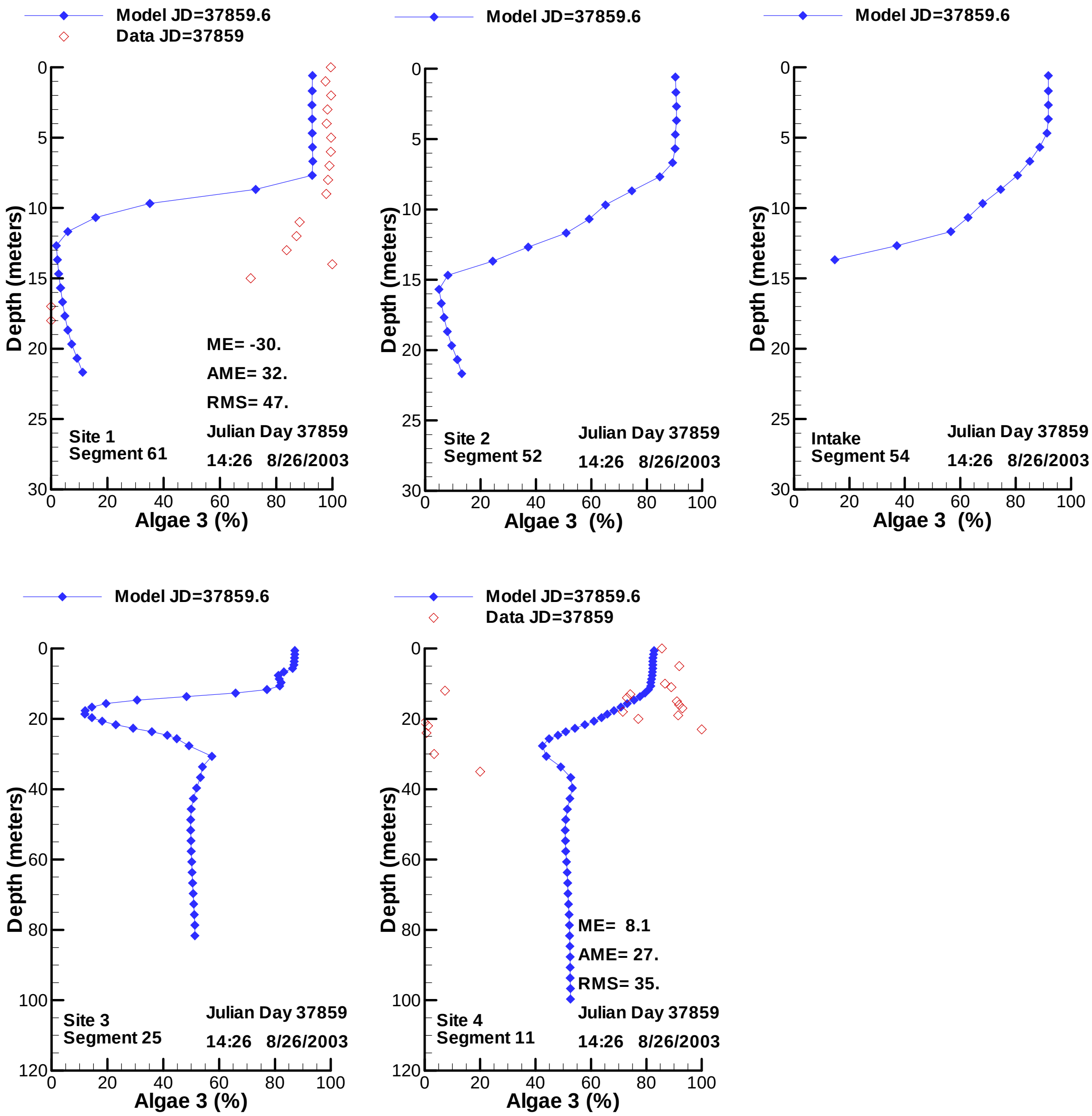

Figure 695. Vertical profiles of CYANOBACTERIA compared with data for 8/26/2003.

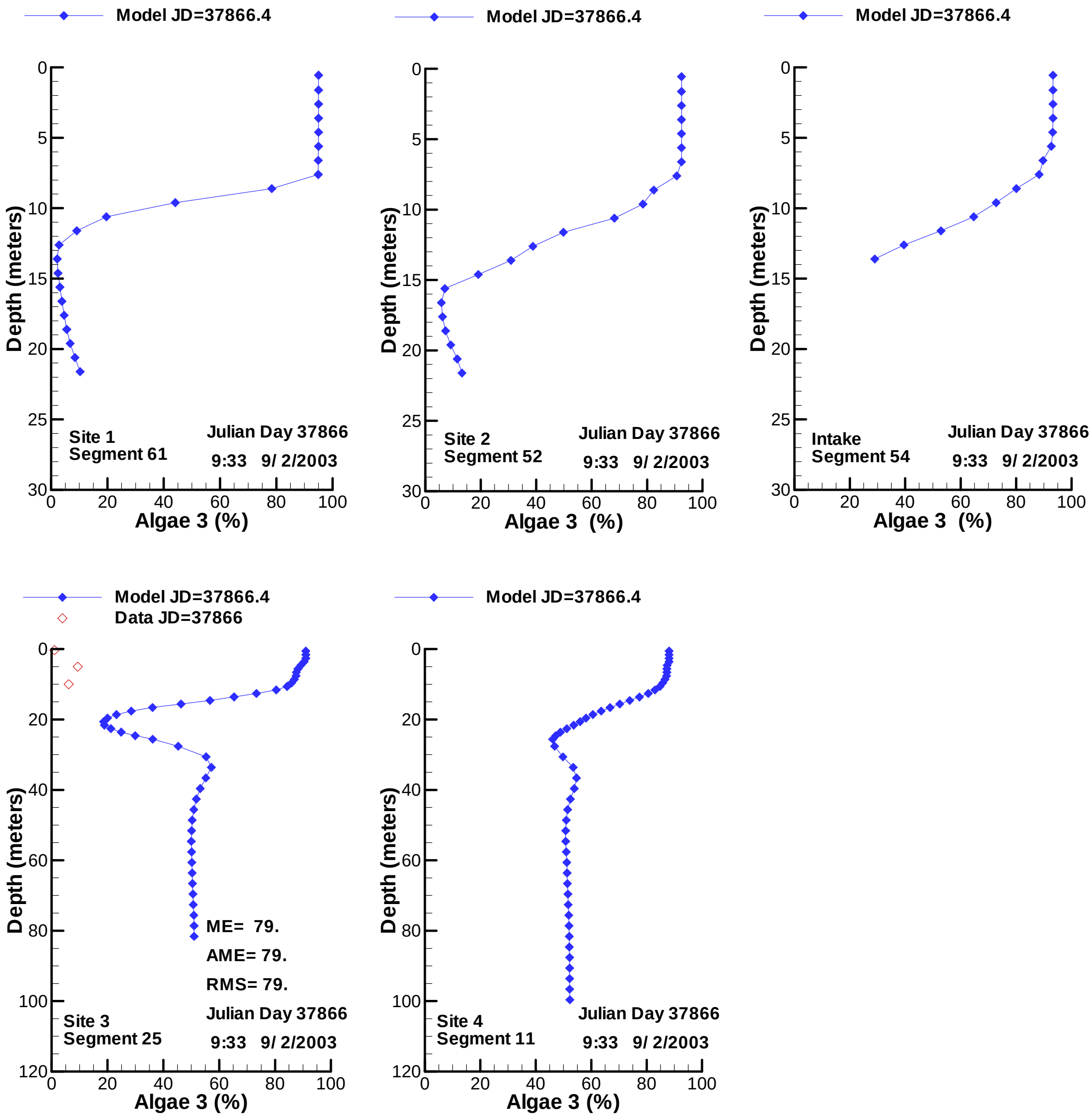

Figure 696. Vertical profiles of CYANOBACTERIA compared with data for 9/ 2/2003.

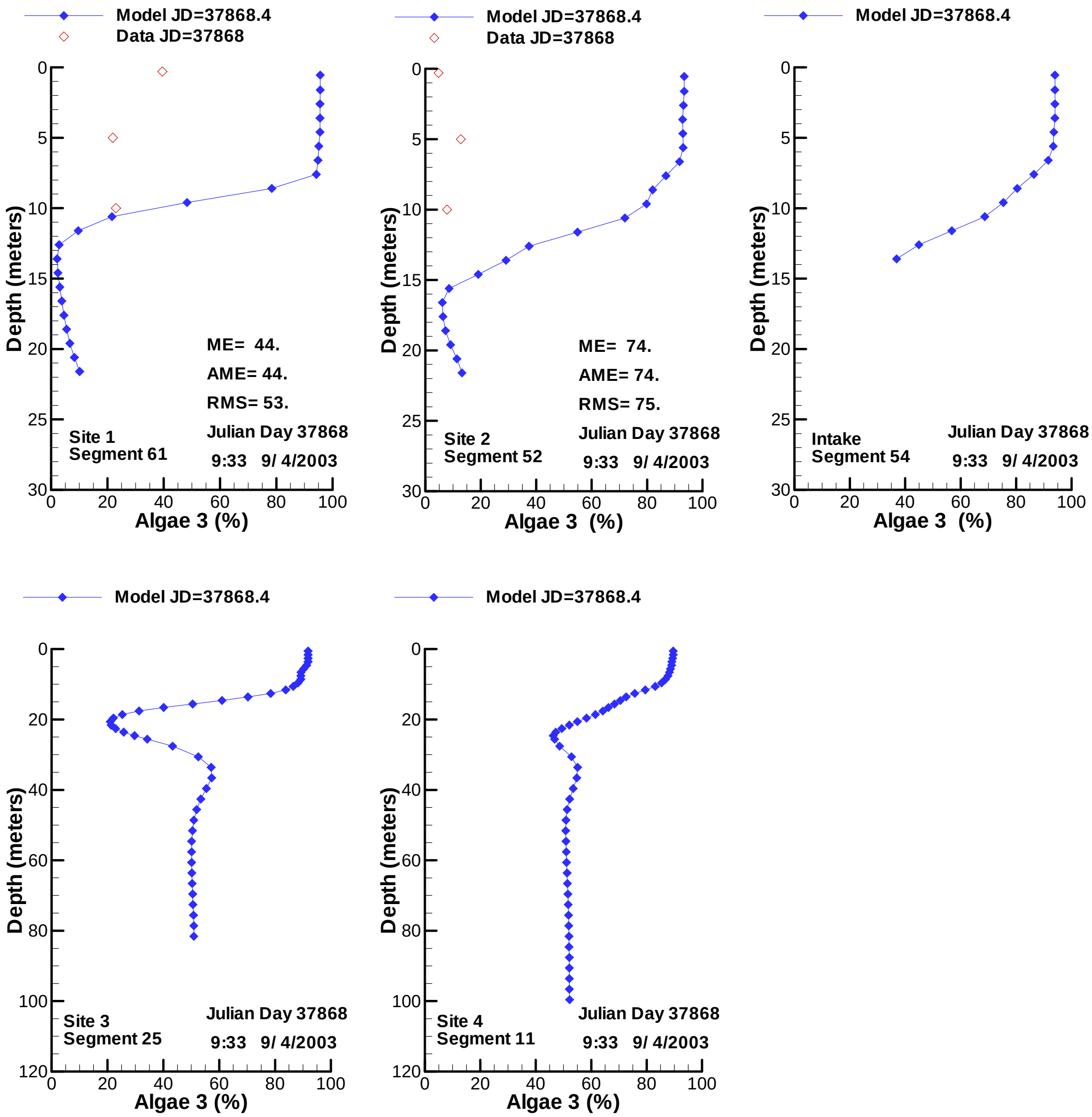

Figure 697. Vertical profiles of CYANOBACTERIA compared with data for 9/ 4/2003.

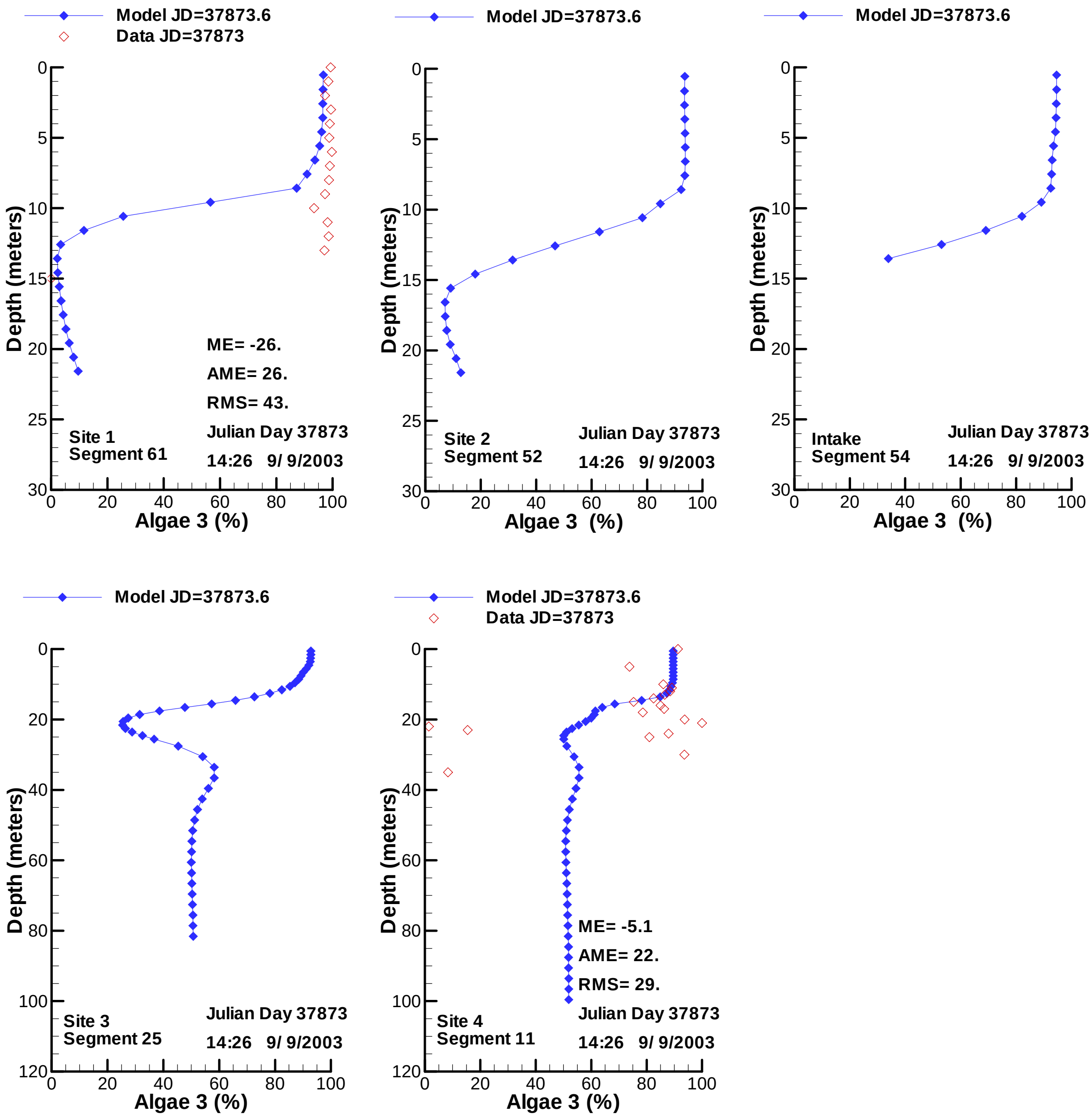

Figure 698. Vertical profiles of CYANOBACTERIA compared with data for 9/ 9/2003.

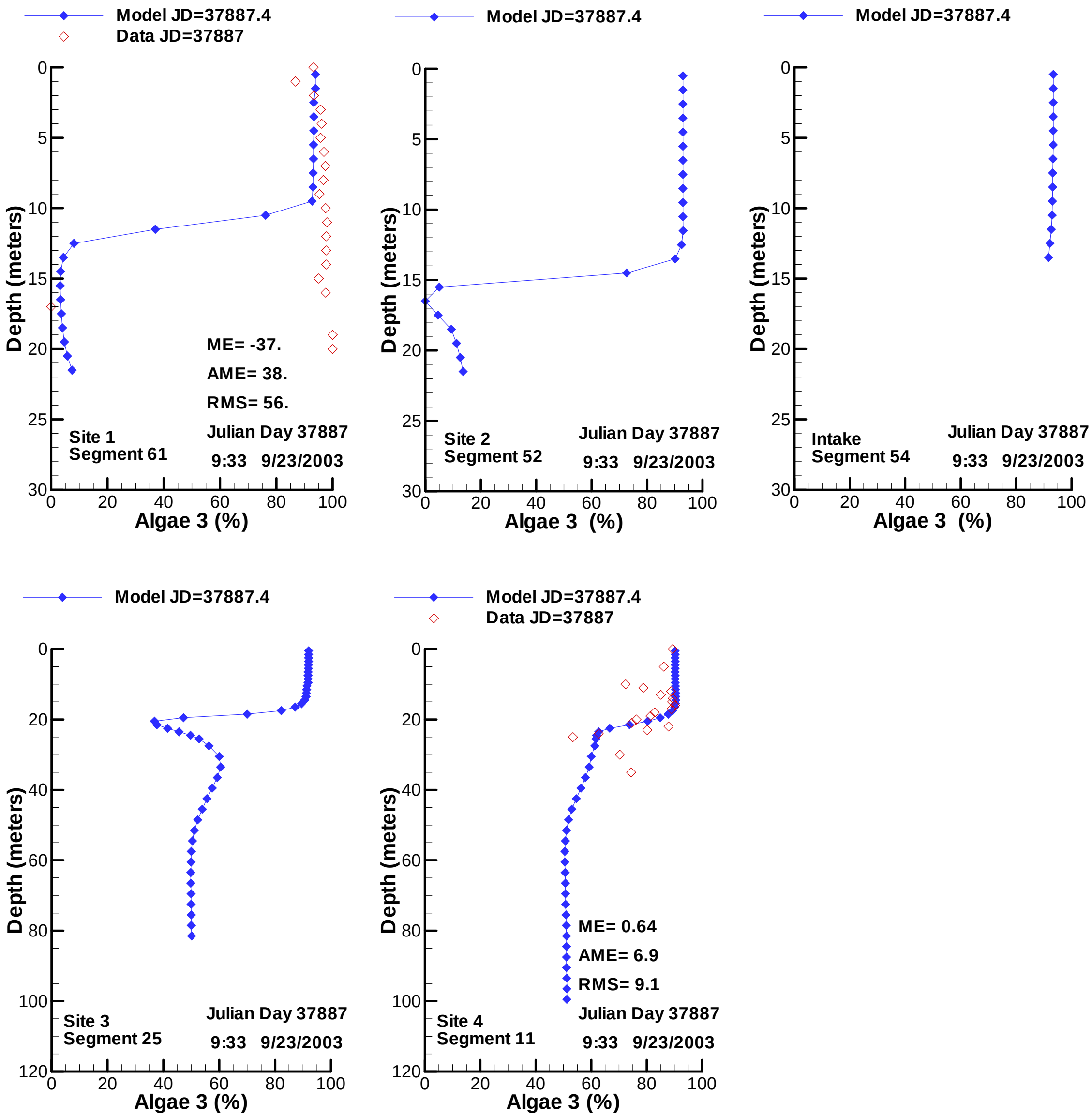

Figure 699. Vertical profiles of CYANOBACTERIA compared with data for 9/23/2003.

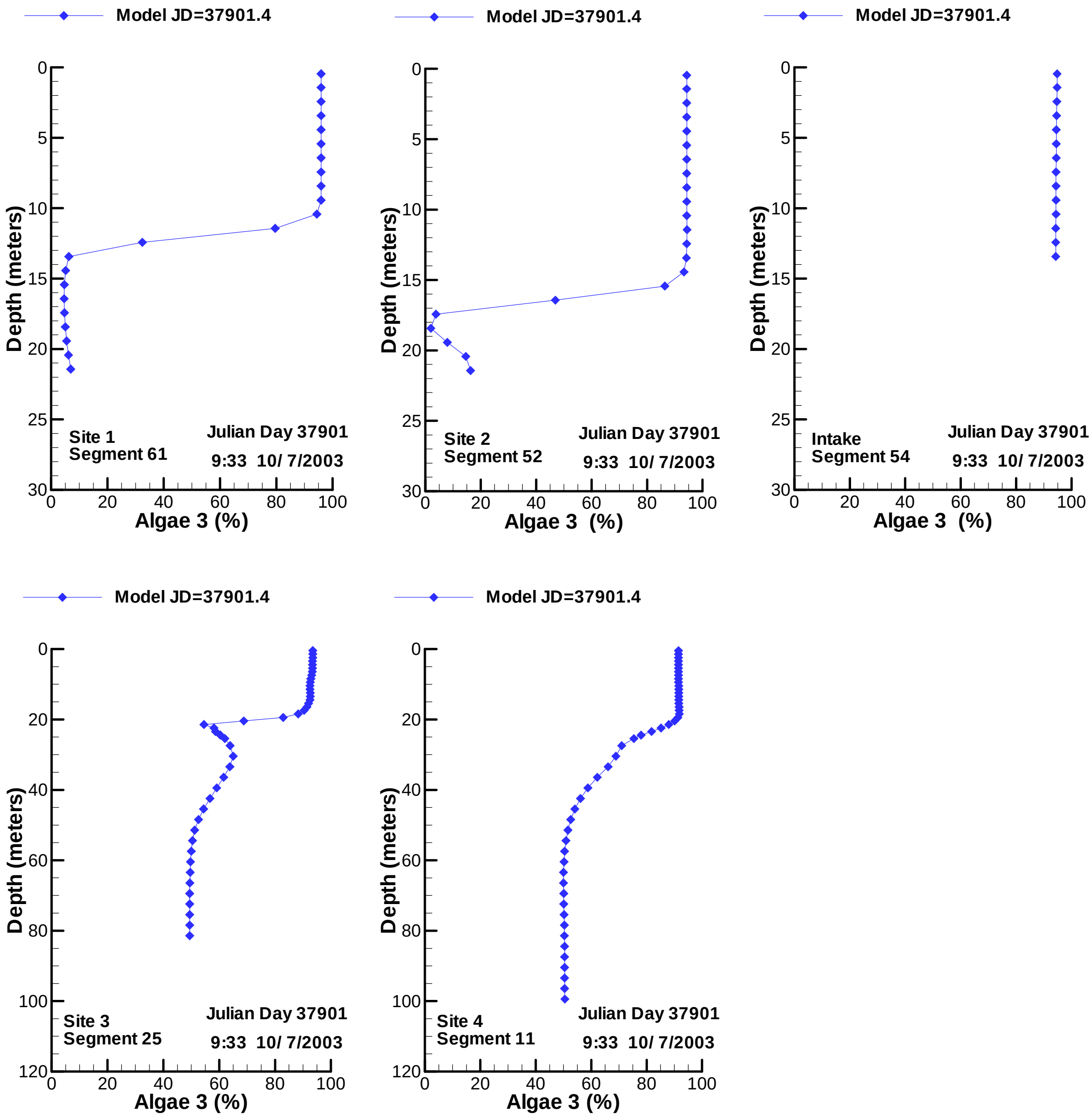

Figure 700. Vertical profiles of CYANOBACTERIA compared with data for 10/ 7/2003.

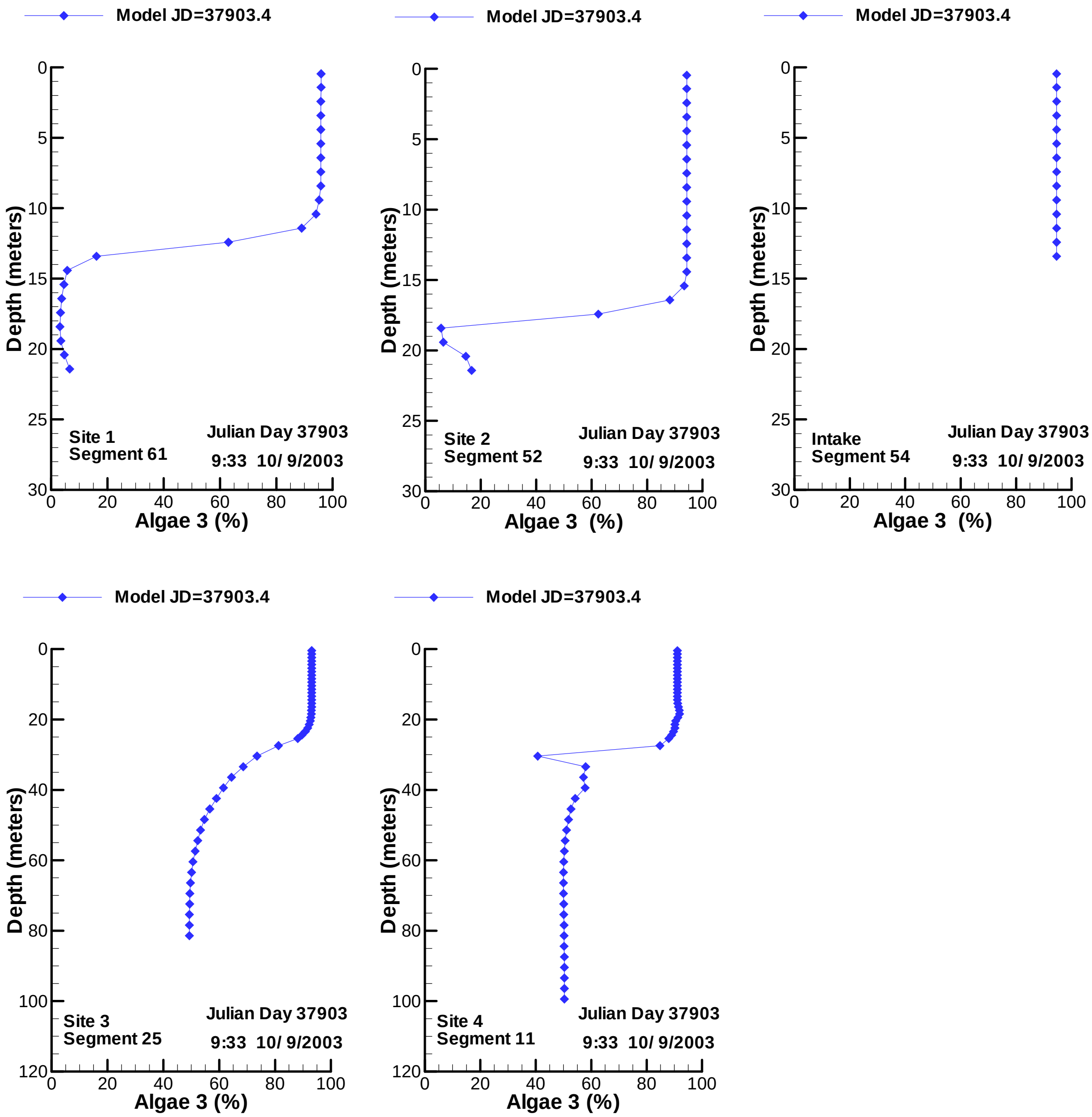

Figure 701. Vertical profiles of CYANOBACTERIA compared with data for 10/ 9/2003.

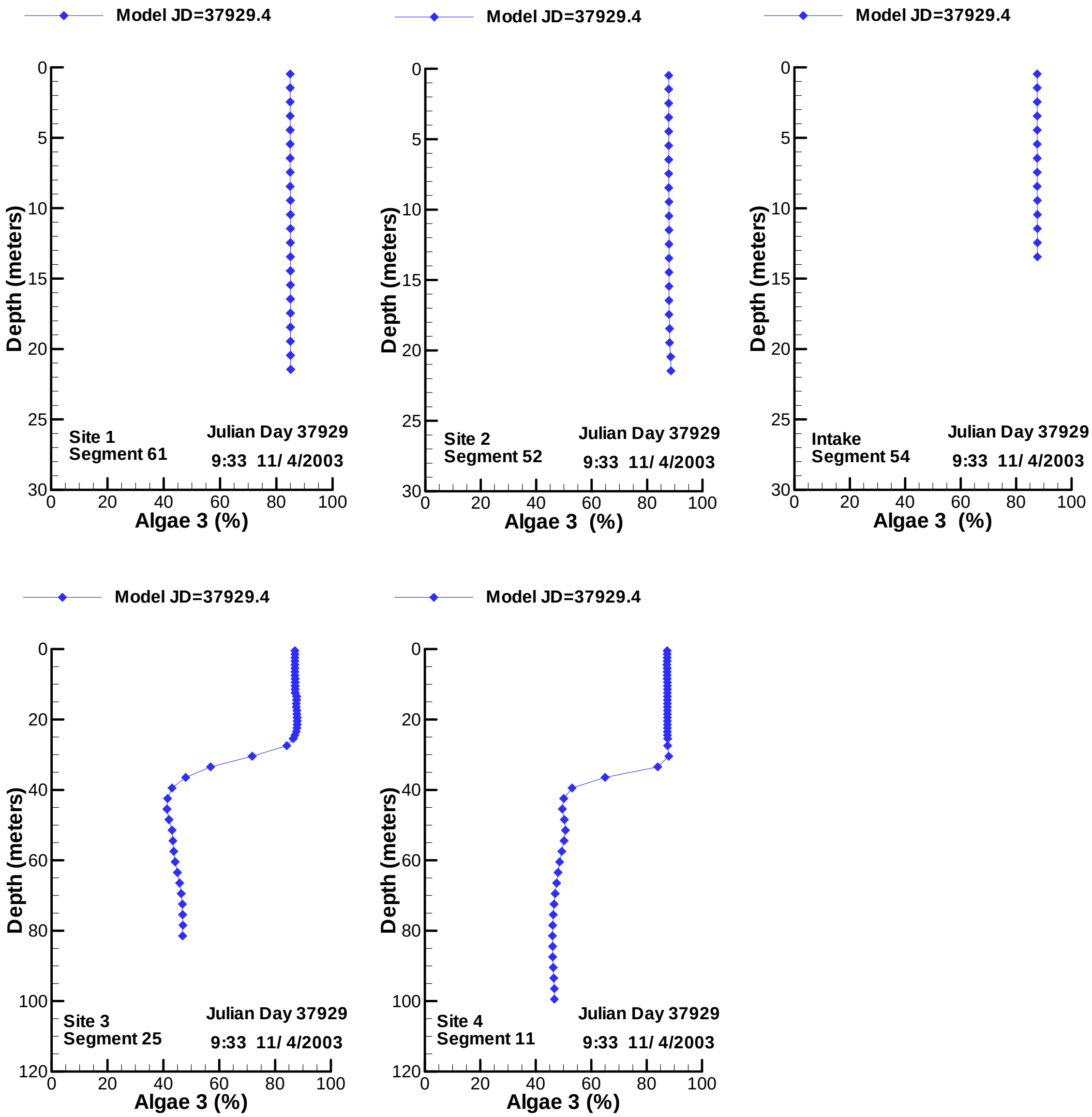

Figure 702. Vertical profiles of CYANOBACTERIA compared with data for 11/ 4/2003.

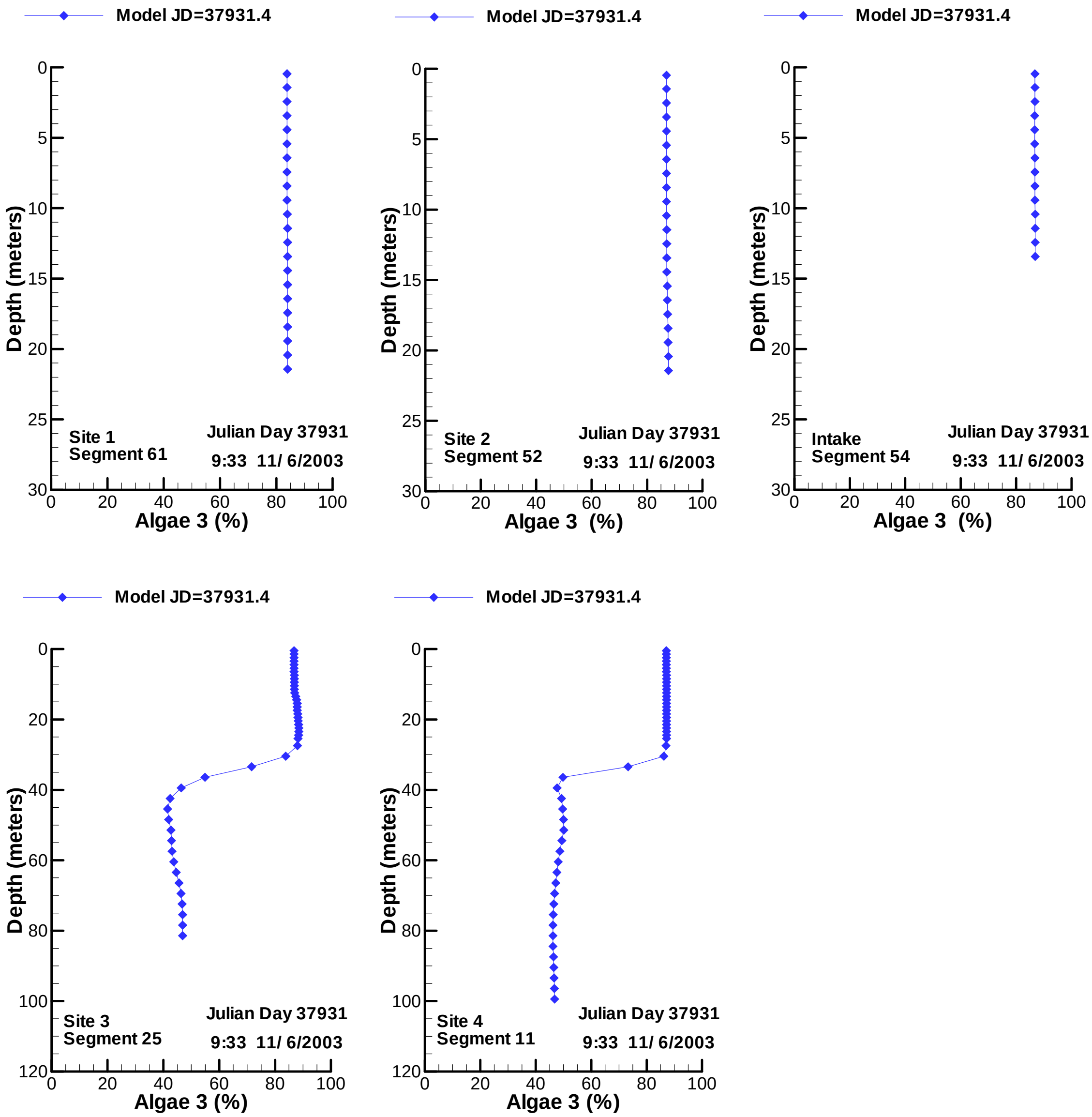

Figure 703. Vertical profiles of CYANOBACTERIA compared with data for 11/ 6/2003.

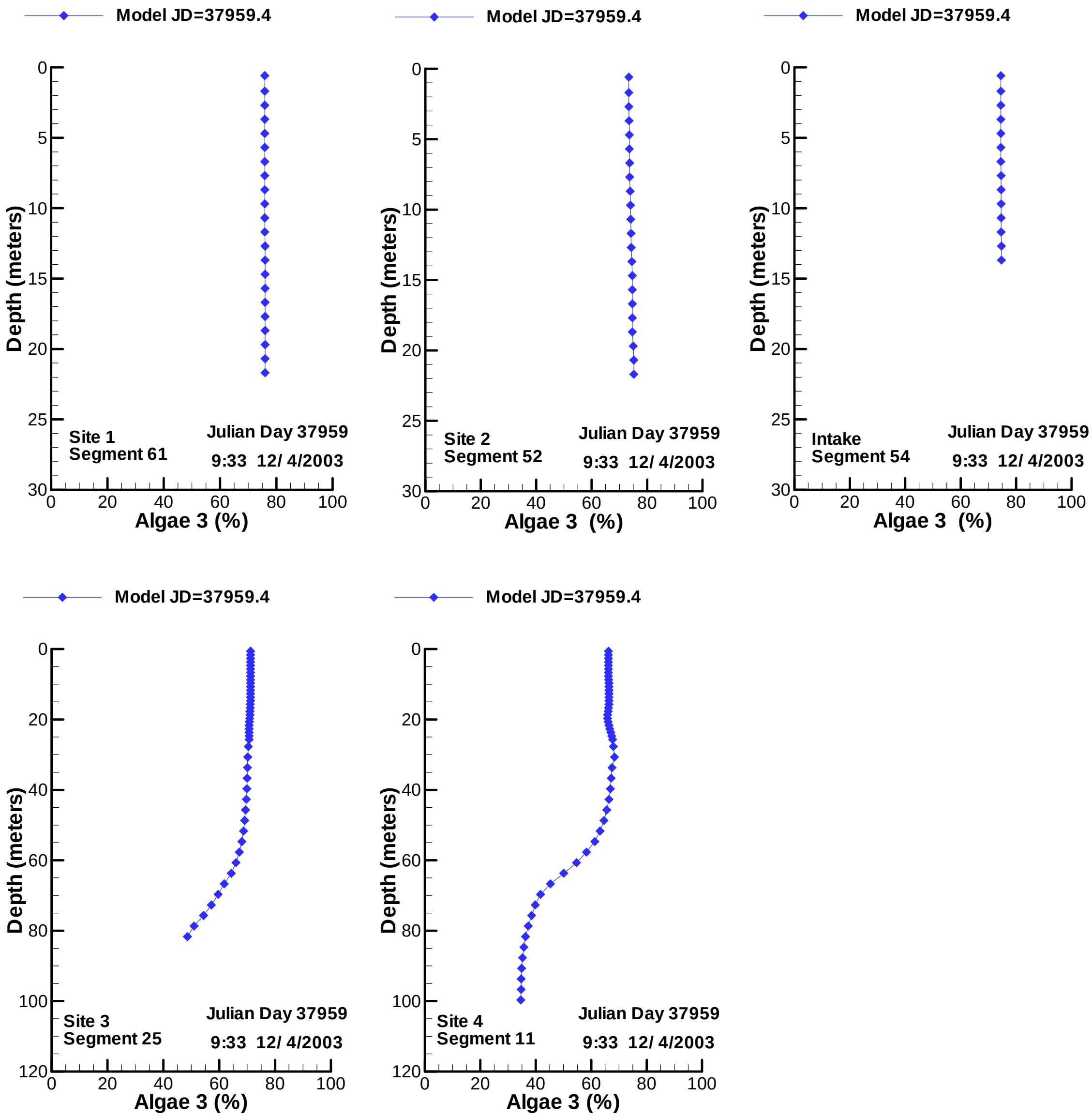

Figure 704. Vertical profiles of CYANOBACTERIA compared with data for 12/ 4/2003.

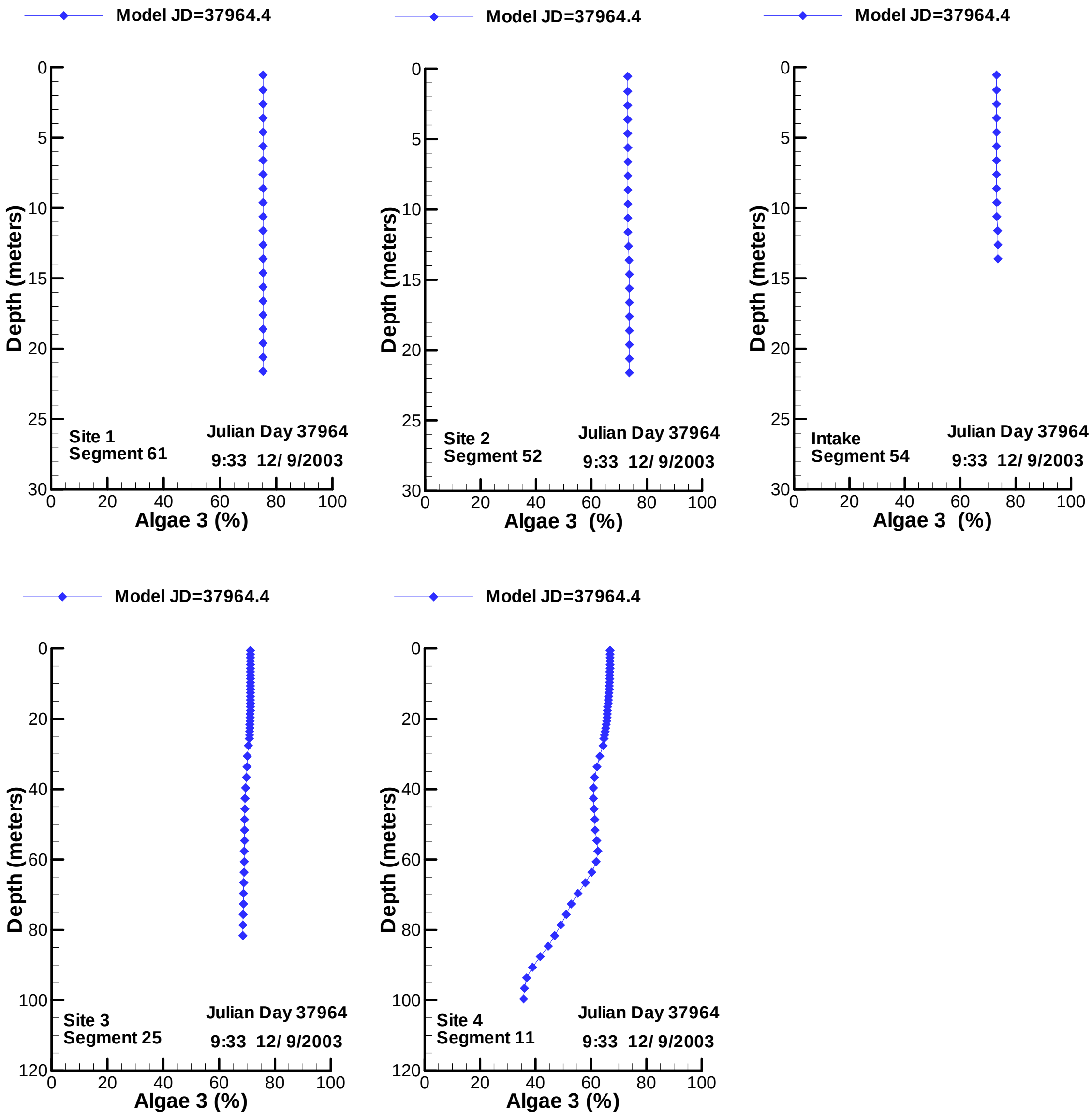

Figure 705. Vertical profiles of CYANOBACTERIA compared with data for 12/ 9/2003.

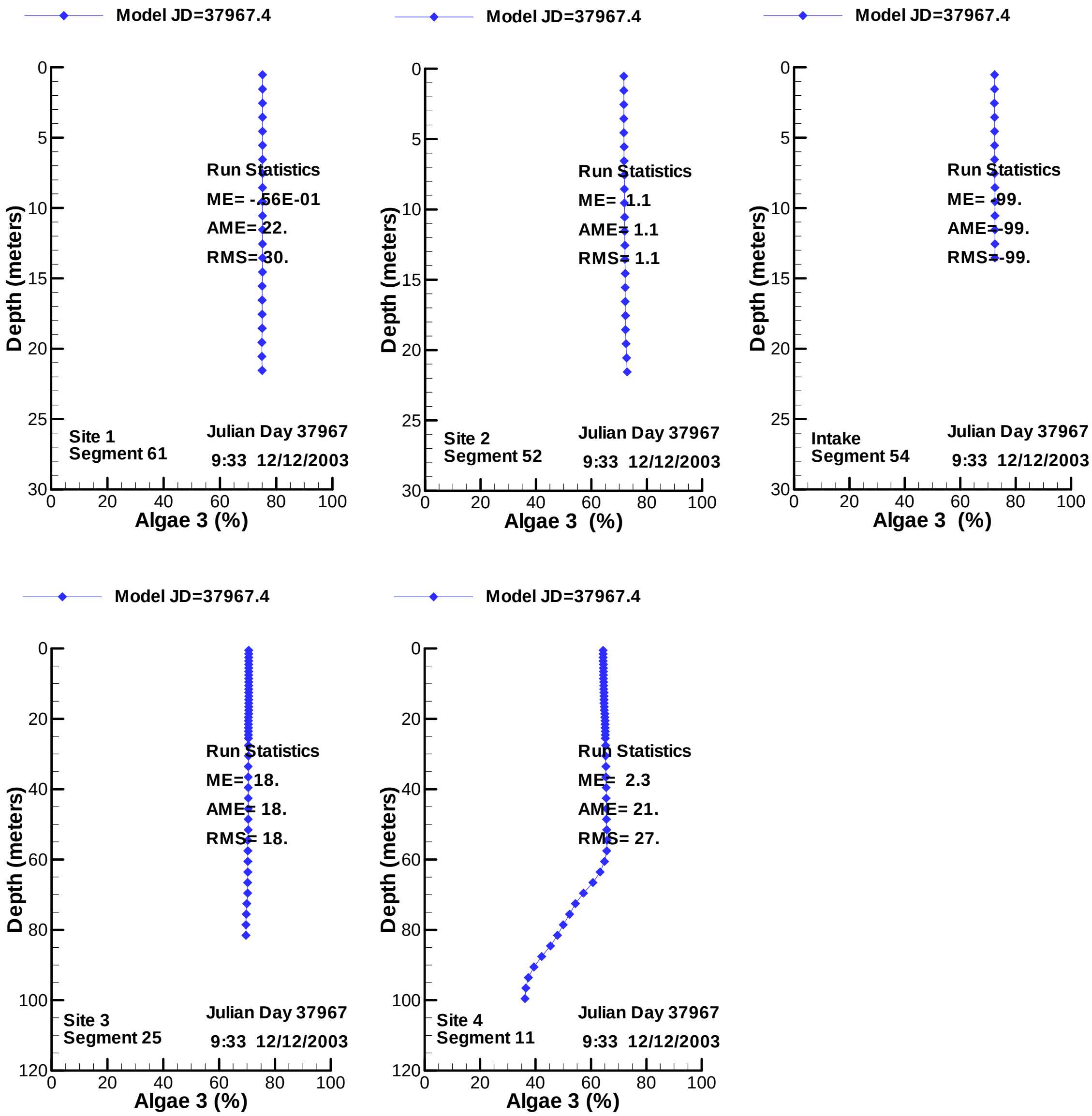

Figure 706. Vertical profiles of CYANOBACTERIA compared with data for 12/12/2003.