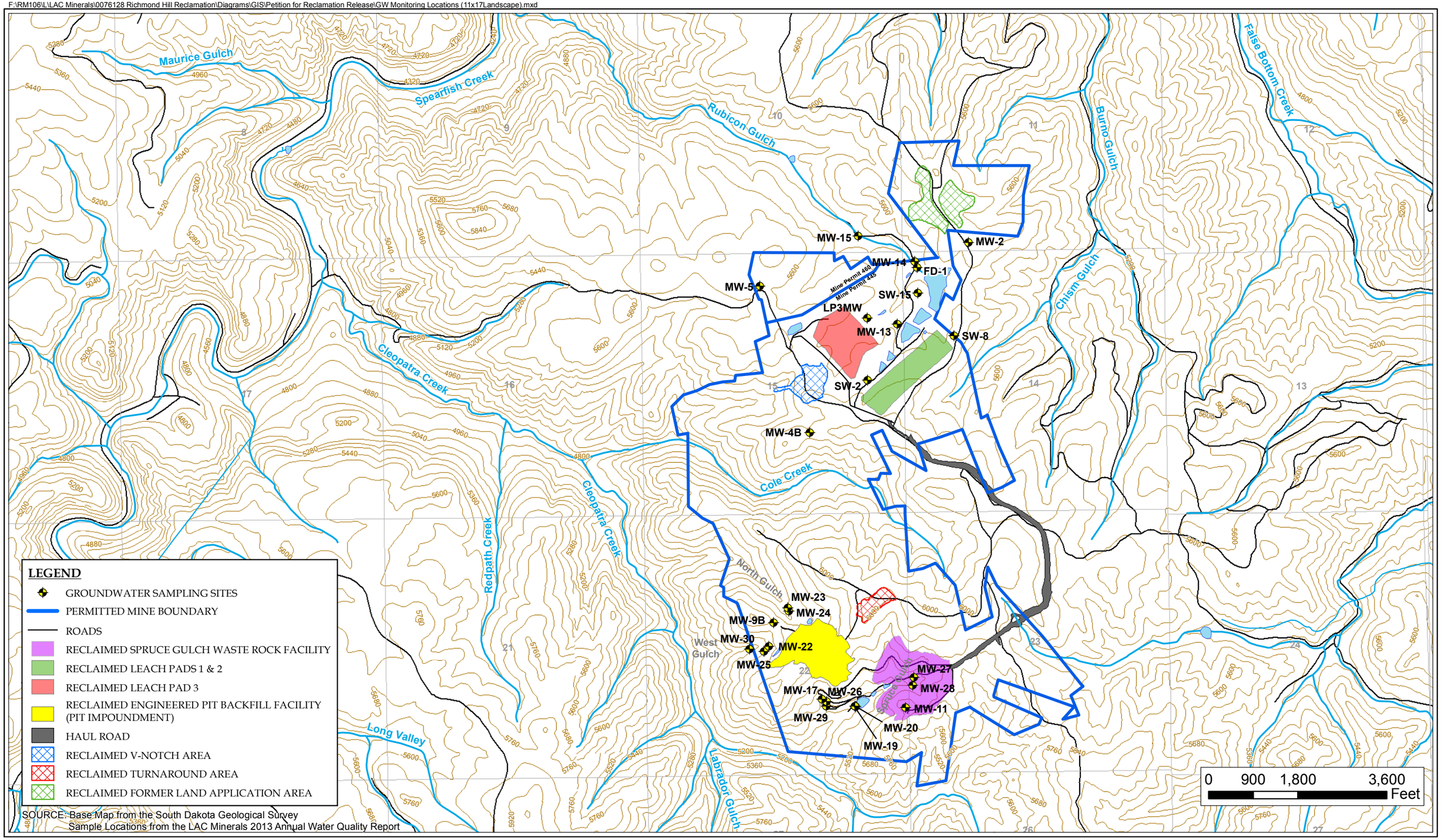
Appendix A

Sample Site Maps

Maps taken from LAC Minerals

Request for Release Petition

F:\RM106\L\LAC Minerals\0076128 Richmond Hill Reclamation\Diagrams\GIS\Petition for Reclamation Release\GW Monitoring Locations (11x17Landscape).mxd



SOURCE: Base Map from the South Dakota Geological Survey
Sample Locations from the LAC Minerals 2013 Annual Water Quality Report

FIGURE	DESIGNED	TFC
7	DRAWN	TFC
	CHECKED	
	DATE	Jul 15, 2014
	TIME	12:00 pm

GROUNDWATER SAMPLE LOCATIONS

RICHMOND HILL MINE
PETITION FOR RELEASE OF RECLAMATION OBLIGATIONS
SURFACE MINE PERMIT NOS. 445 AND 460
CENTRAL CITY, SOUTH DAKOTA

ERM
Environmental Resources Management
6455 S. Yosemite St., Suite 900
Greenwood Village, Colorado 80111
(303) 741-5050

N W E S

REVISION	DESCRIPTION	DATE

F:\RM106\L\LAC Minerals\0076128 Richmond Hill Reclamation\Diagrams\GIS\Petition for Reclamation Release\SW Monitoring Locations (11x17Landscape).mxd

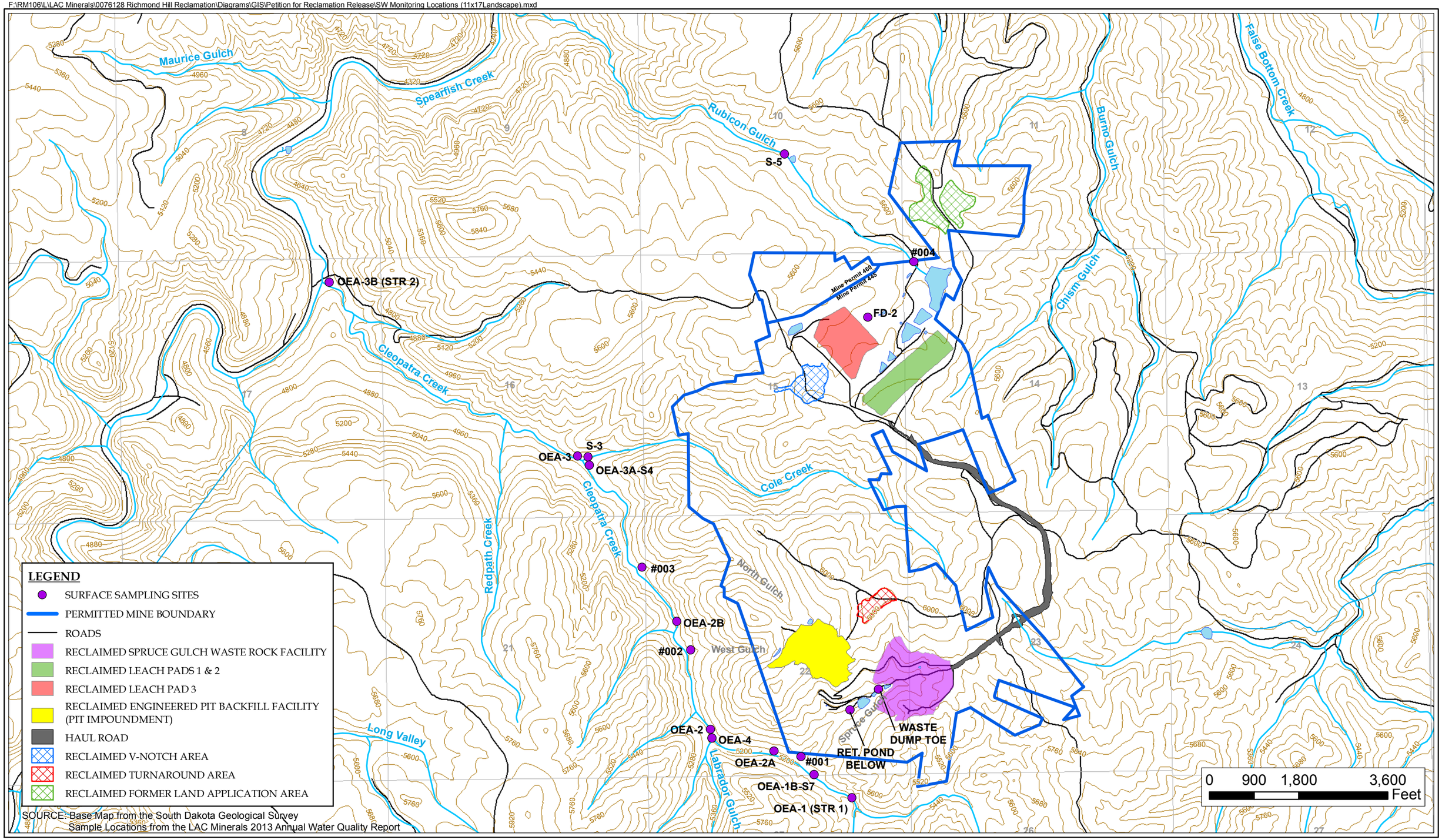


FIGURE	DESIGNED	TFC
3	DRAWN	TFC
	CHECKED	
	DATE	Jul 15, 2014
	TIME	12:00 pm

SURFACE DRAINAGES AND SURFACE WATER SAMPLE LOCATIONS

RICHMOND HILL MINE
PETITION FOR RELEASE OF RECLAMATION OBLIGATIONS
SURFACE MINE PERMIT NOS. 445 AND 460
CENTRAL CITY, SOUTH DAKOTA

ERM
Environmental Resources Management
6455 S. Yosemite St., Suite 900
Greenwood Village, Colorado 80111
(303) 741-5050

N W E S

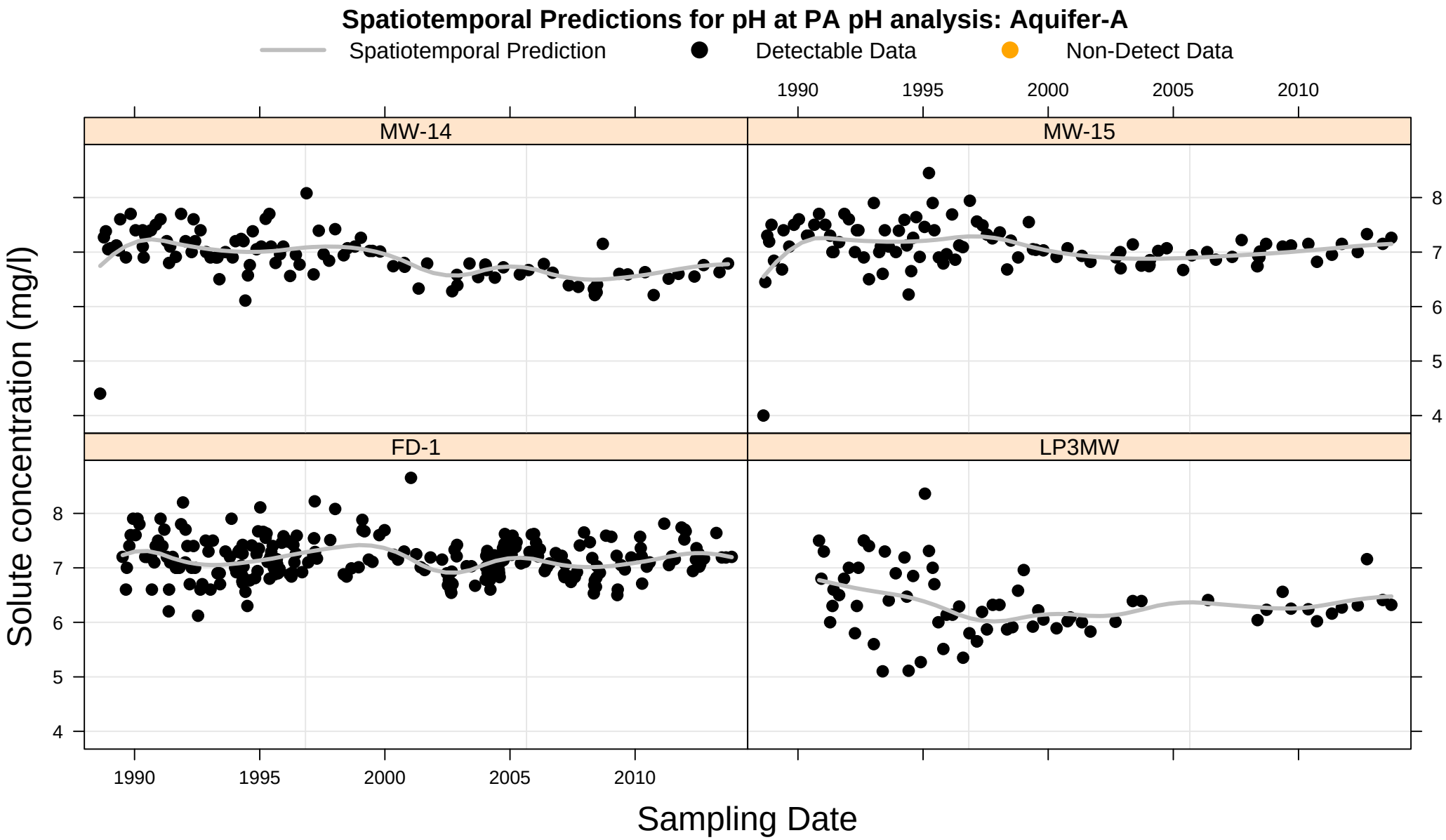
REVISION	DESCRIPTION	DATE

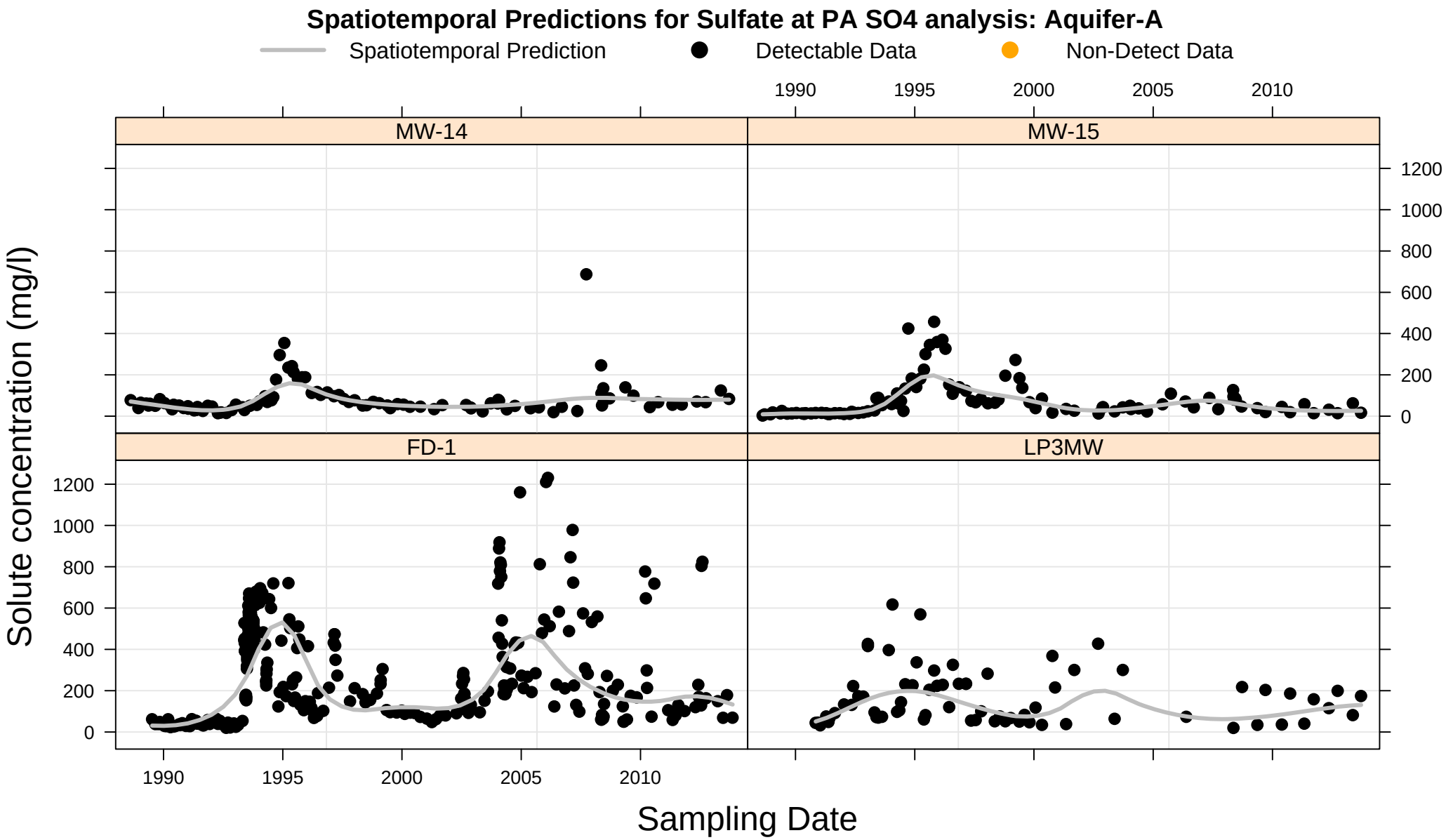
Appendix B.1

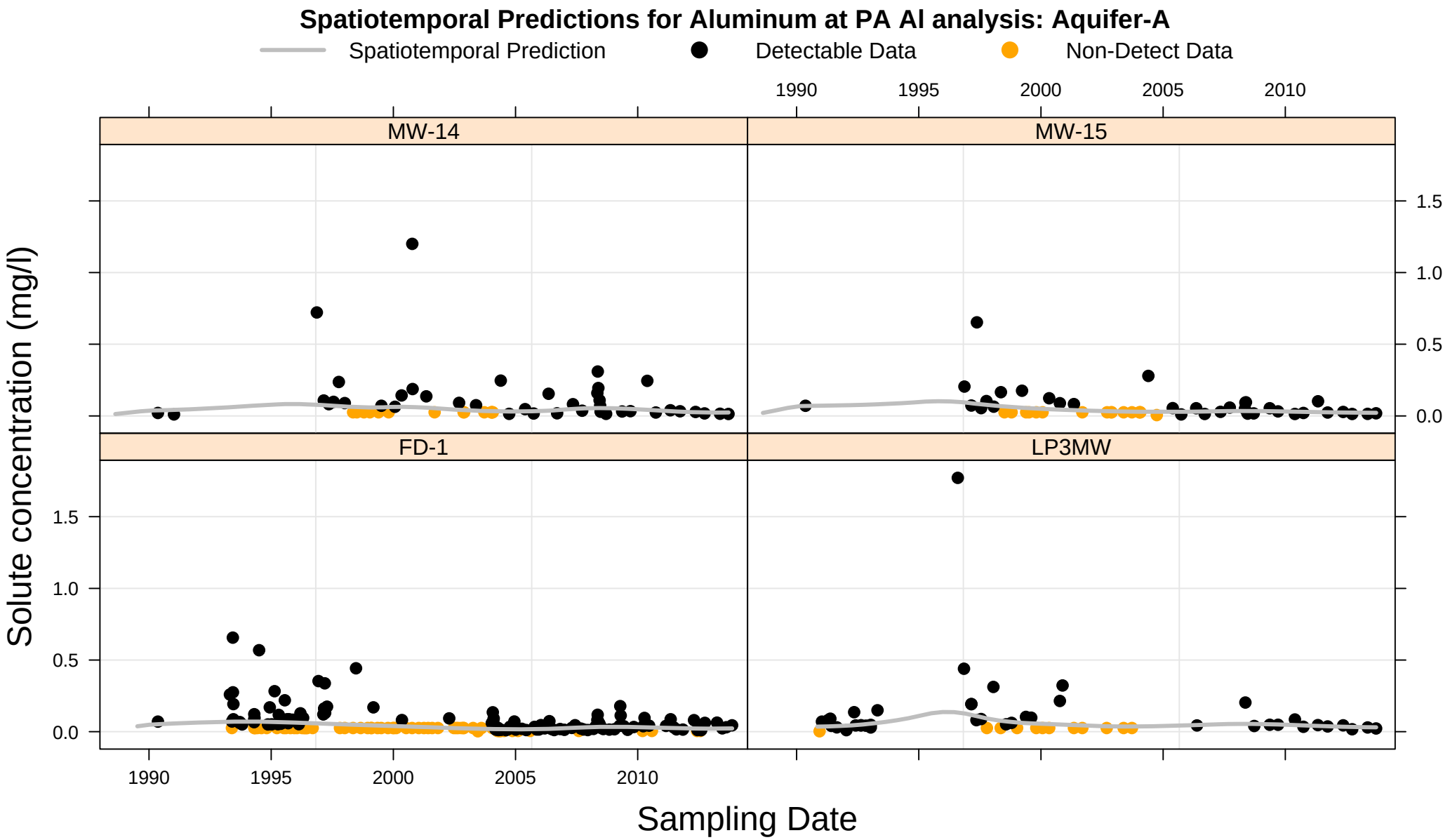
Process Area:

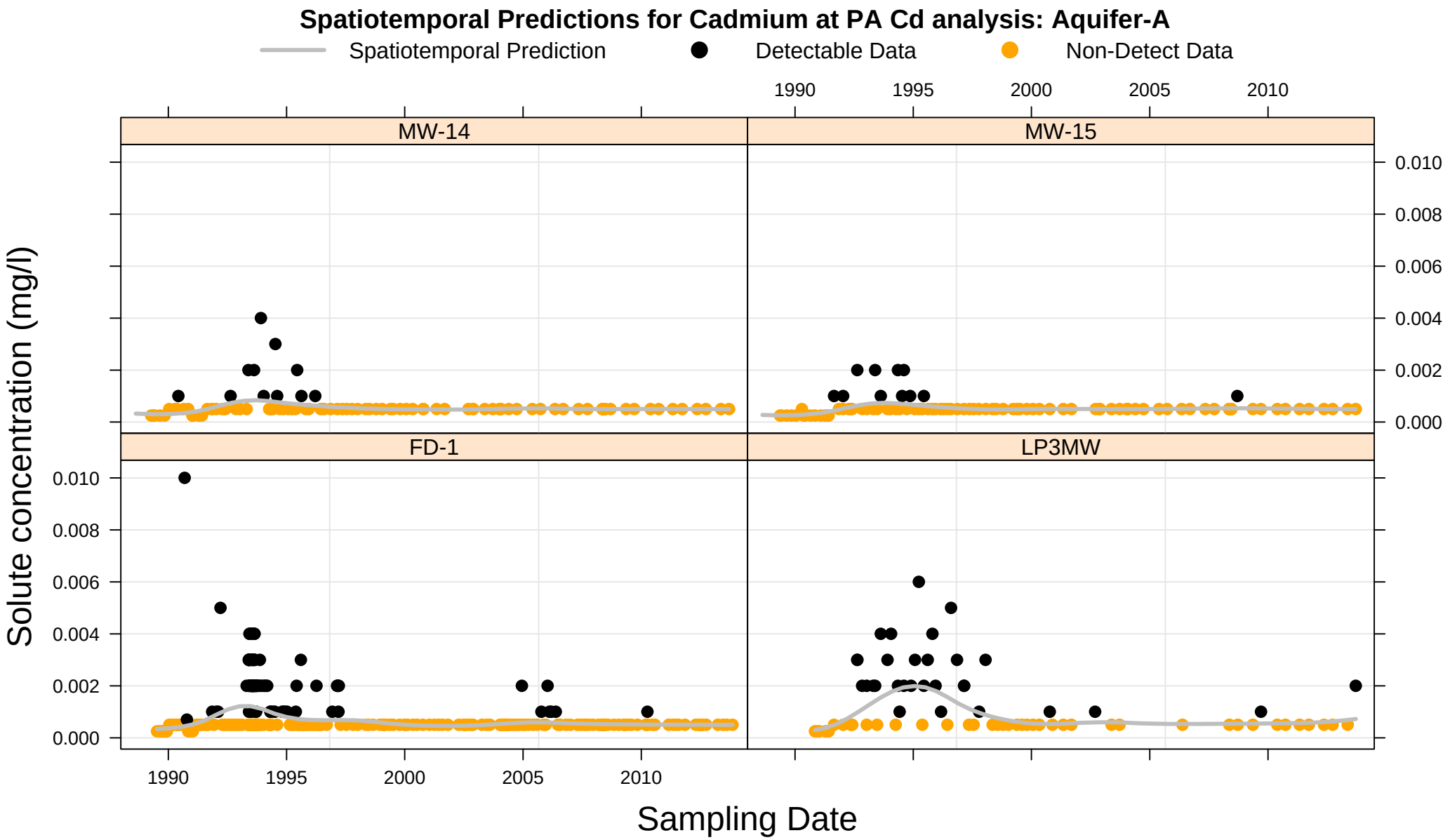
Alluvial/Colluvial Aquifer

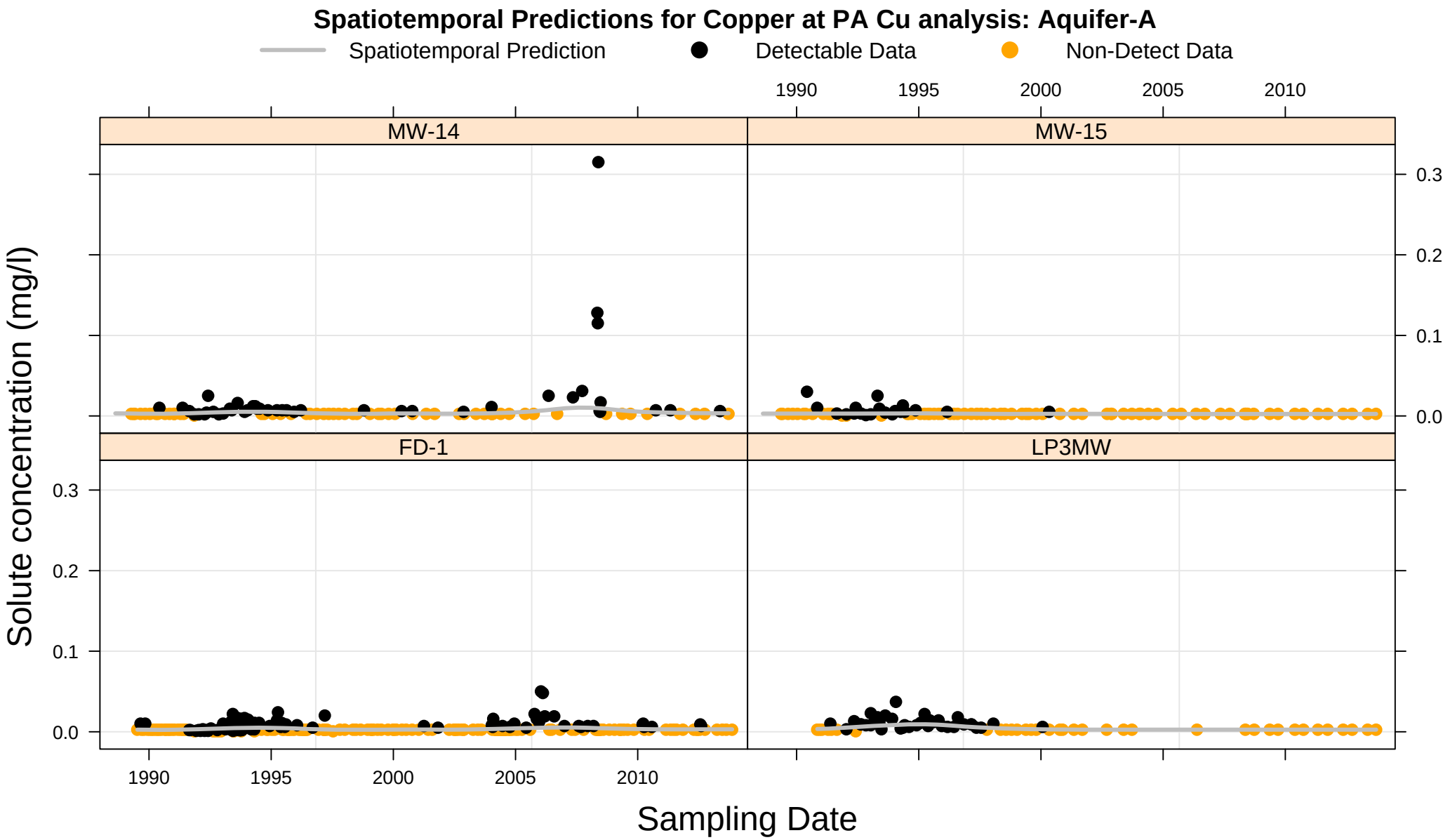
Water Quality Graphs

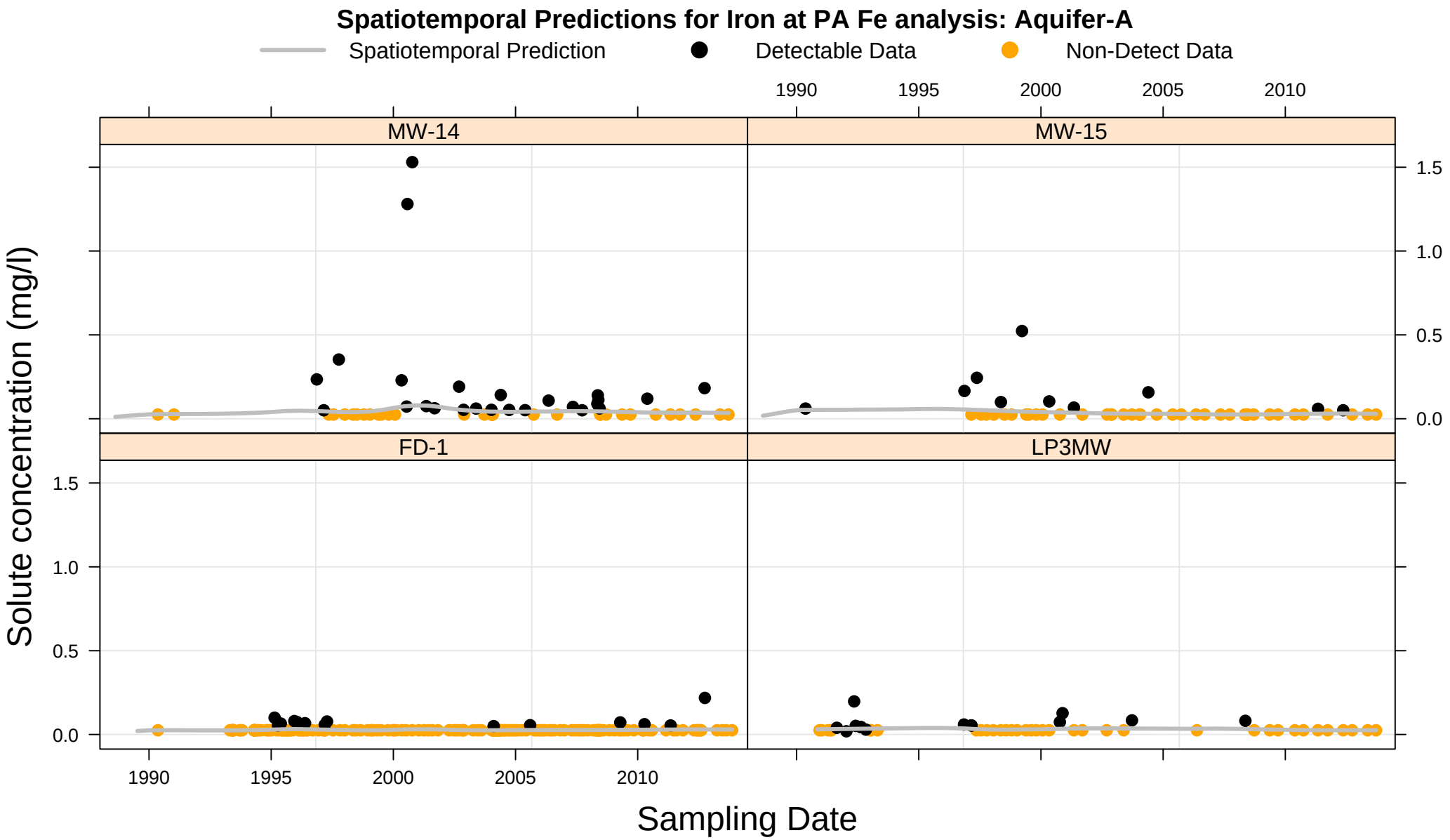

Spatiotemporal Predictions for pH at PA pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
4
5
6
7
8

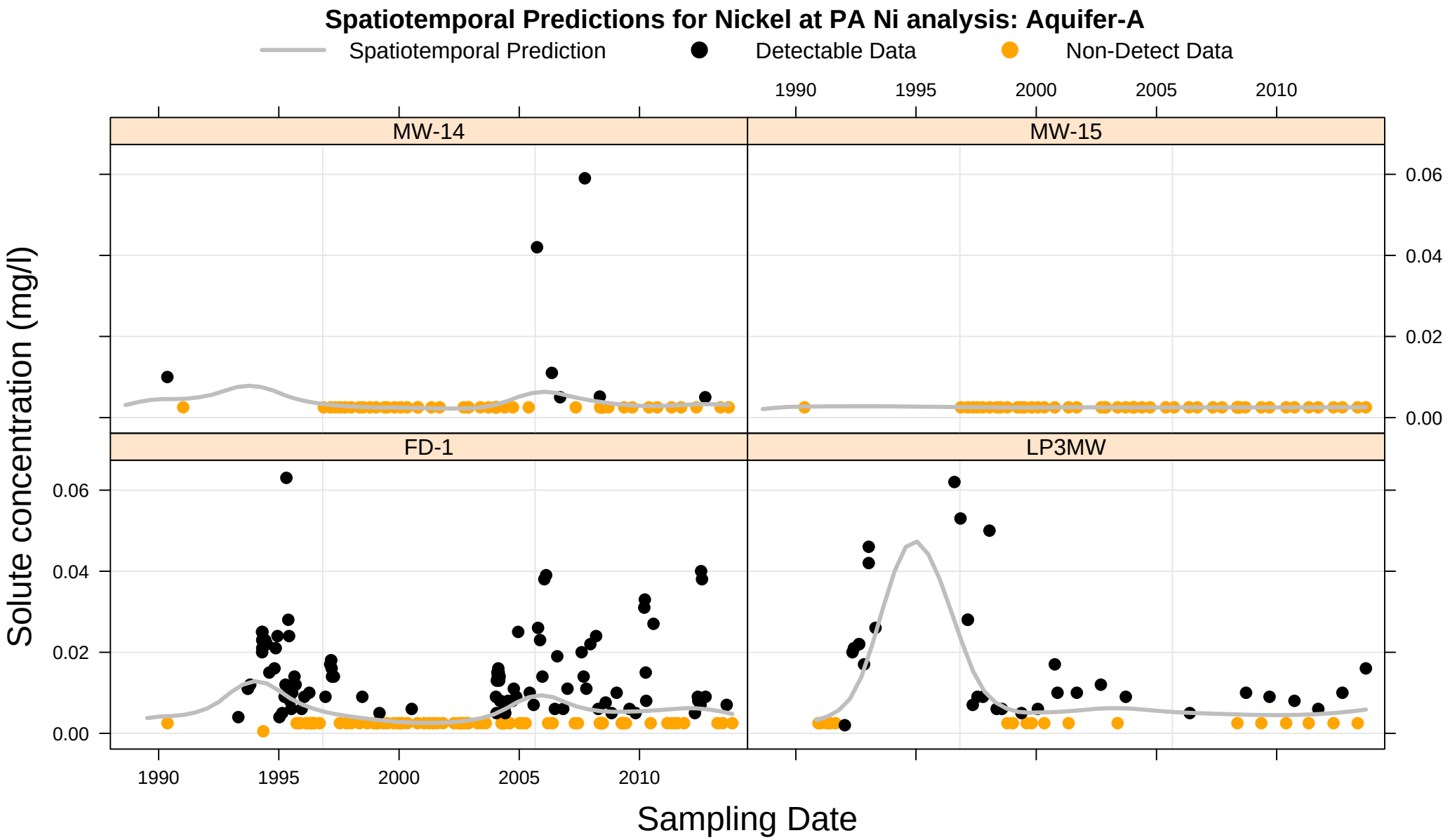

Spatiotemporal Predictions for Sulfate at PA SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0
200
400
600
800
1000
1200
1990
1995
2000
2005
2010

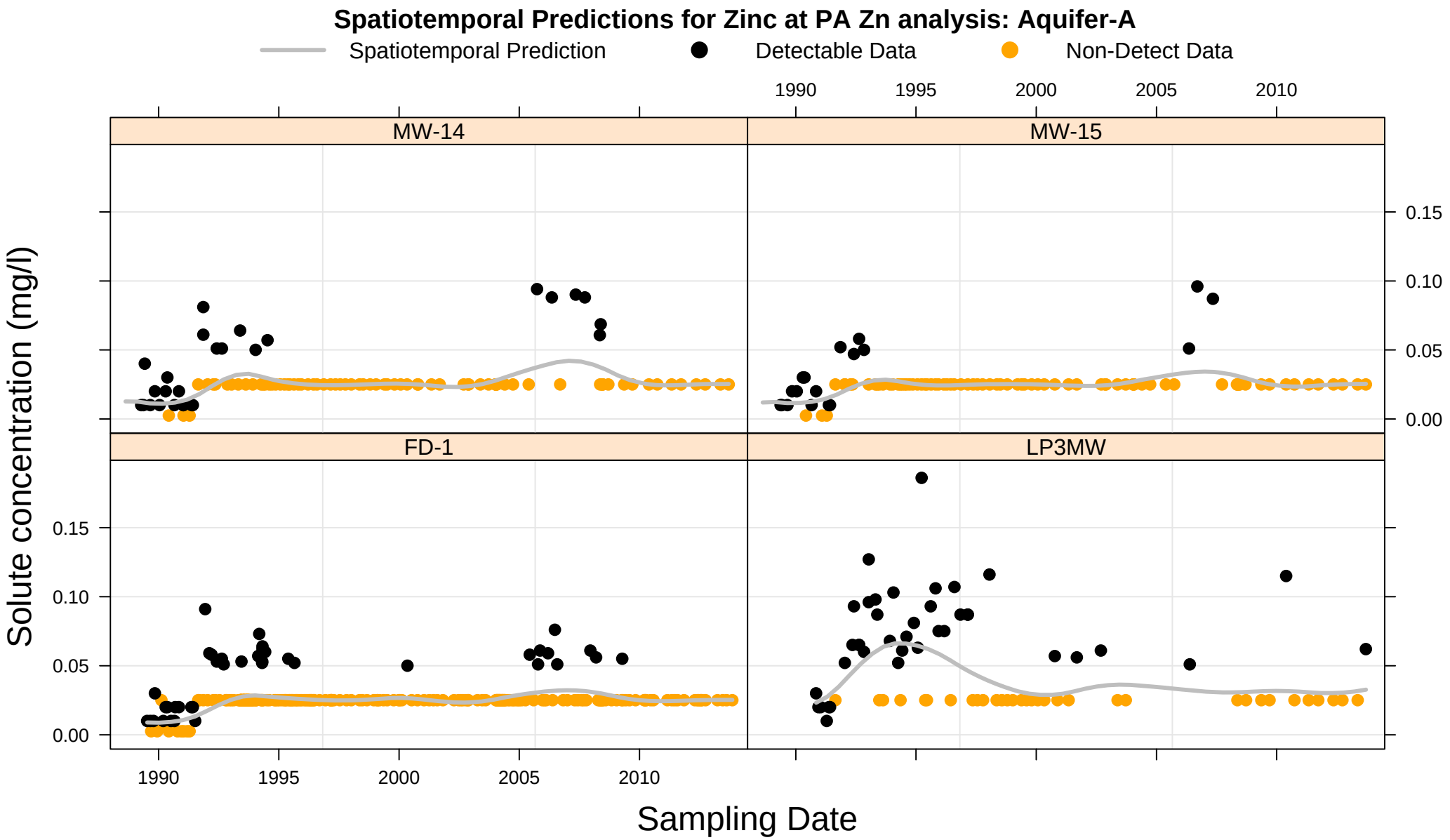

Spatiotemporal Predictions for Aluminum at PA Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0.0
0.5
1.0
1.5
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Cadmium at PA Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0.000
0.002
0.004
0.006
0.008
0.010
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Copper at PA Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0.0
0.1
0.2
0.3
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron at PA Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0.0
0.5
1.0
1.5
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Nickel at PA Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
0.00
0.02
0.04
0.06
1990
1995
2000
2005
2010
Sampling Date

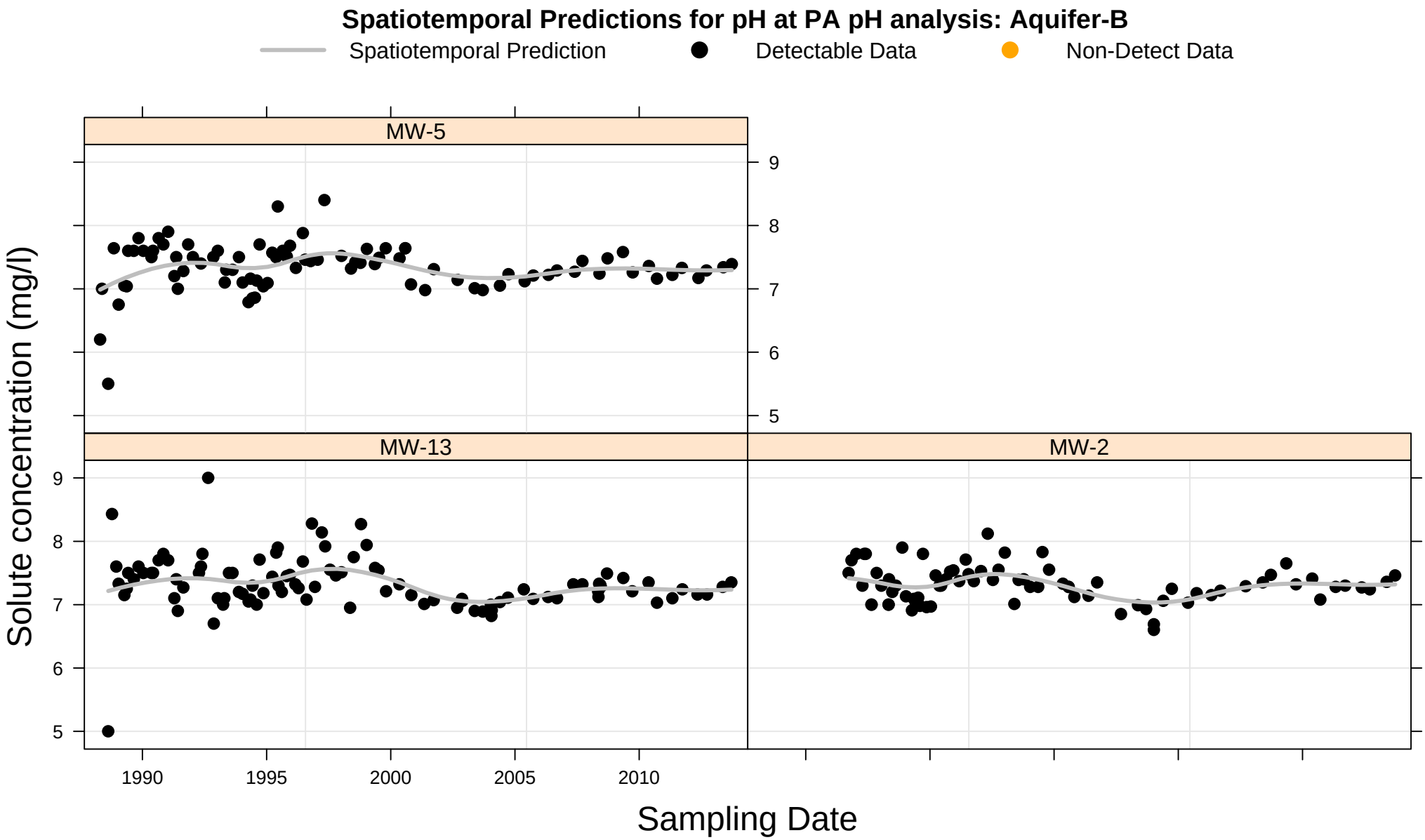

Spatiotemporal Predictions for Zinc at PA Zn analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-14
MW-15
FD-1
LP3MW
Solute concentration (mg/l)
Sampling Date
0.00
0.05
0.10
0.15
1990
1995
2000
2005
2010

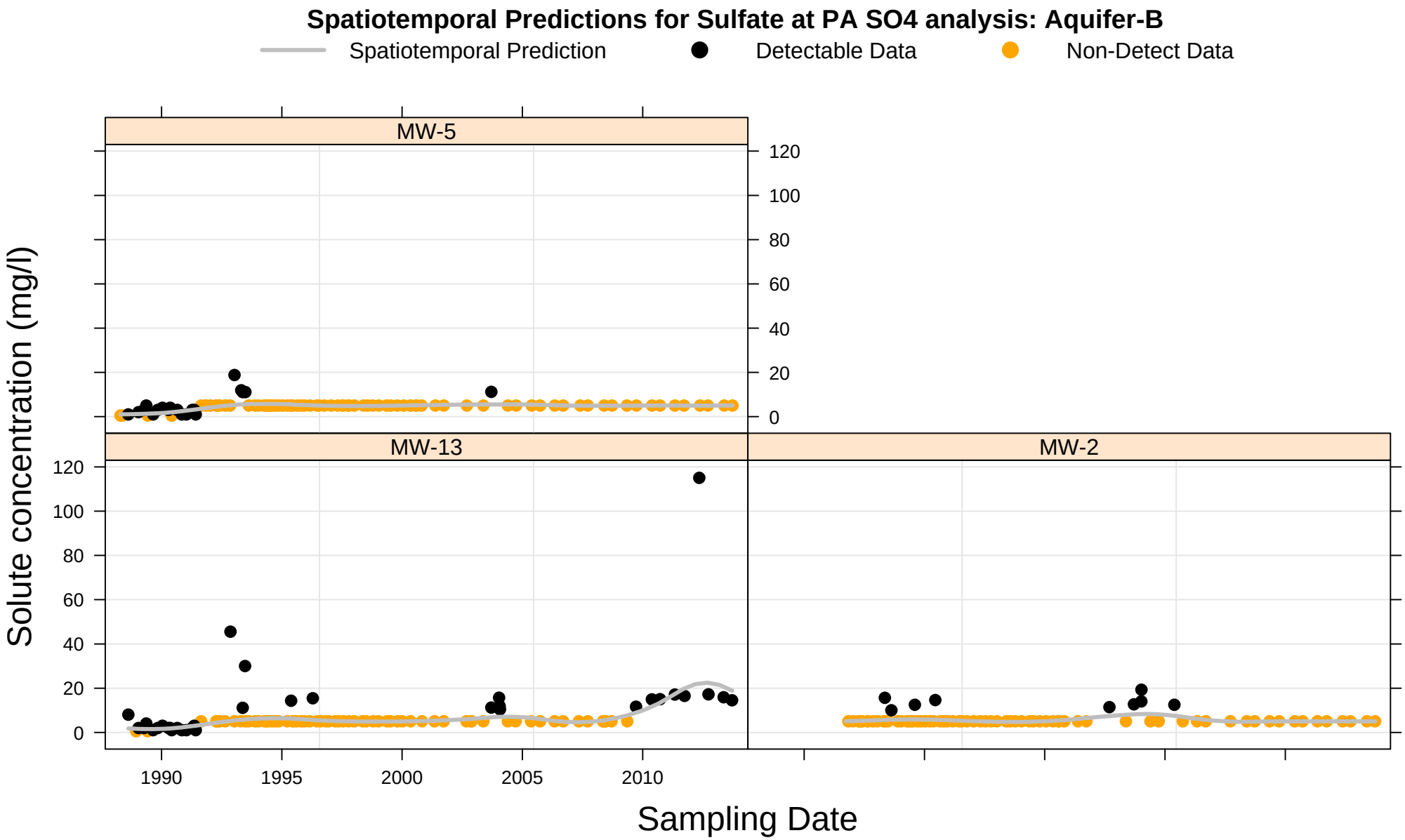
Appendix B.2

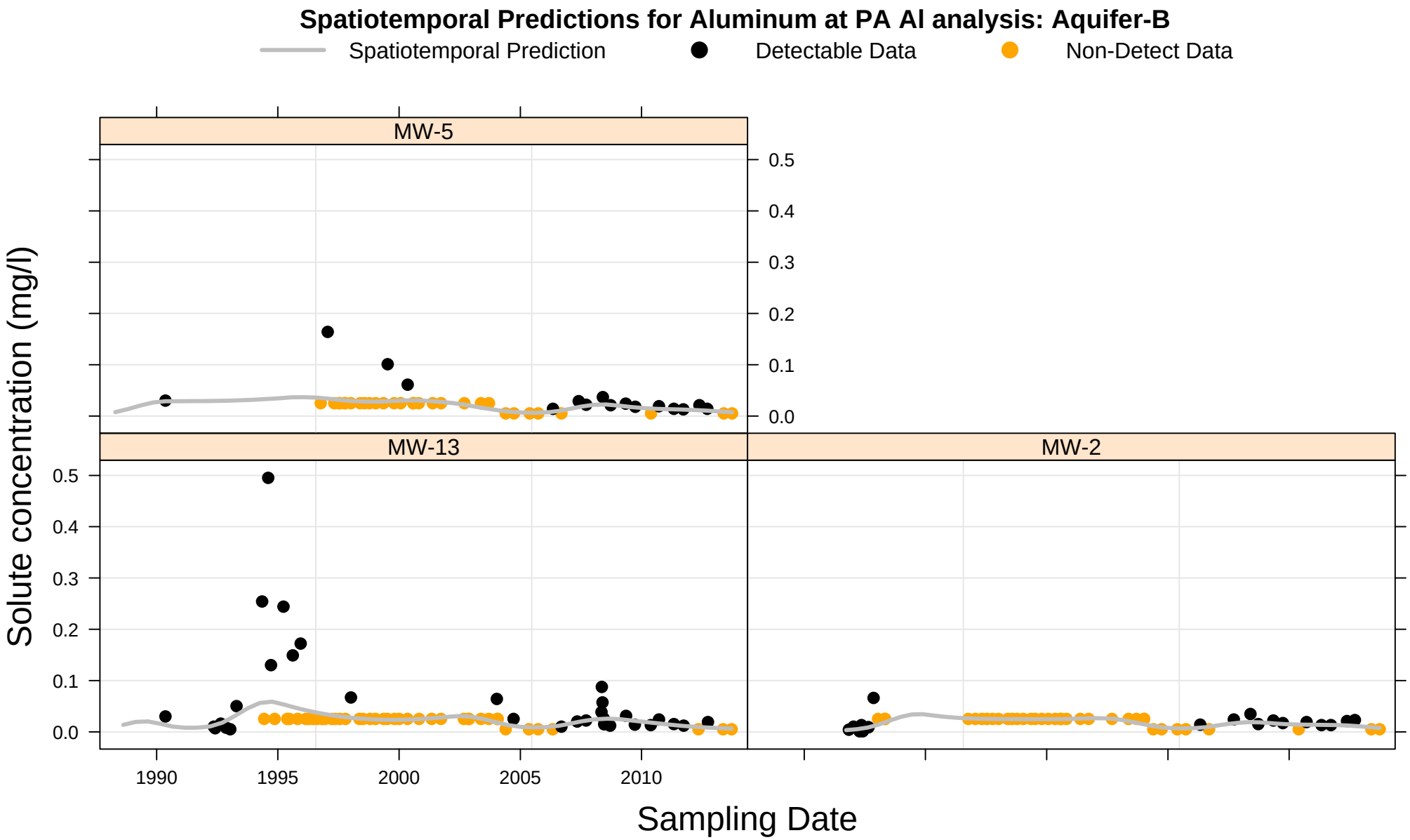
Process Area:

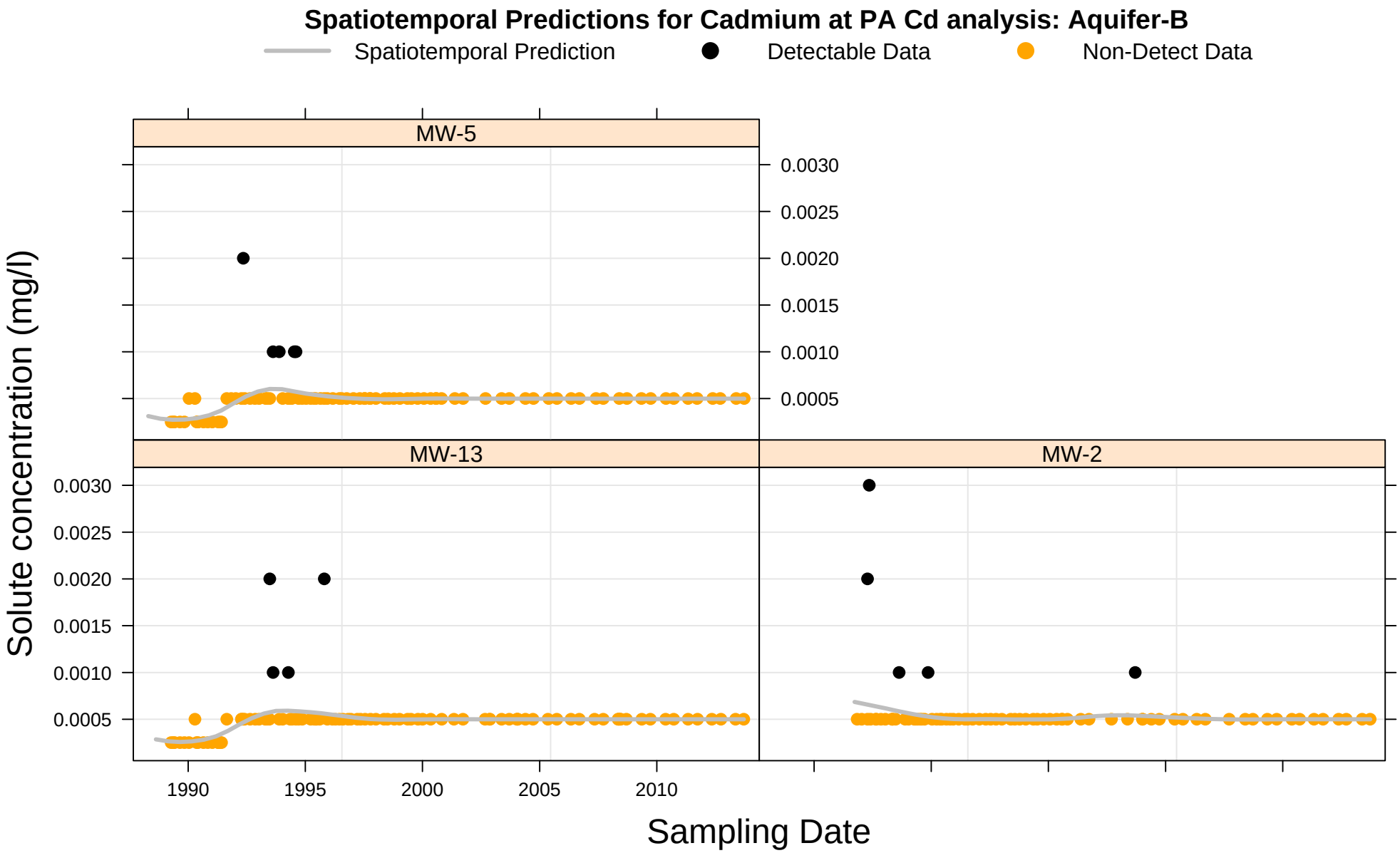
Upper Bedrock Monitoring Network

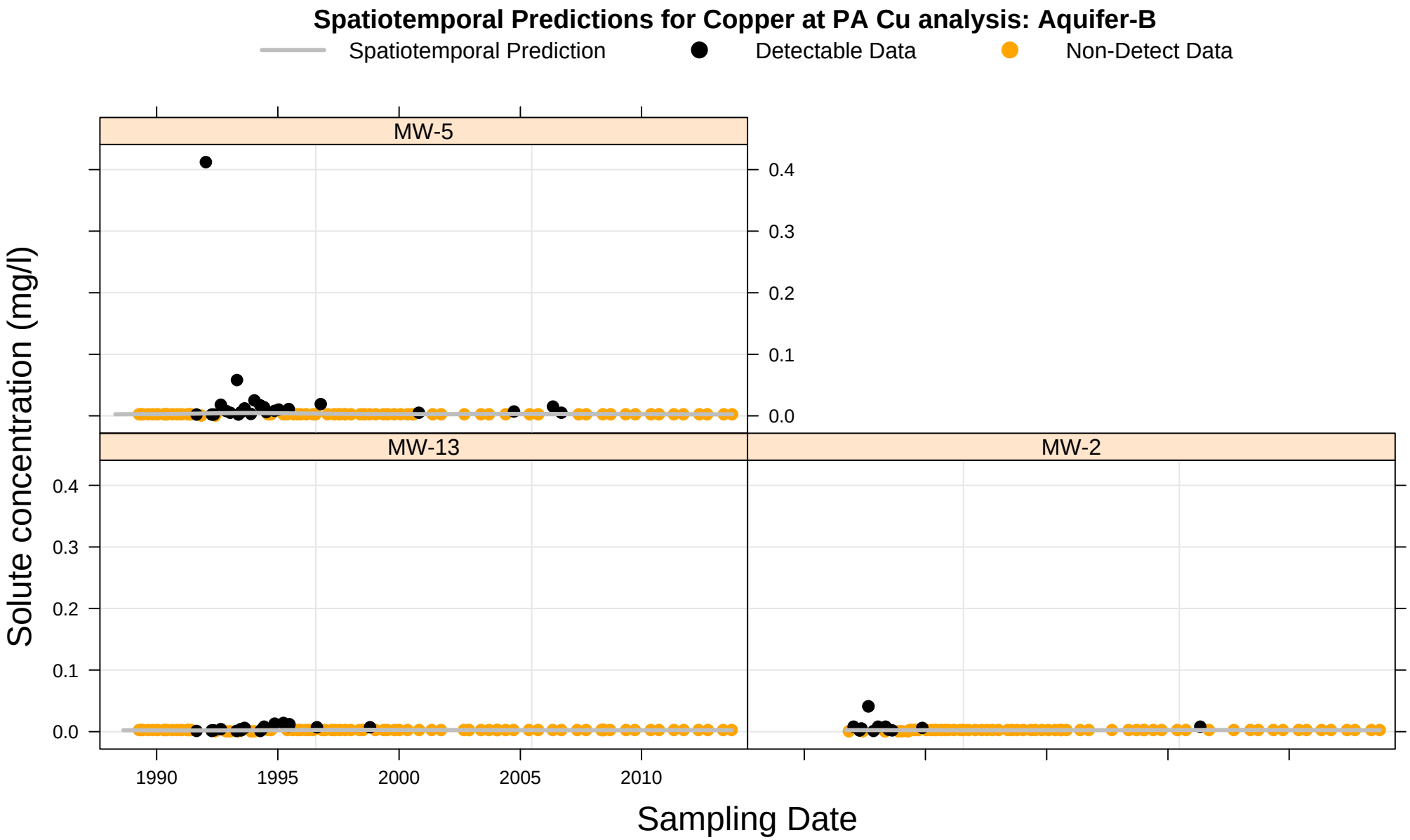
Water Quality Graphs

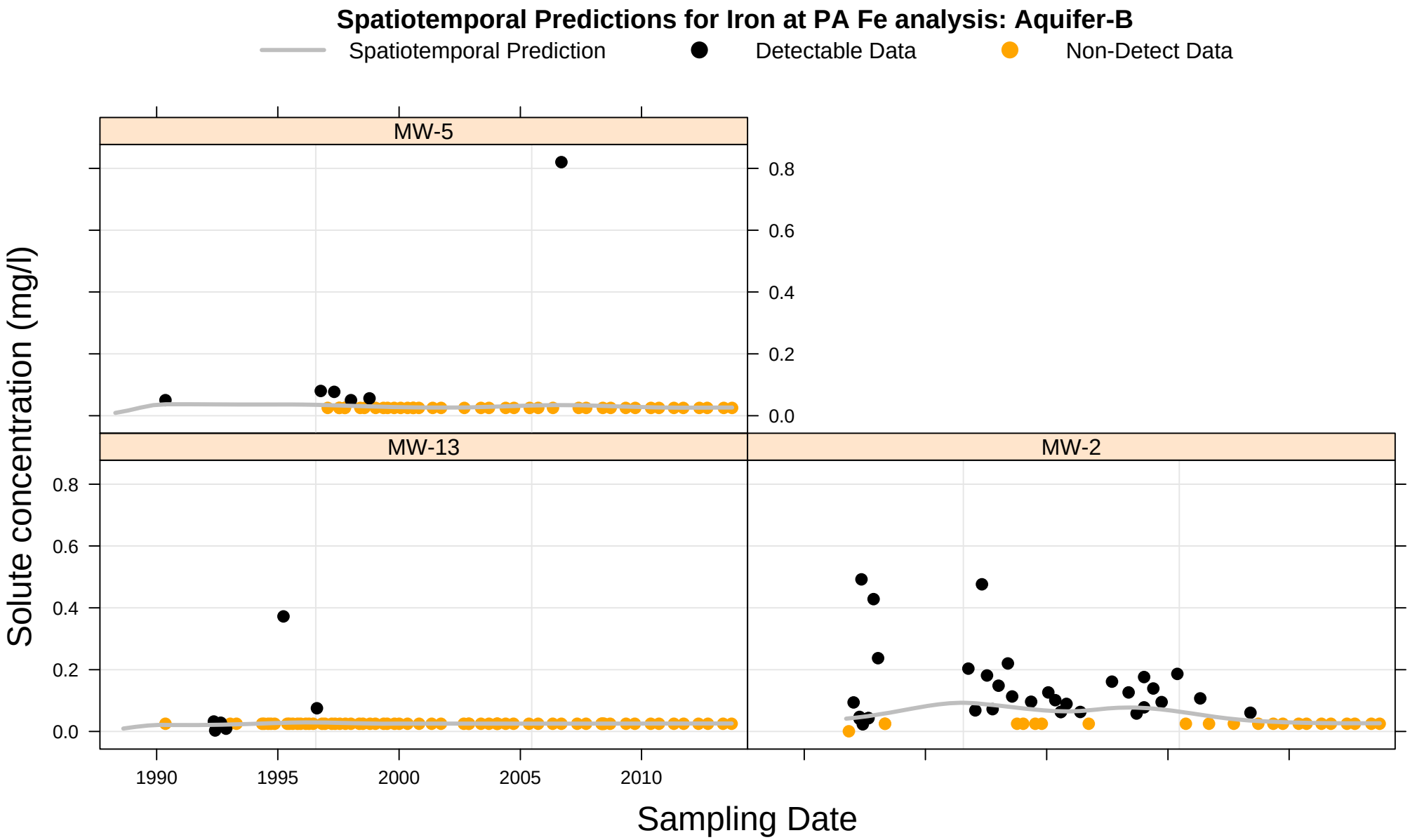

Spatiotemporal Predictions for pH at PA pH analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
5
6
7
8
9

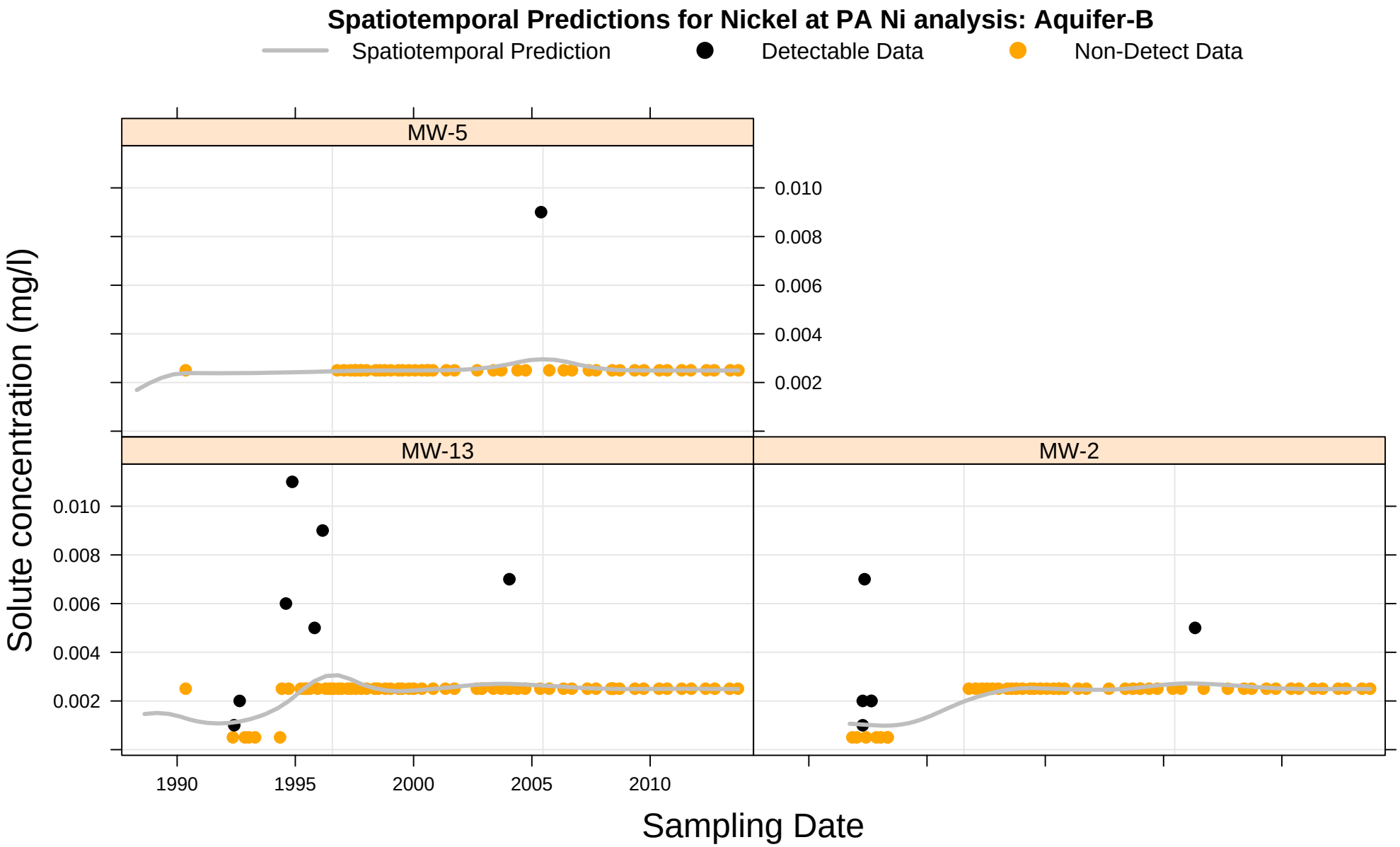

Spatiotemporal Predictions for Sulfate at PA SO4 analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
Solute concentration (mg/l)
Sampling Date
0
20
40
60
80
100
120
1990
1995
2000
2005
2010

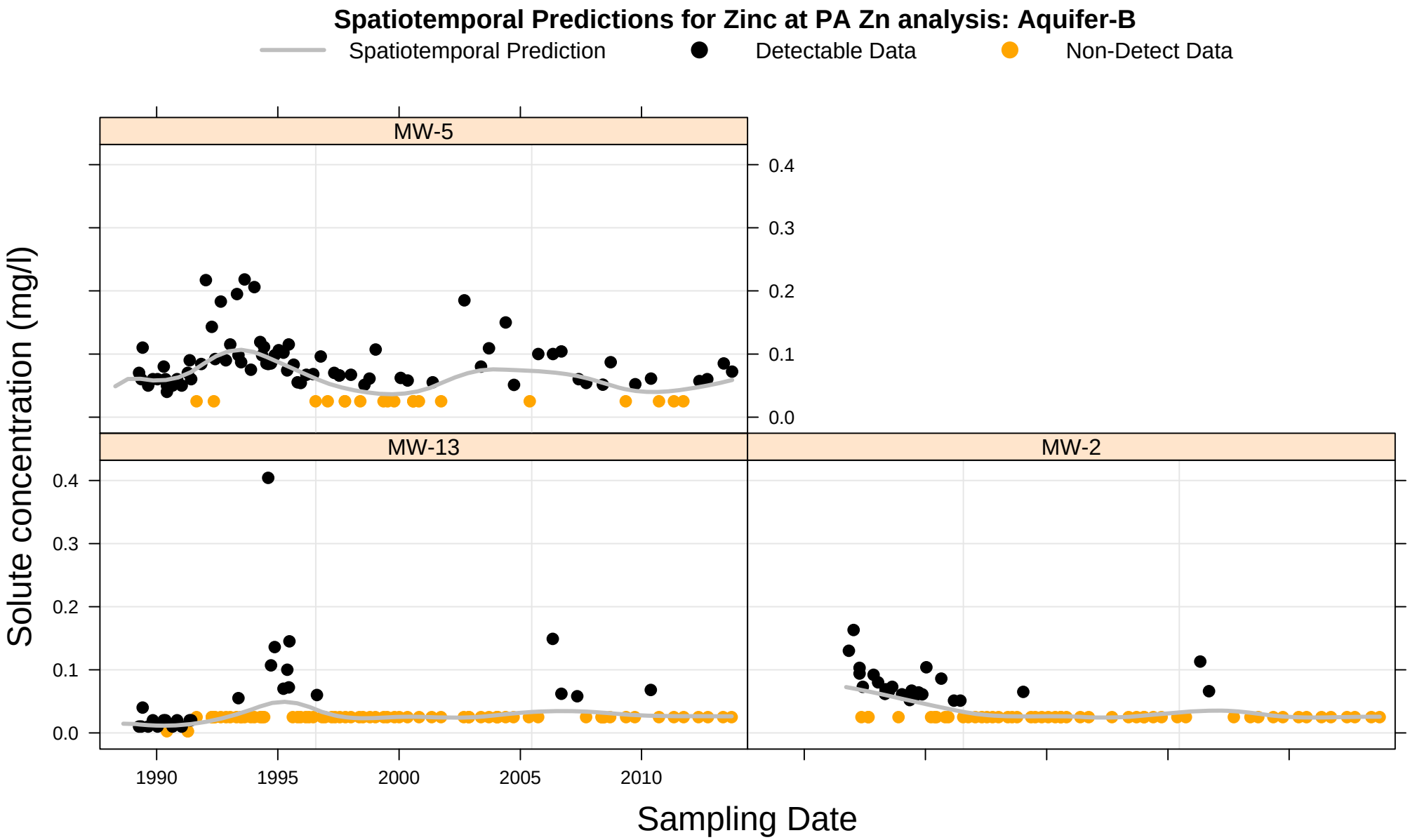

Spatiotemporal Predictions for Aluminum at PA Al analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
Solute concentration (mg/l)
0.0
0.1
0.2
0.3
0.4
0.5
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Cadmium at PA Cd analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Copper at PA Cu analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
0.4
0.3
0.2
0.1
0.0
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Iron at PA Fe analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
Solute concentration (mg/l)
0.0
0.2
0.4
0.6
0.8
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Nickel at PA Ni analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
0.010
0.008
0.006
0.004
0.002
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date

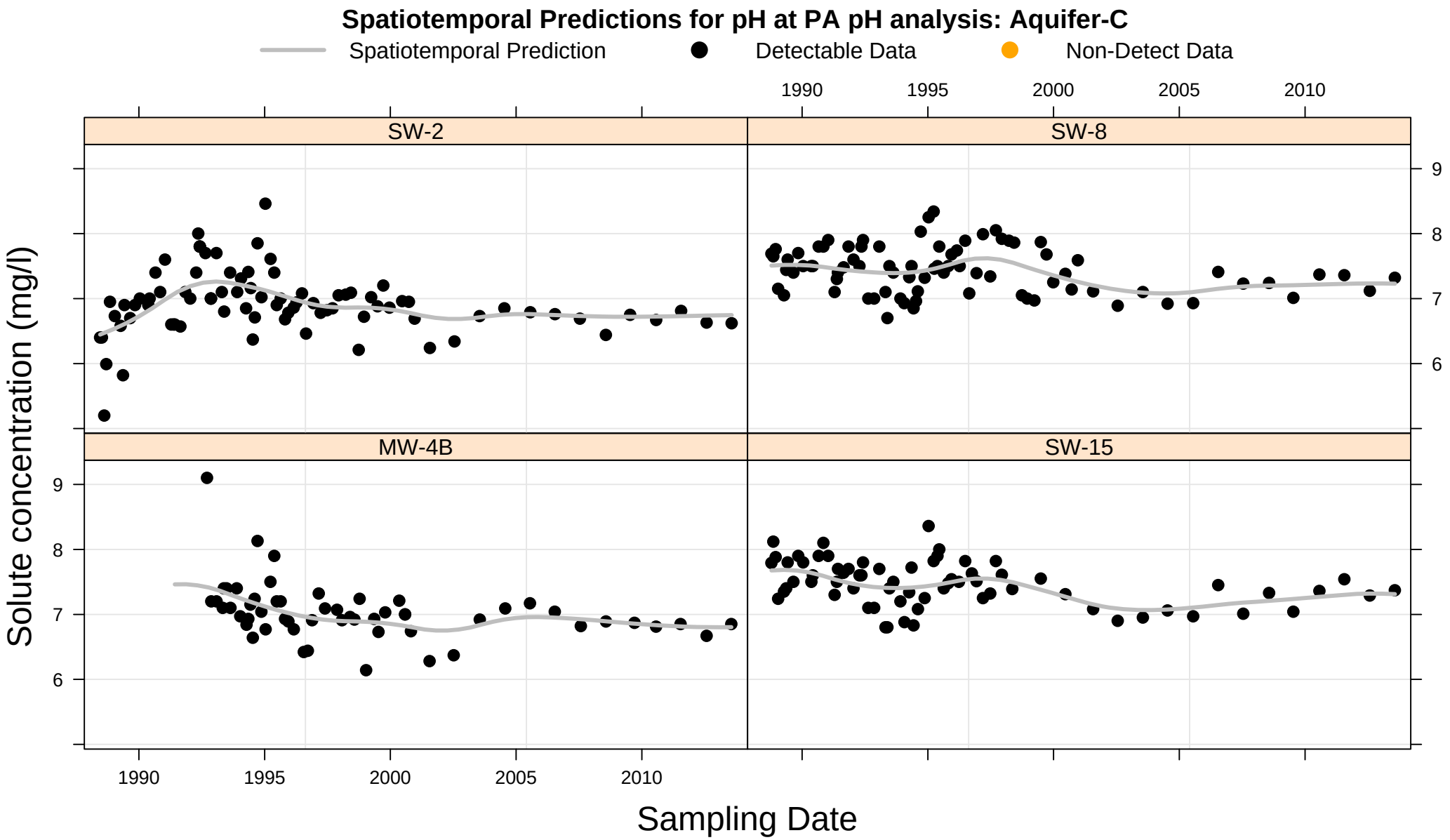

Spatiotemporal Predictions for Zinc at PA Zn analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-5
MW-13
MW-2
Solute concentration (mg/l)
0.0
0.1
0.2
0.3
0.4
1990
1995
2000
2005
2010
Sampling Date

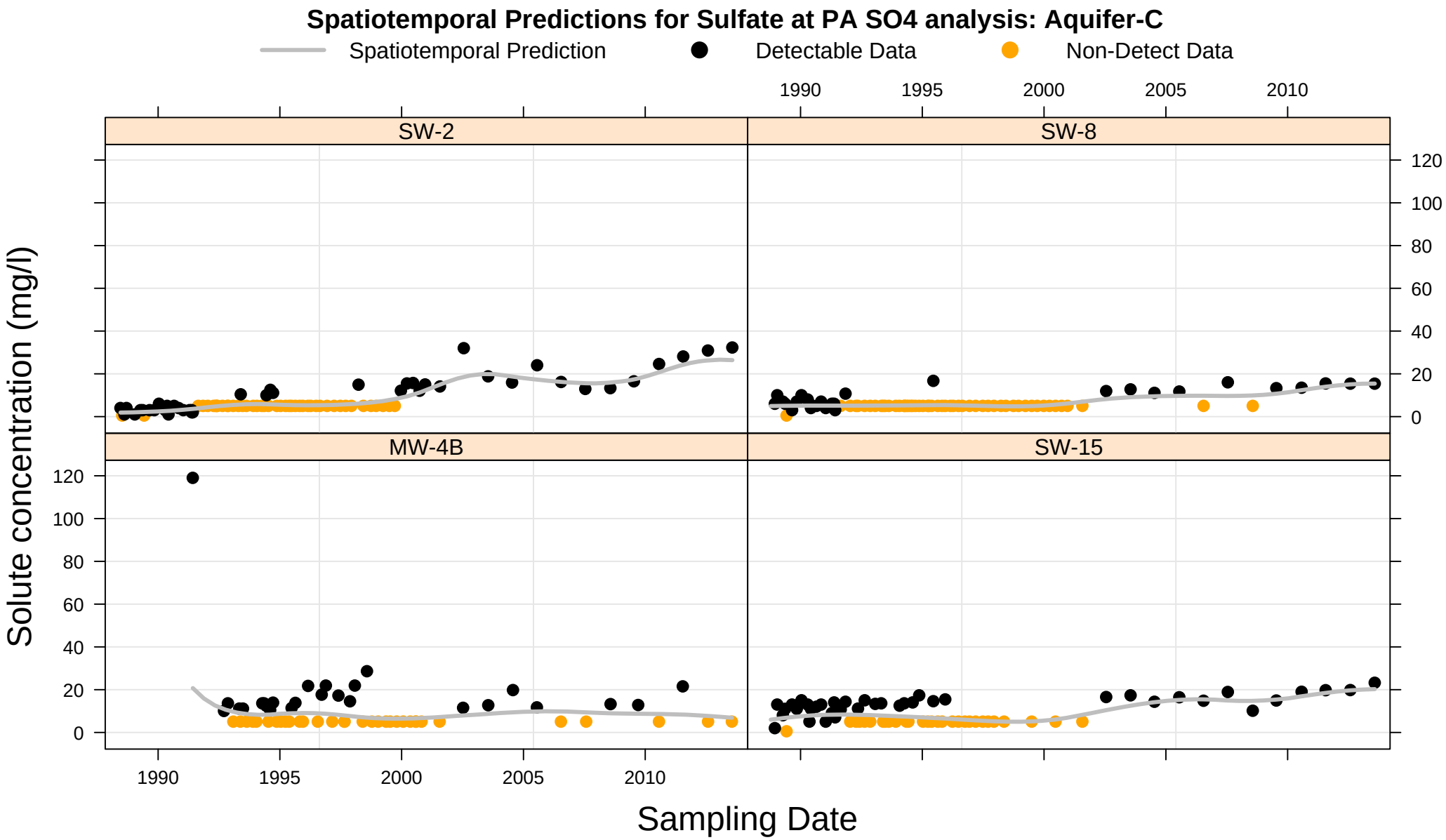
Appendix B.3

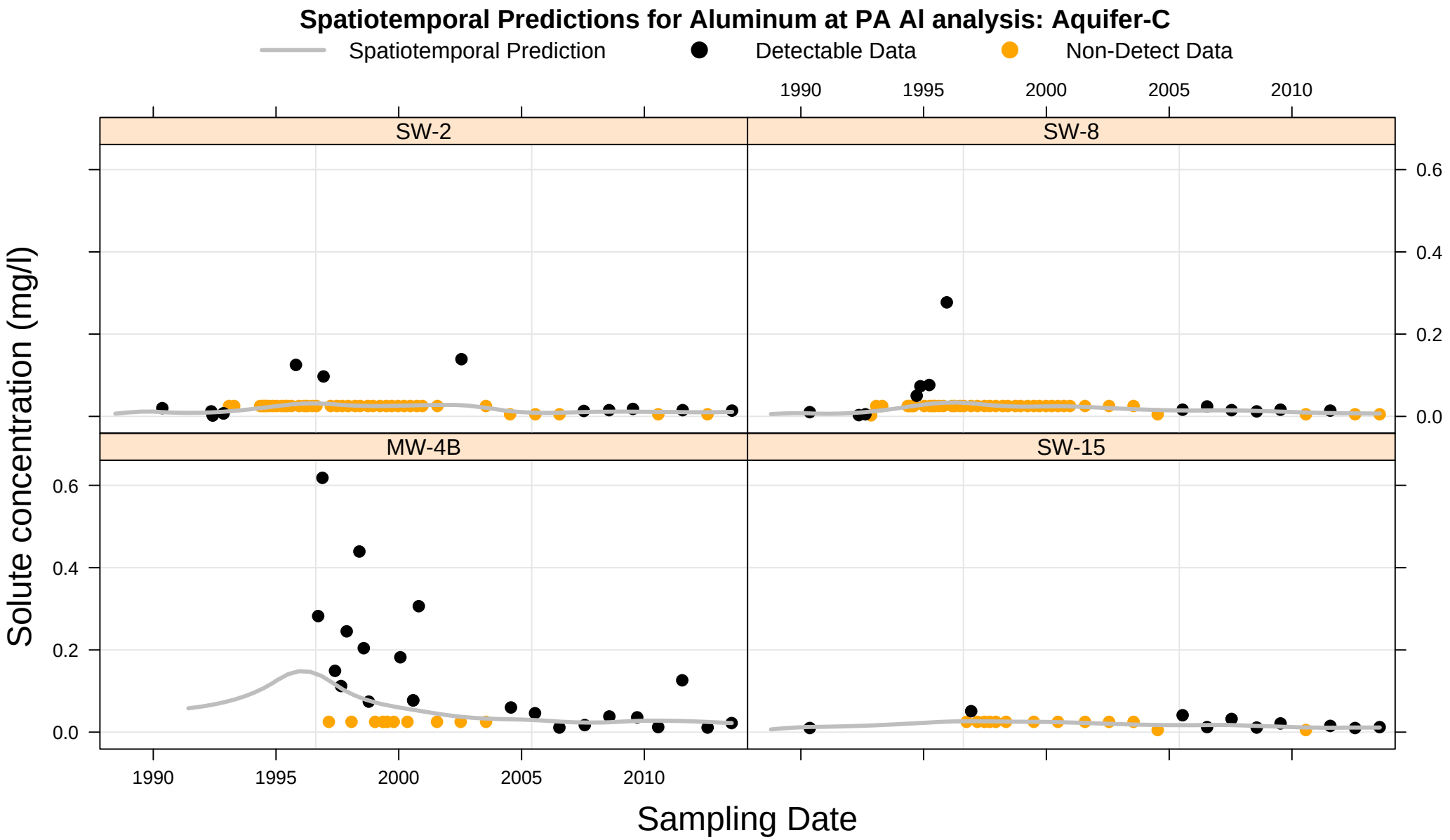
Process Area:

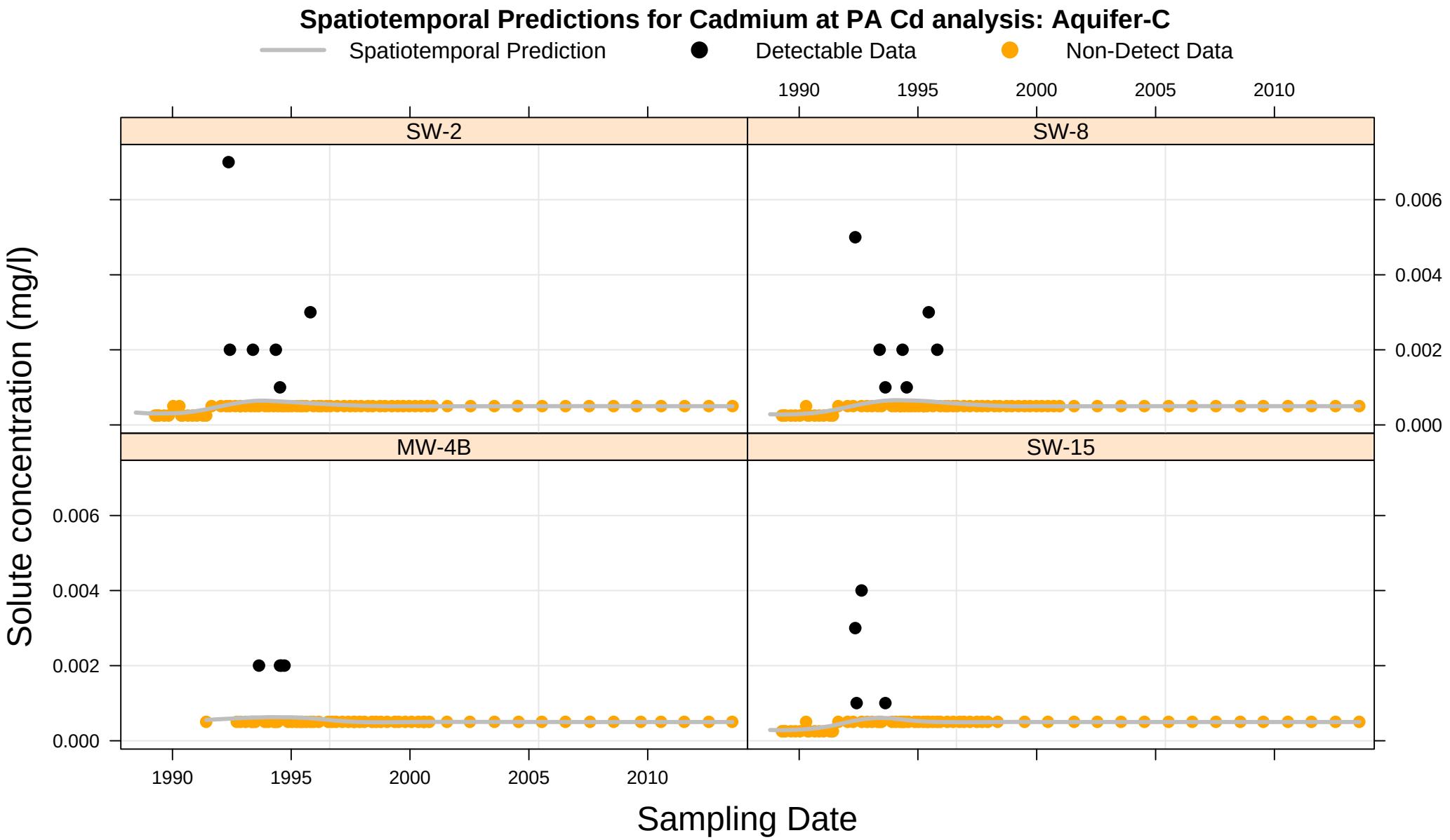
Lower Bedrock Monitoring Network

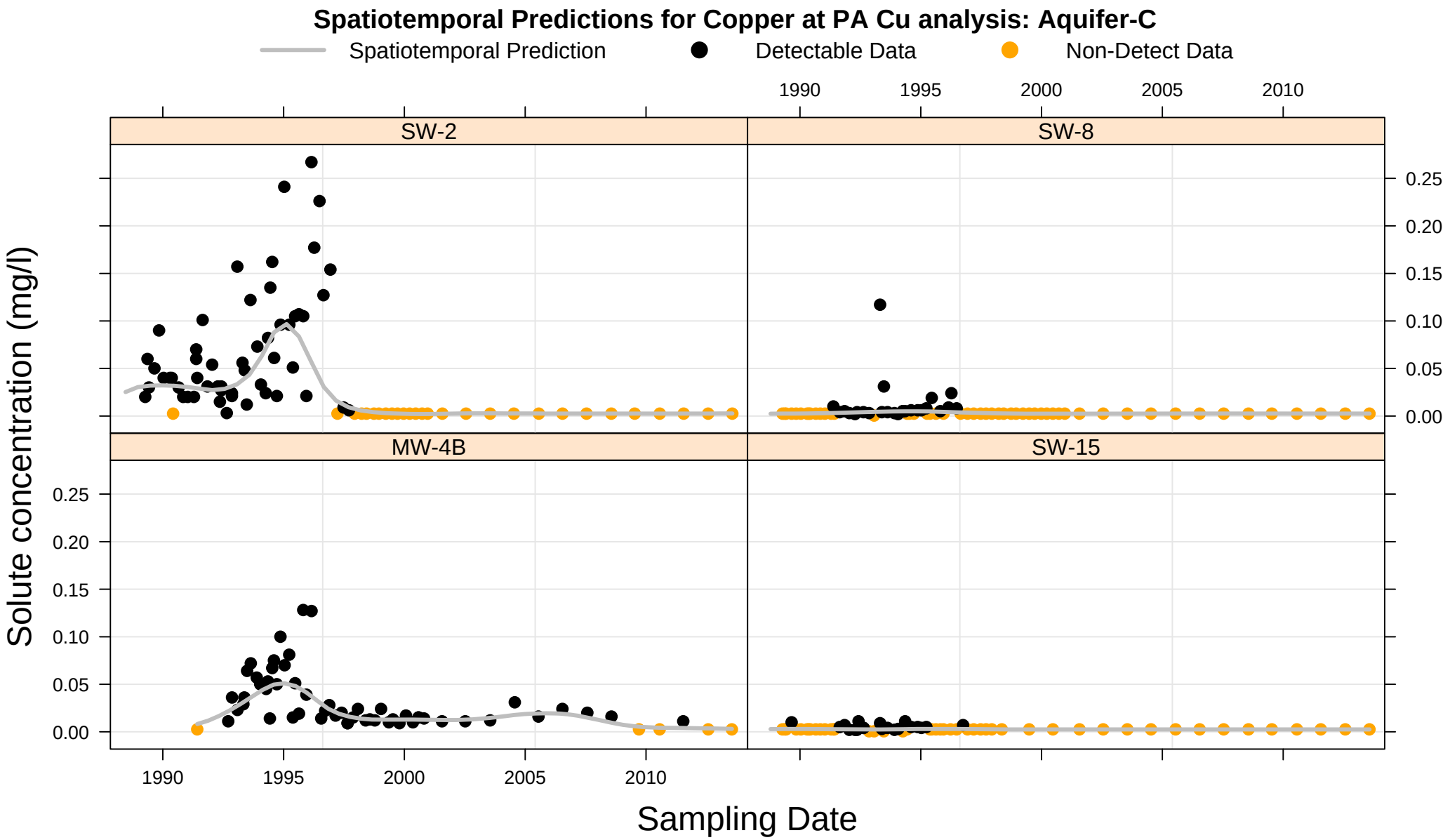
Water Quality Graphs

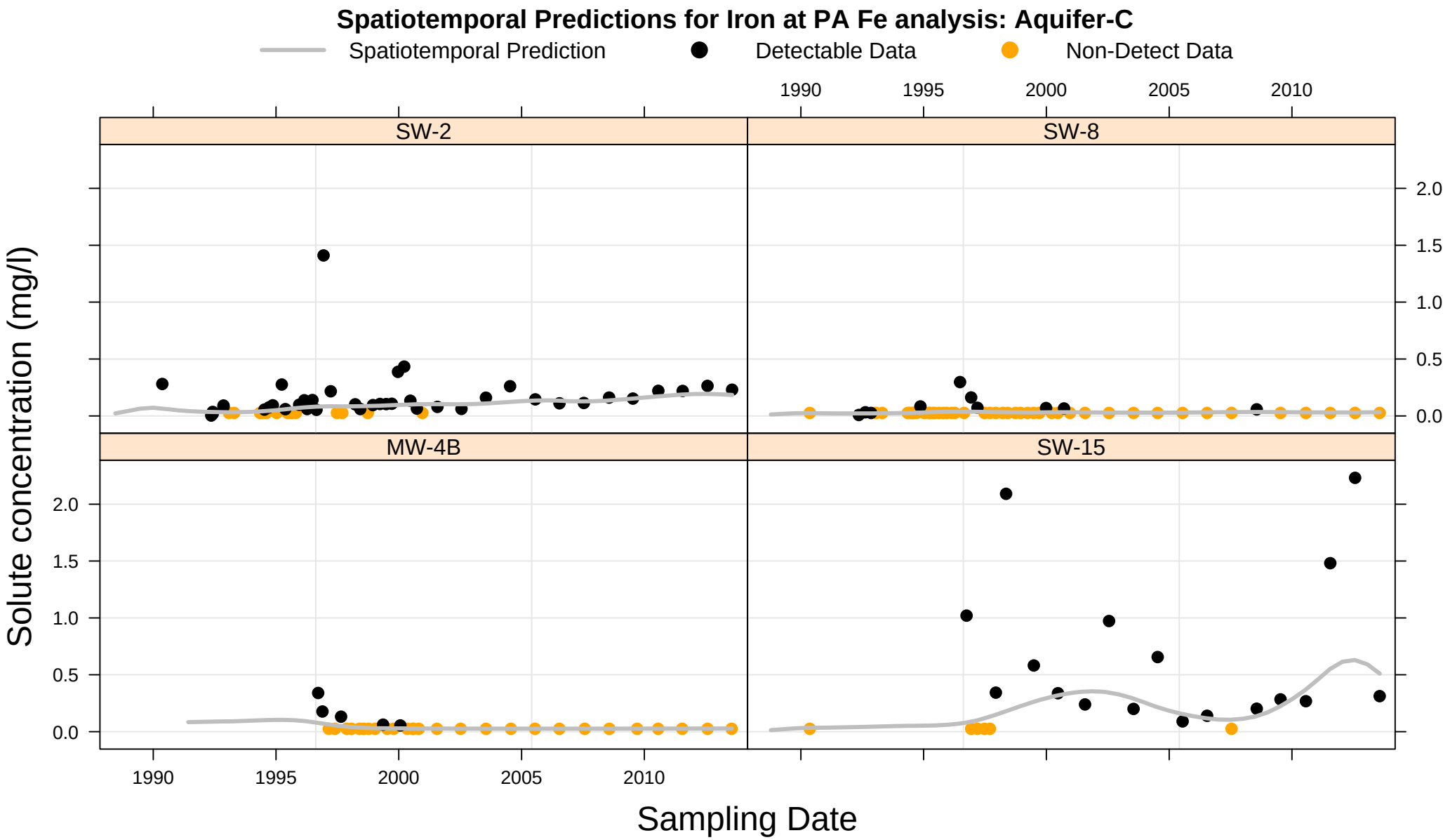

Spatiotemporal Predictions for pH at PA pH analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
6
7
8
9

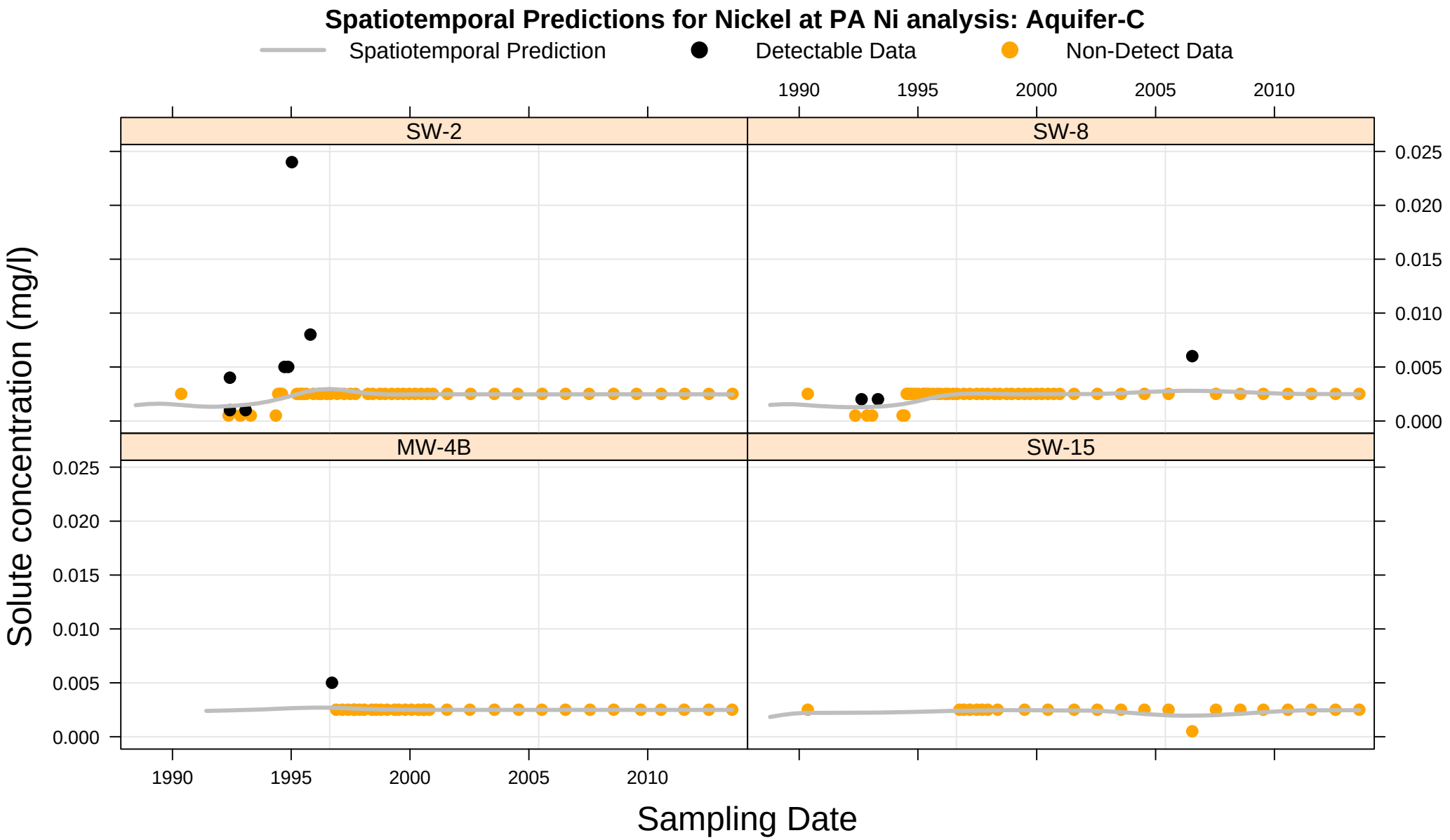

Spatiotemporal Predictions for Sulfate at PA SO4 analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0
20
40
60
80
100
120
1990
1995
2000
2005
2010

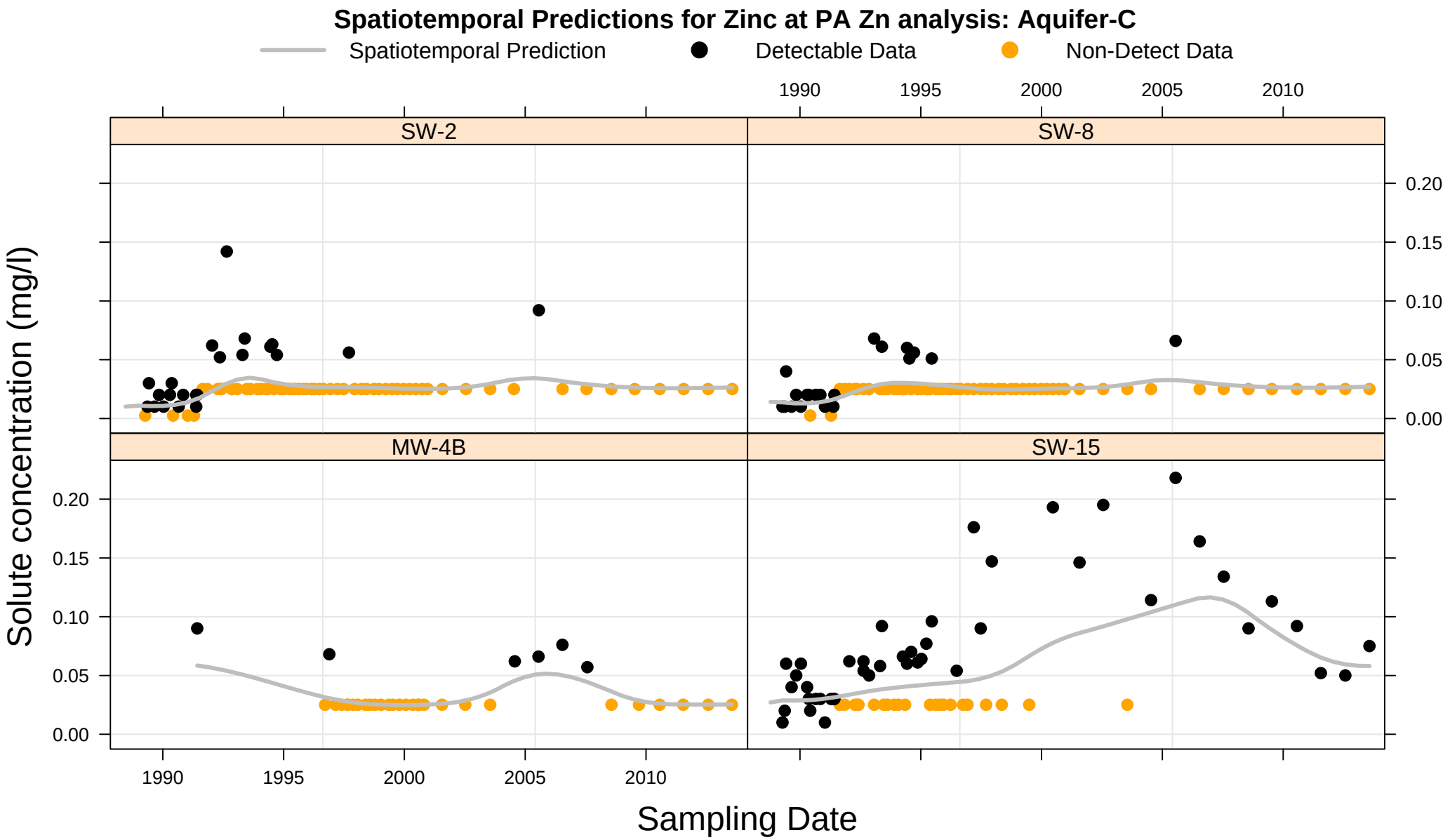

Spatiotemporal Predictions for Aluminum at PA Al analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Cadmium at PA Cd analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
0.000
0.002
0.004
0.006
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Copper at PA Cu analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0.00
0.05
0.10
0.15
0.20
0.25
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron at PA Fe analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Nickel at PA Ni analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0.000
0.005
0.010
0.015
0.020
0.025
1990
1995
2000
2005
2010

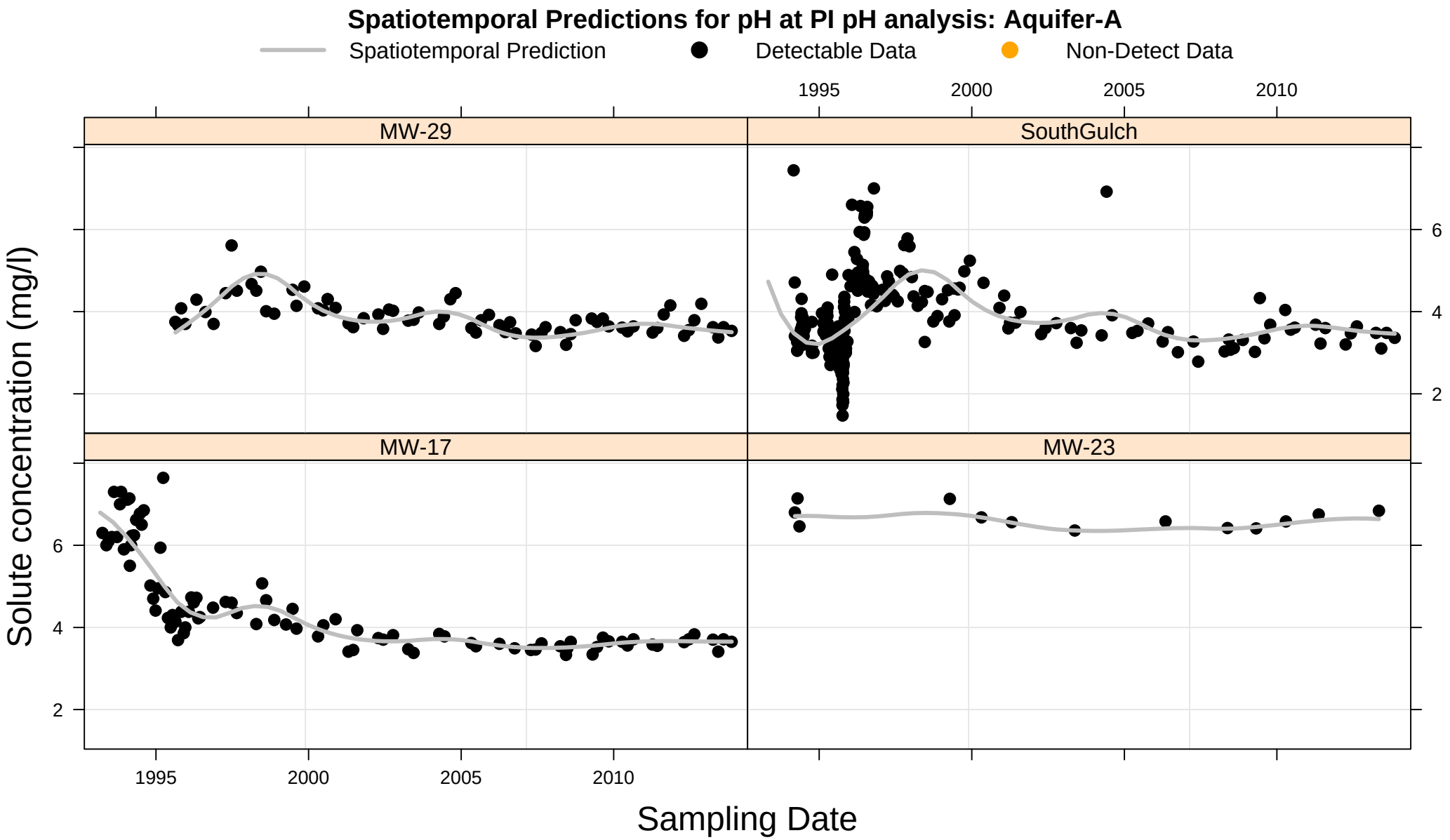

Spatiotemporal Predictions for Zinc at PA Zn analysis: Aquifer-C
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
SW-2
SW-8
MW-4B
SW-15
Solute concentration (mg/l)
Sampling Date
0.00
0.05
0.10
0.15
0.20
1990
1995
2000
2005
2010

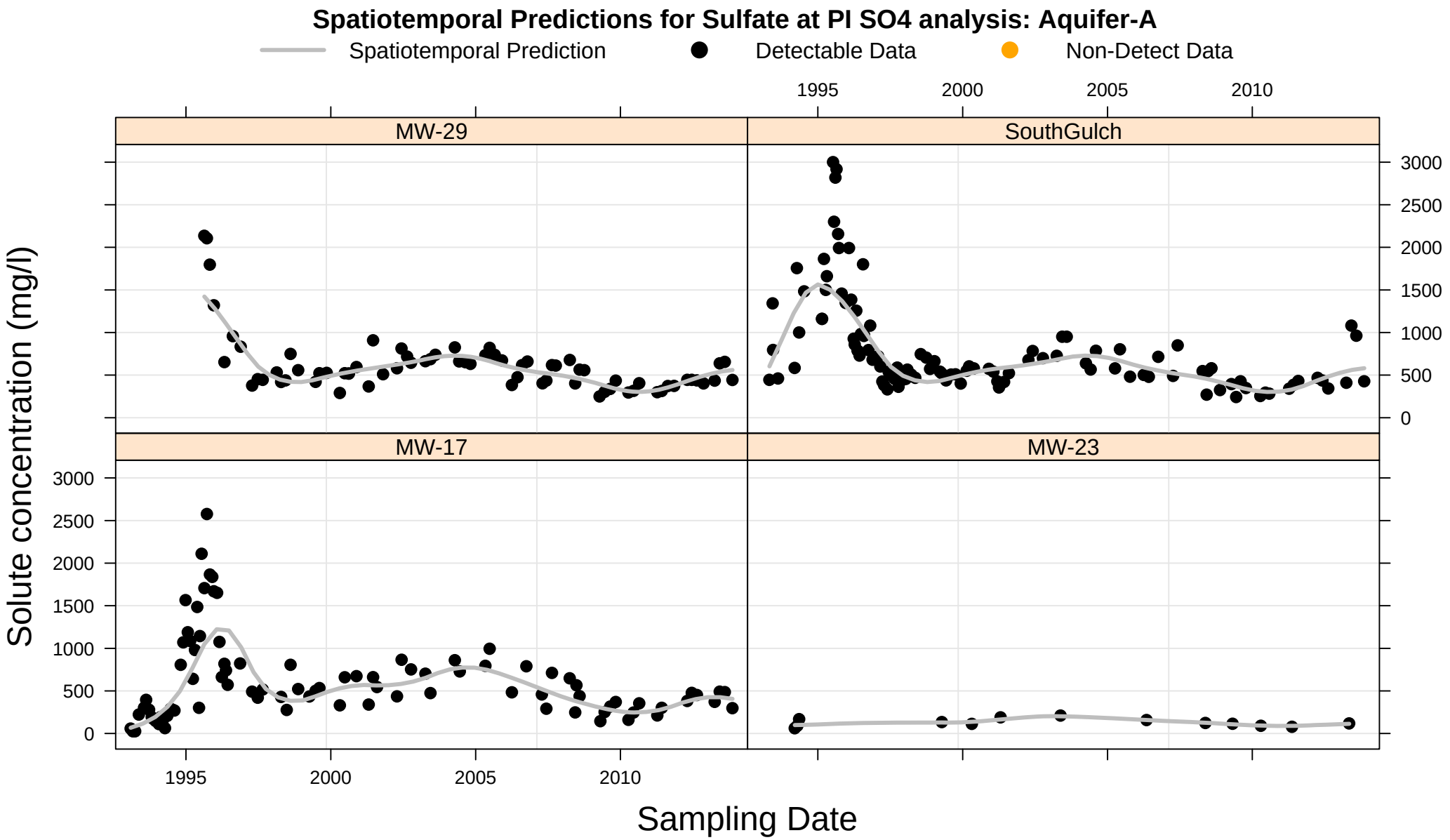
Appendix C.1

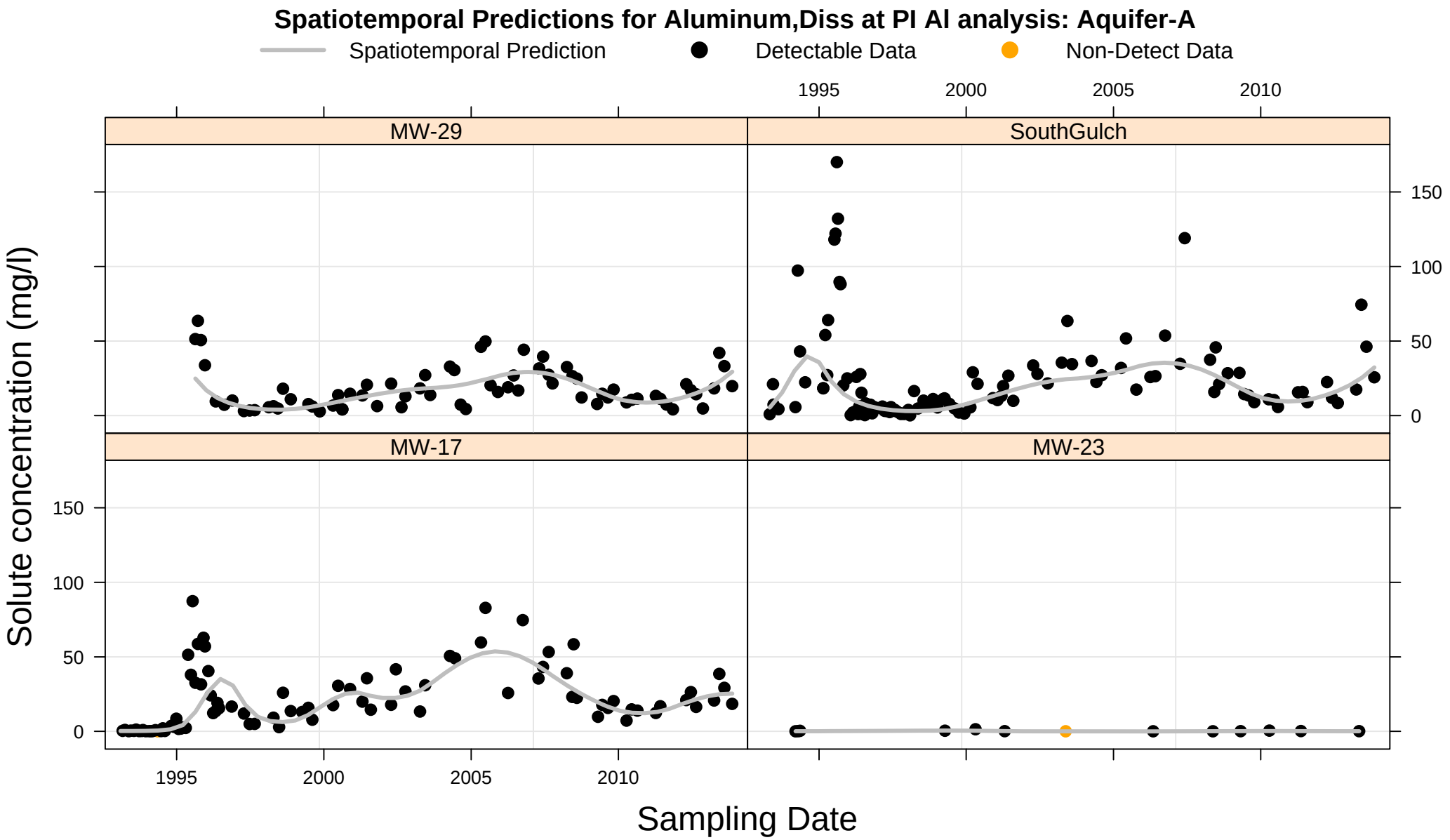
Pit Impoundment:

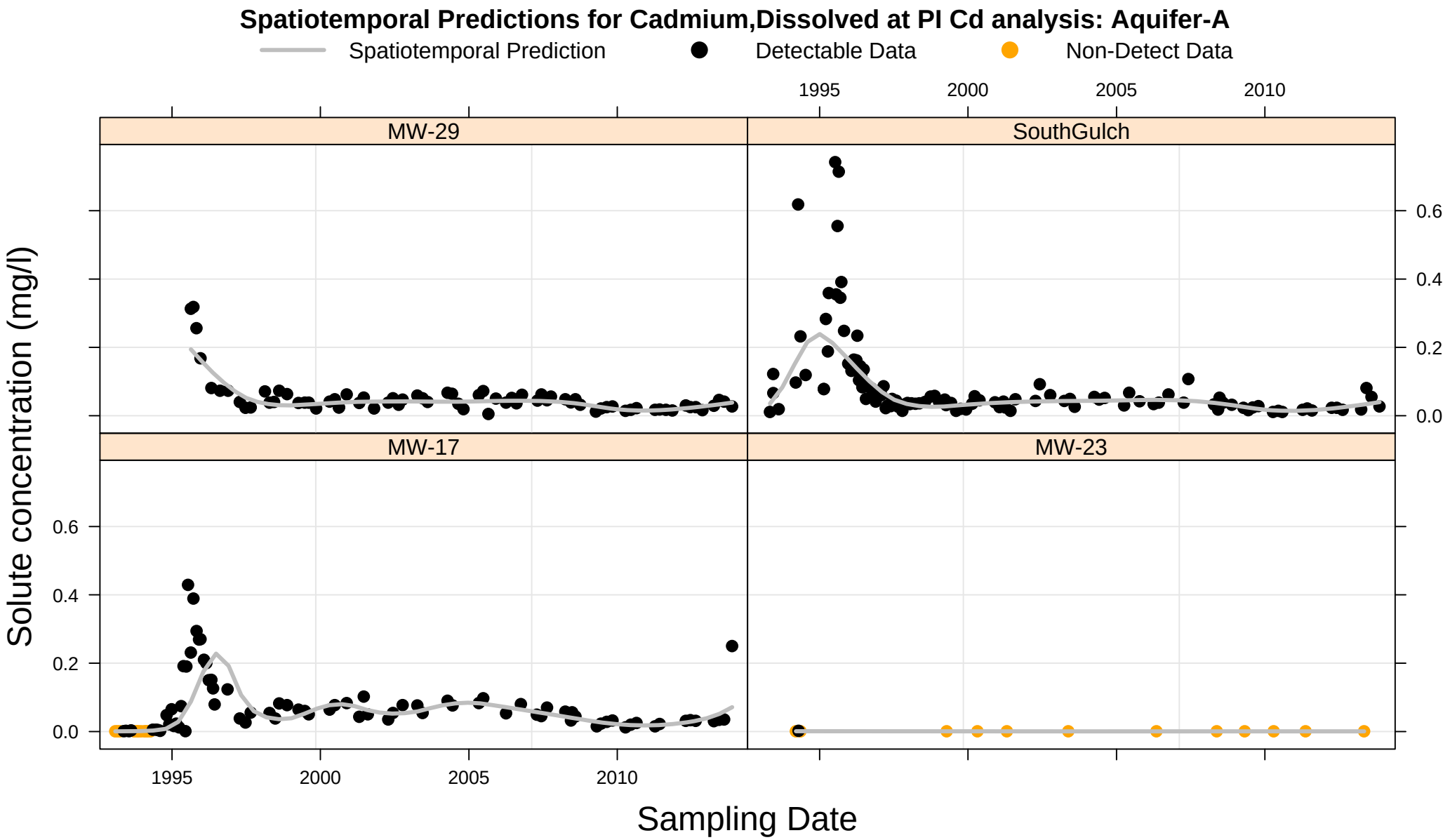
Shallow Monitoring Network

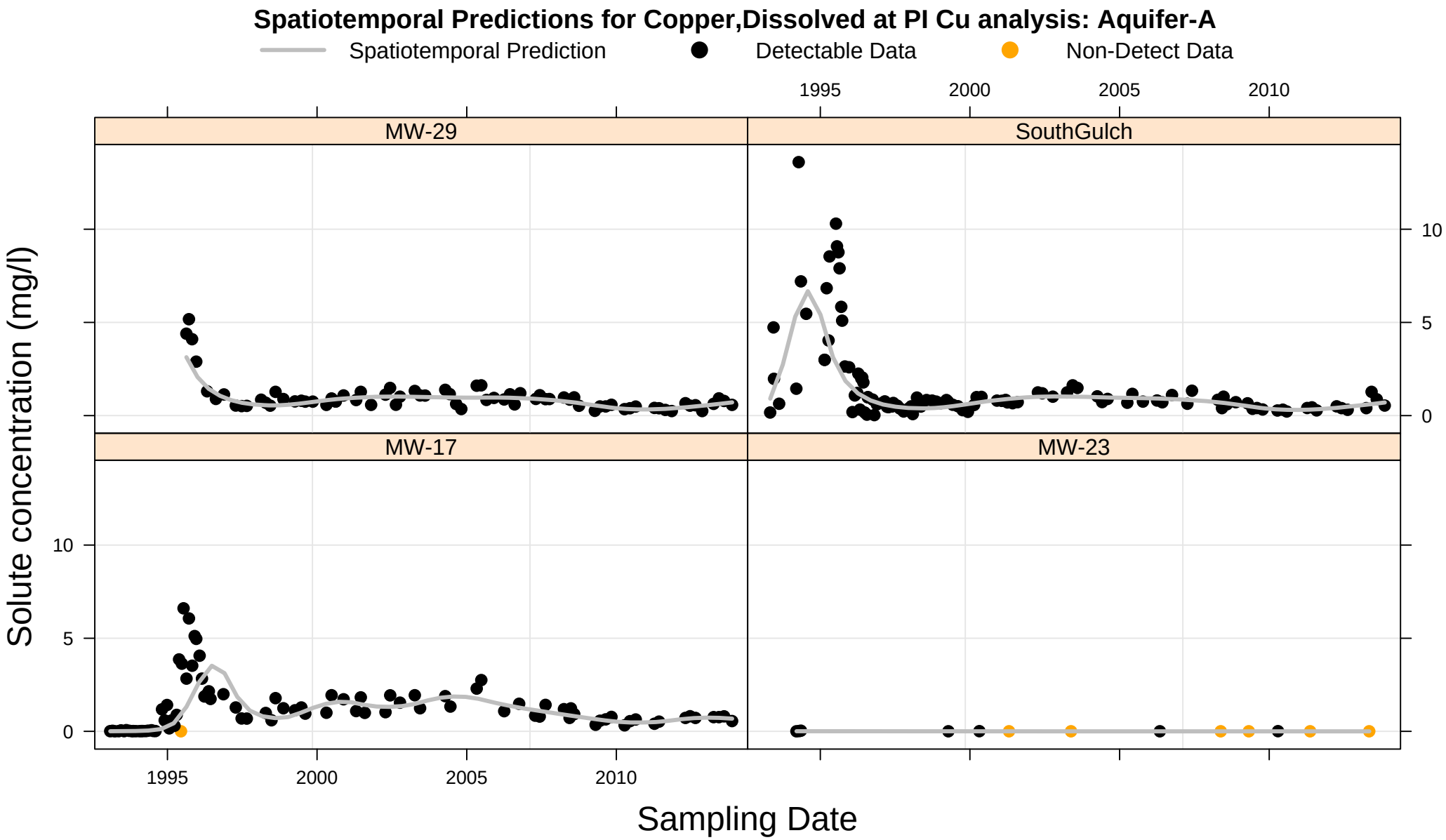
Water Quality Graphs

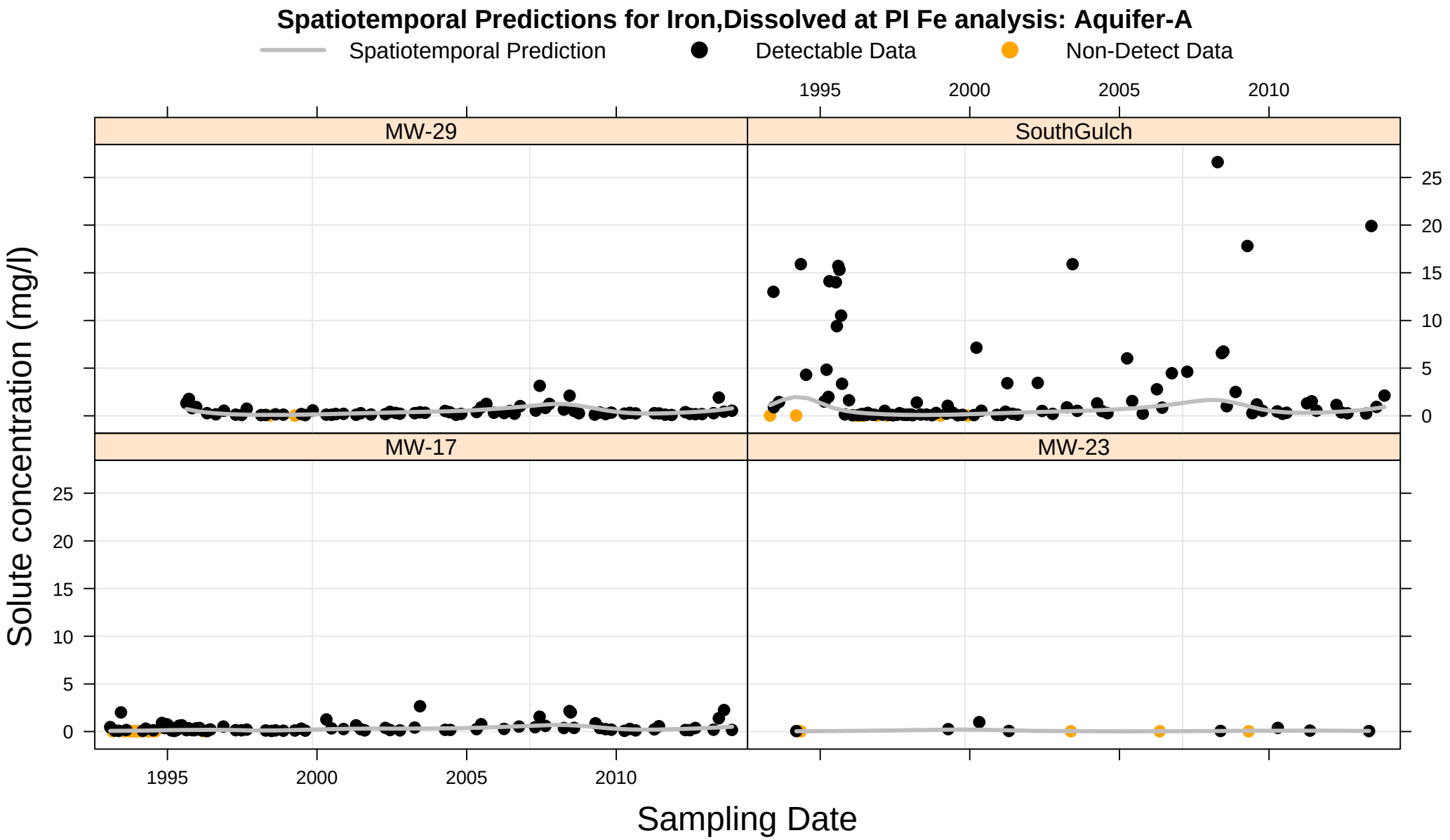

Spatiotemporal Predictions for pH at PI pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
1995
2000
2005
2010
2
4
6

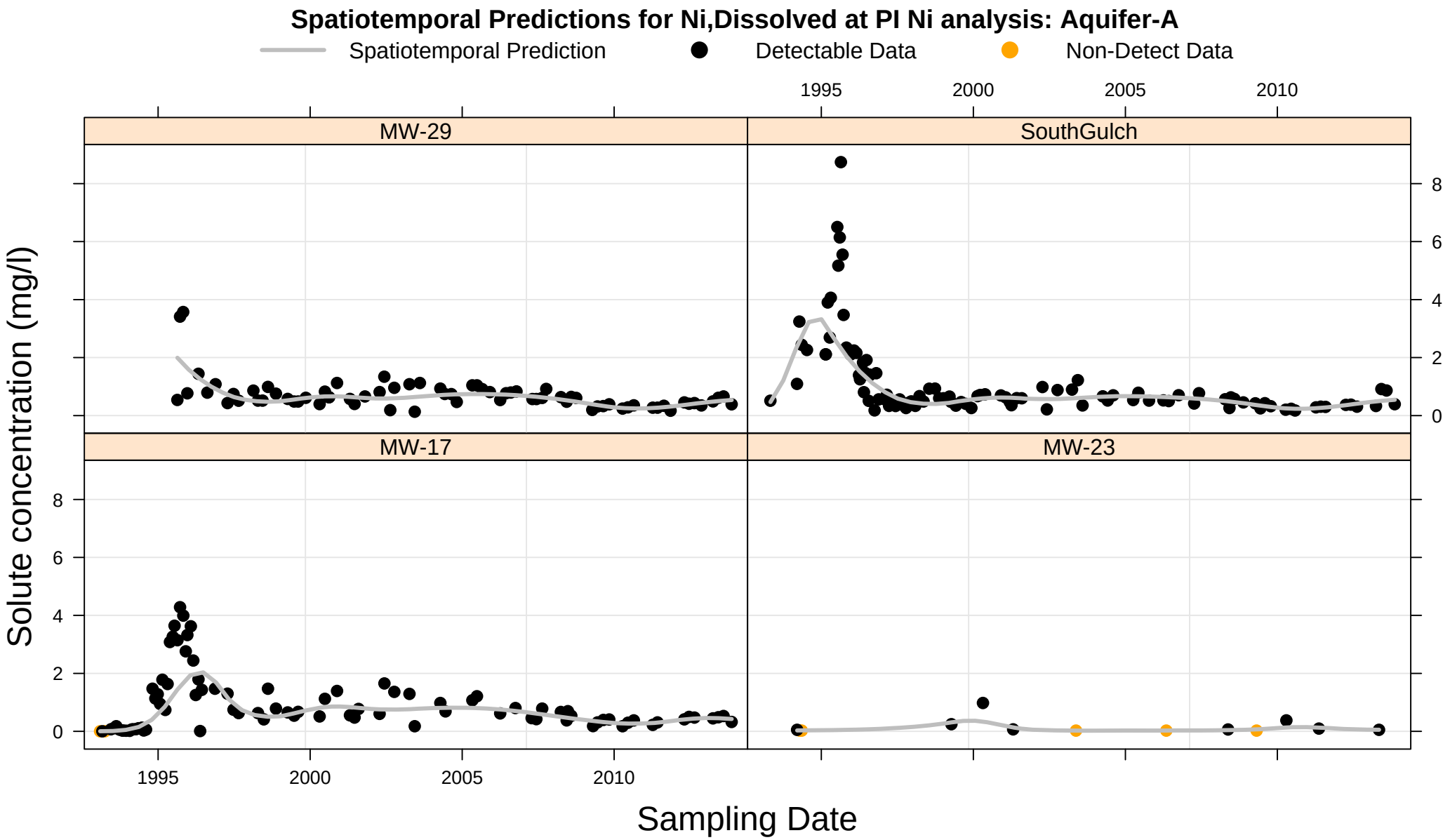

Spatiotemporal Predictions for Sulfate at PI SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0
500
1000
1500
2000
2500
3000
1995
2000
2005
2010

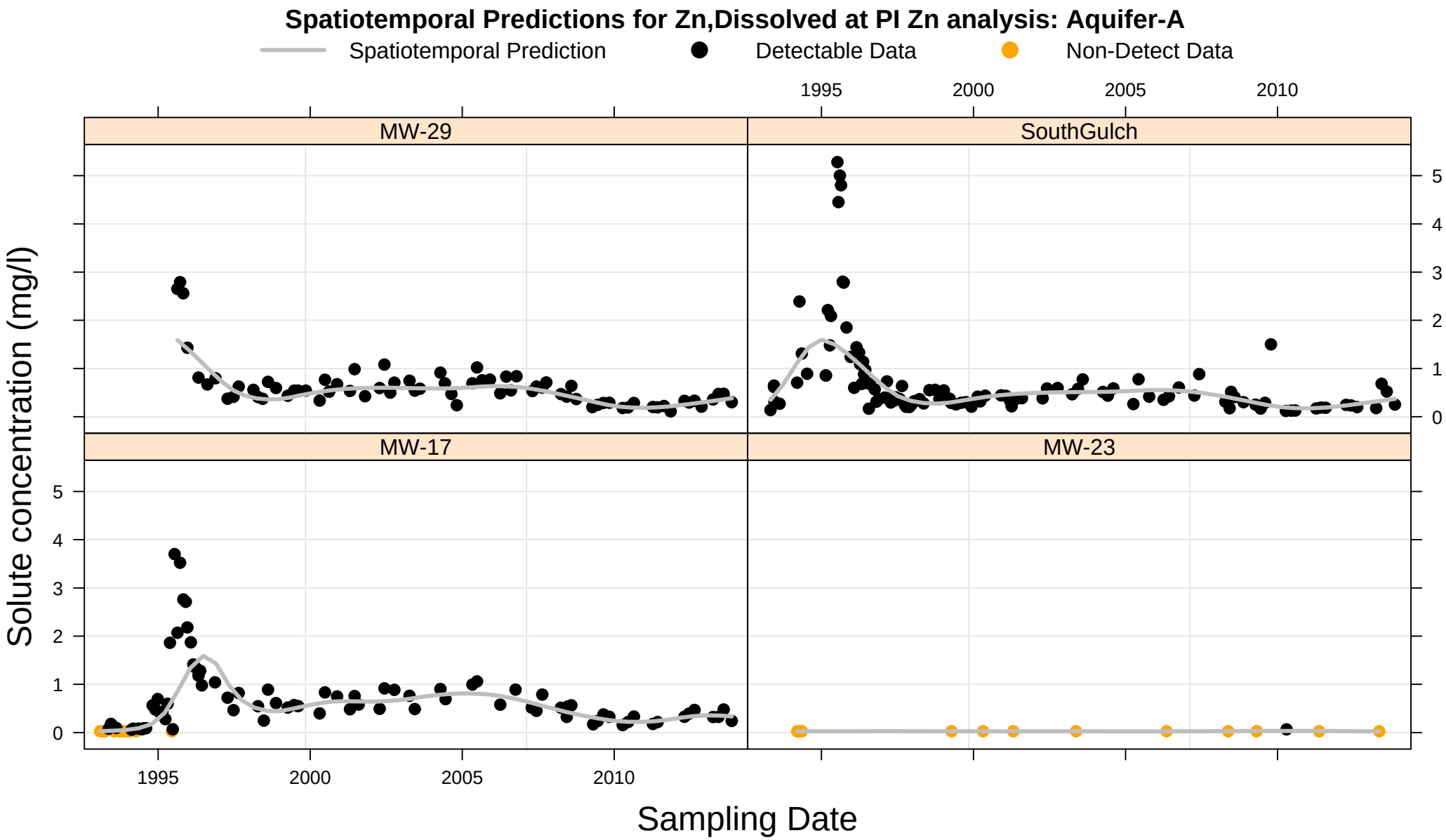

Spatiotemporal Predictions for Aluminum,Diss at Pl Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0
50
100
150
1995
2000
2005
2010


Spatiotemporal Predictions for Cadmium,Dissolved at Pl Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
1995
2000
2005
2010


Spatiotemporal Predictions for Copper,Dissolved at Pl Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0
5
10
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,Dissolved at Pl Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0
5
10
15
20
25
1995
2000
2005
2010


Spatiotemporal Predictions for Ni,Dissolved at PI Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
0
2
4
6
8
1995
2000
2005
2010

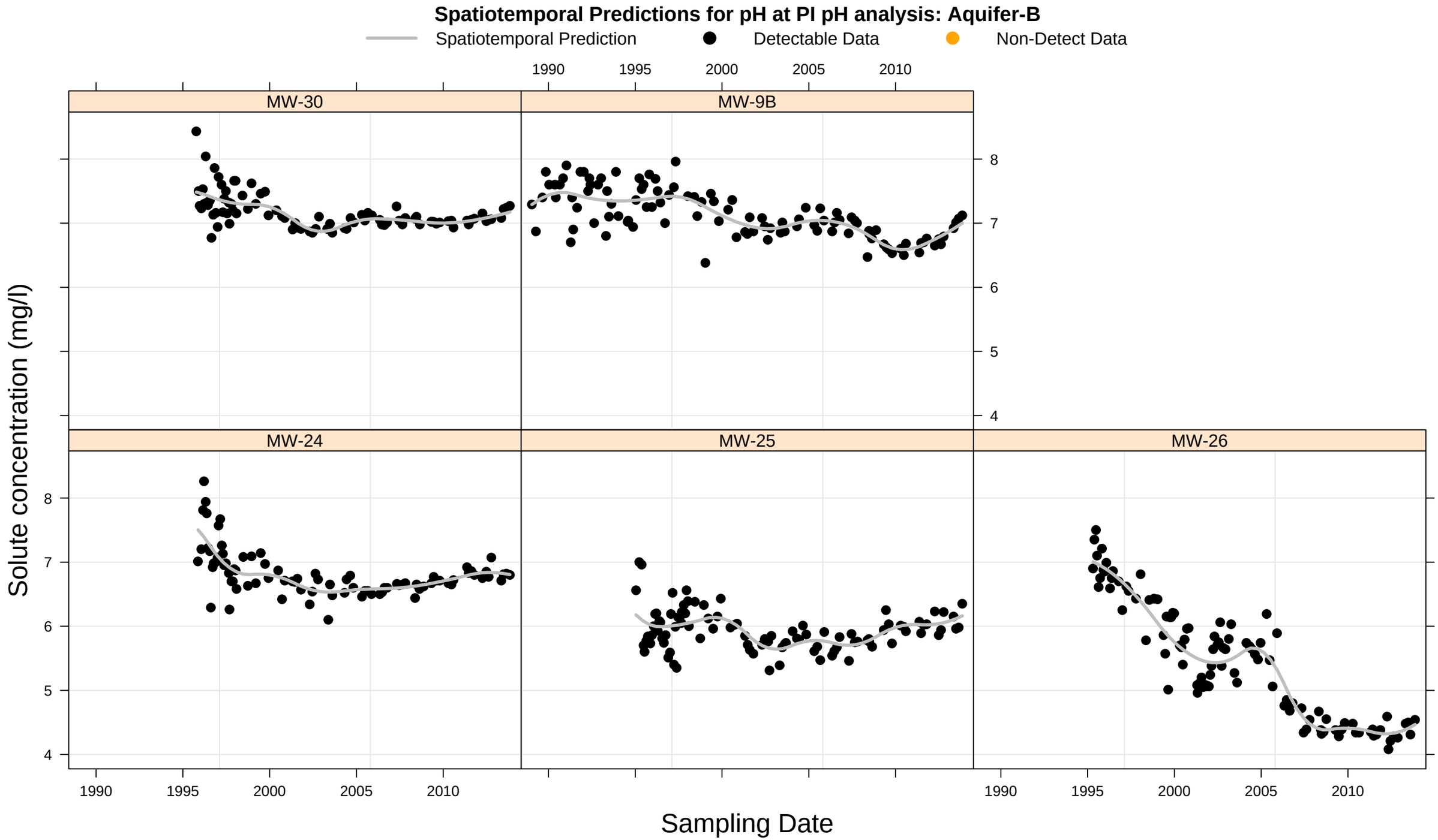

Spatiotemporal Predictions for Zn,Dissolved at PI Zn analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-29
SouthGulch
MW-17
MW-23
Solute concentration (mg/l)
Sampling Date
1995
2000
2005
2010
0
1
2
3
4
5

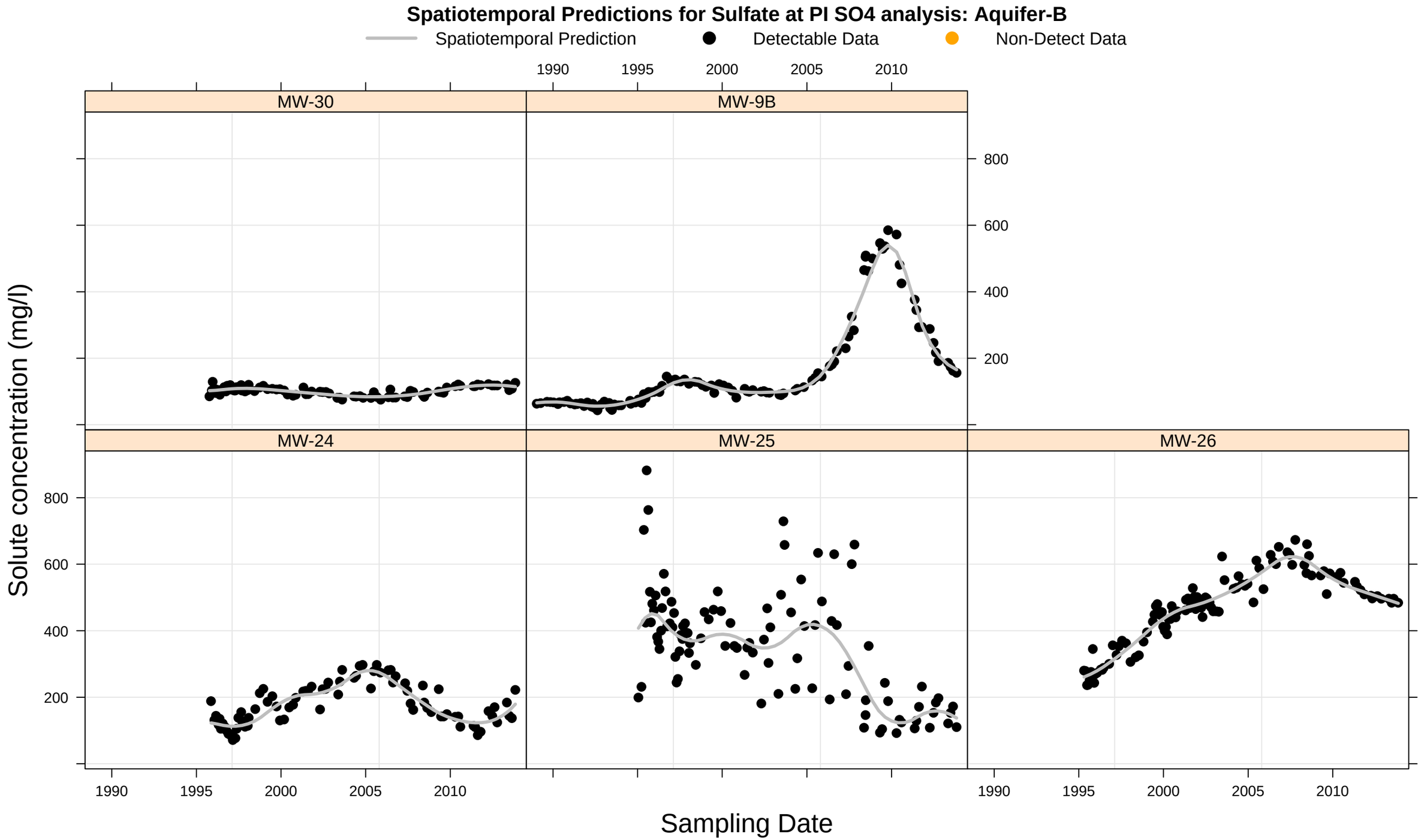
Appendix C.2

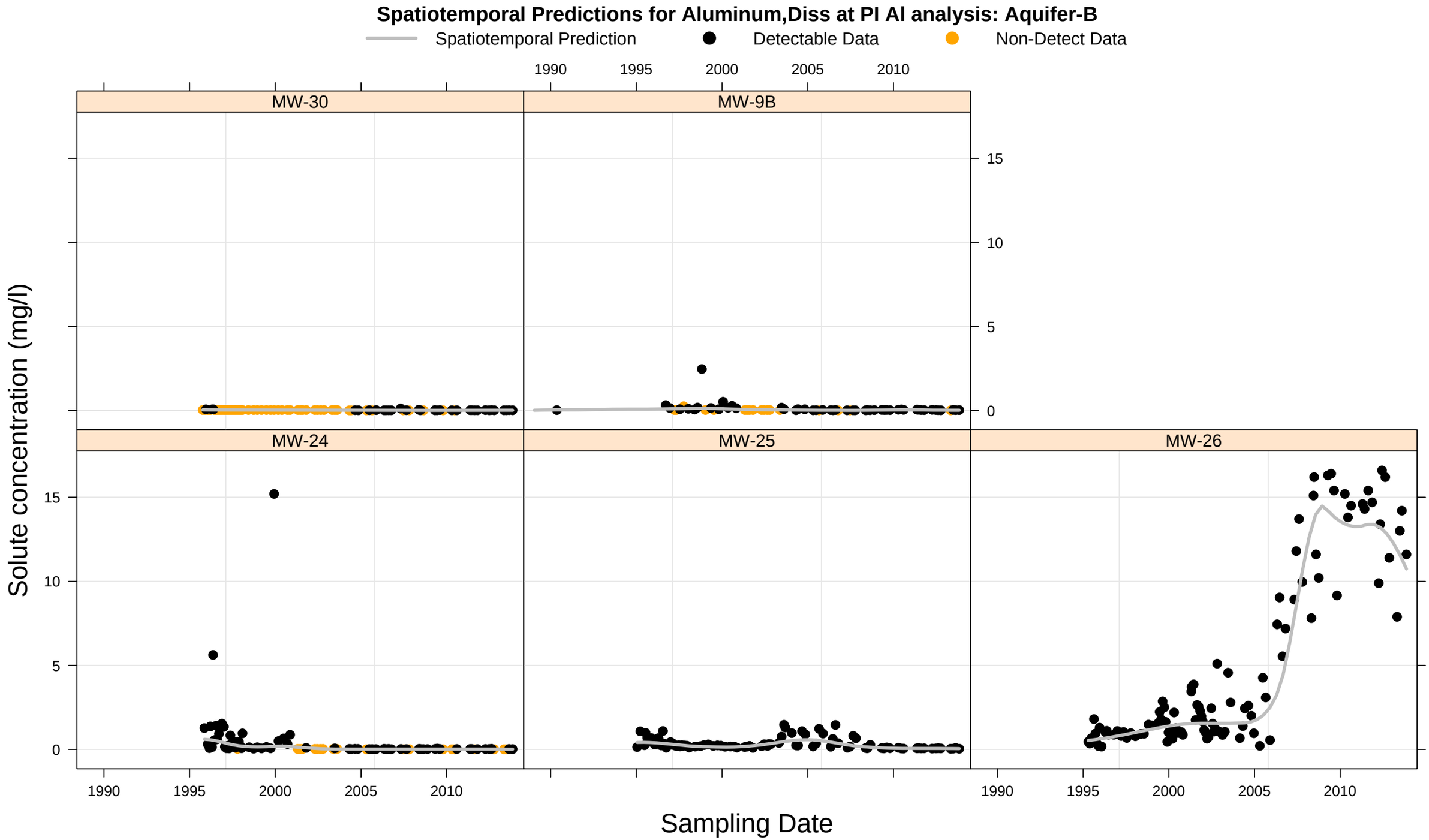
Pit Impoundment:

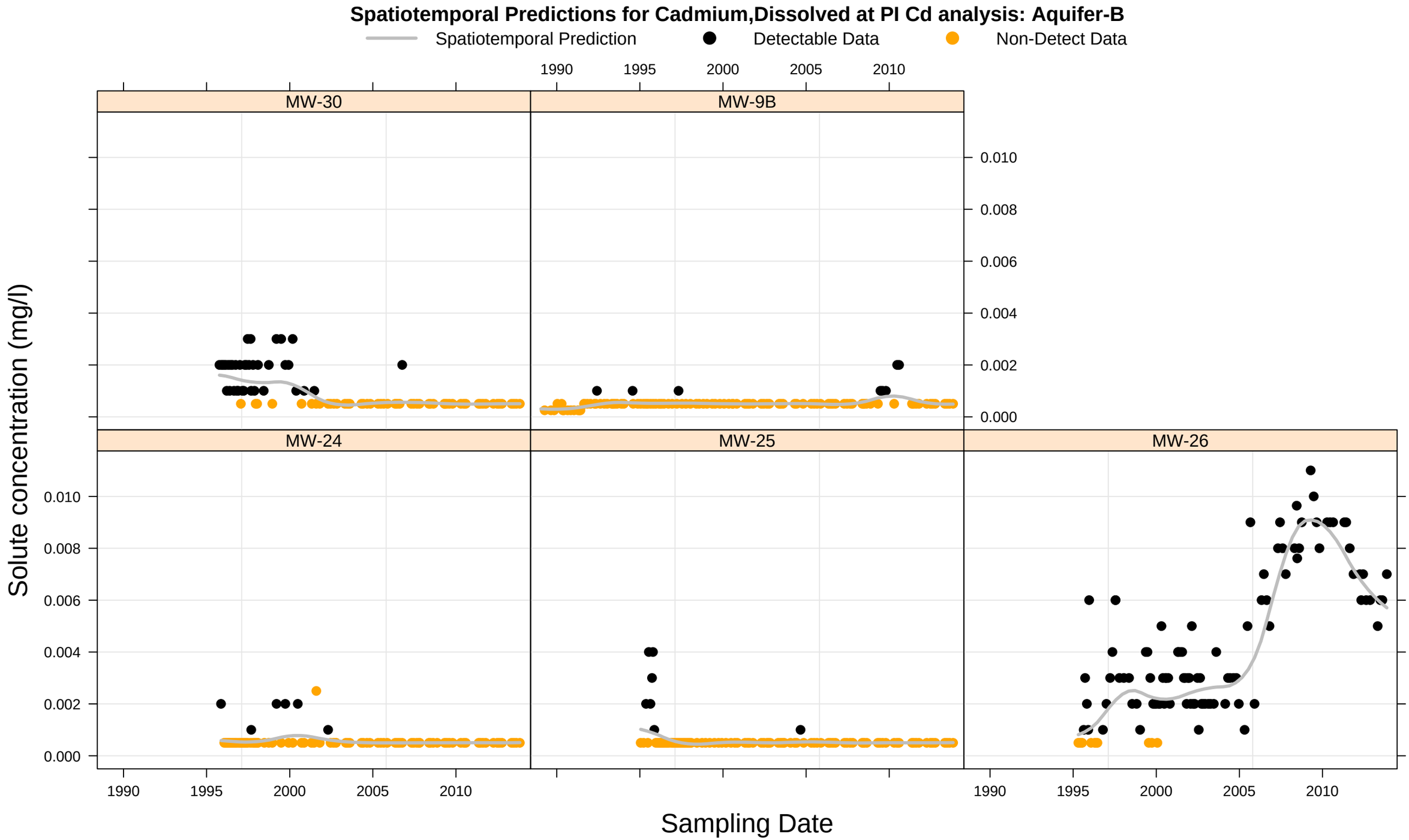
Deep Monitoring Network

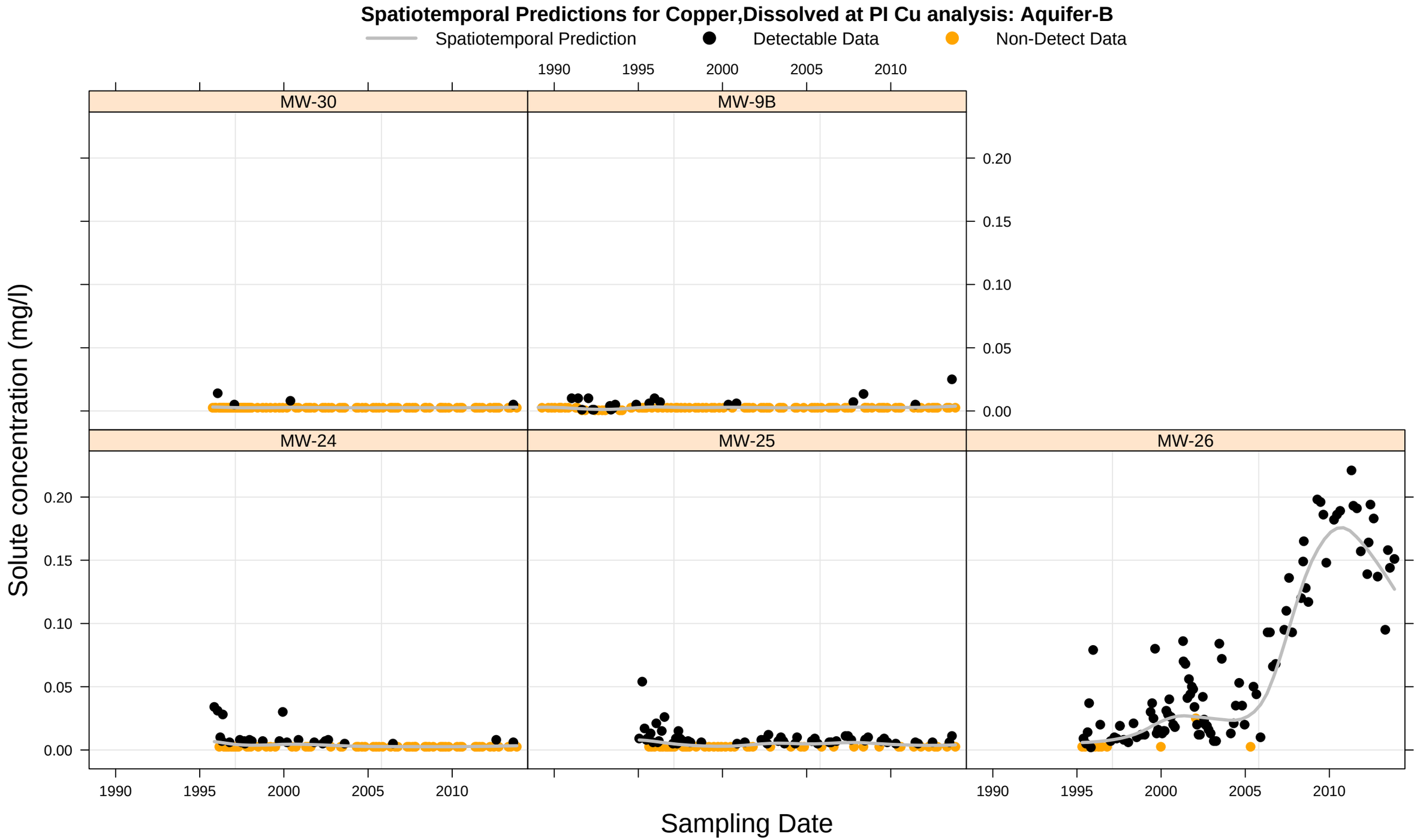
Water Quality Graphs

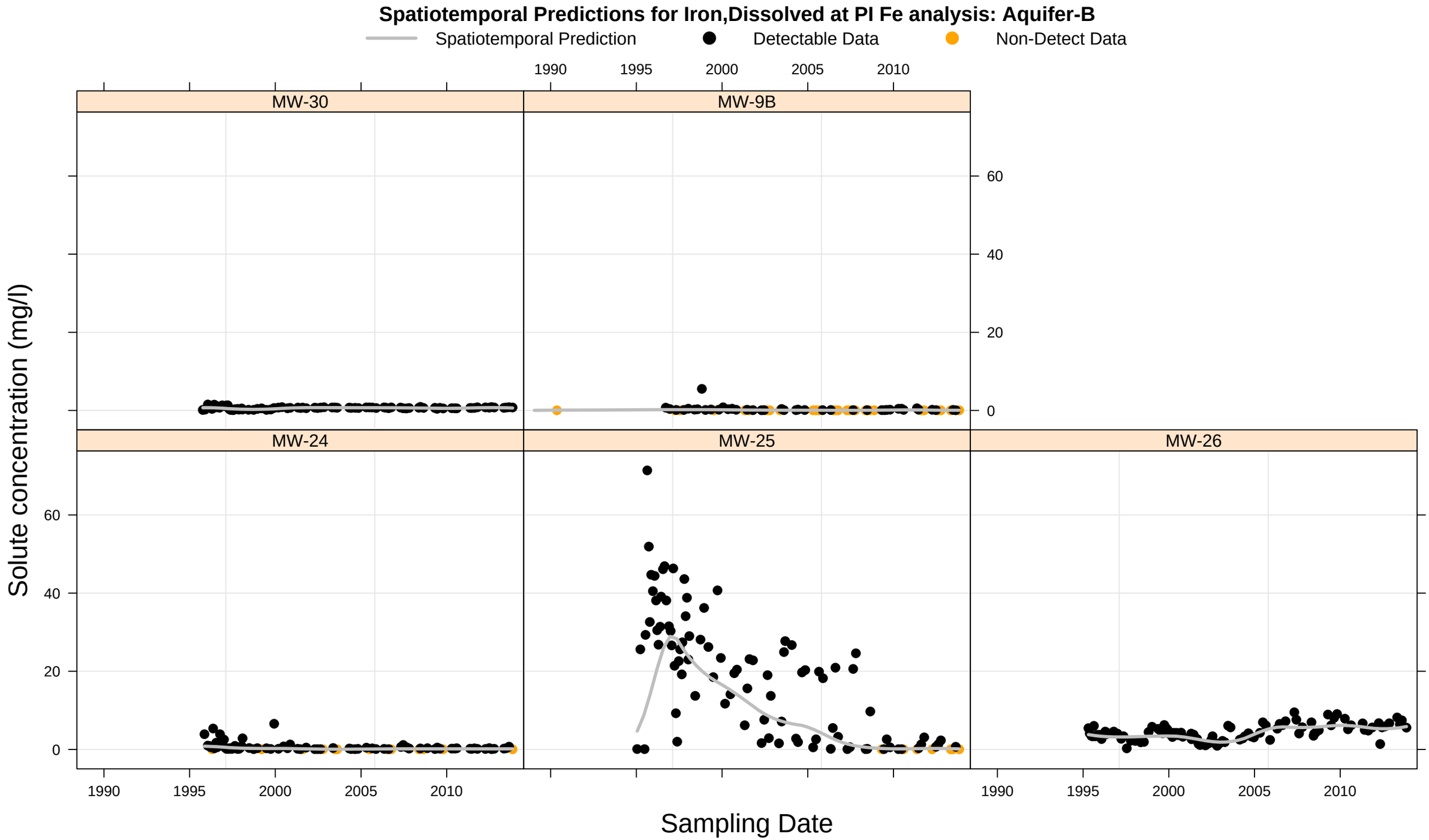

Spatiotemporal Predictions for pH at PI pH analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
4
5
6
7
8

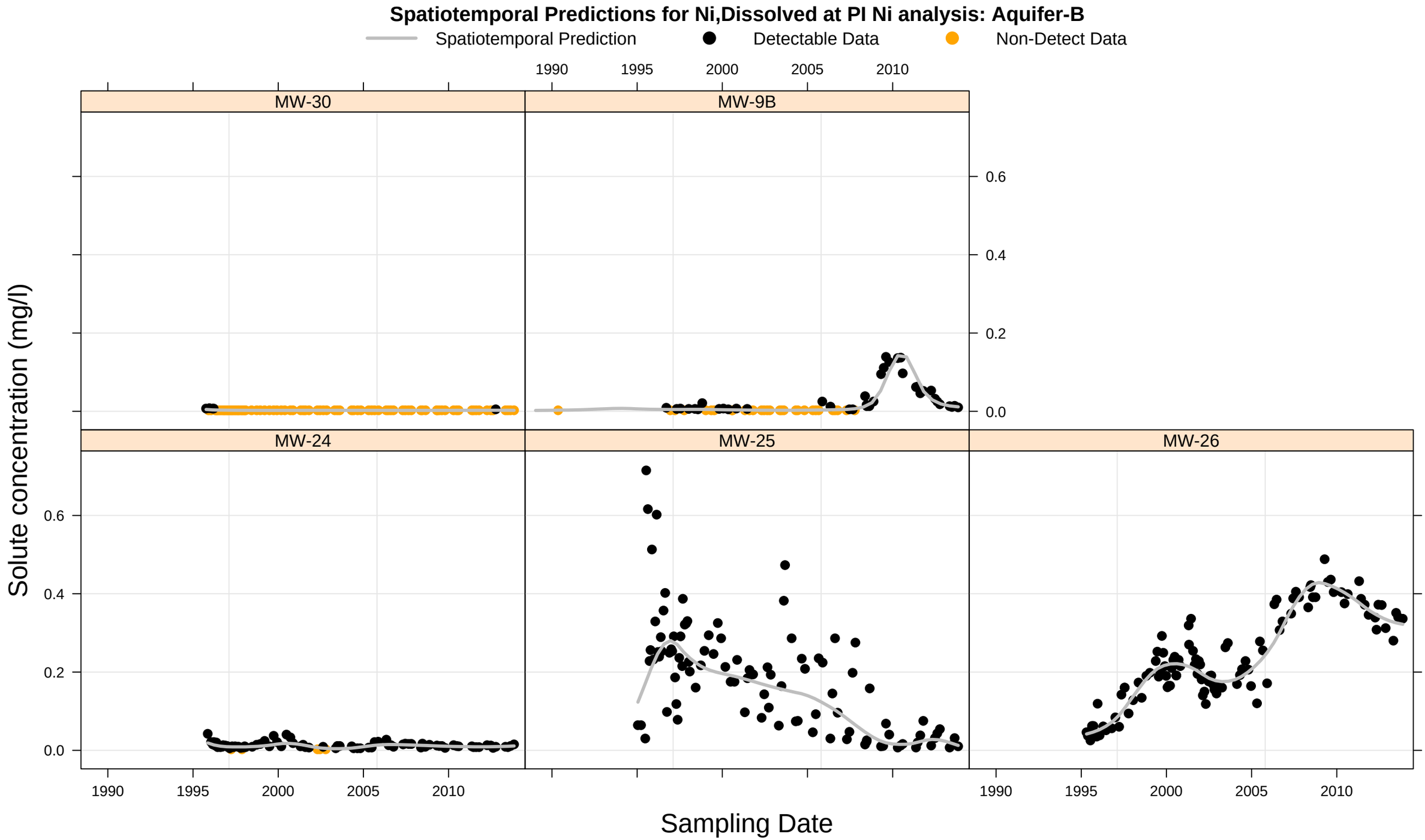

Spatiotemporal Predictions for Sulfate at PI SO4 analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
200
400
600
800
1990
1995
2000
2005
2010

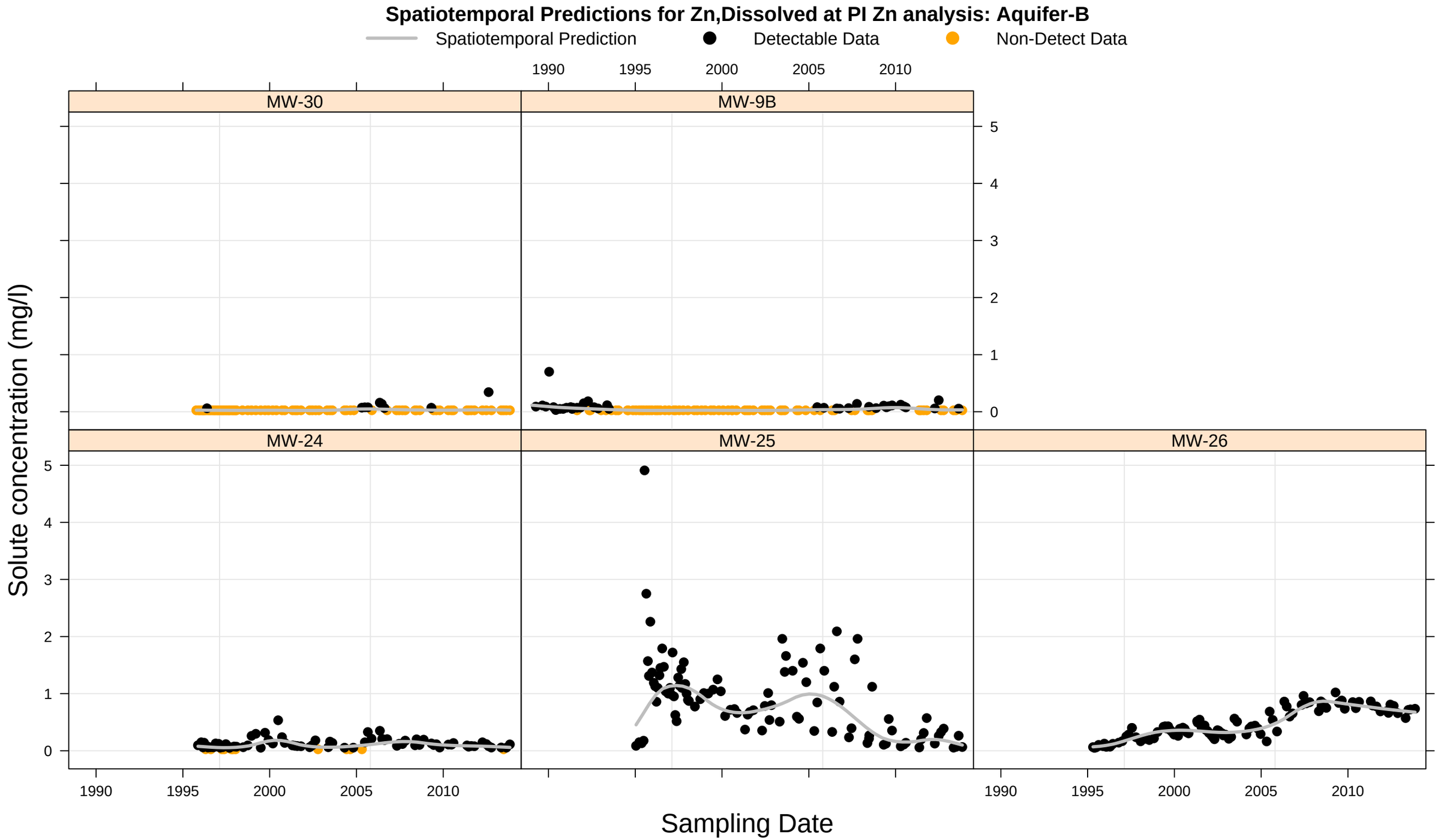

Spatiotemporal Predictions for Aluminum,Diss at PI Al analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0
5
10
15
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Cadmium,Dissolved at PI Cd analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0.000
0.002
0.004
0.006
0.008
0.010
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Copper,Dissolved at PI Cu analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0.00
0.05
0.10
0.15
0.20
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,Dissolved at PI Fe analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0
20
40
60
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Ni,Dissolved at PI Ni analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
1990
1995
2000
2005
2010

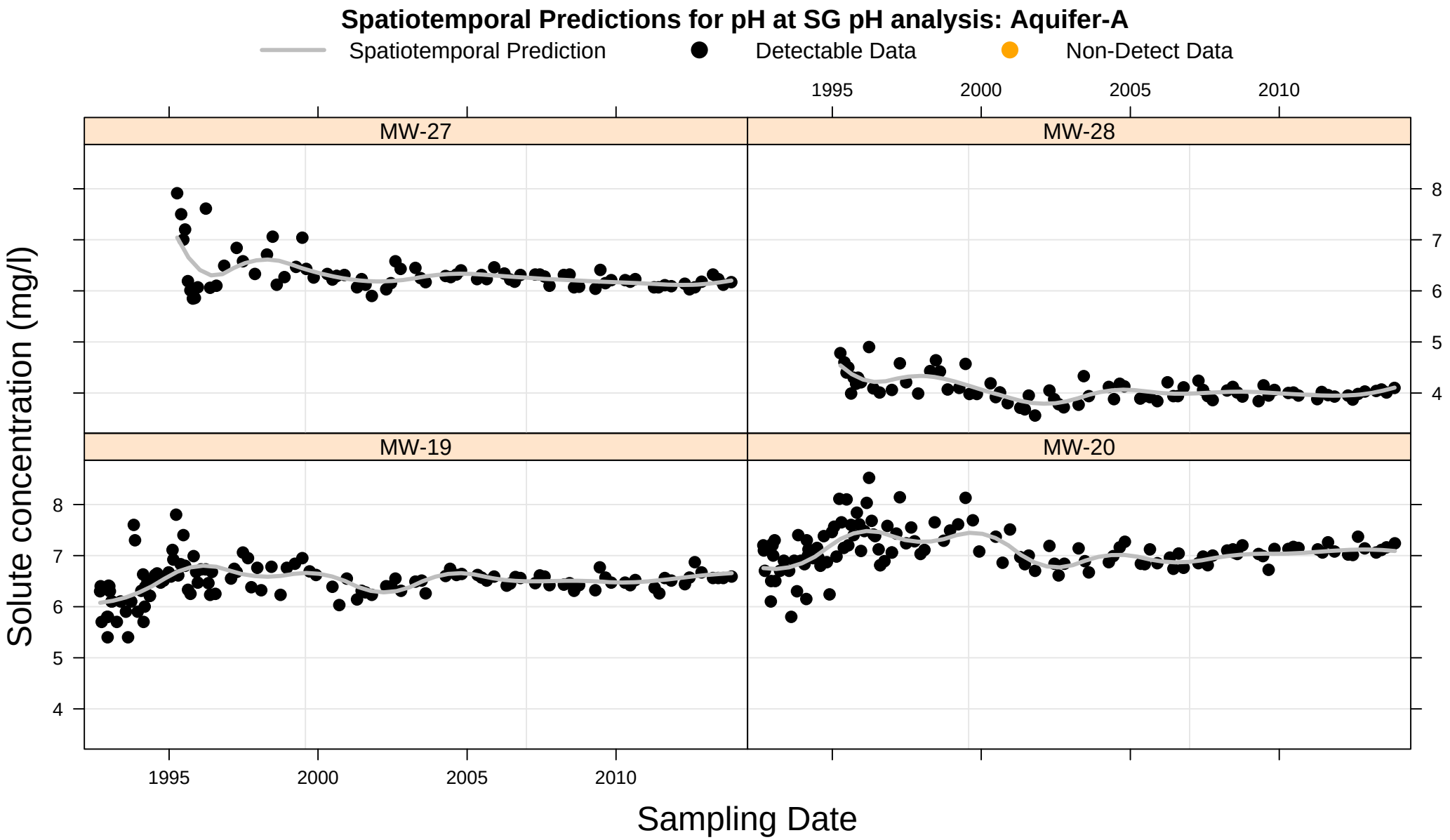

Spatiotemporal Predictions for Zn,Dissolved at PI Zn analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-30
MW-9B
MW-24
MW-25
MW-26
Solute concentration (mg/l)
Sampling Date
0
1
2
3
4
5
1990
1995
2000
2005
2010

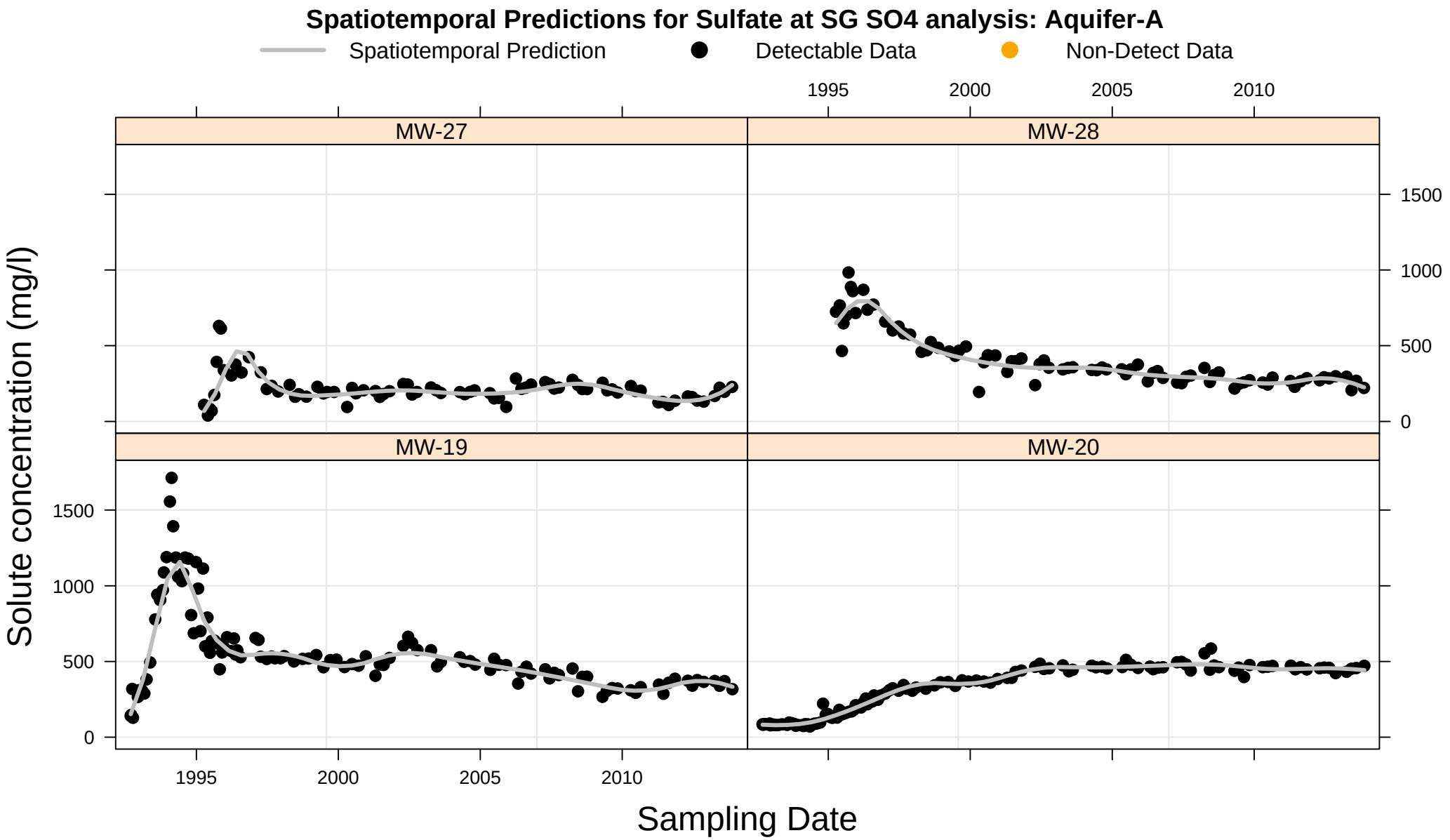
Appendix D.1

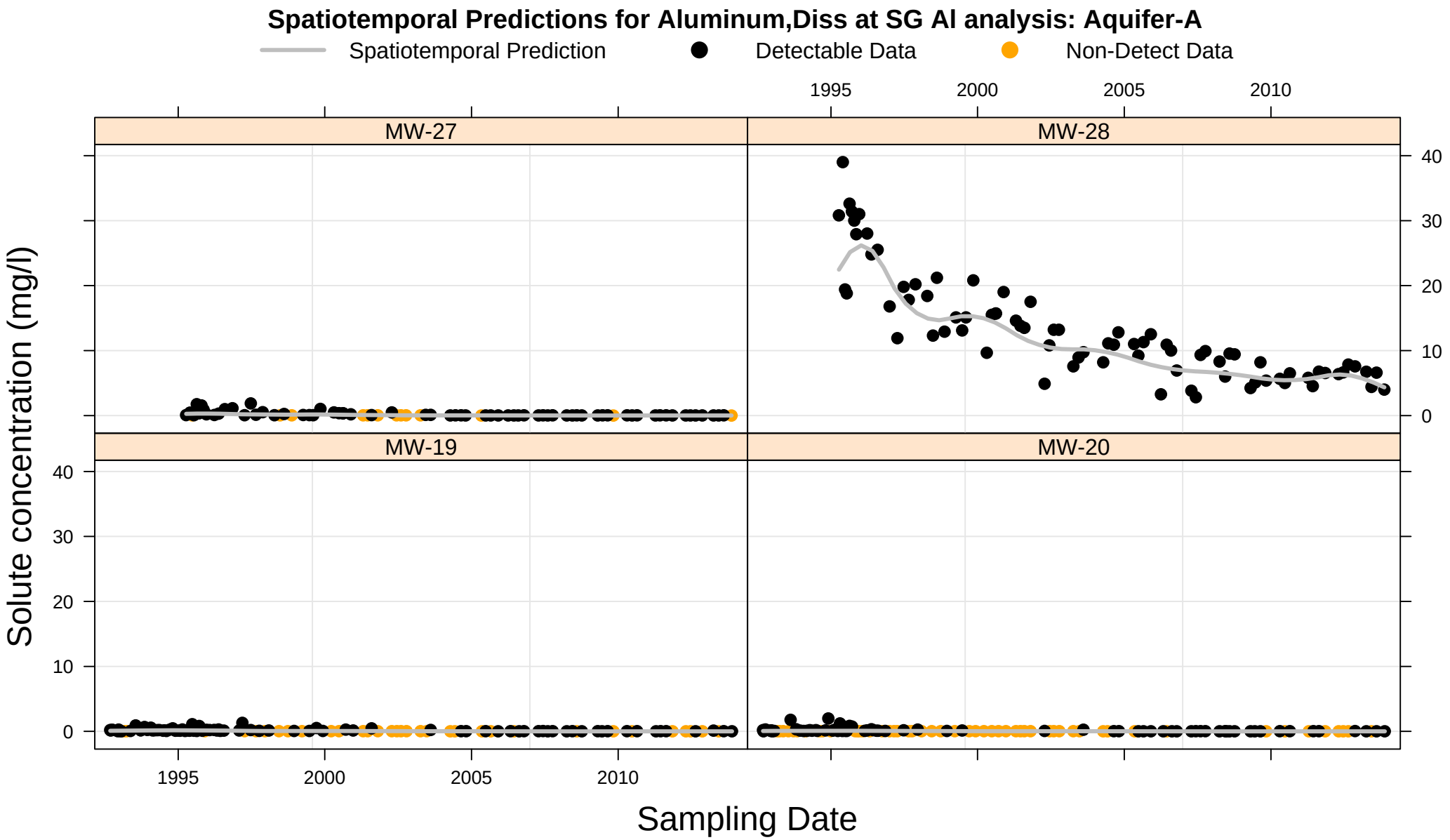
Spruce Gulch:

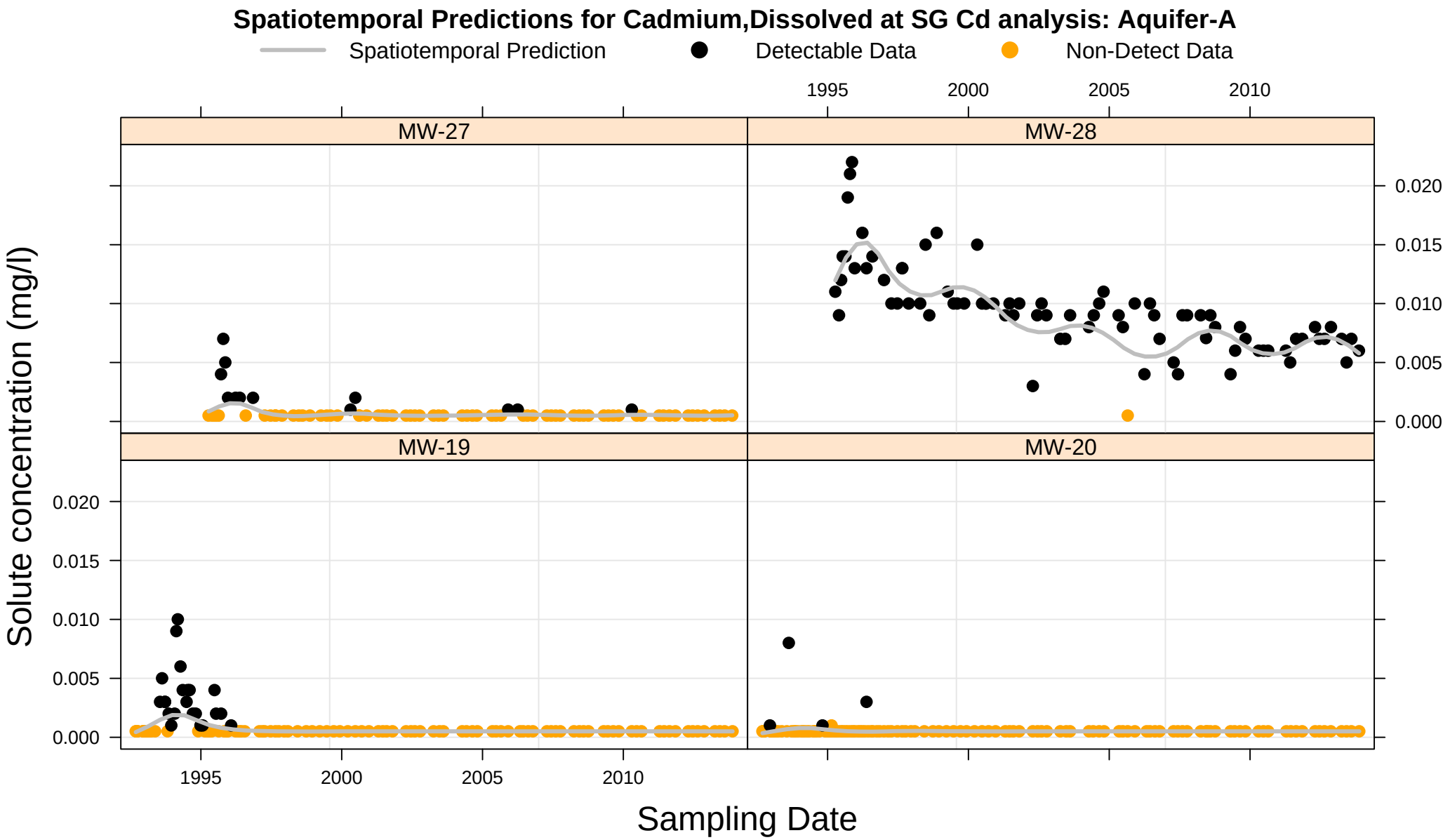
Alluvial/Colluvial Aquifer

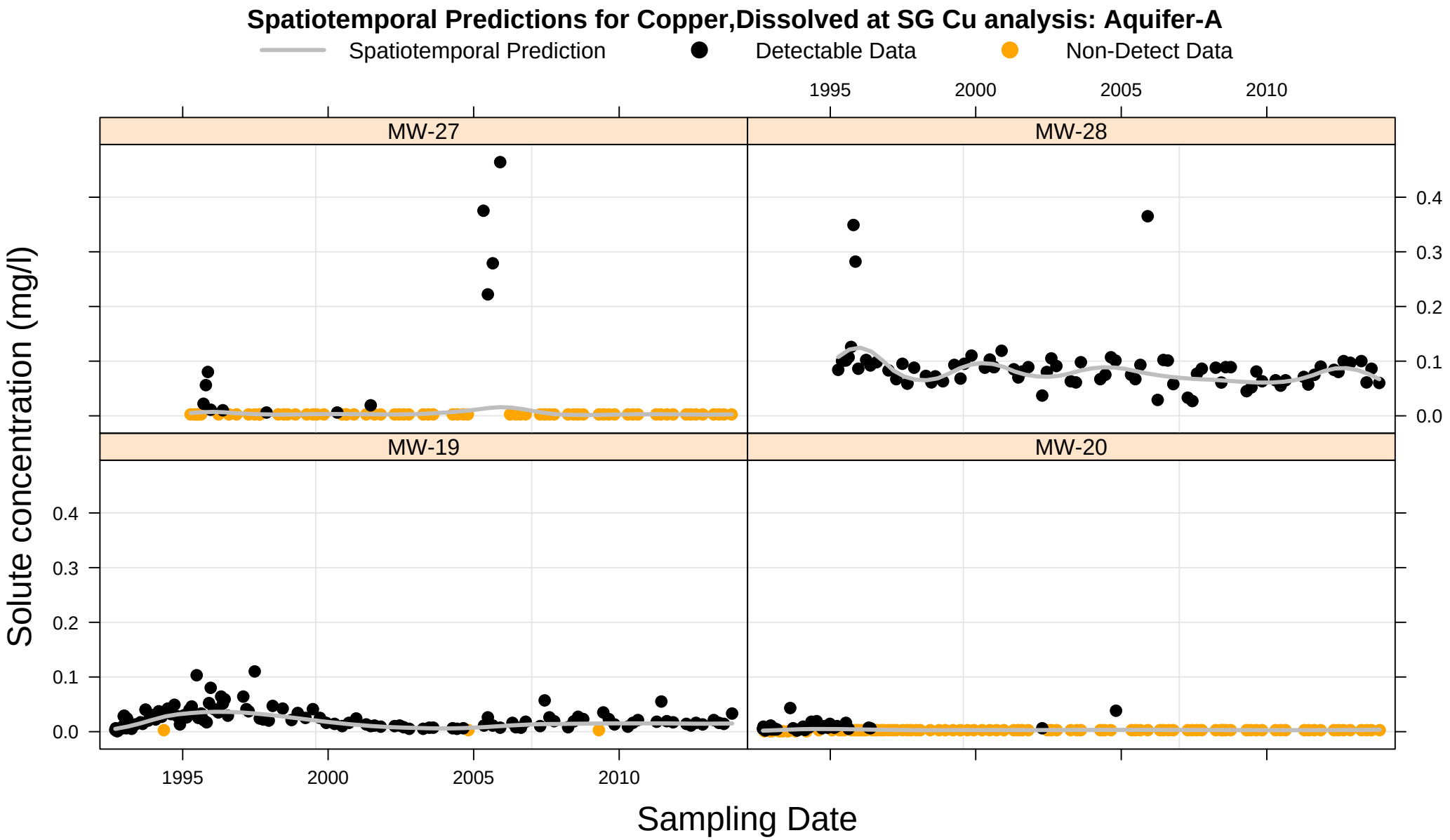
Water Quality Graphs

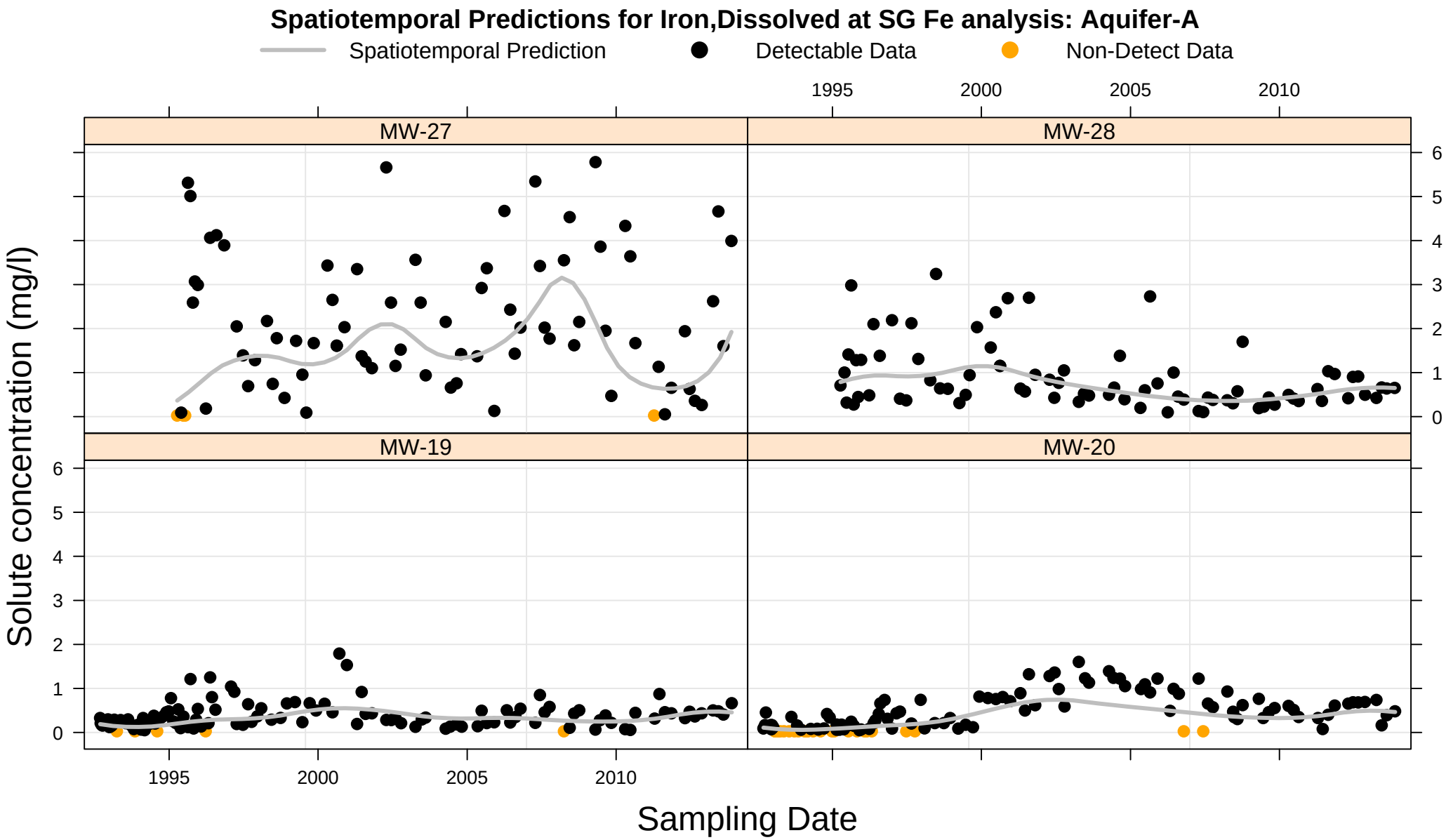

Spatiotemporal Predictions for pH at SG pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
1995
2000
2005
2010
4
5
6
7
8

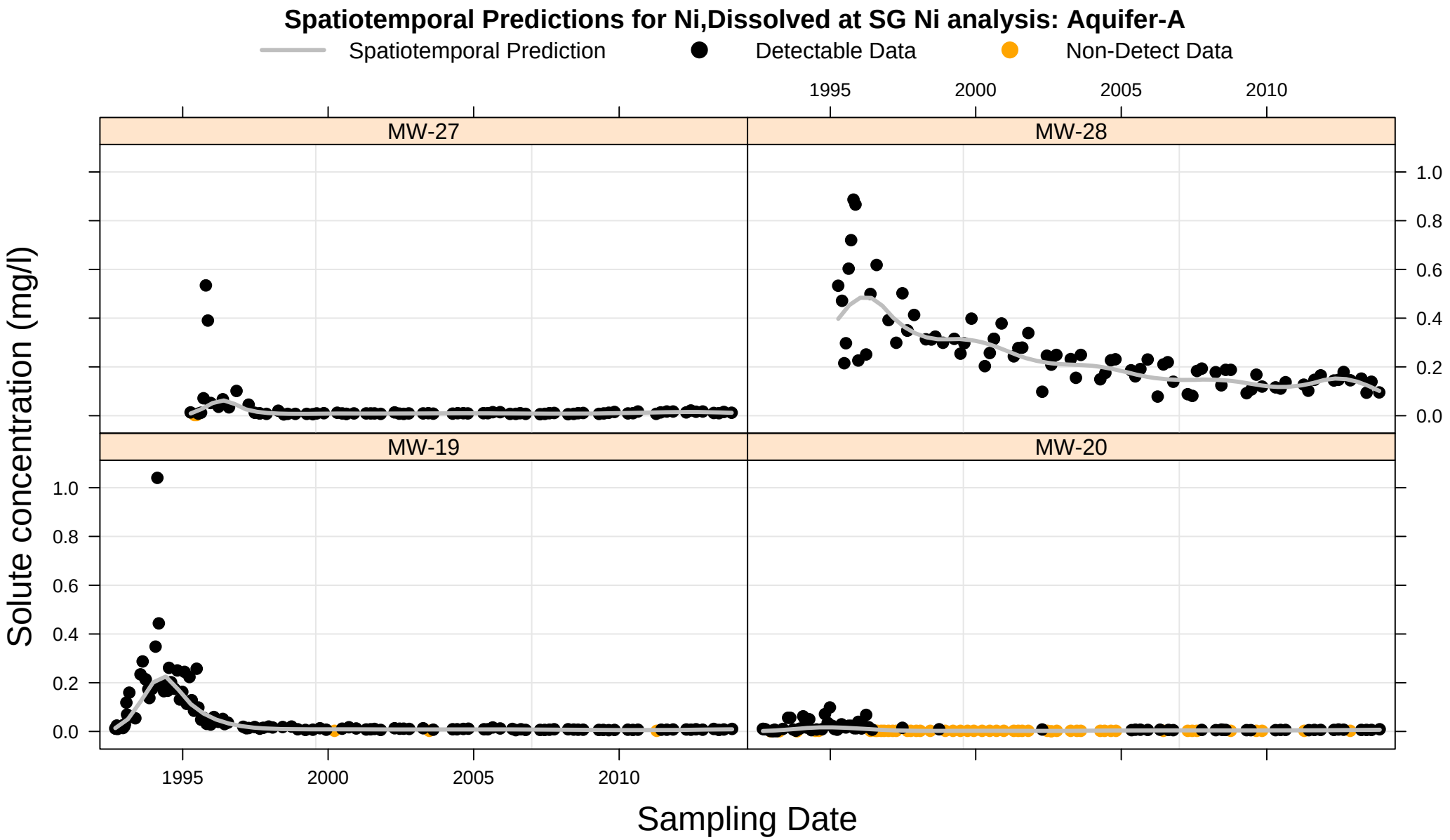

Spatiotemporal Predictions for Sulfate at SG SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0
500
1000
1500
1995
2000
2005
2010

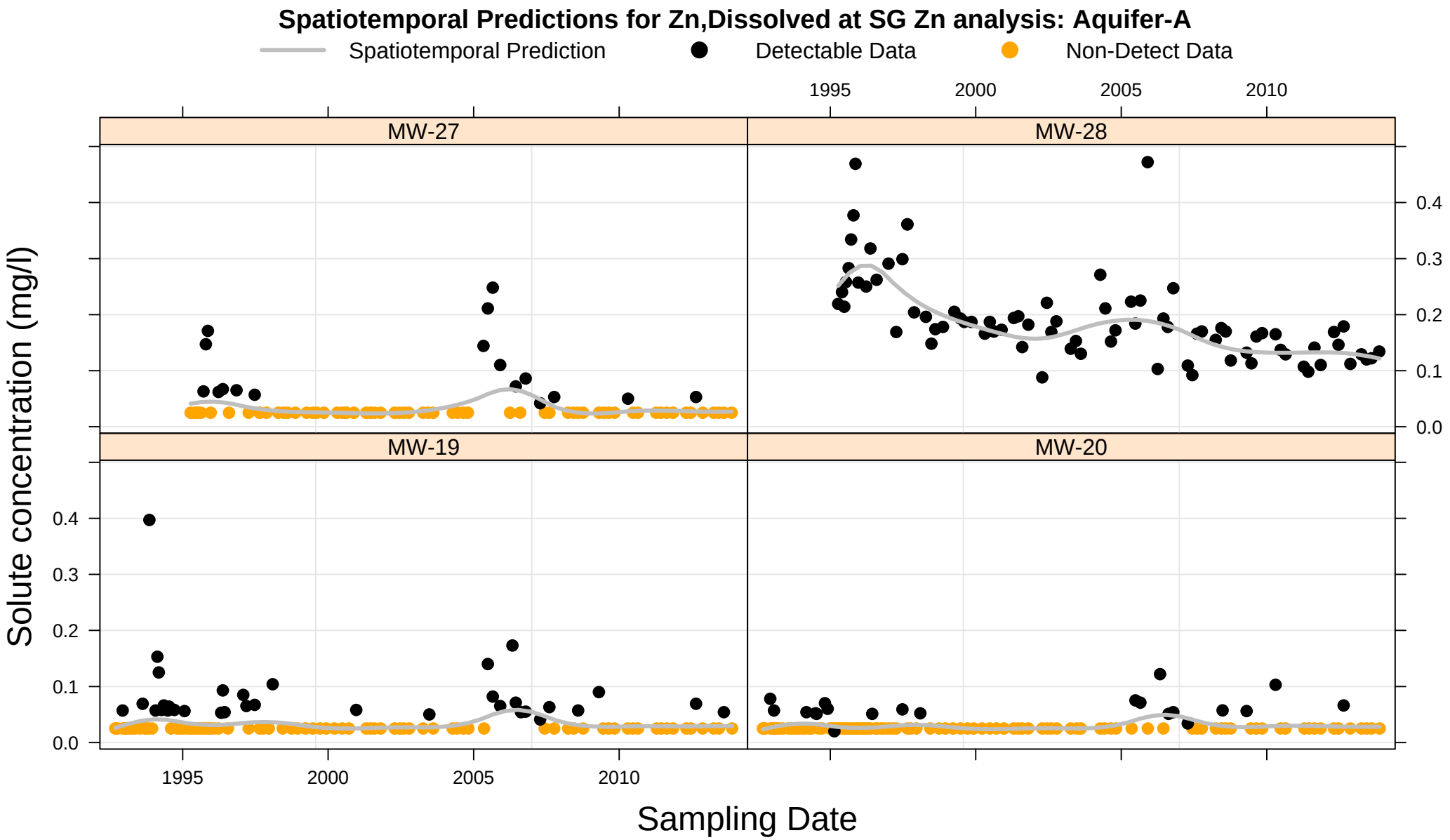

Spatiotemporal Predictions for Aluminum,Diss at SG Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0
10
20
30
40
1995
2000
2005
2010


Spatiotemporal Predictions for Cadmium,Dissolved at SG Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0.000
0.005
0.010
0.015
0.020
1995
2000
2005
2010


Spatiotemporal Predictions for Copper,Dissolved at SG Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0.0
0.1
0.2
0.3
0.4
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,Dissolved at SG Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
1995
2000
2005
2010
0
1
2
3
4
5
6


Spatiotemporal Predictions for Ni,Dissolved at SG Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
0.8
1.0
1995
2000
2005
2010

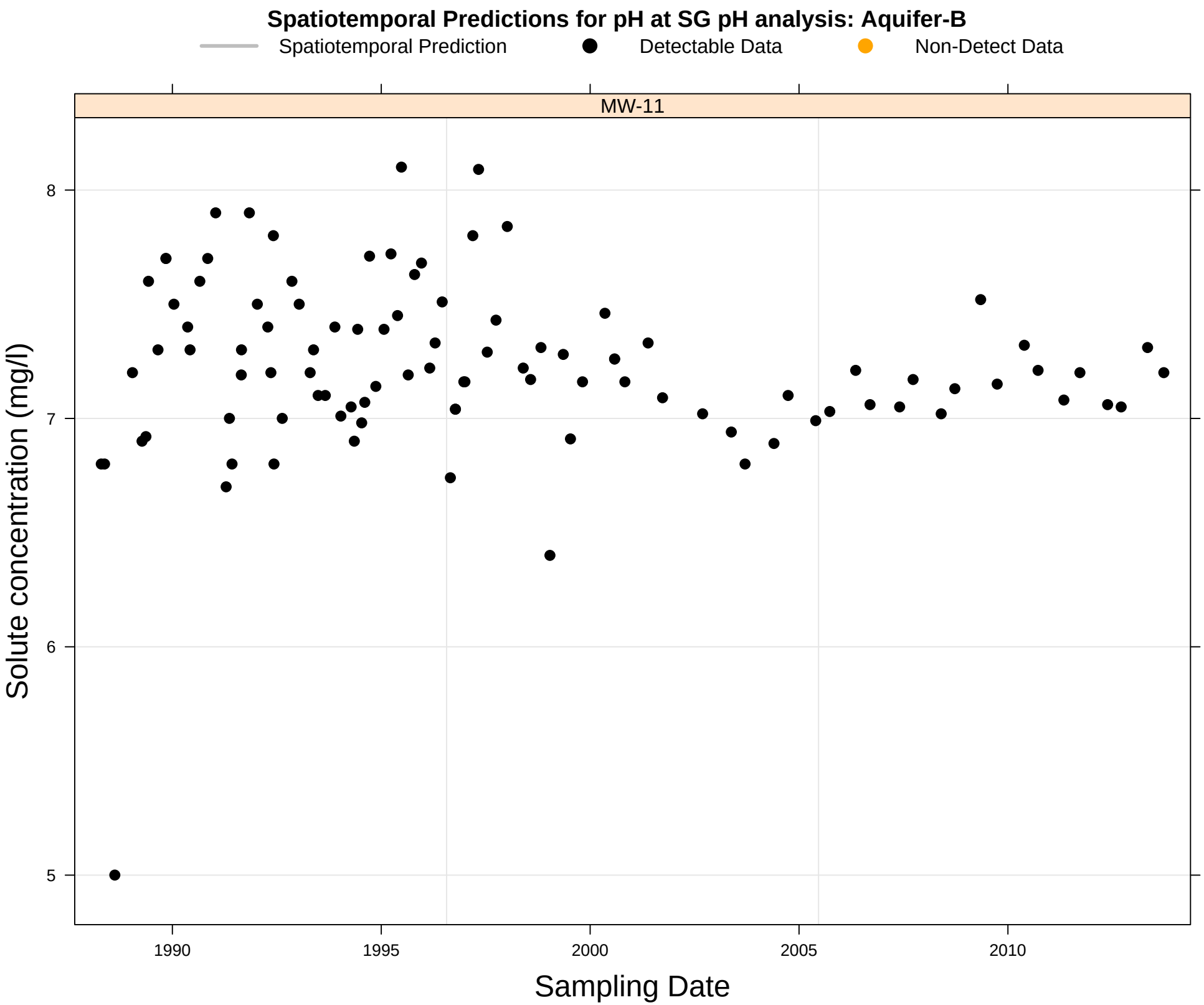

Spatiotemporal Predictions for Zn,Dissolved at SG Zn analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-27
MW-28
MW-19
MW-20
Solute concentration (mg/l)
Sampling Date
0.0
0.1
0.2
0.3
0.4
1995
2000
2005
2010

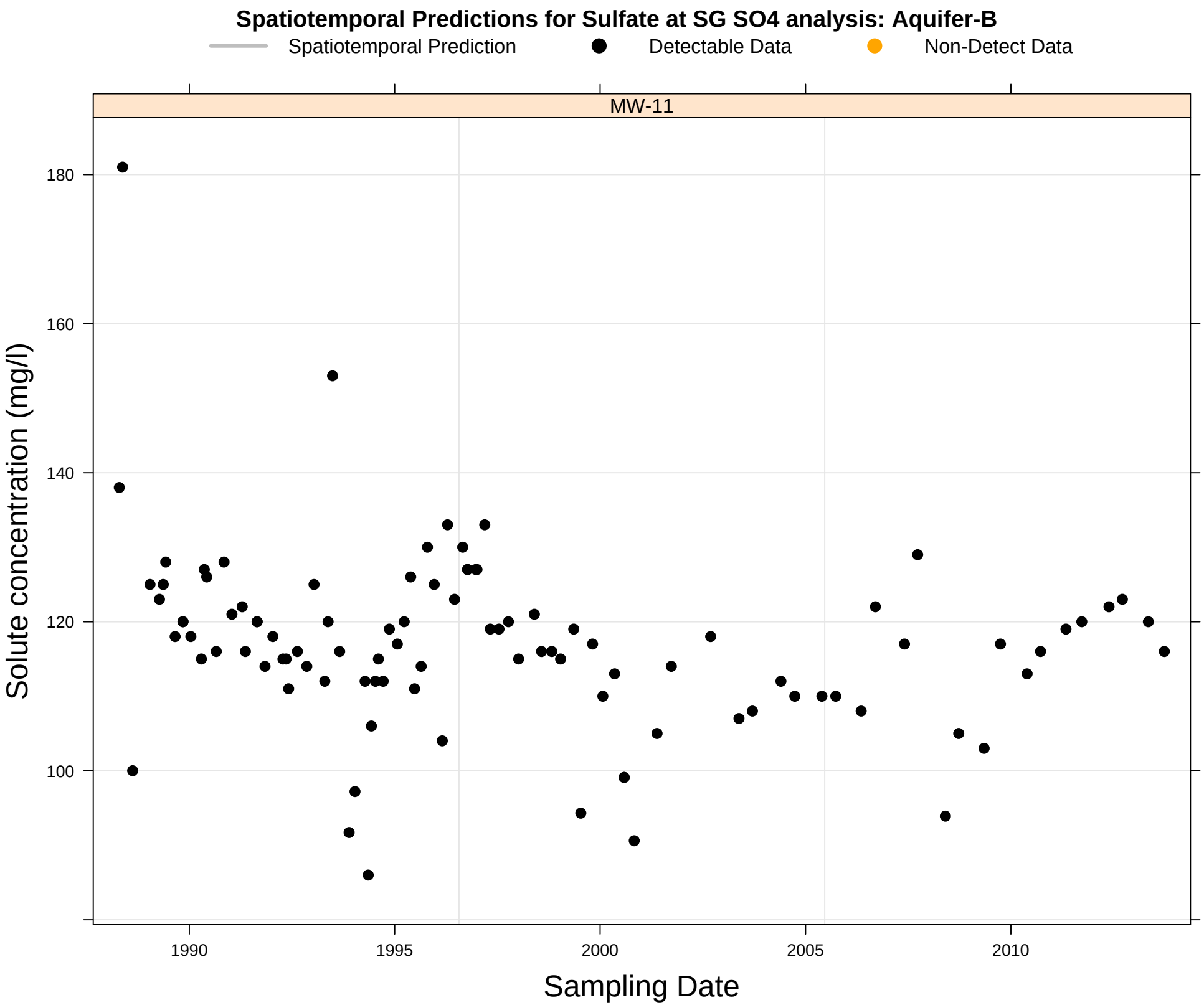
Appendix D.2

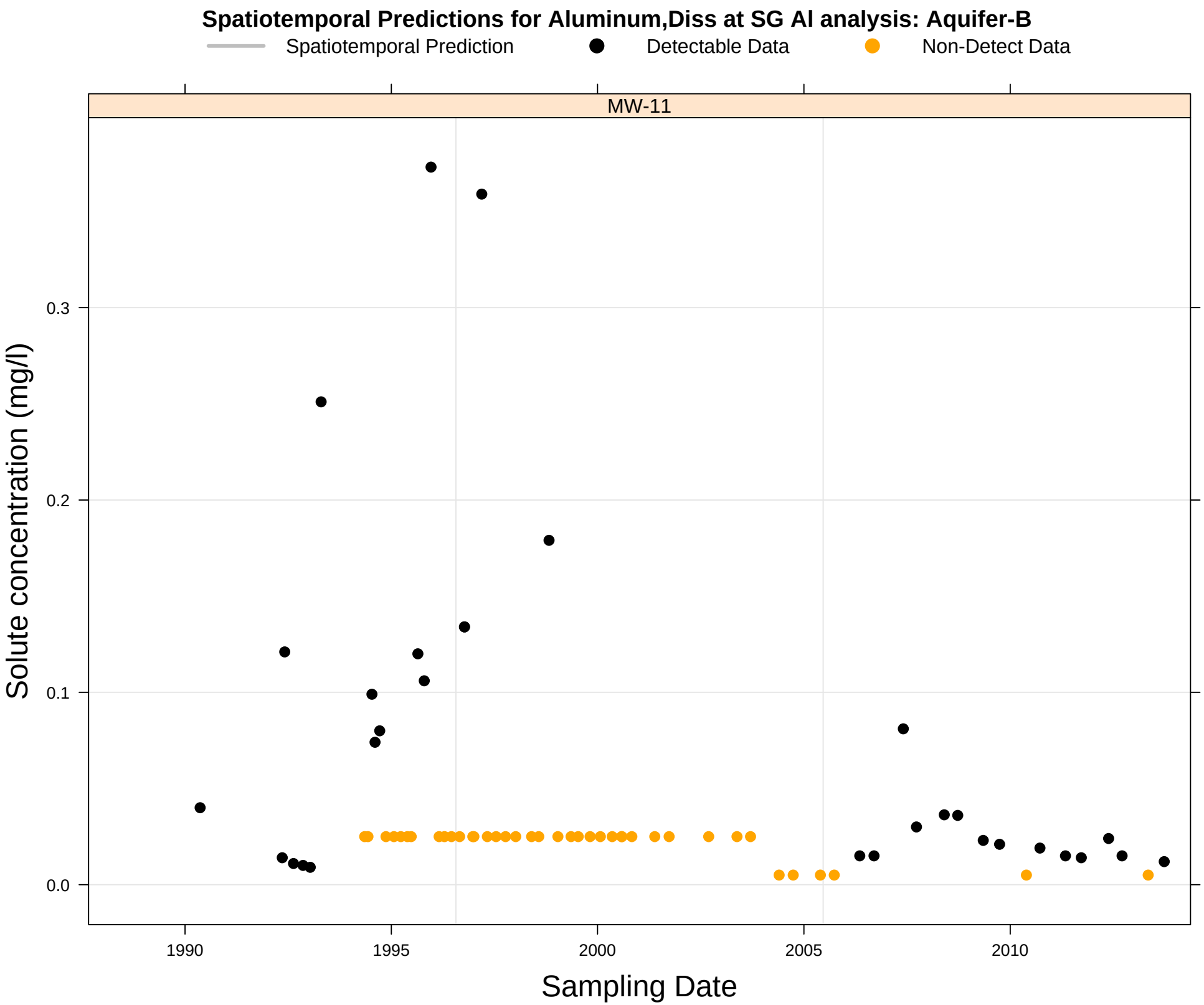
Spruce Gulch:

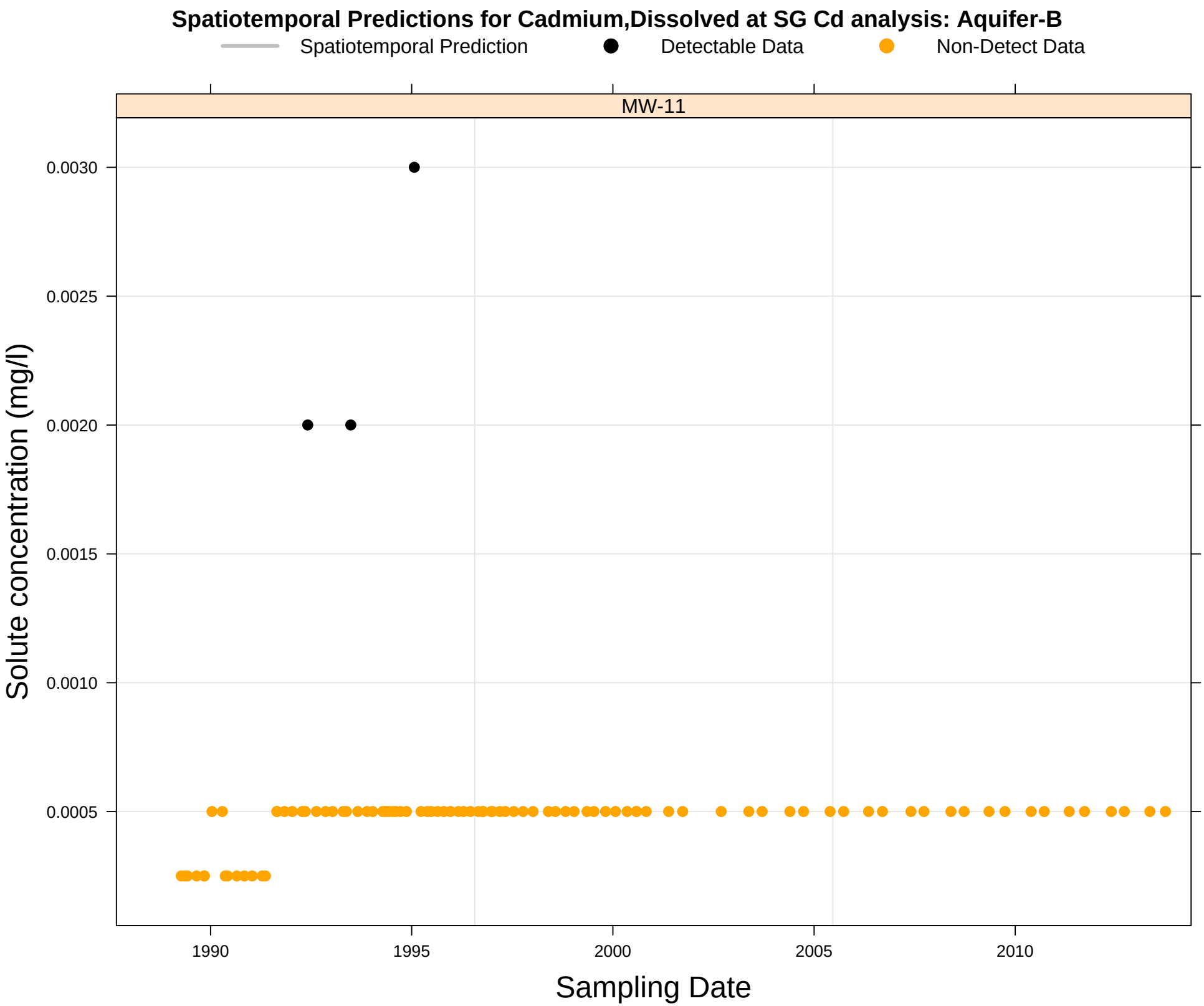
Deep Bedrock Monitoring Network

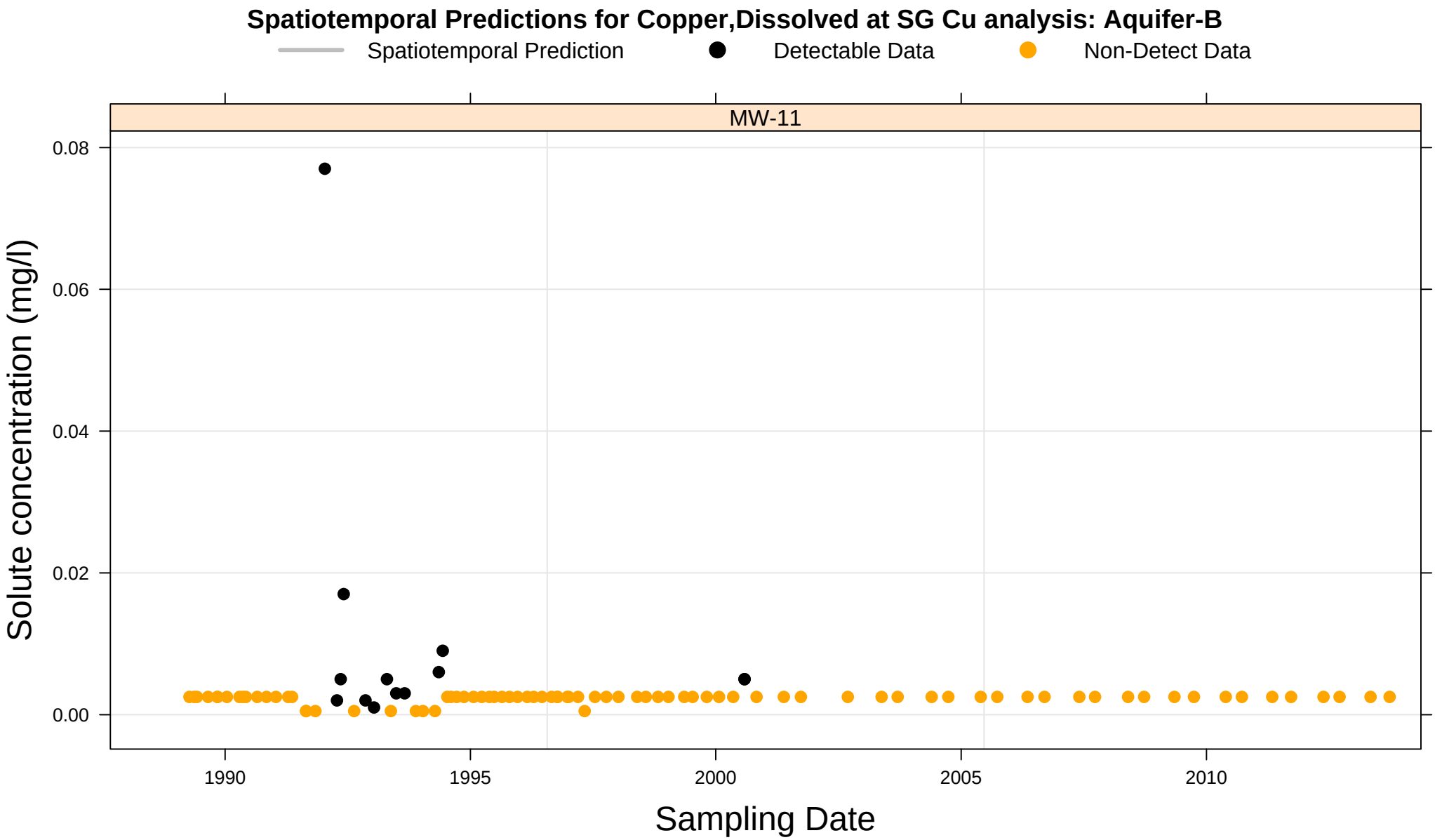
Water Quality Graphs

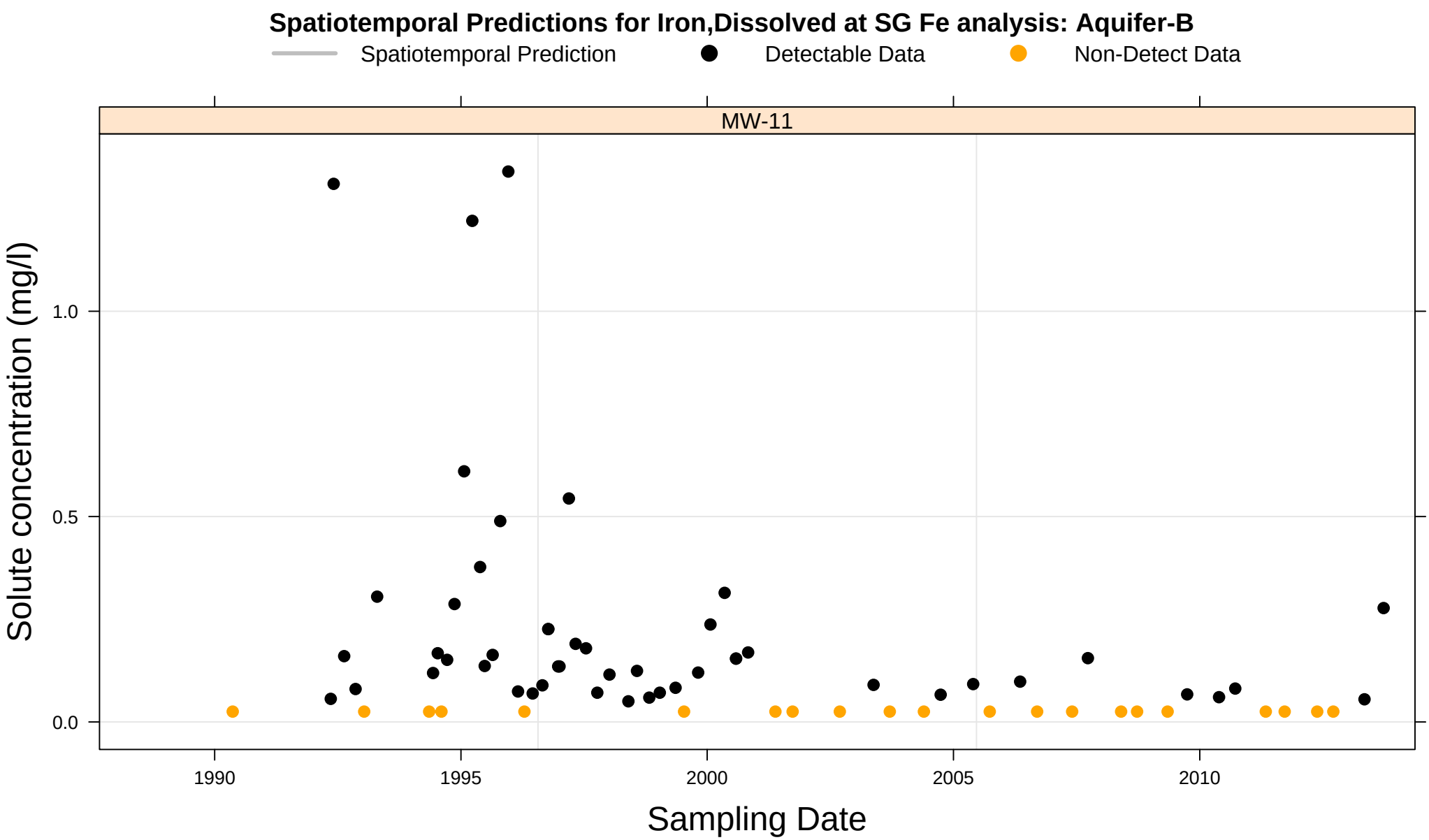

Spatiotemporal Predictions for pH at SG pH analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
8
7
6
5
1990
1995
2000
2005
2010
Sampling Date

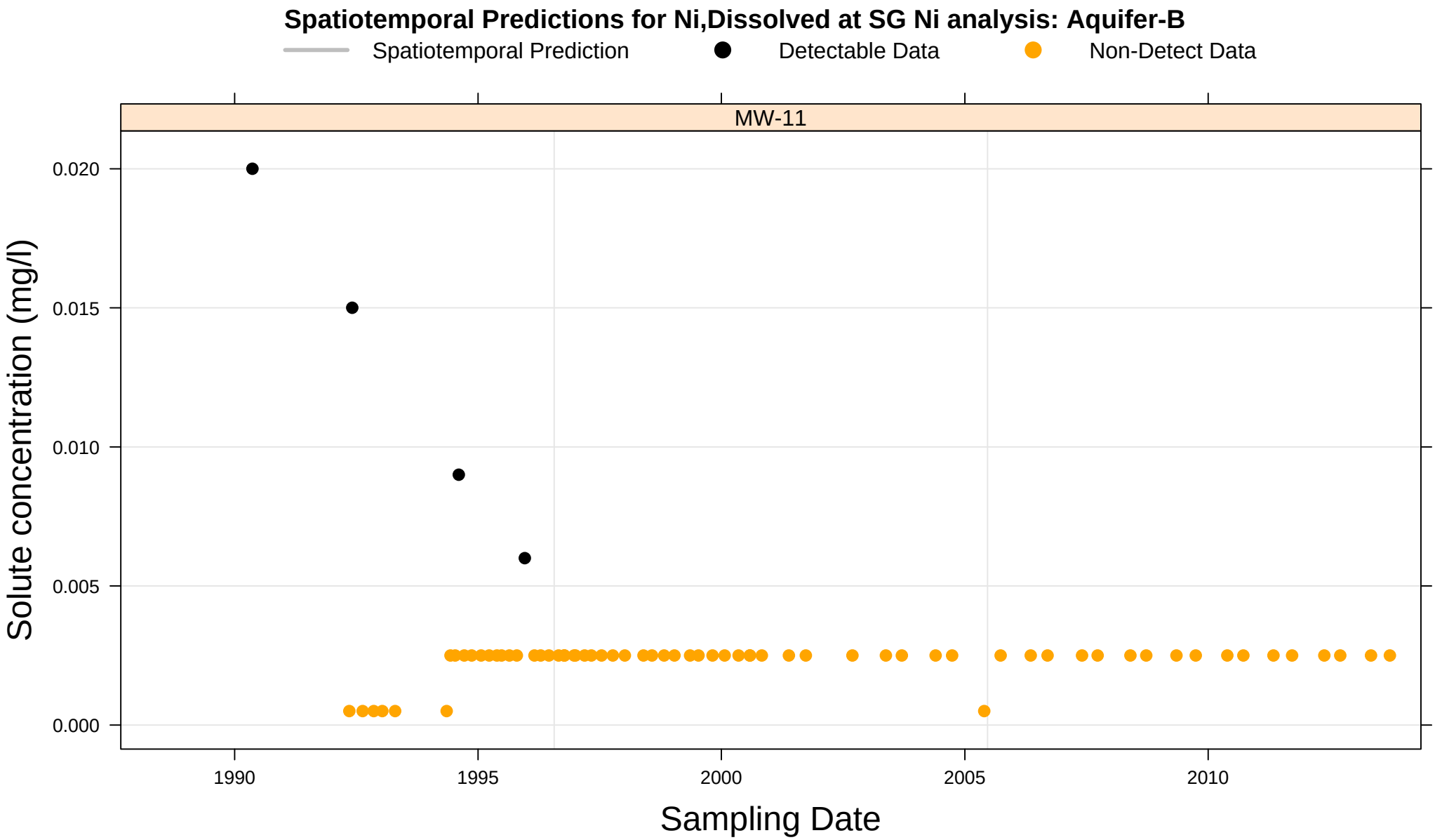

Spatiotemporal Predictions for Sulfate at SG SO4 analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
180
160
140
120
100
1990
1995
2000
2005
2010
Sampling Date

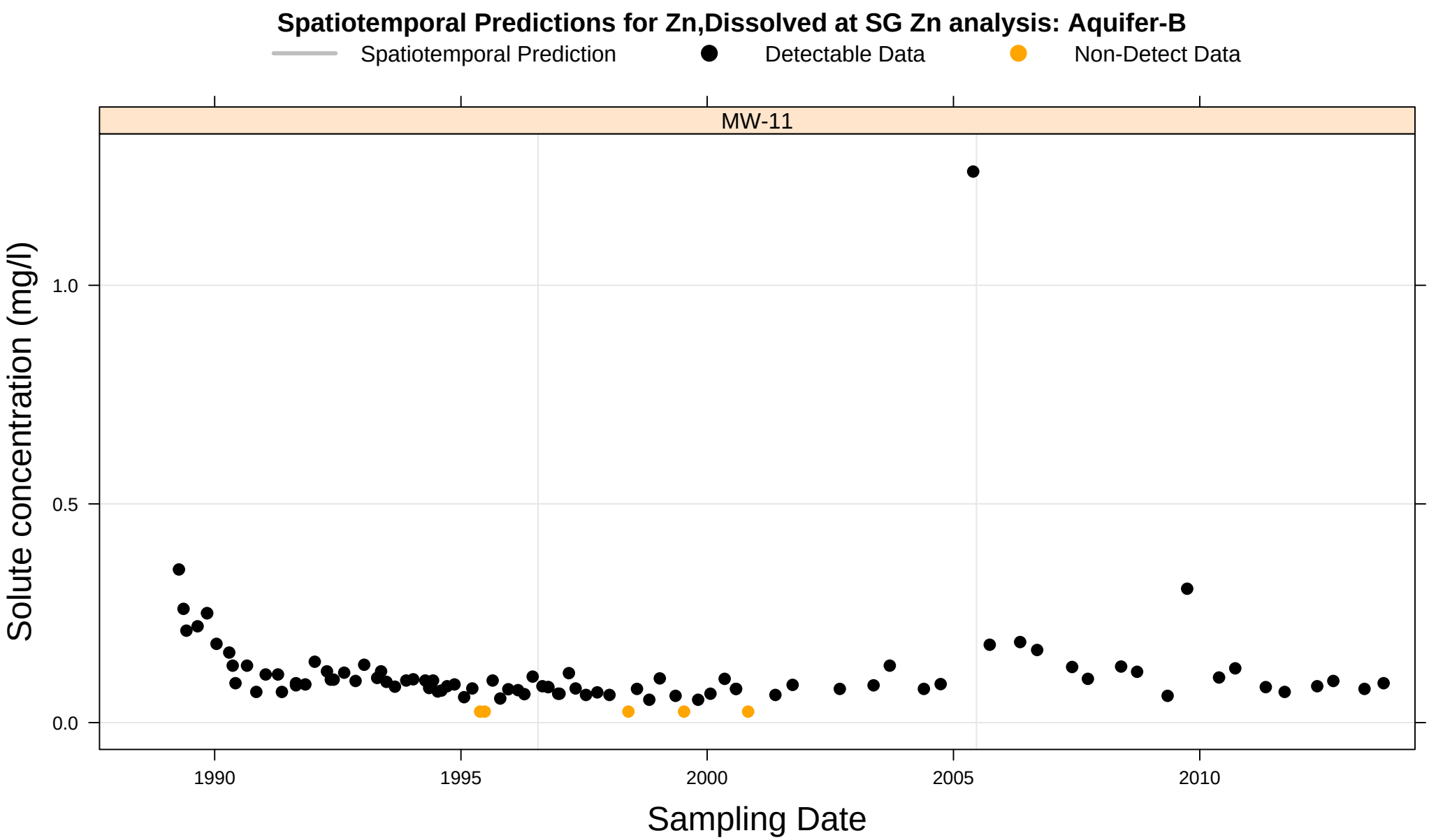

Spatiotemporal Predictions for Aluminum,Diss at SG Al analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
0.0
0.1
0.2
0.3
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Cadmium,Dissolved at SG Cd analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
Solute concentration (mg/l)
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Copper,Dissolved at SG Cu analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
0.08
0.06
0.04
0.02
0.00
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Iron,Dissolved at SG Fe analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
1.0
0.5
0.0
1990
1995
2000
2005
2010
Sampling Date

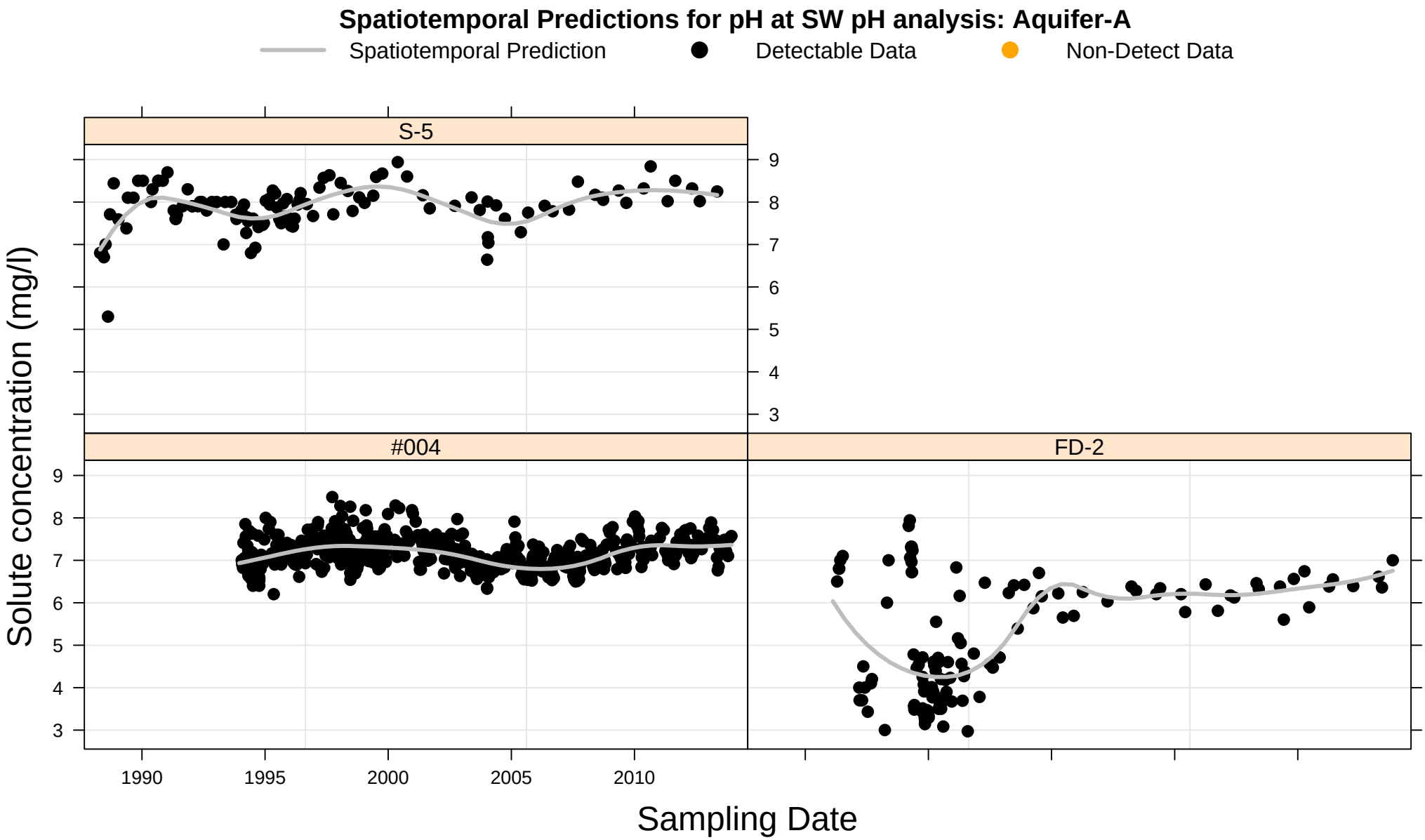

Spatiotemporal Predictions for Ni,Dissolved at SG Ni analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
0.020
0.015
0.010
0.005
0.000
1990
1995
2000
2005
2010
Sampling Date

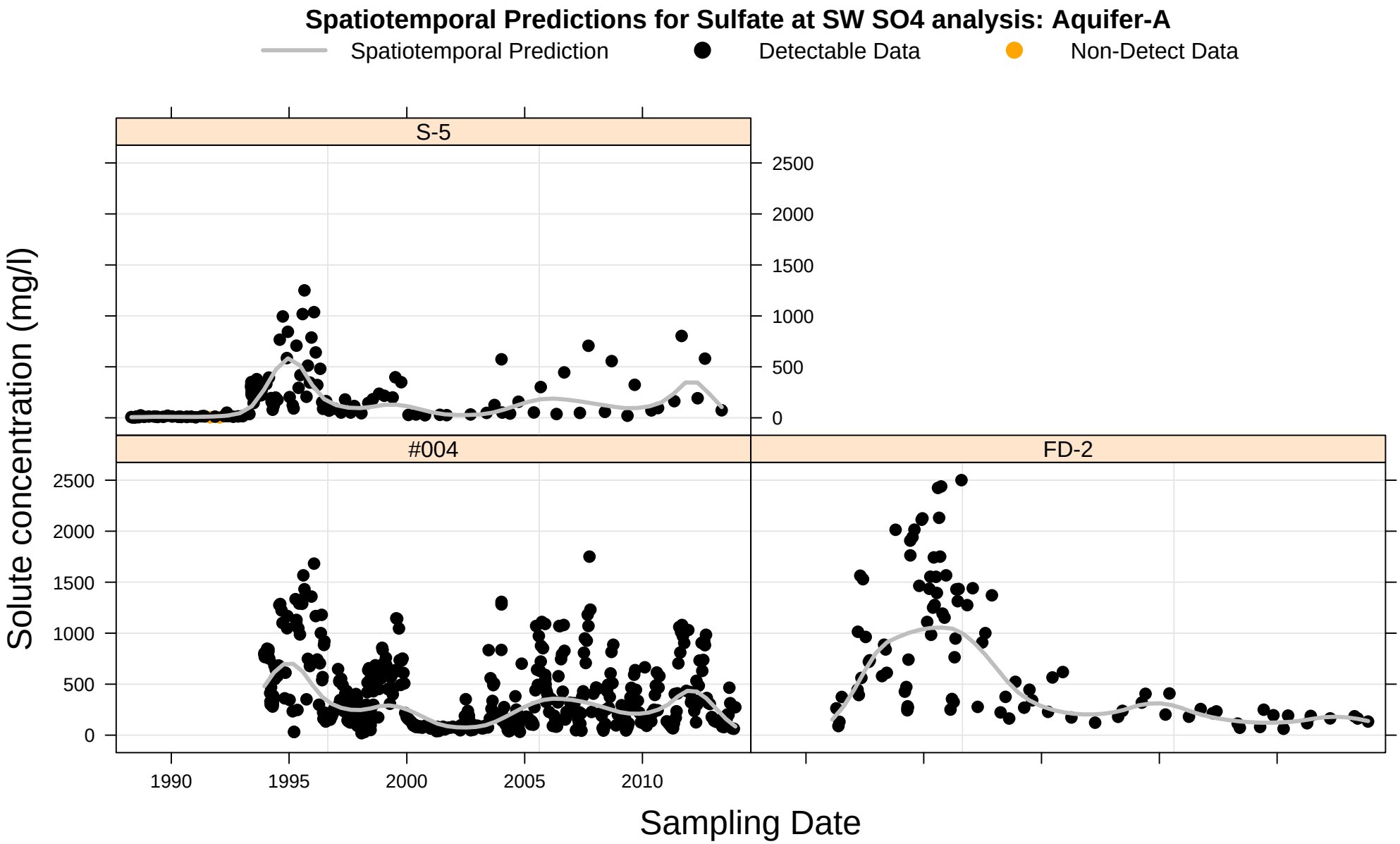

Spatiotemporal Predictions for Zn,Dissolved at SG Zn analysis: Aquifer-B
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
MW-11
Solute concentration (mg/l)
1.0
0.5
0.0
1990
1995
2000
2005
2010
Sampling Date

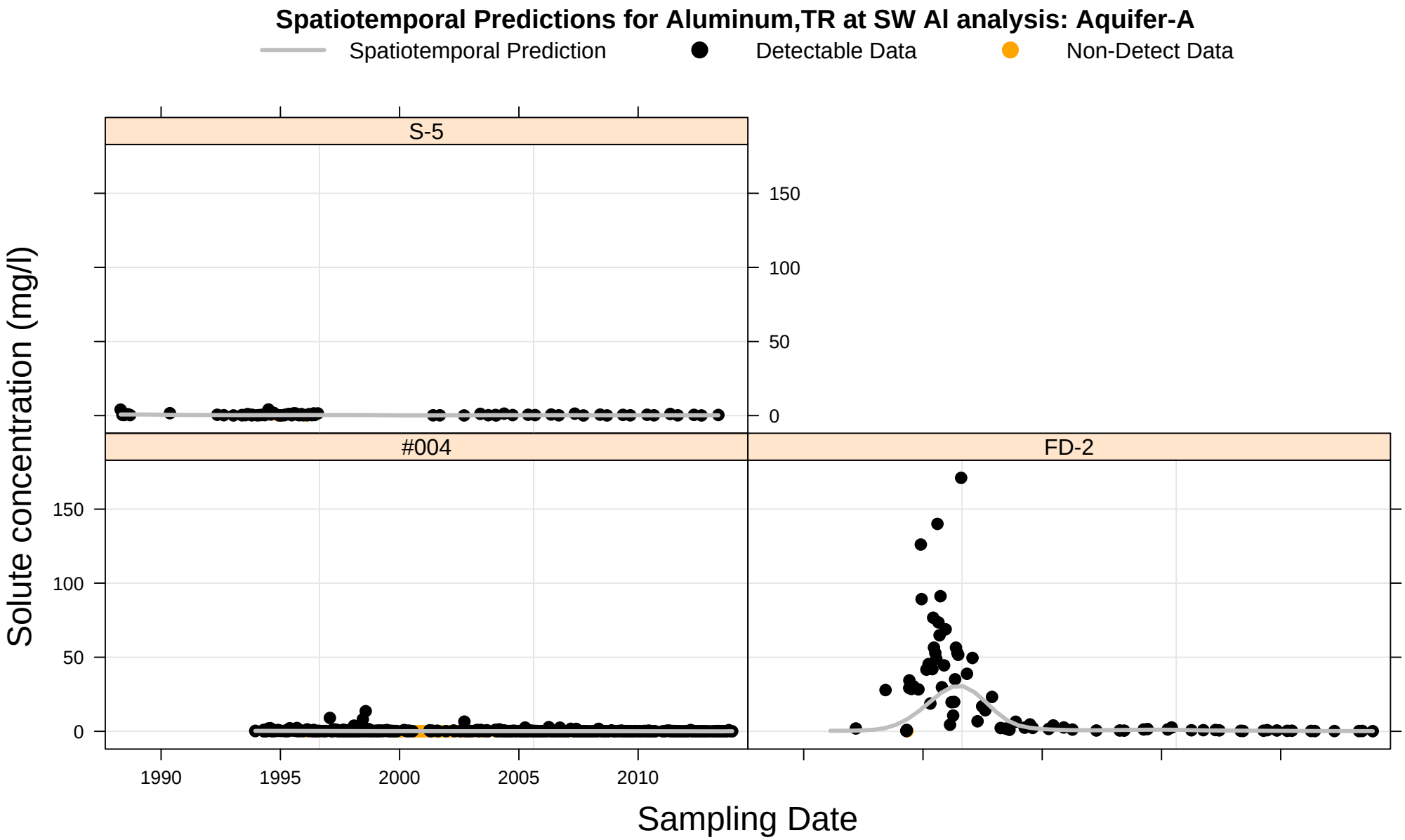
Appendix E

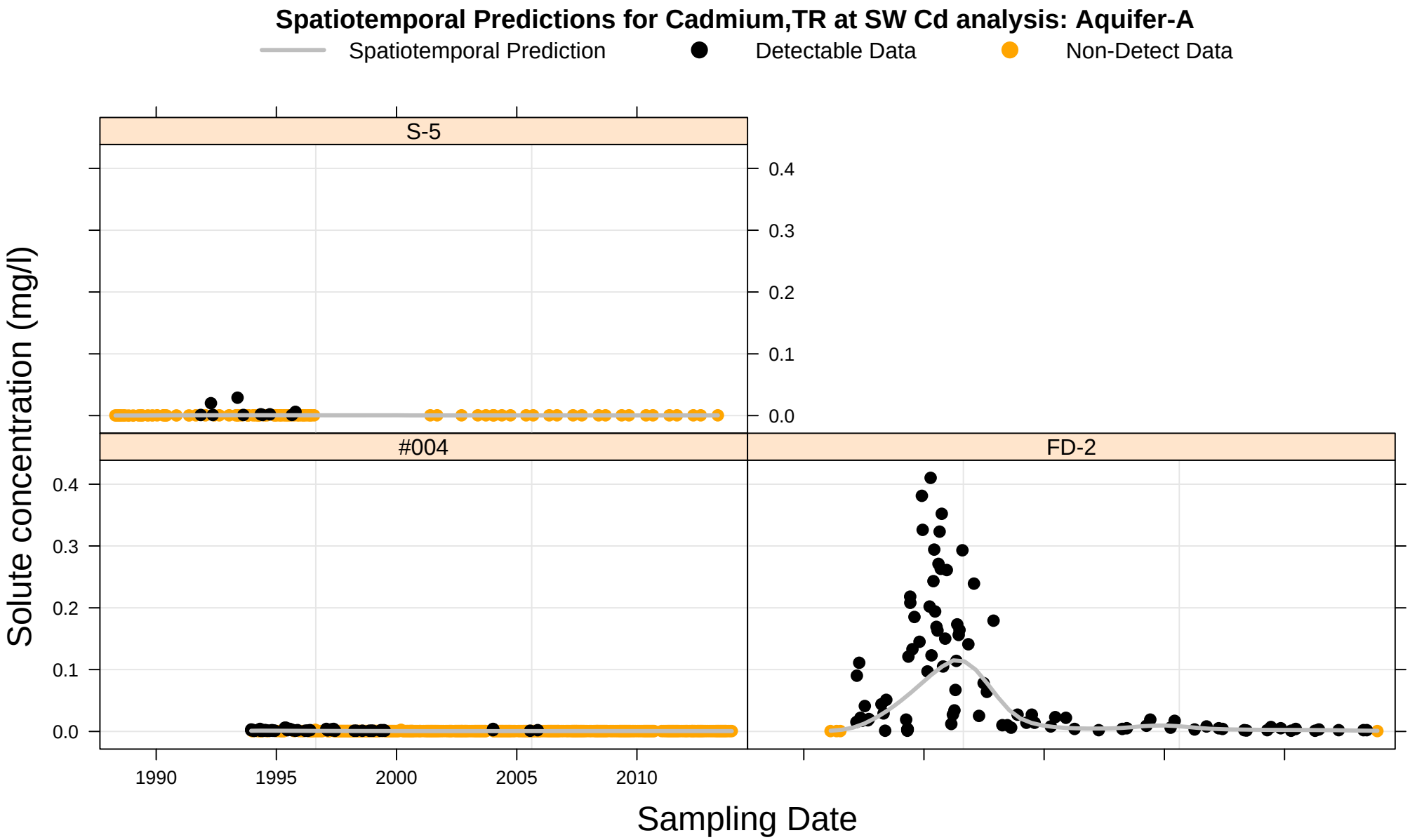
Process Area:

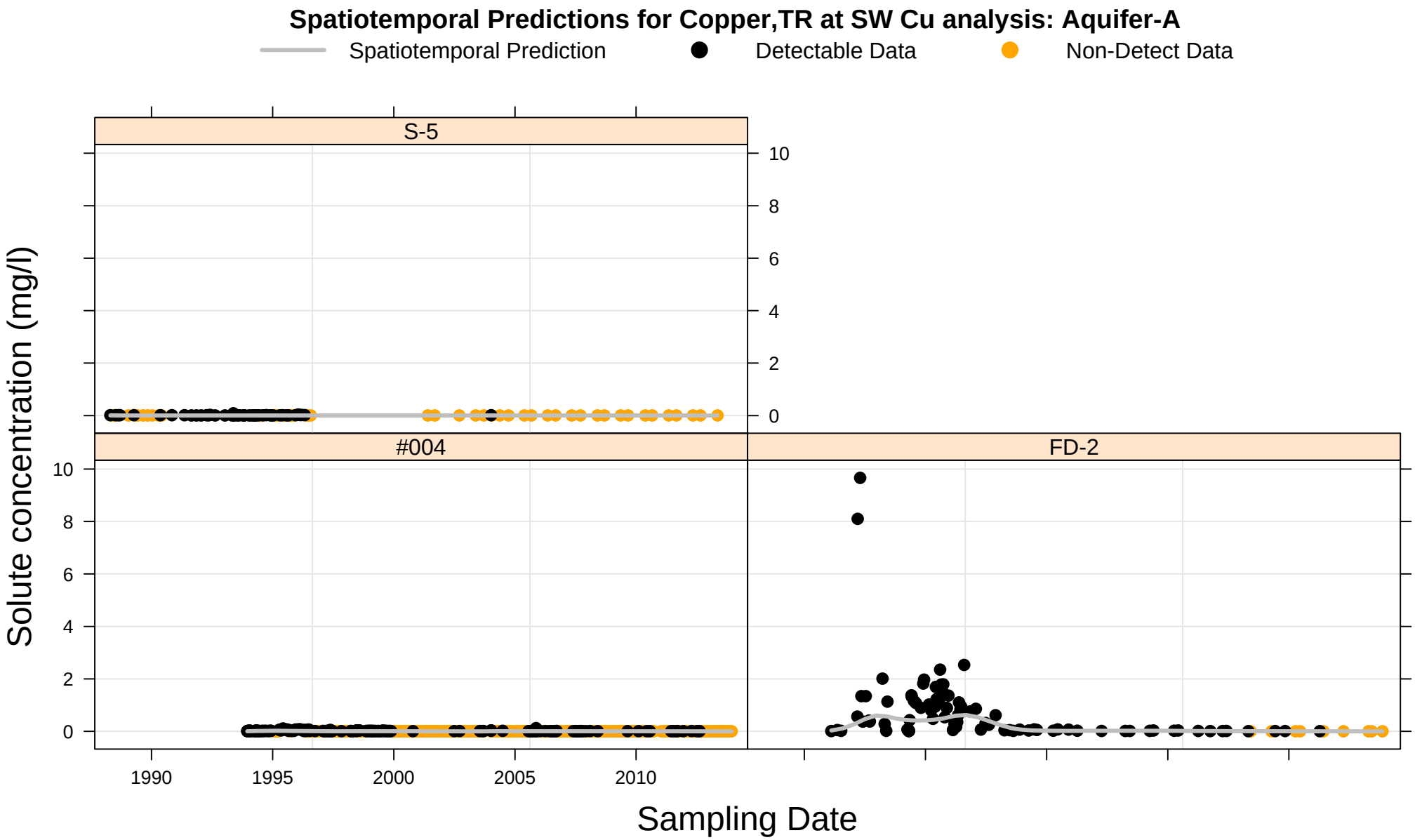
Surface Water Quality Graphs

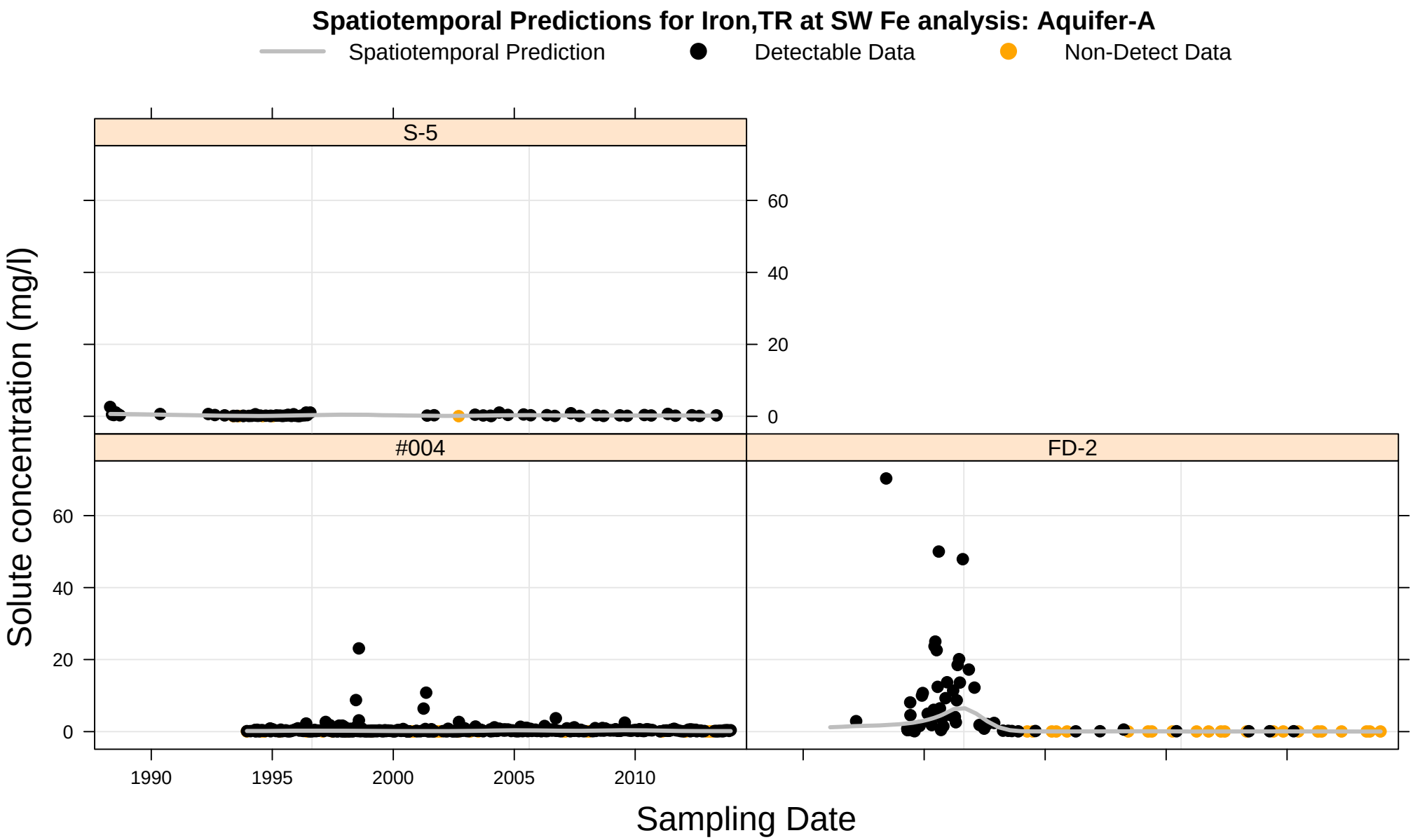

Spatiotemporal Predictions for pH at SW pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
3
4
5
6
7
8
9

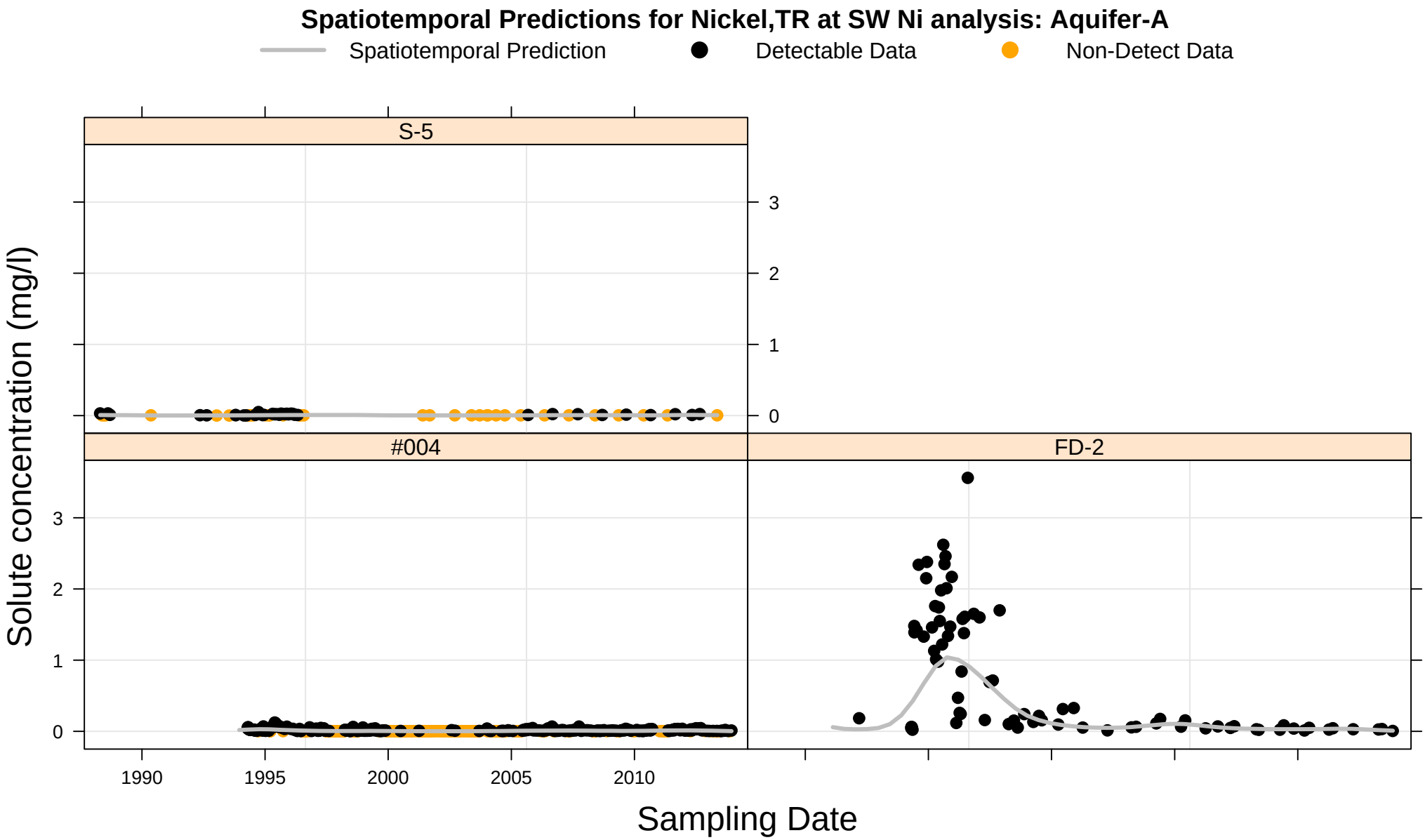

Spatiotemporal Predictions for Sulfate at SW SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
Sampling Date
0
500
1000
1500
2000
2500
1990
1995
2000
2005
2010

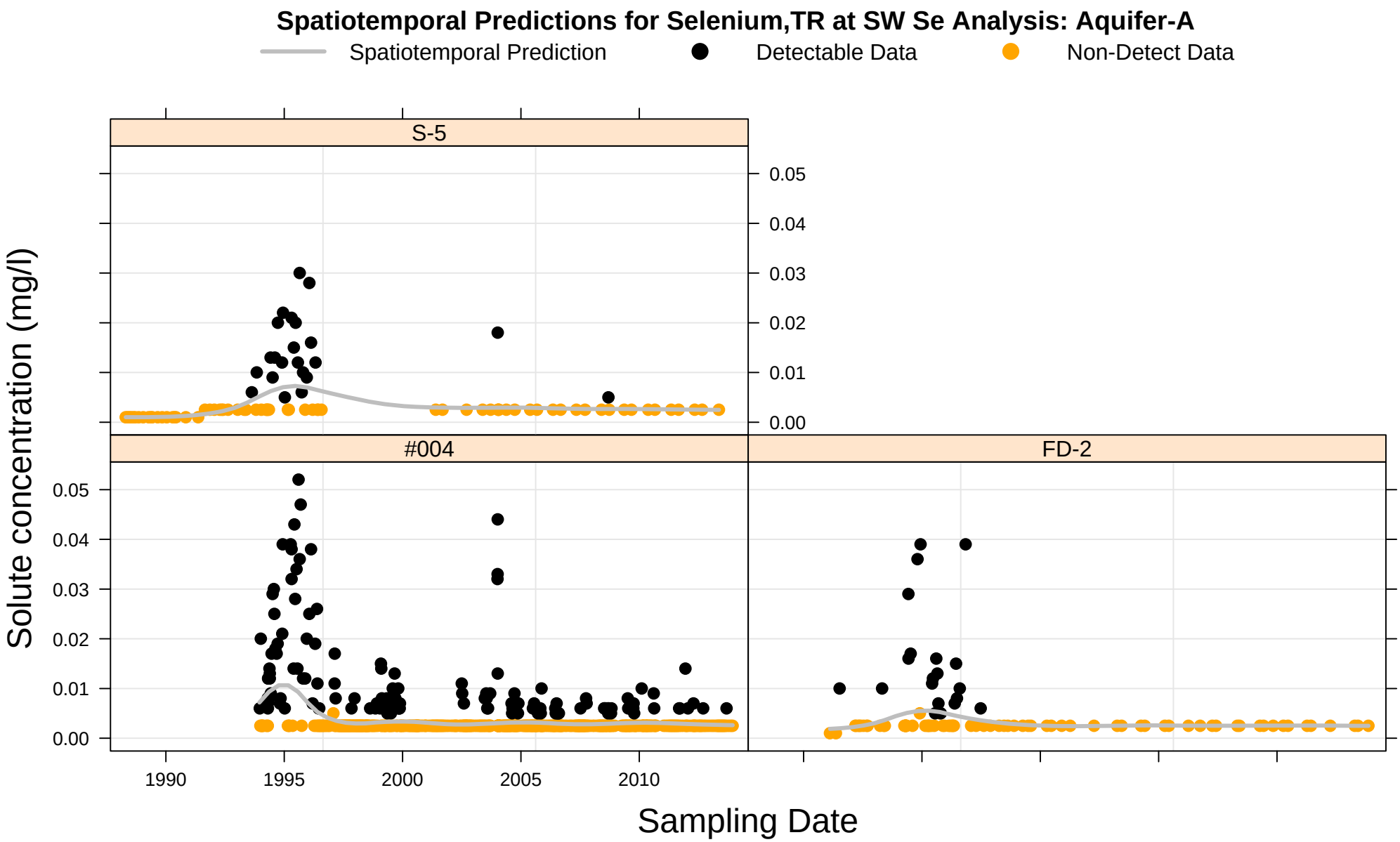

Spatiotemporal Predictions for Aluminum,TR at SW Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
0
50
100
150
1990
1995
2000
2005
2010
Sampling Date

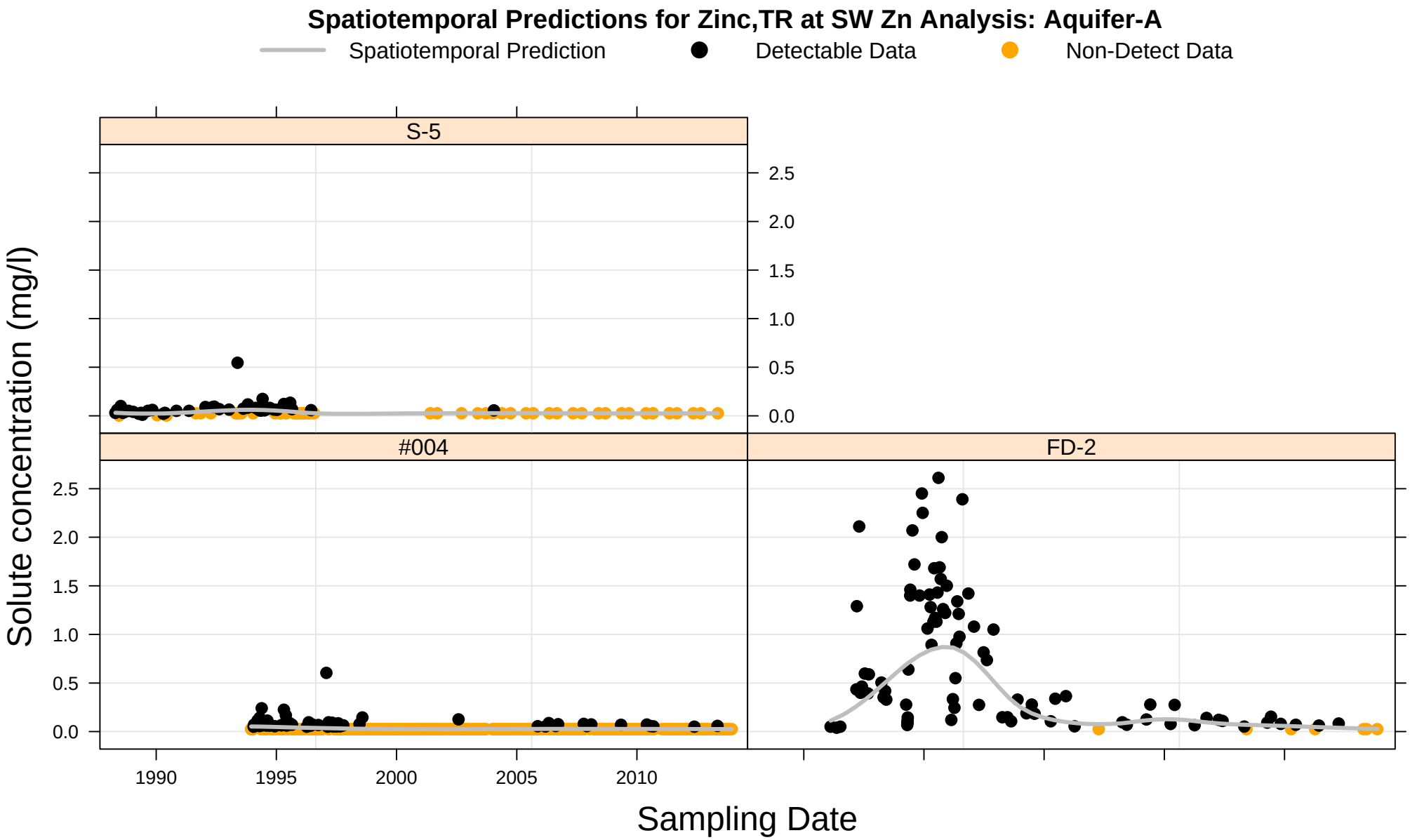

Spatiotemporal Predictions for Cadmium,TR at SW Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
0.0
0.1
0.2
0.3
0.4
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Copper,TR at SW Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
Sampling Date
0
2
4
6
8
10
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,TR at SW Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
0
20
40
60
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Nickel,TR at SW Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
Sampling Date
0
1
2
3
1990
1995
2000
2005
2010

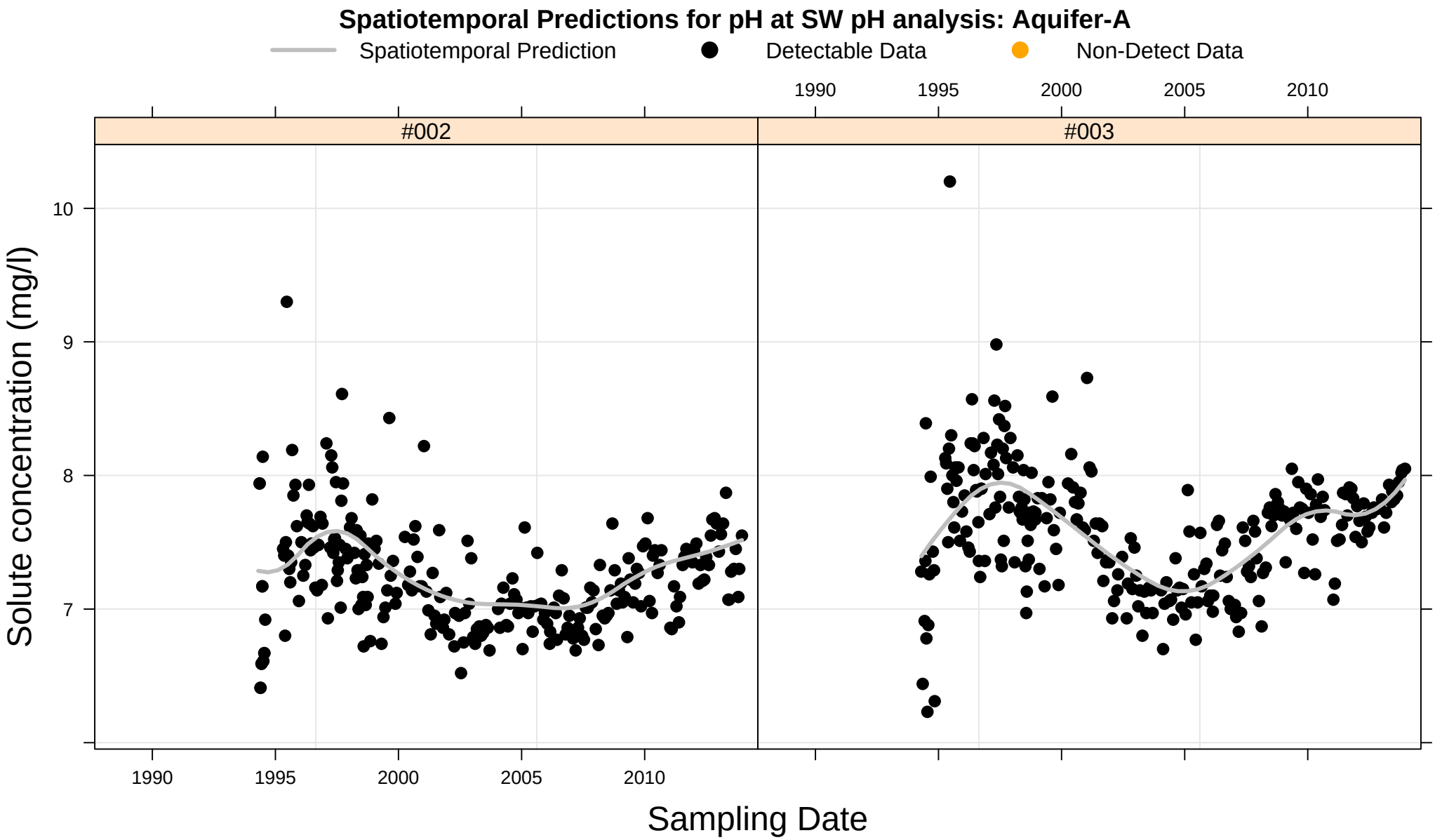

Spatiotemporal Predictions for Selenium,TR at SW Se Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
0.00
0.01
0.02
0.03
0.04
0.05
1990
1995
2000
2005
2010
Sampling Date

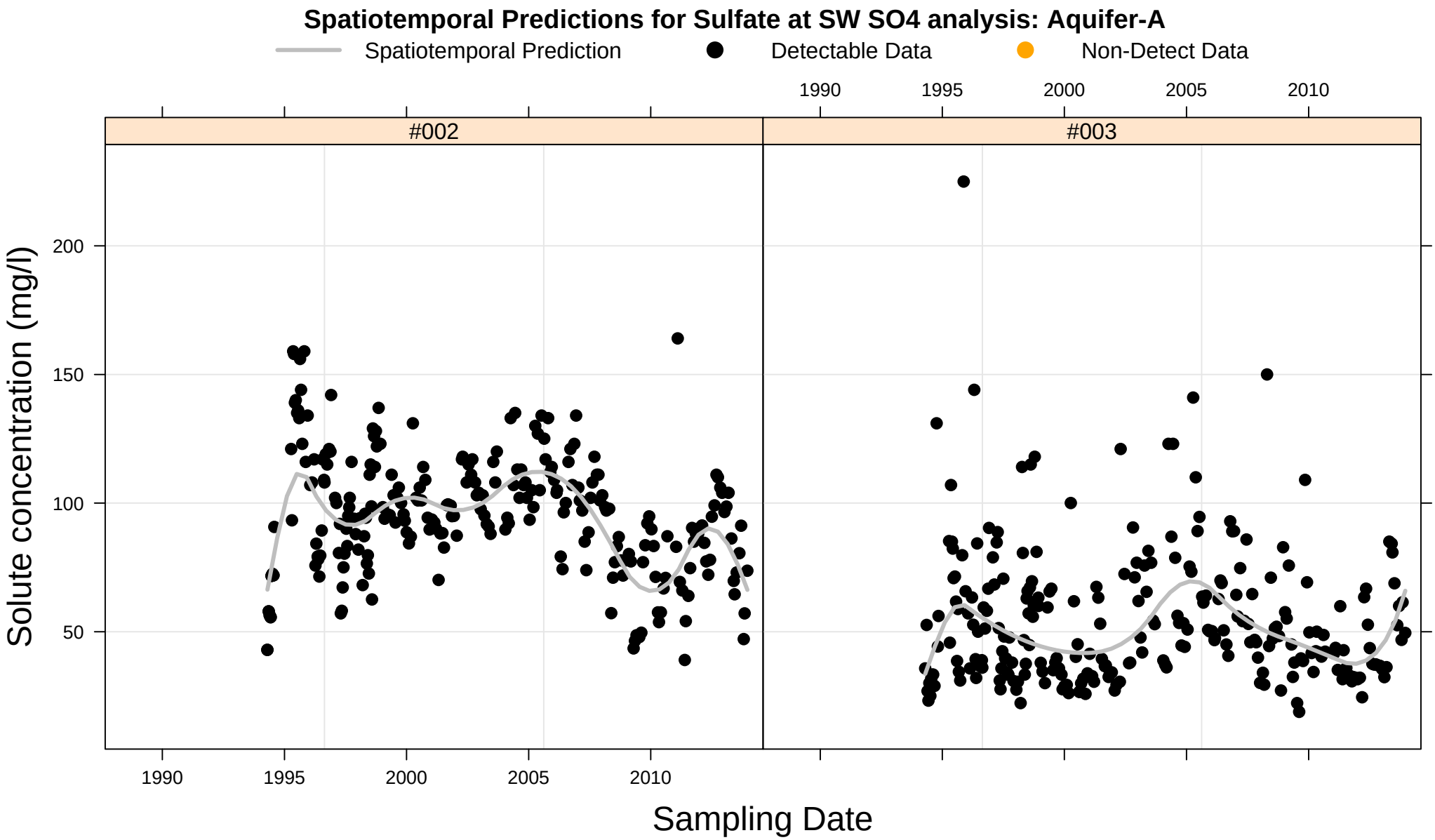

Spatiotemporal Predictions for Zinc,TR at SW Zn Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-5
#004
FD-2
Solute concentration (mg/l)
Sampling Date
0.0
0.5
1.0
1.5
2.0
2.5
1990
1995
2000
2005
2010

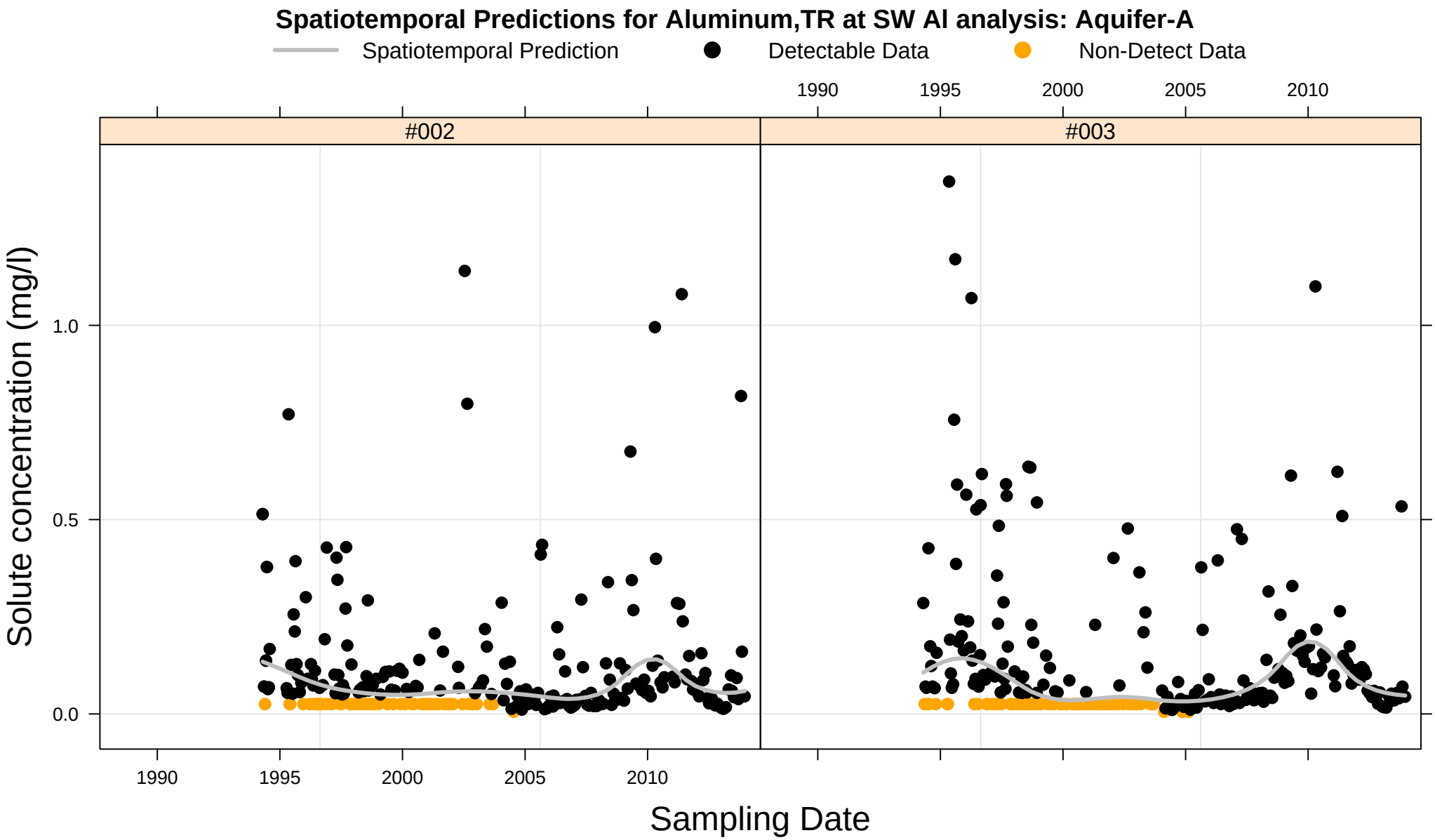
Appendix F

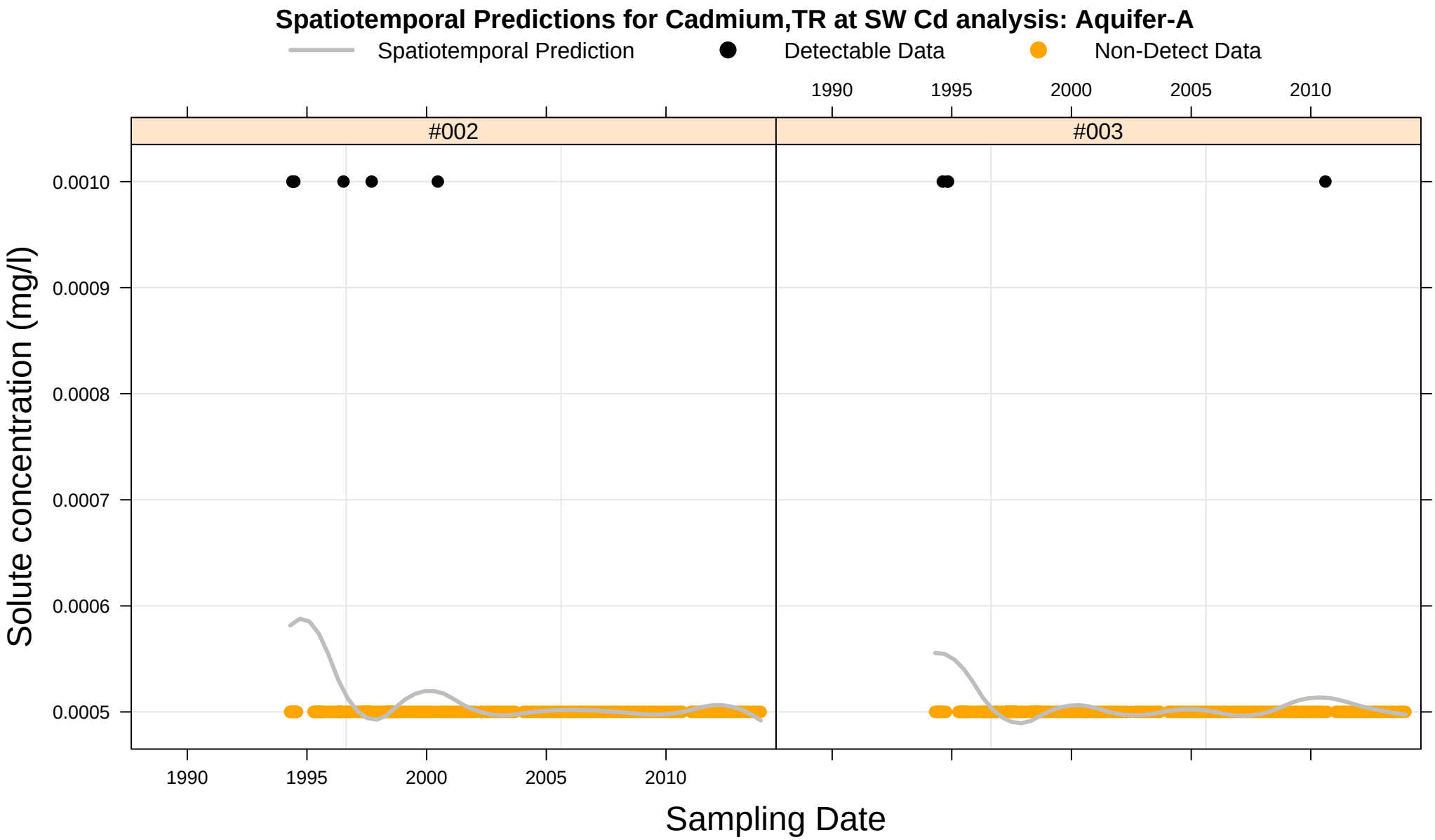
Pit Impoundment:

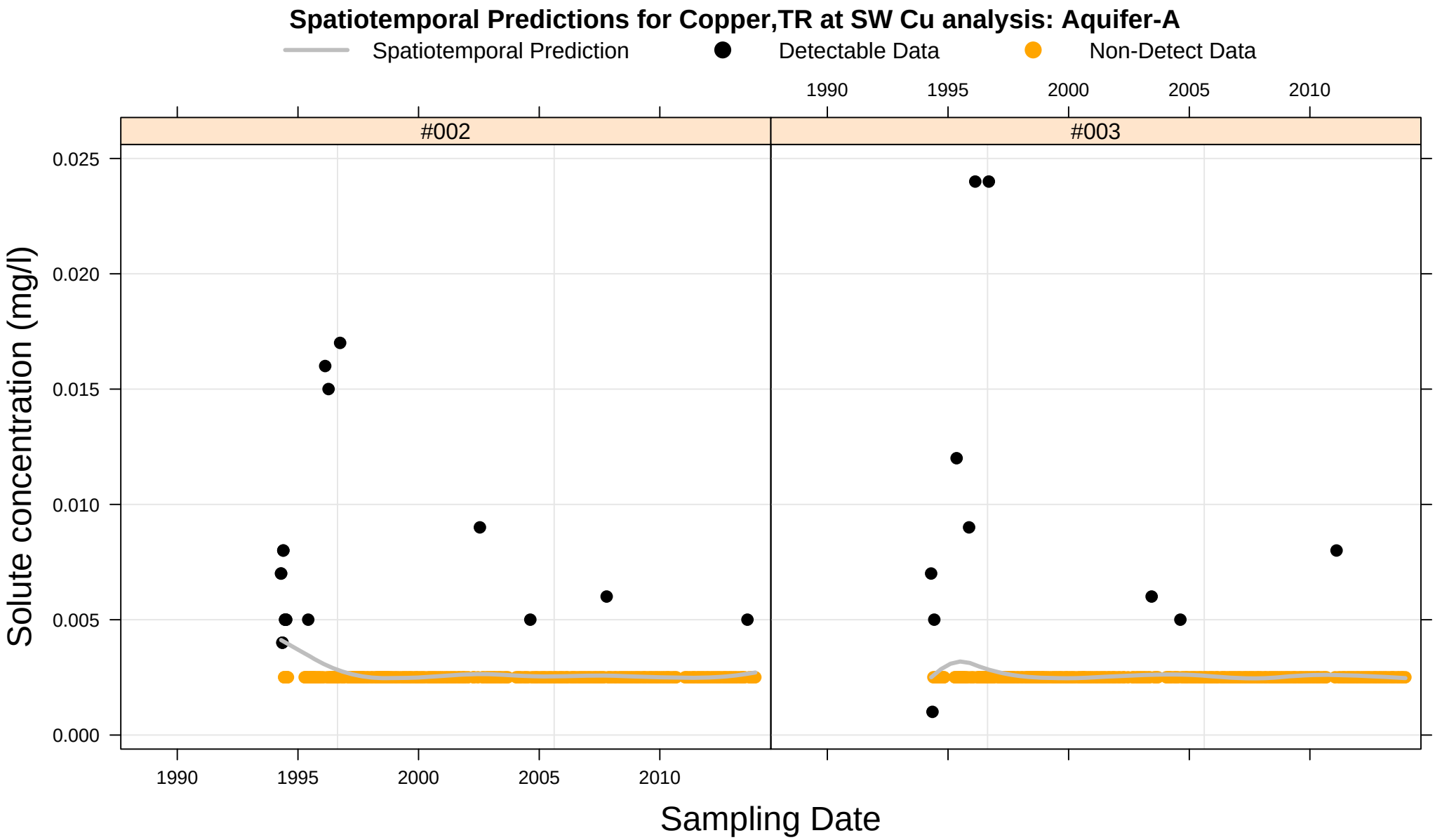
Surface Water Quality Graphs

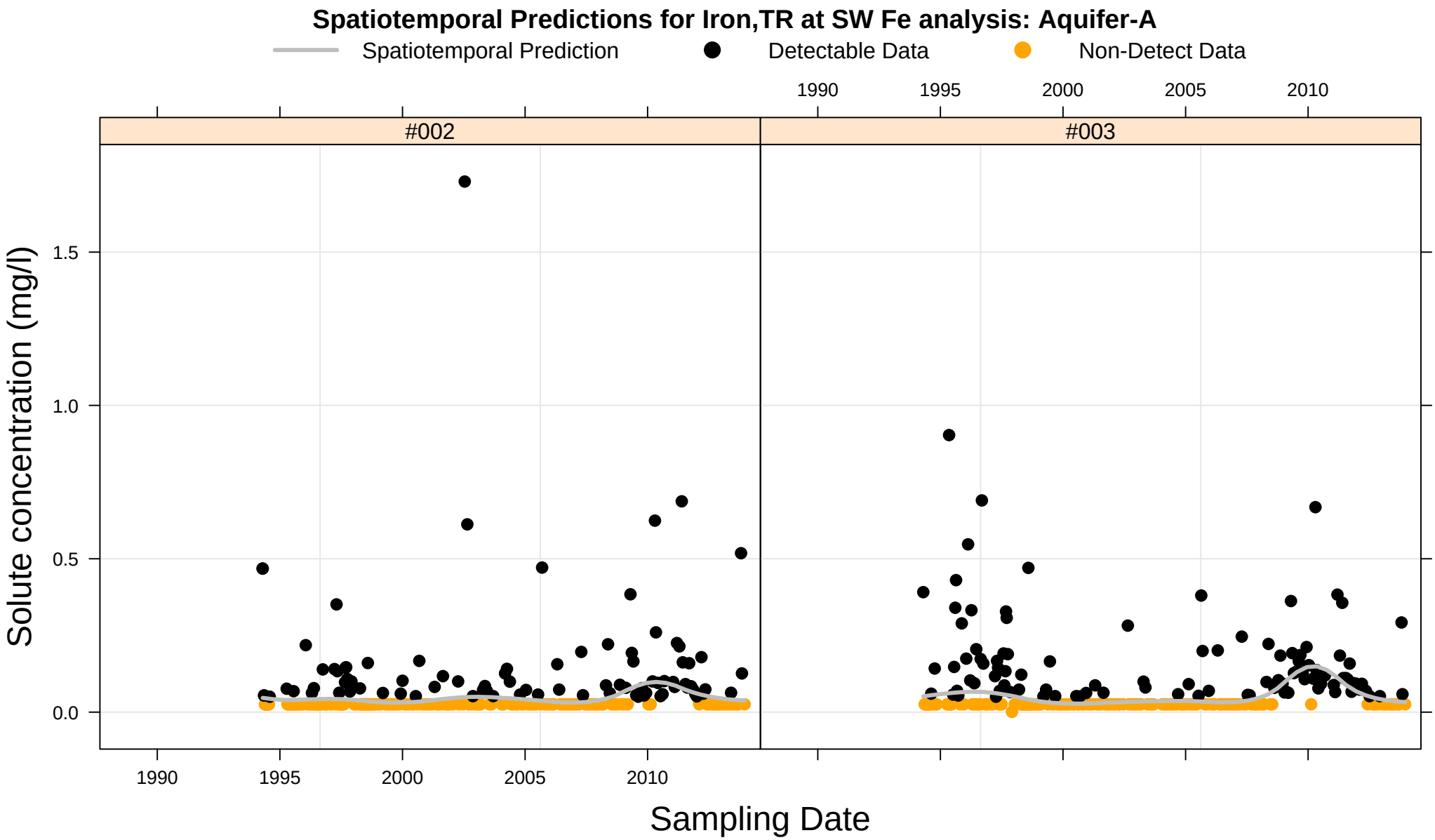

Spatiotemporal Predictions for pH at SW pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
Sampling Date
10
9
8
7
1990
1995
2000
2005
2010

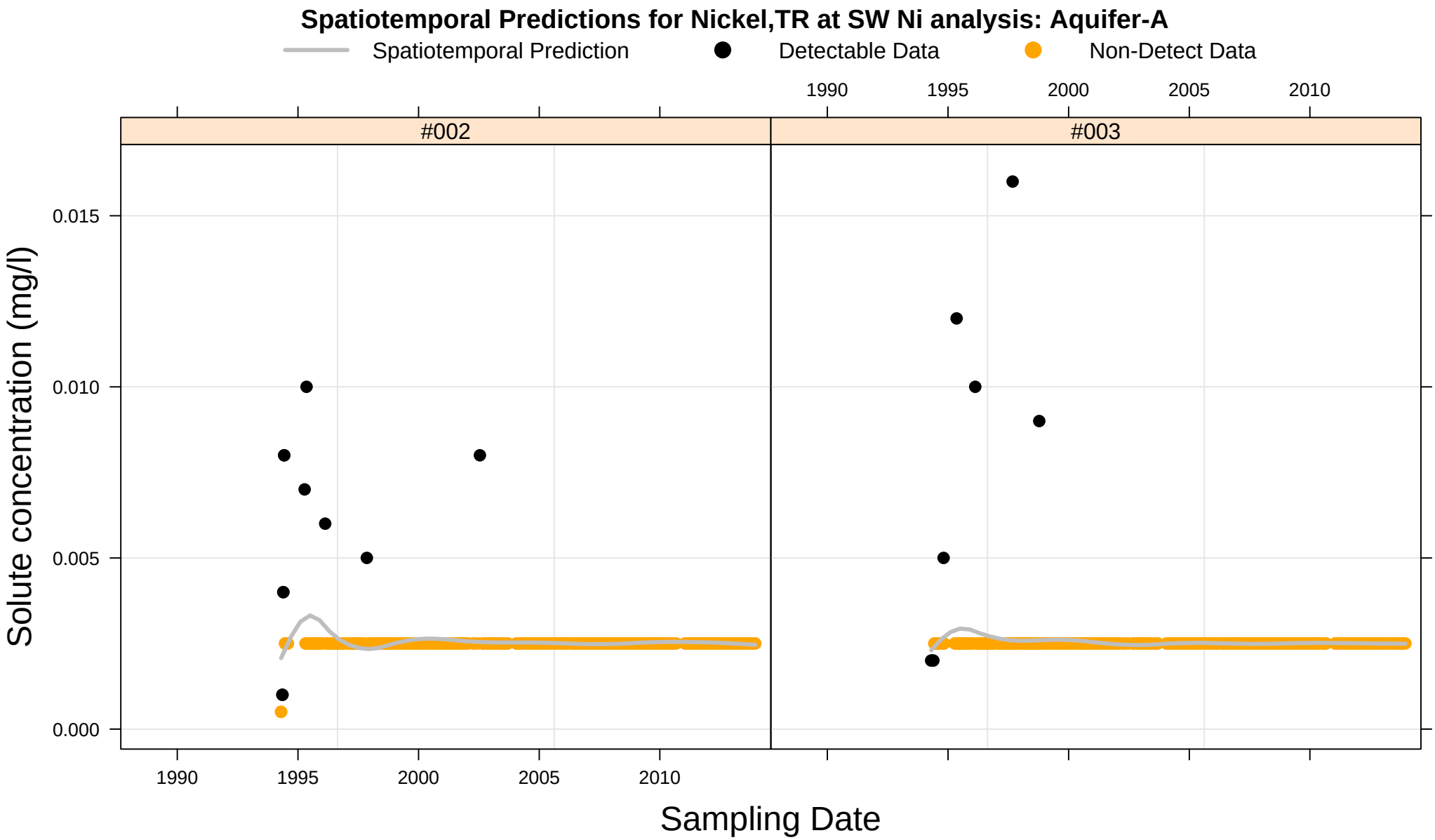

Spatiotemporal Predictions for Sulfate at SW SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
200
150
100
50
1990
1995
2000
2005
2010
Sampling Date

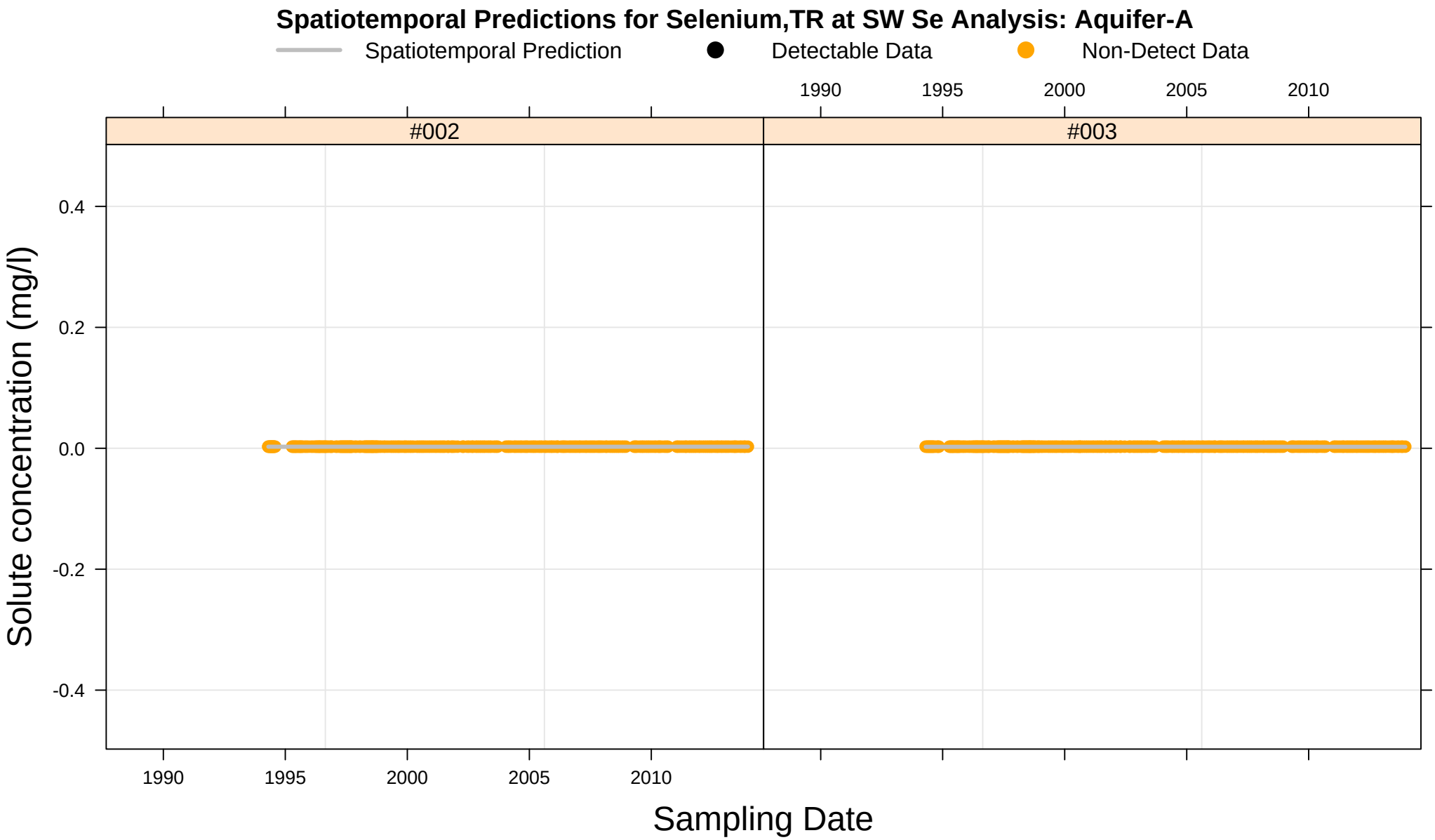

Spatiotemporal Predictions for Aluminum,TR at SW Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.0
0.5
1.0
1990
1995
2000
2005
2010
Sampling Date

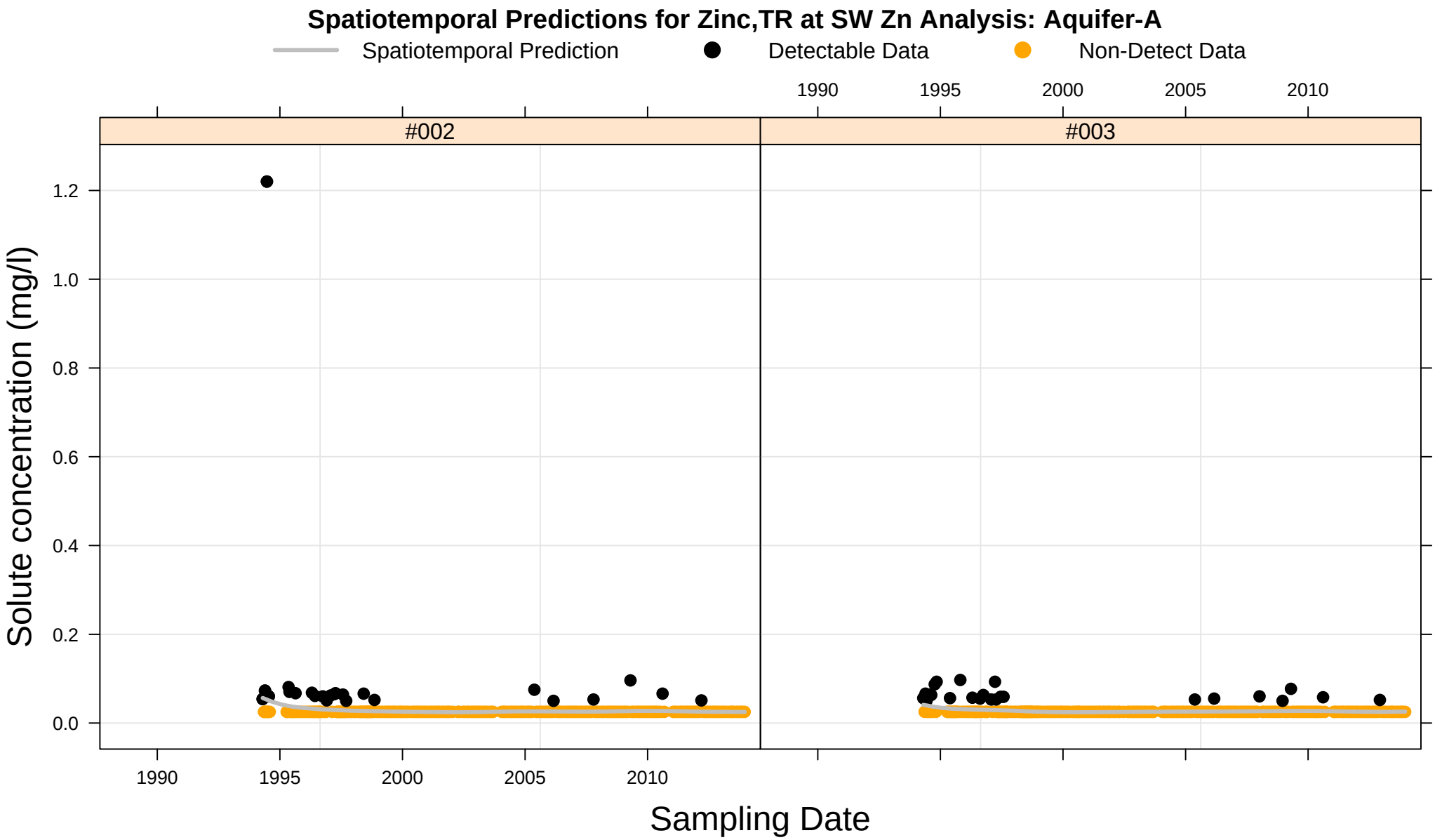

Spatiotemporal Predictions for Cadmium,TR at SW Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.0010
0.0009
0.0008
0.0007
0.0006
0.0005
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Copper,TR at SW Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.025
0.020
0.015
0.010
0.005
0.000
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Iron,TR at SW Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.0
0.5
1.0
1.5
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Nickel,TR at SW Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.000
0.005
0.010
0.015
1990
1995
2000
2005
2010
Sampling Date

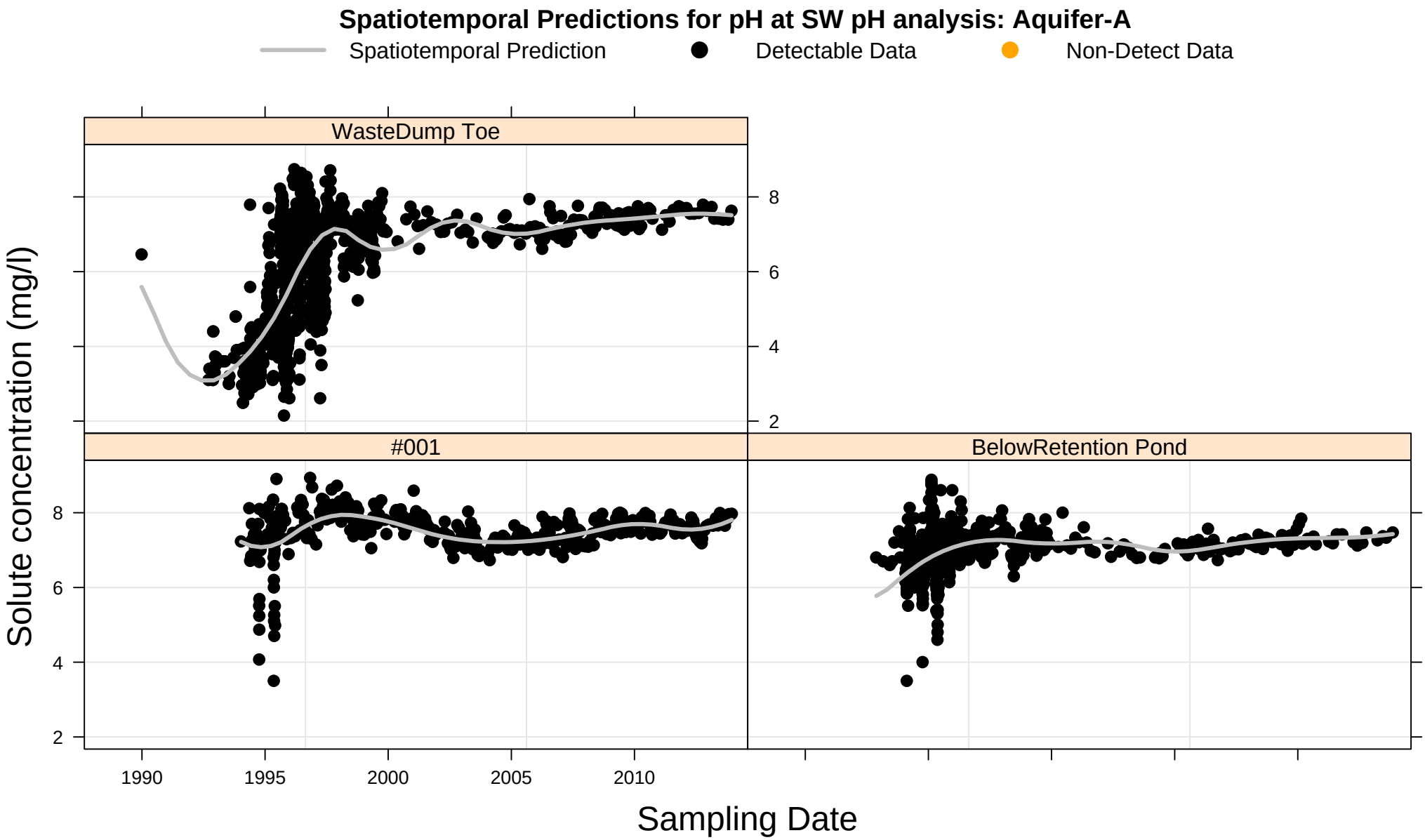

Spatiotemporal Predictions for Selenium,TR at SW Se Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
0.4
0.2
0.0
-0.2
-0.4
1990
1995
2000
2005
2010
Sampling Date

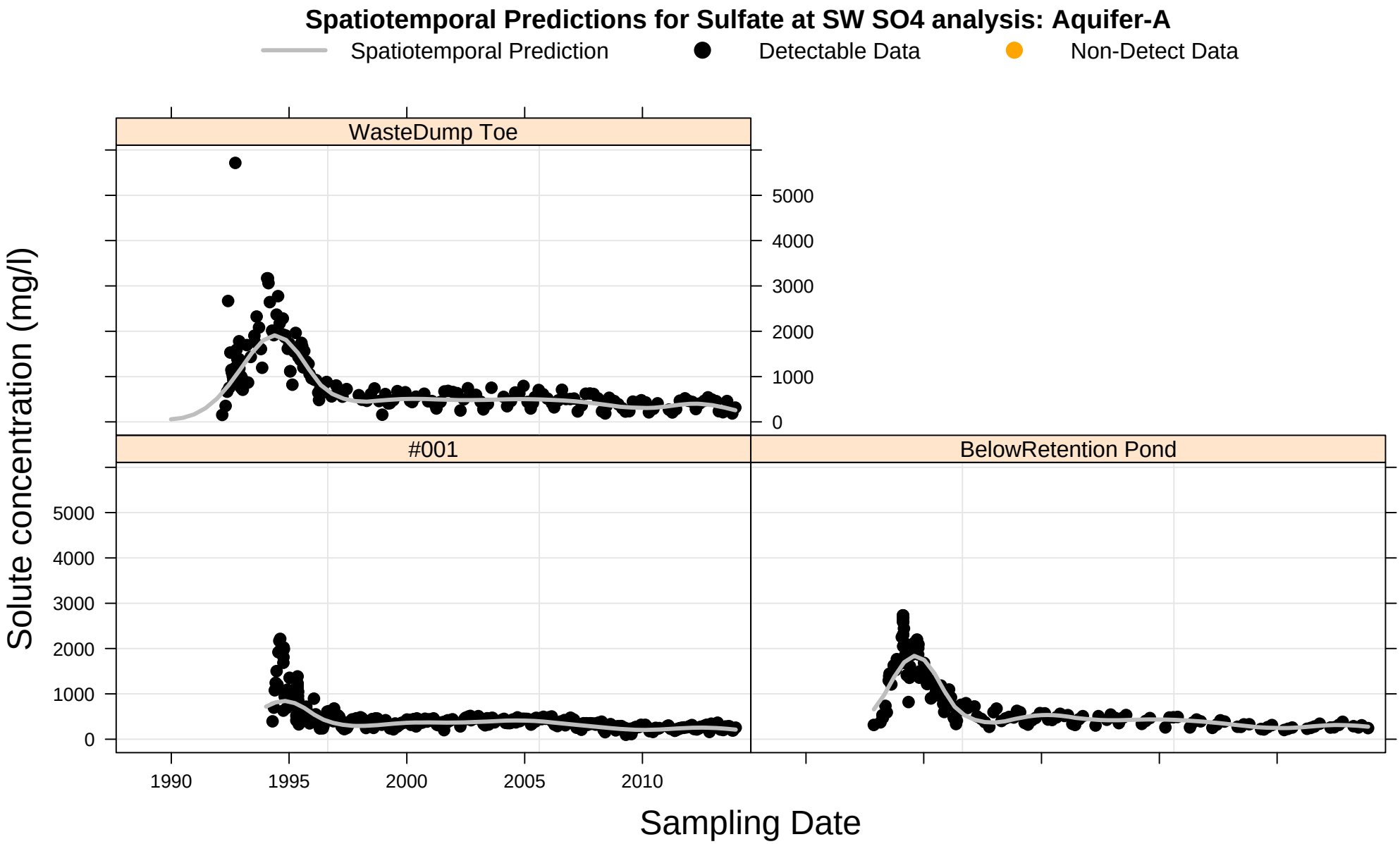

Spatiotemporal Predictions for Zinc,TR at SW Zn Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
#002
#003
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1990
1995
2000
2005
2010

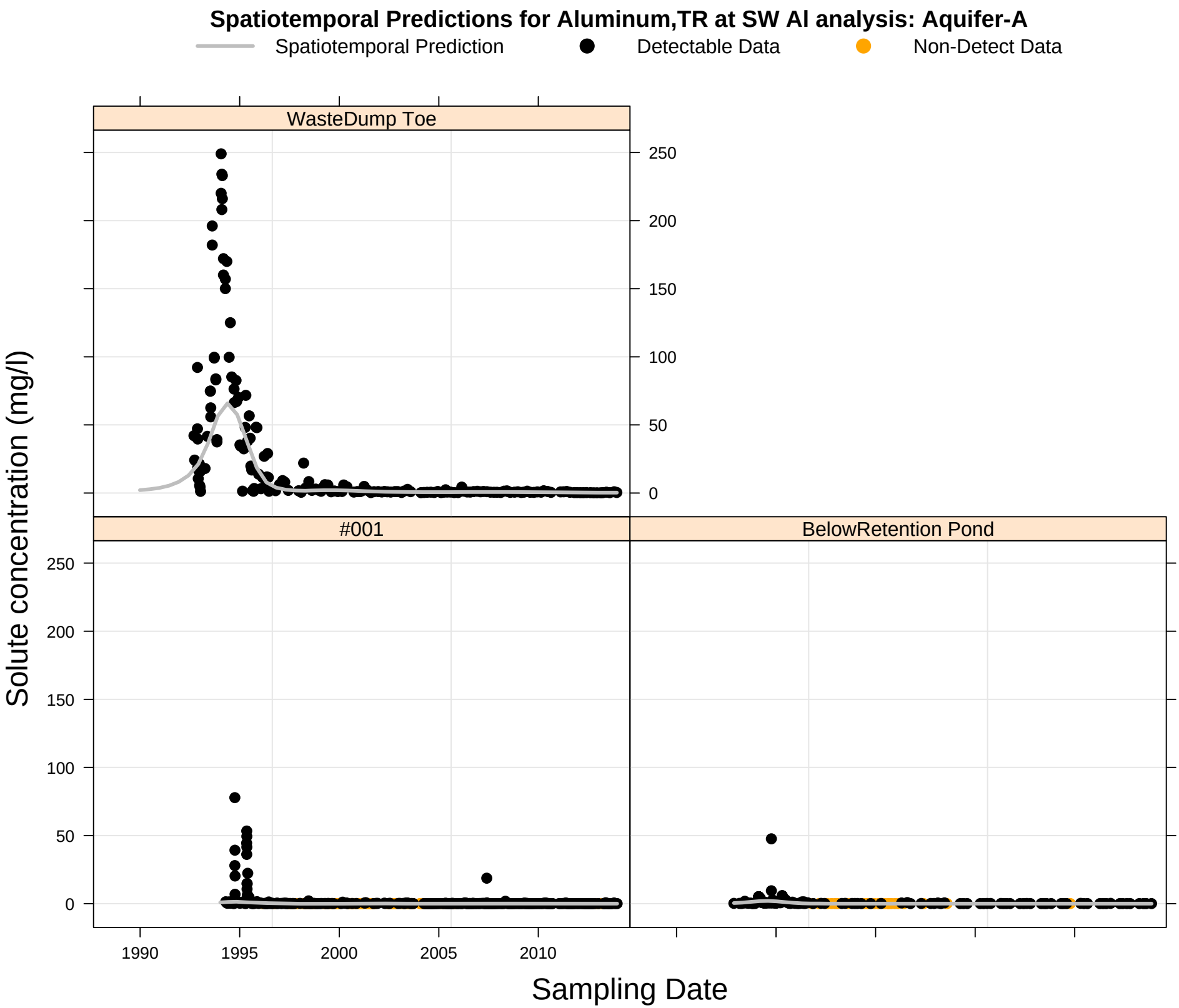
Appendix G

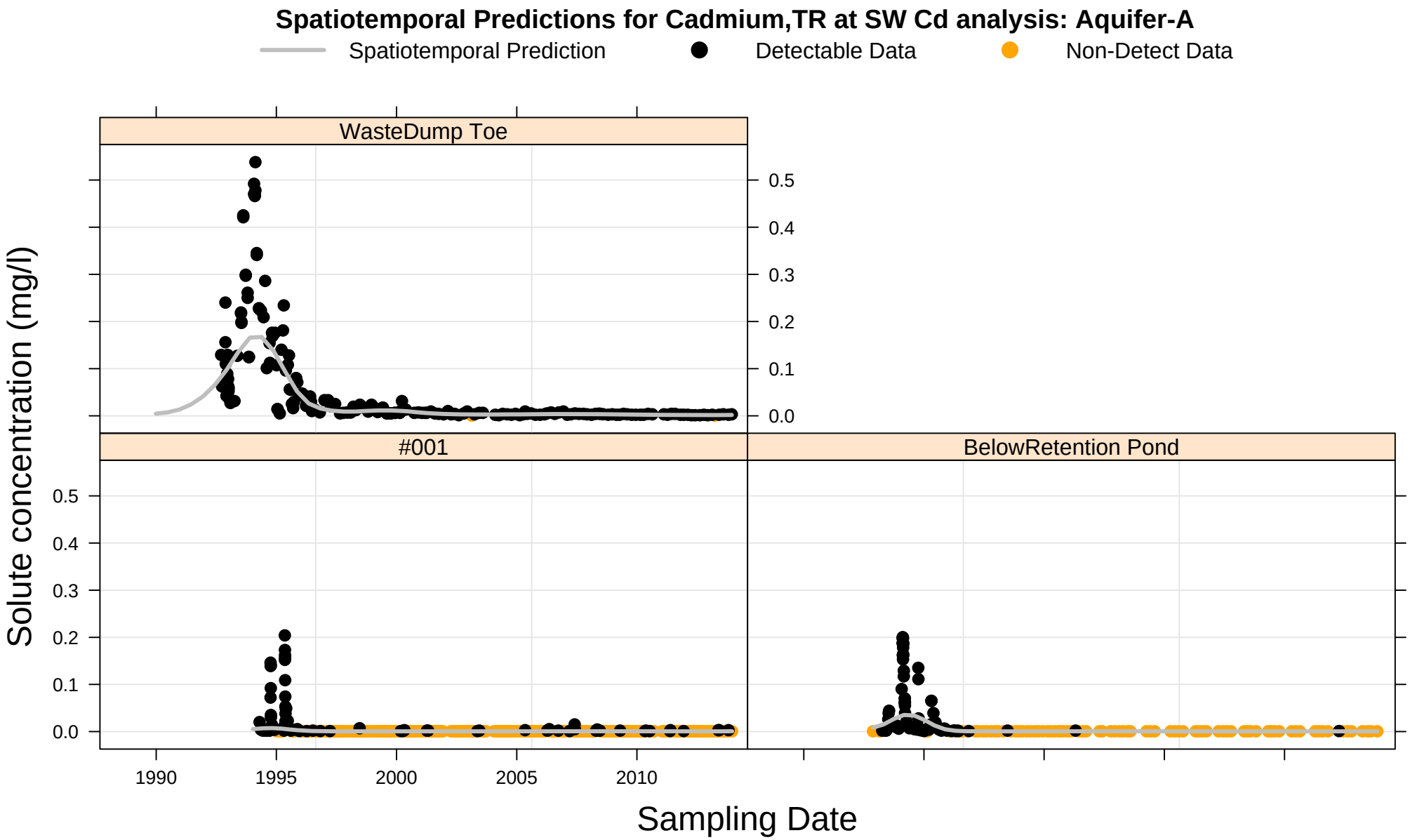
Spruce Gulch:

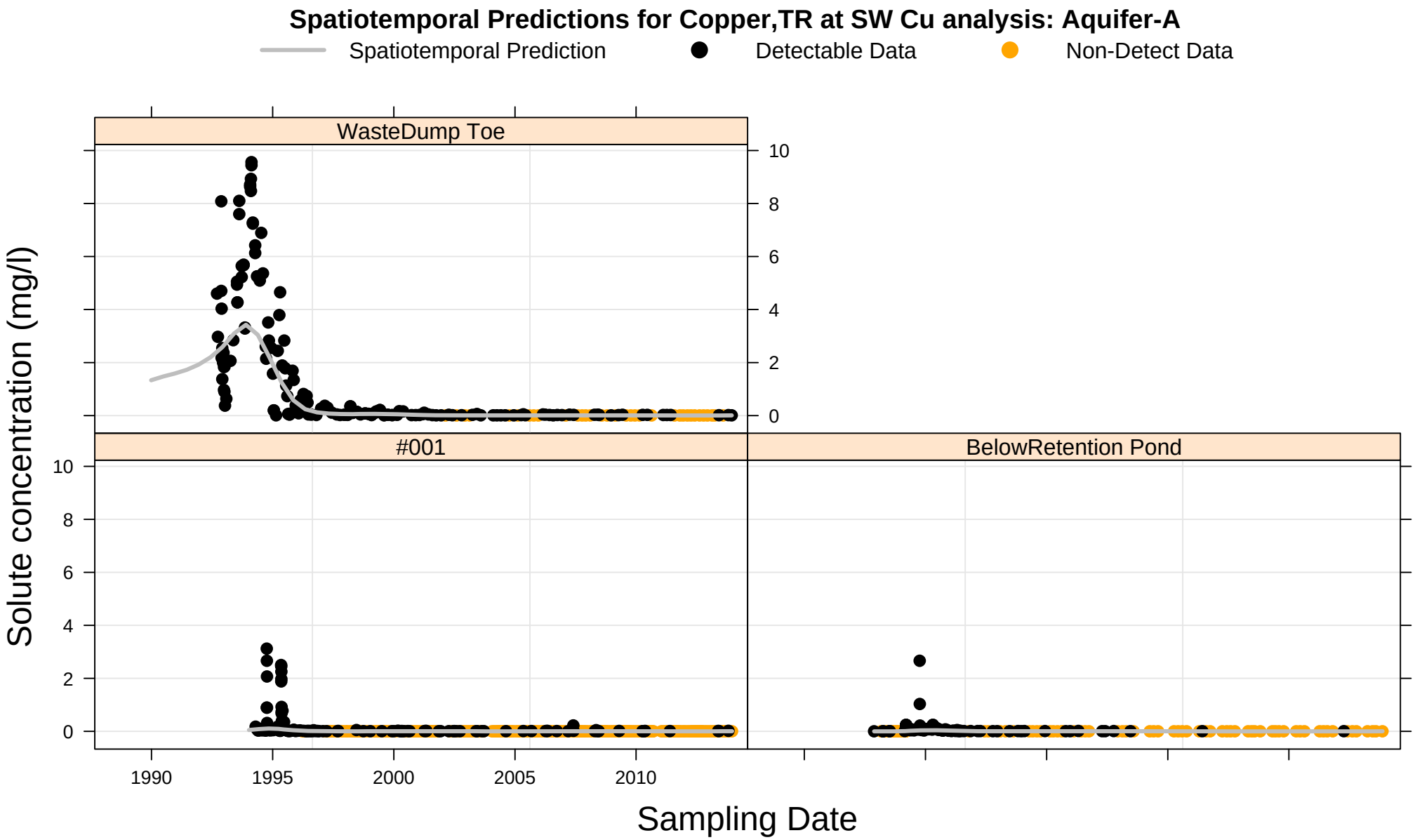
Surface Water Quality Graphs

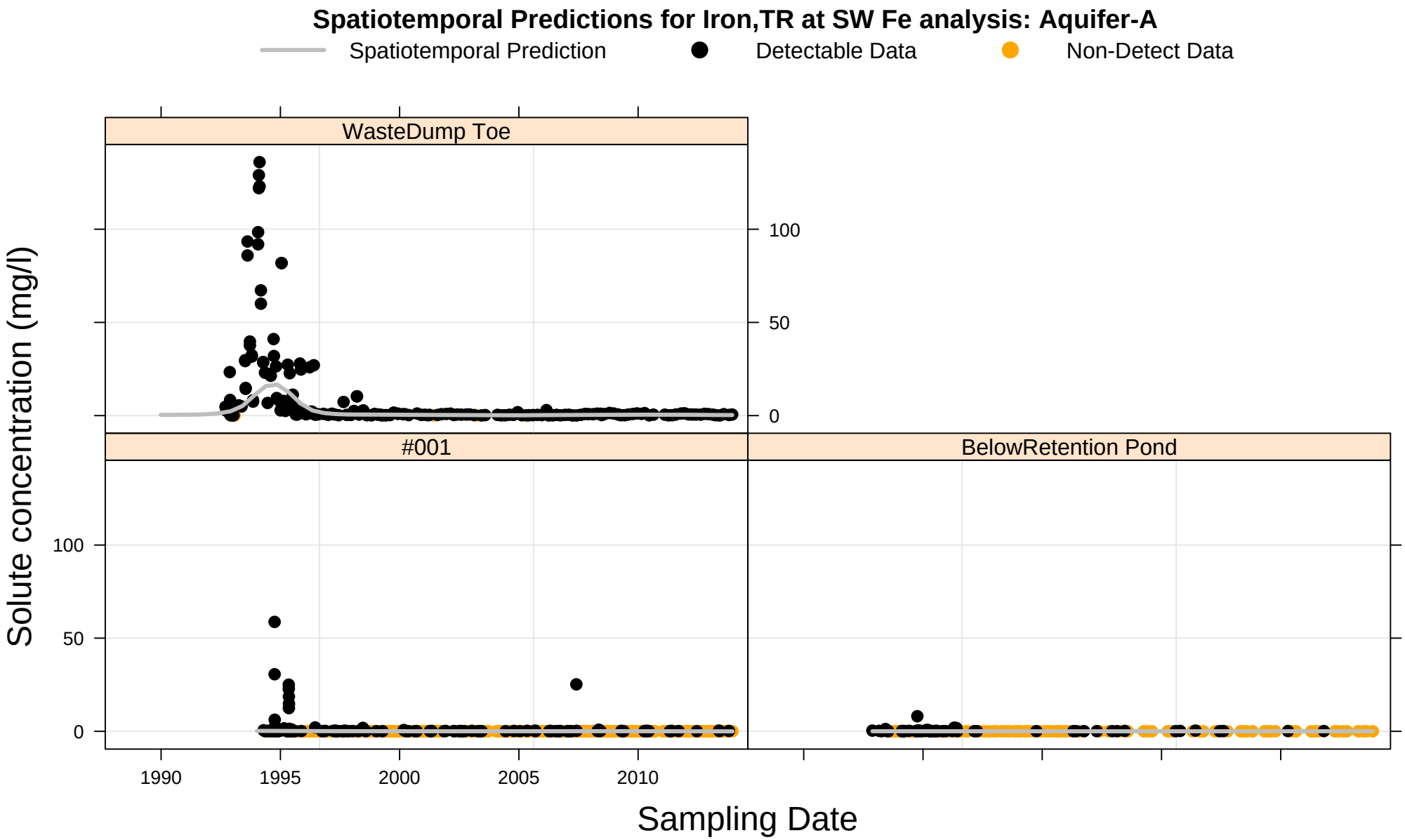

Spatiotemporal Predictions for pH at SW pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
Sampling Date
2
4
6
8
1990
1995
2000
2005
2010

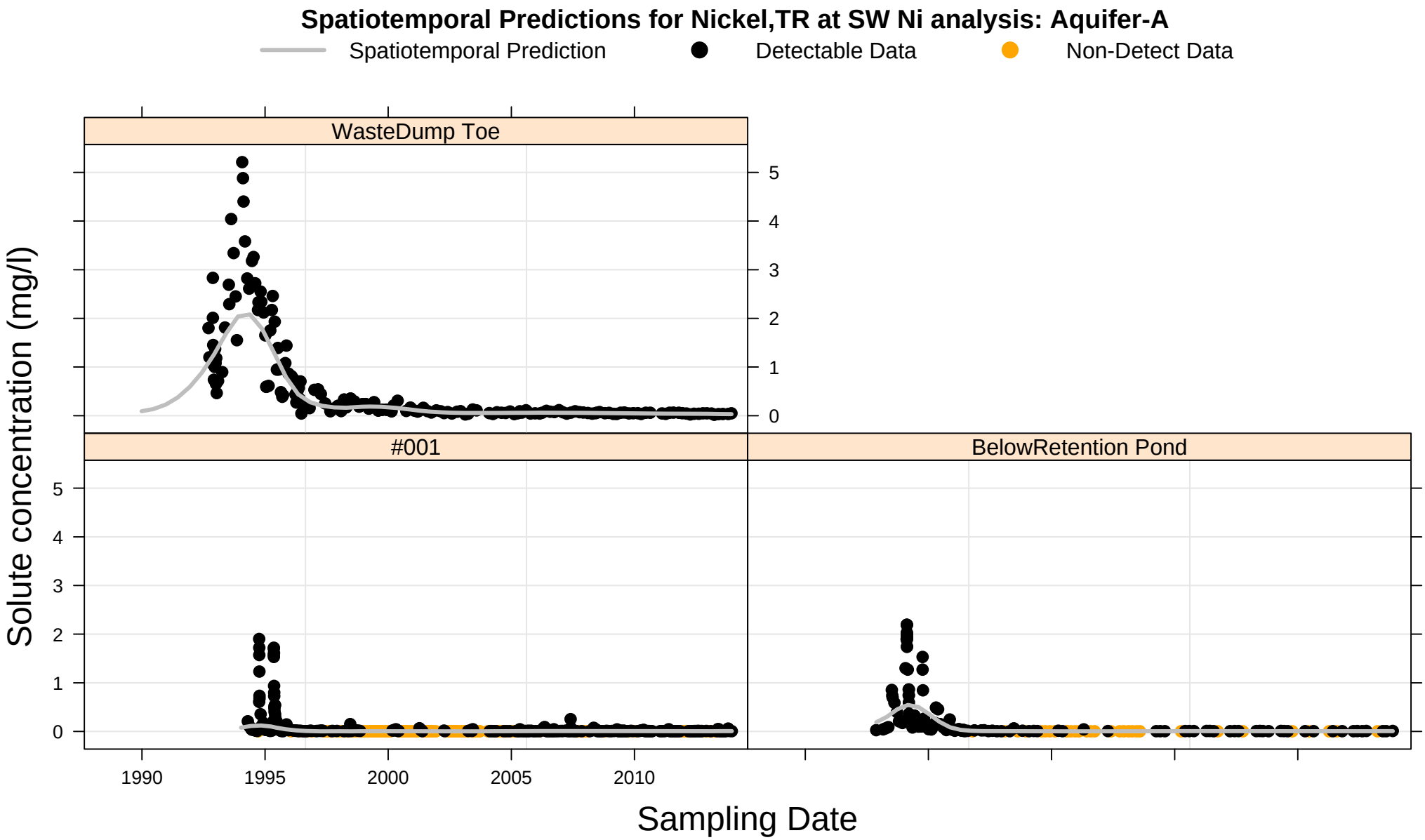

Spatiotemporal Predictions for Sulfate at SW SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
0
1000
2000
3000
4000
5000
1990
1995
2000
2005
2010
Sampling Date

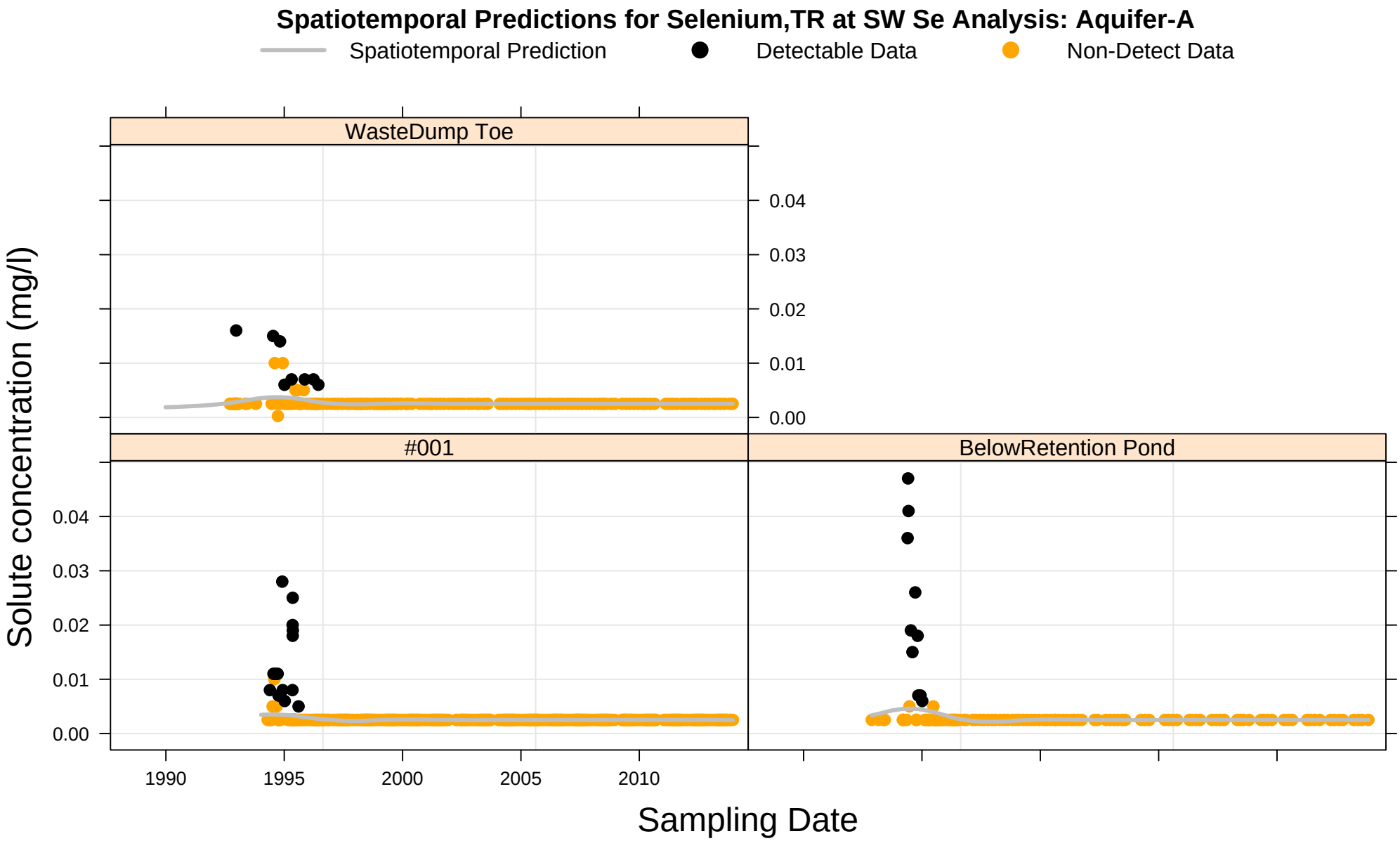

Spatiotemporal Predictions for Aluminum,TR at SW Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
Sampling Date
0
50
100
150
200
250
1990
1995
2000
2005
2010

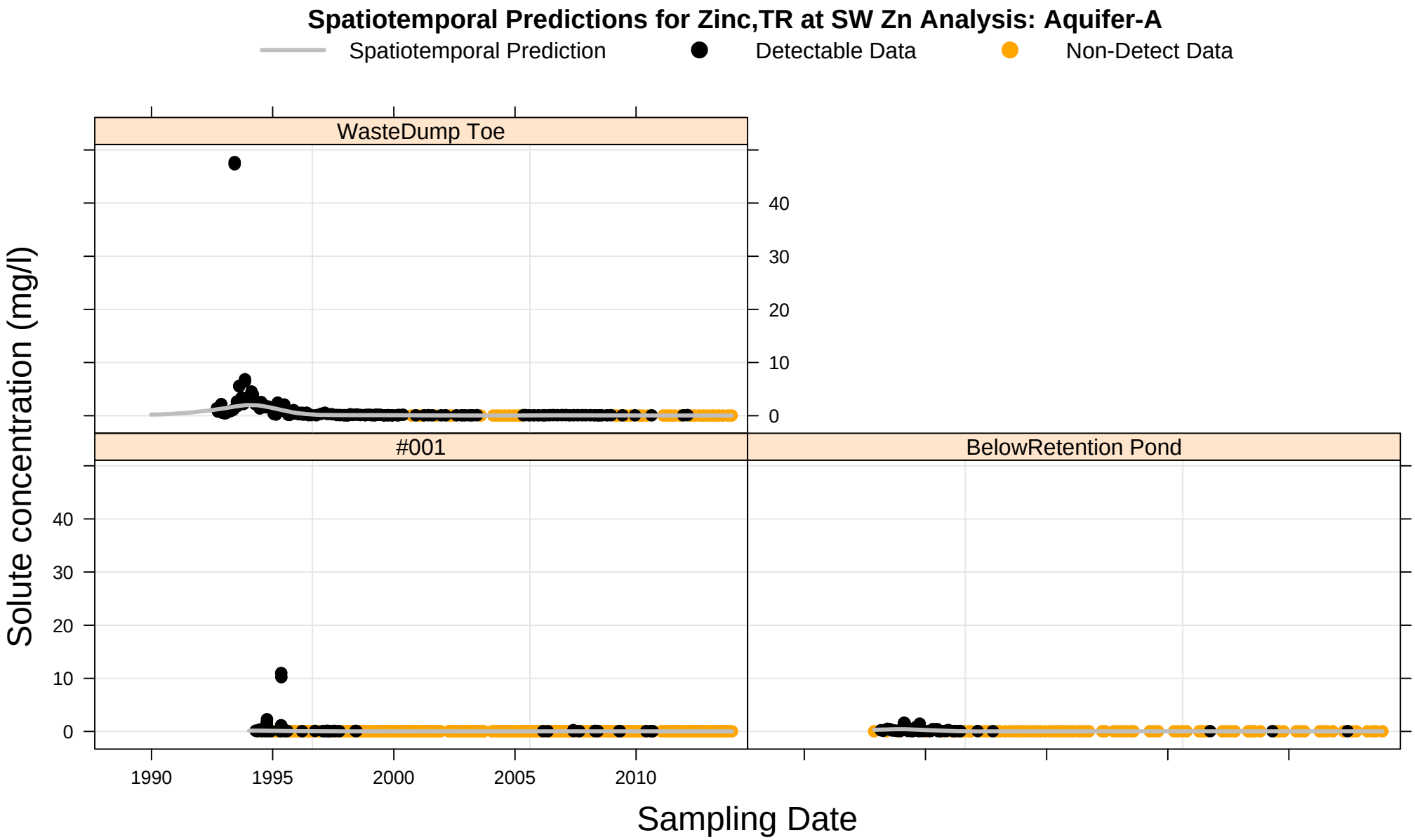

Spatiotemporal Predictions for Cadmium,TR at SW Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
0.0
0.1
0.2
0.3
0.4
0.5
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Copper,TR at SW Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
Sampling Date
0
2
4
6
8
10
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,TR at SW Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
0
50
100
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Nickel,TR at SW Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
Sampling Date
0
1
2
3
4
5
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Selenium,TR at SW Se Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
0.00
0.01
0.02
0.03
0.04
1990
1995
2000
2005
2010
Sampling Date

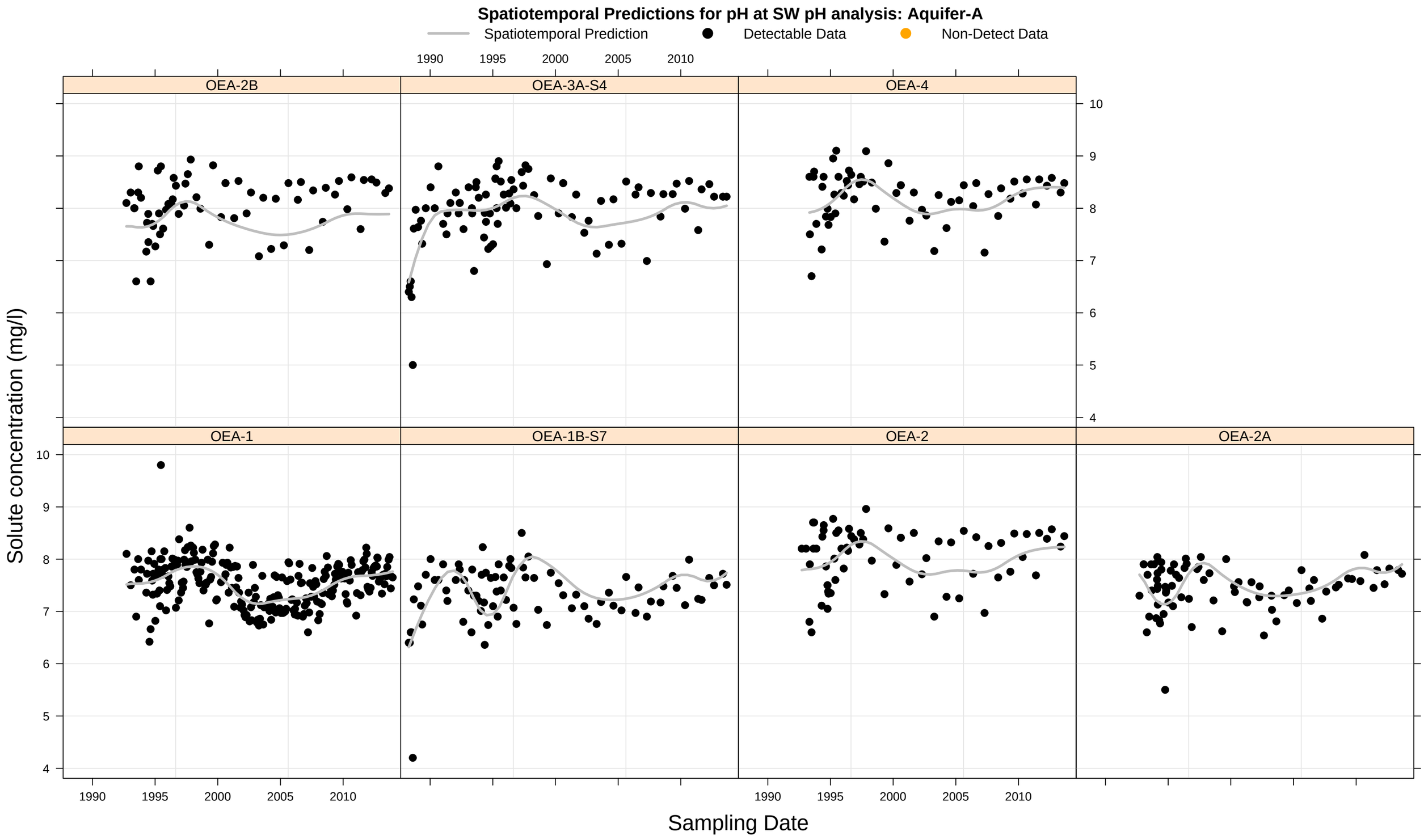

Spatiotemporal Predictions for Zinc,TR at SW Zn Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
WasteDump Toe
#001
BelowRetention Pond
Solute concentration (mg/l)
0
10
20
30
40
1990
1995
2000
2005
2010
Sampling Date

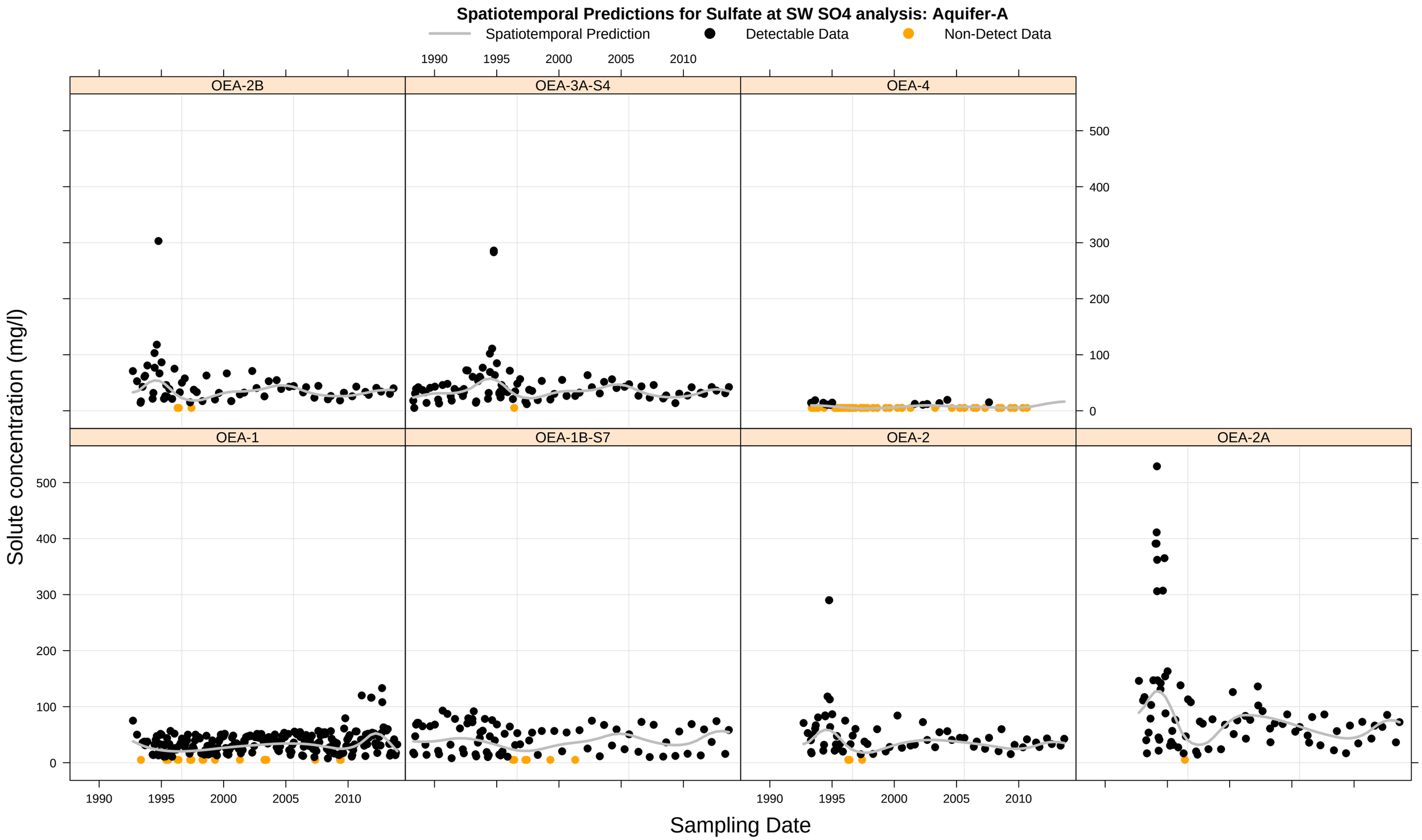
Appendix H.1

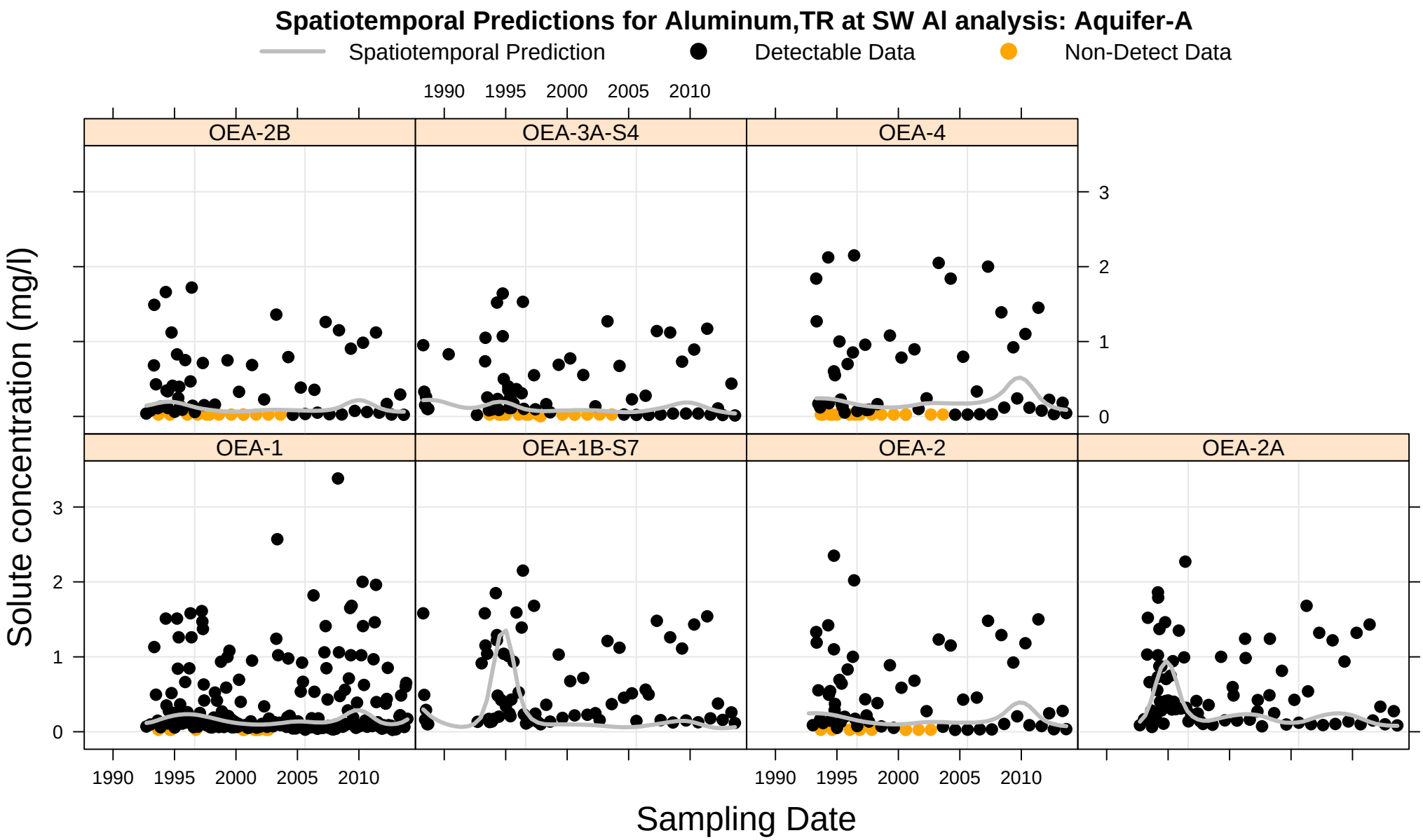
Cleopatra Creek:

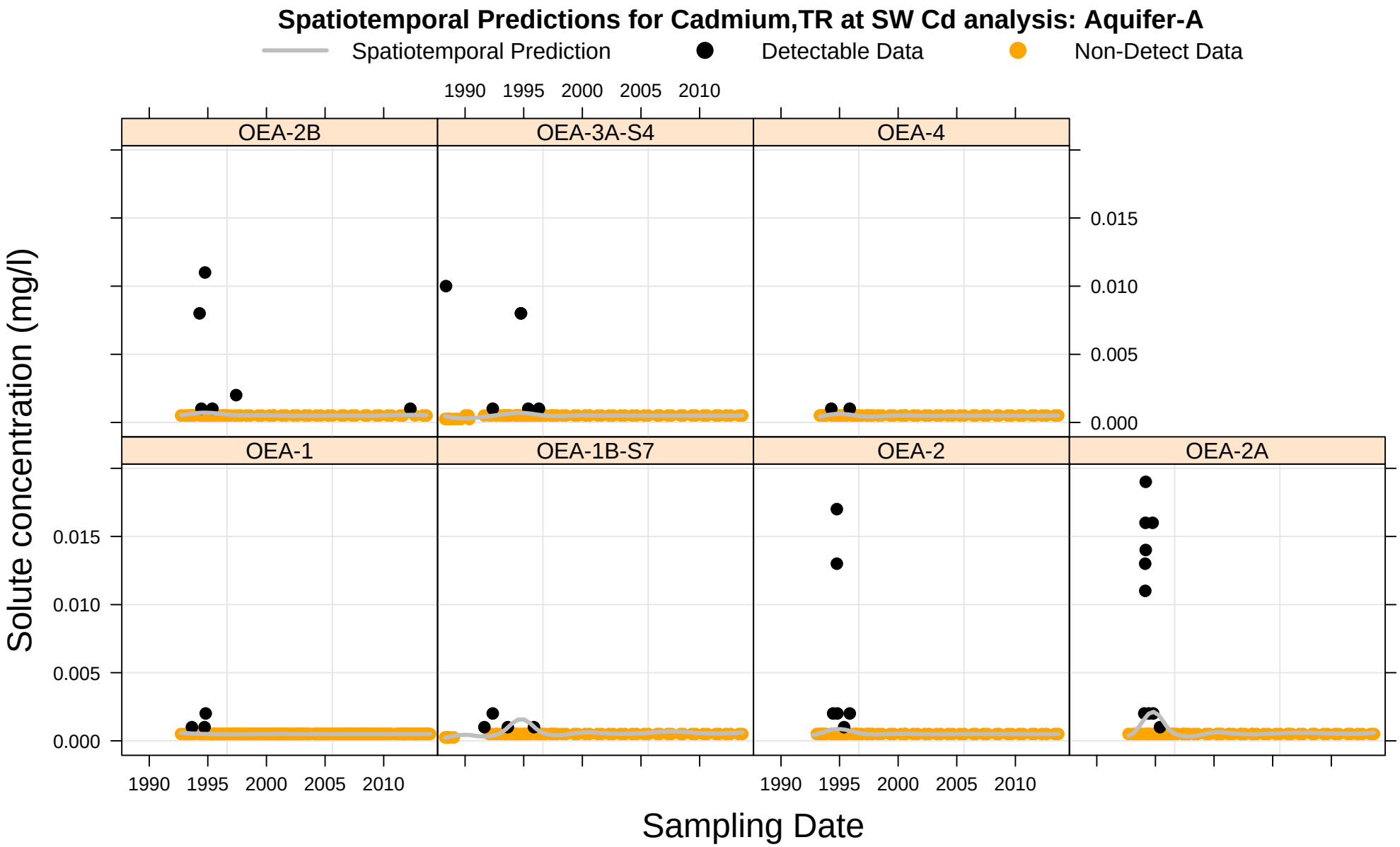
Surface Water Quality Graphs

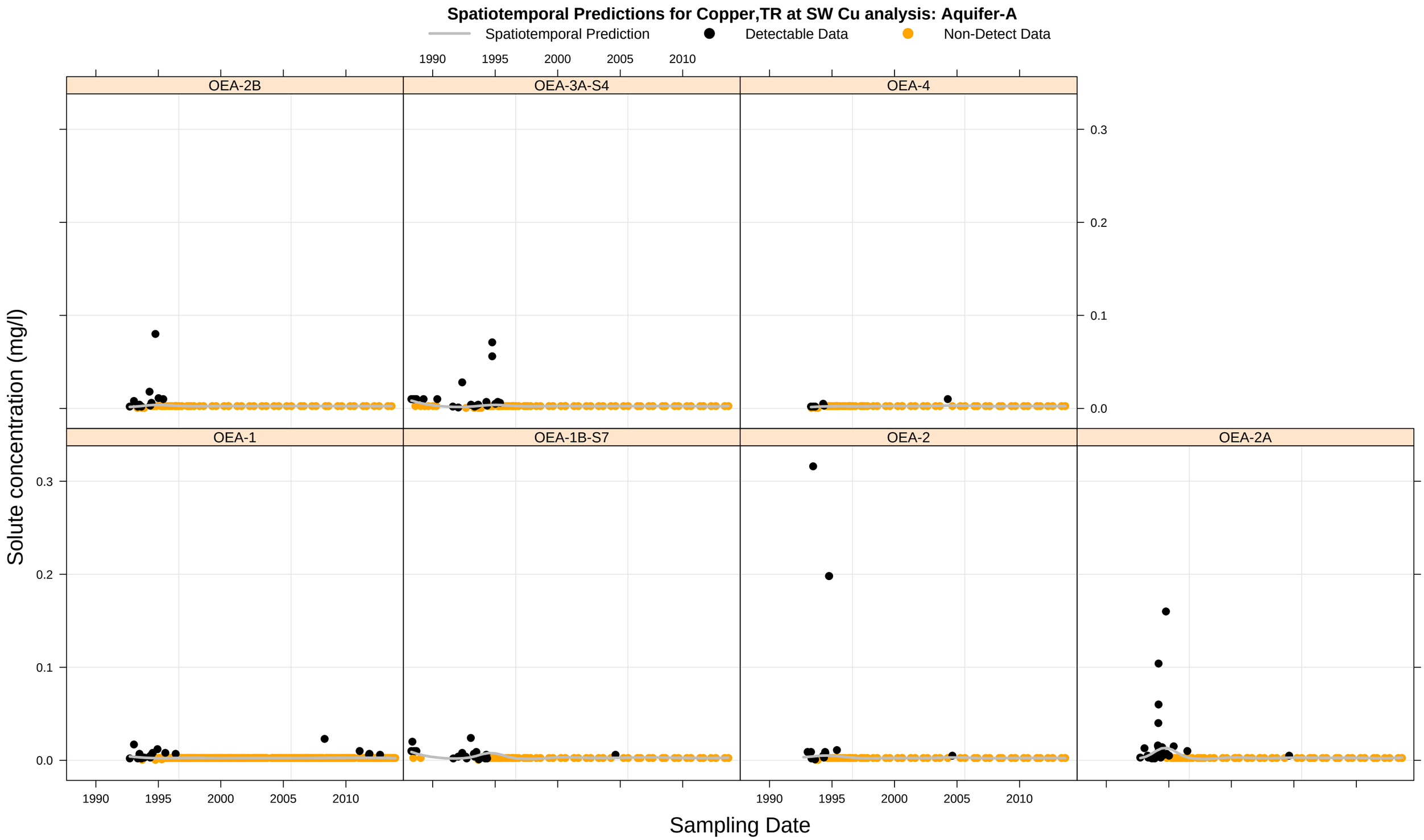
Sample sites above confluence with Cole Creek

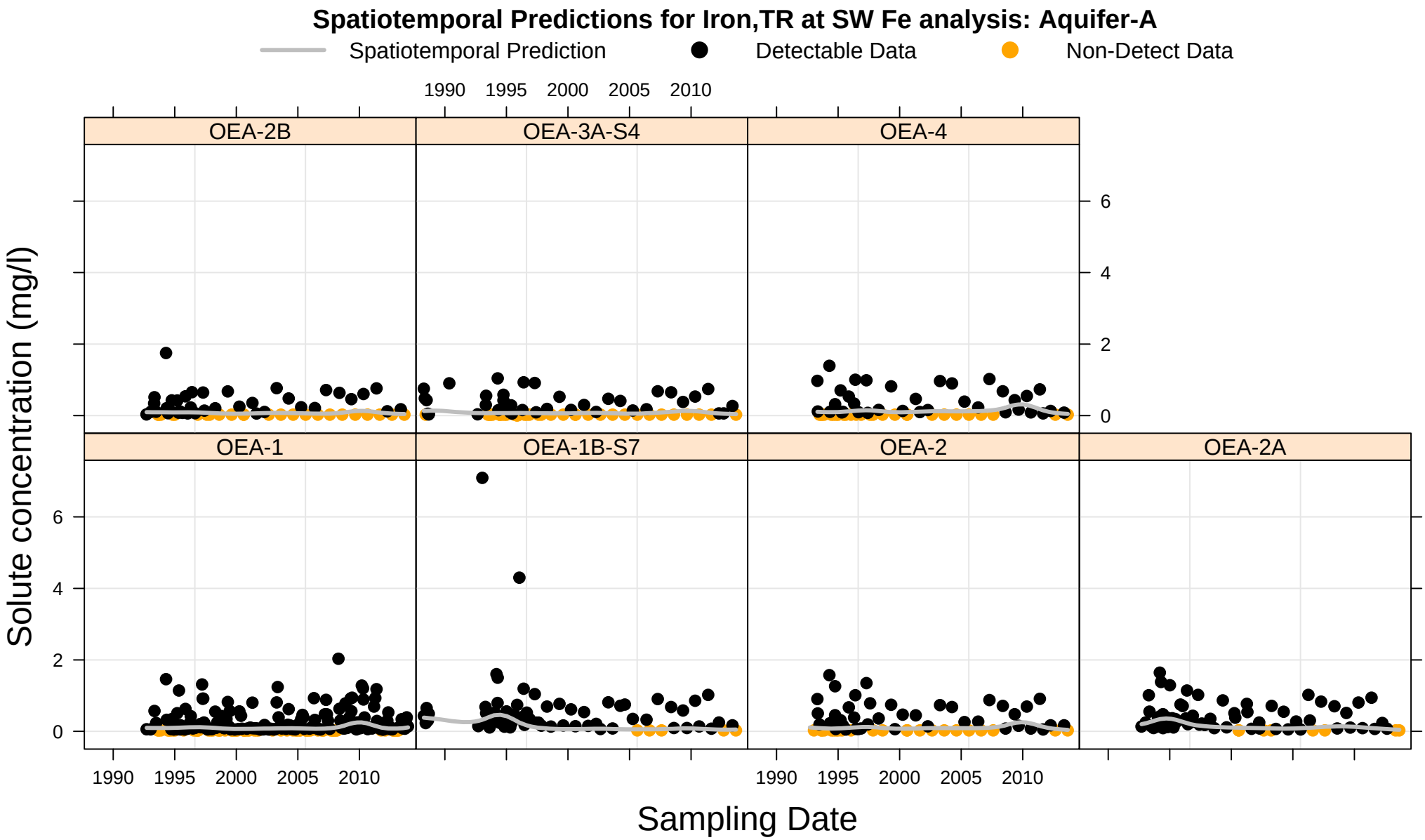

Spatiotemporal Predictions for pH at SW pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
1990
1995
2000
2005
2010
4
5
6
7
8
9
10

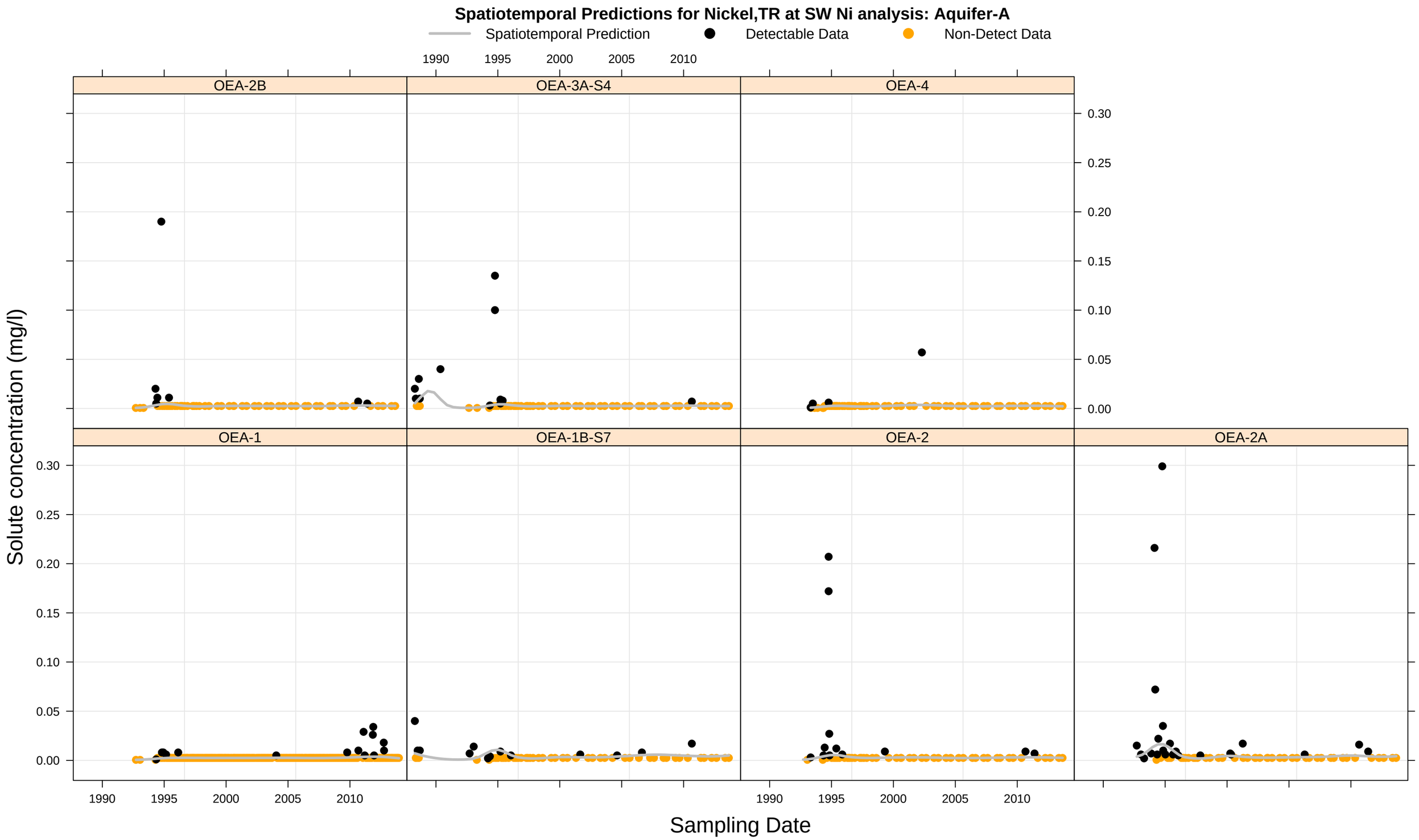

Spatiotemporal Predictions for Sulfate at SW SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0
100
200
300
400
500
1990
1995
2000
2005
2010

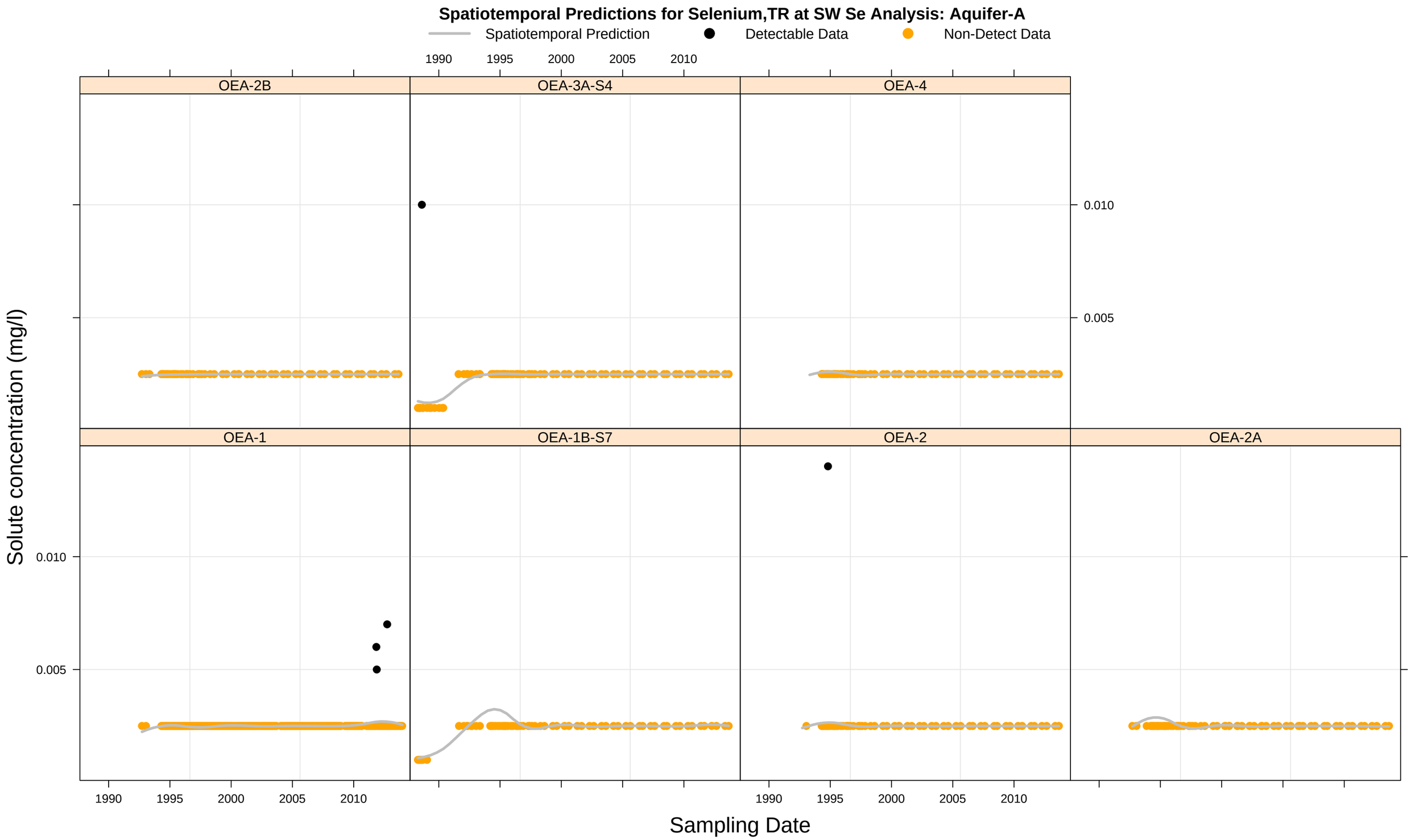

Spatiotemporal Predictions for Aluminum,TR at SW Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0
1
2
3
1990
1995
2000
2005
2010

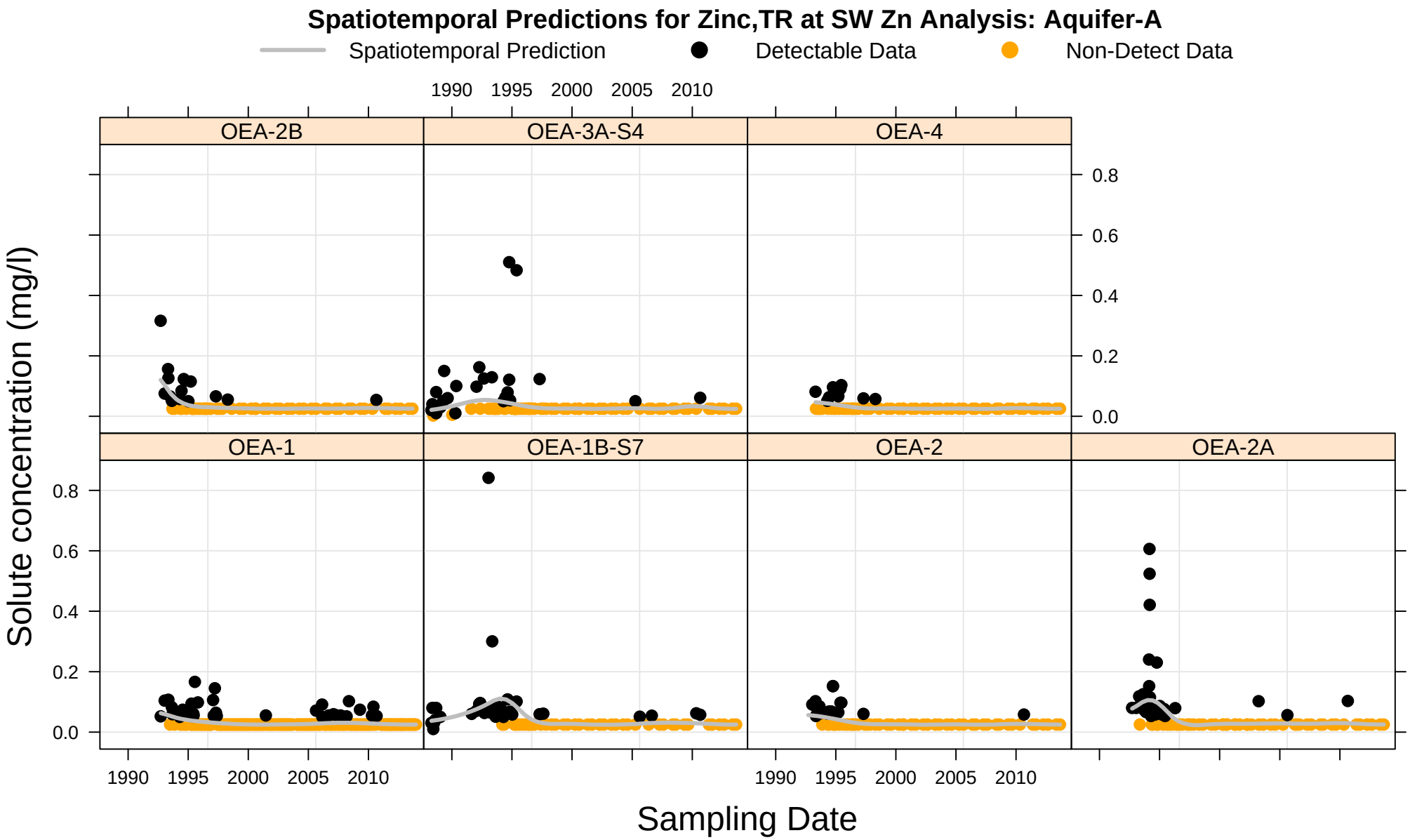

Spatiotemporal Predictions for Cadmium,TR at SW Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
0.000
0.005
0.010
0.015
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Copper,TR at SW Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0.0
0.1
0.2
0.3
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Iron,TR at SW Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0
2
4
6
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Nickel,TR at SW Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0.00
0.05
0.10
0.15
0.20
0.25
0.30
1990
1995
2000
2005
2010


Spatiotemporal Predictions for Selenium,TR at SW Se Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
0.010
0.005
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date

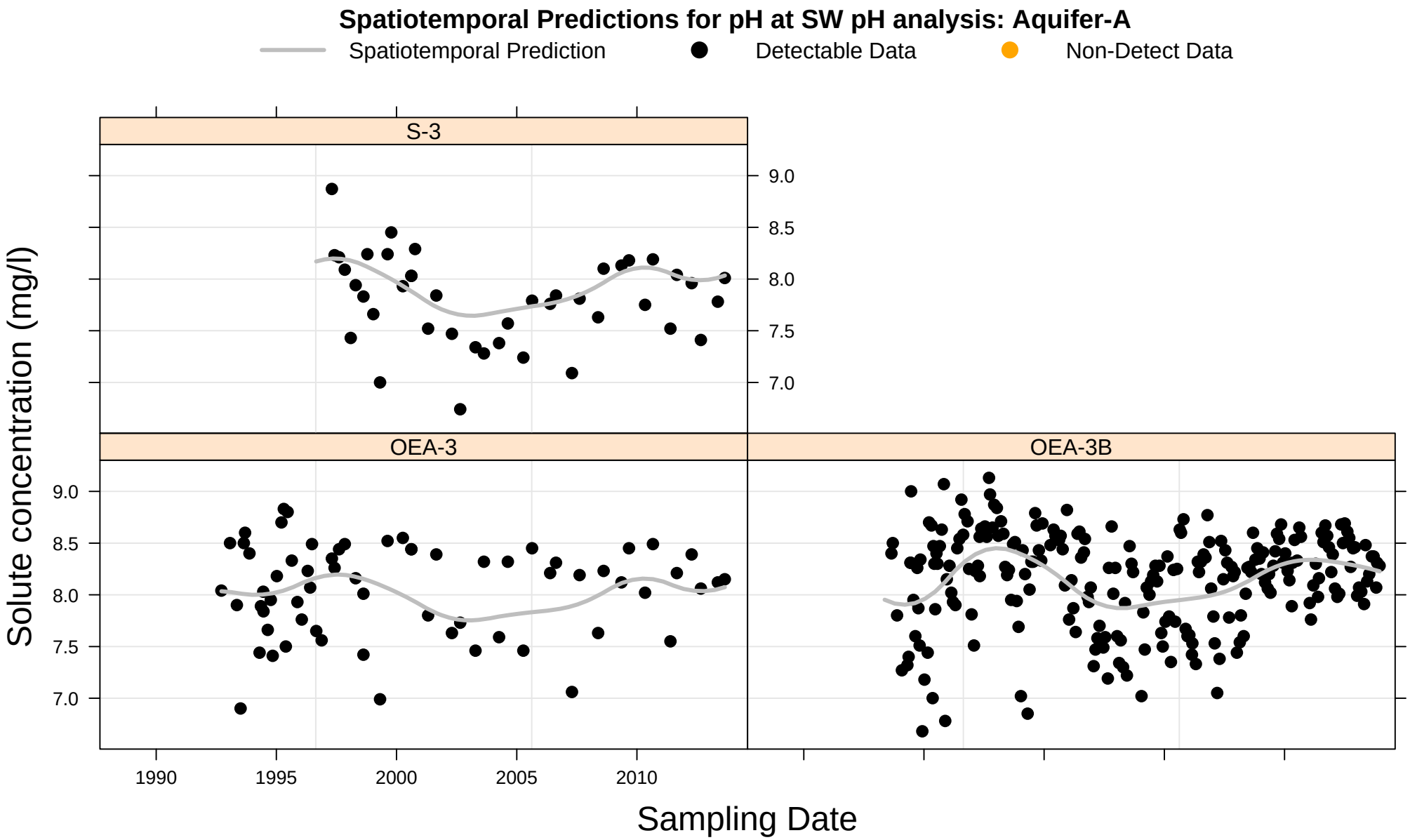

Spatiotemporal Predictions for Zinc,TR at SW Zn Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
OEA-2B
OEA-3A-S4
OEA-4
OEA-1
OEA-1B-S7
OEA-2
OEA-2A
Solute concentration (mg/l)
Sampling Date
0.0
0.2
0.4
0.6
0.8
1990
1995
2000
2005
2010

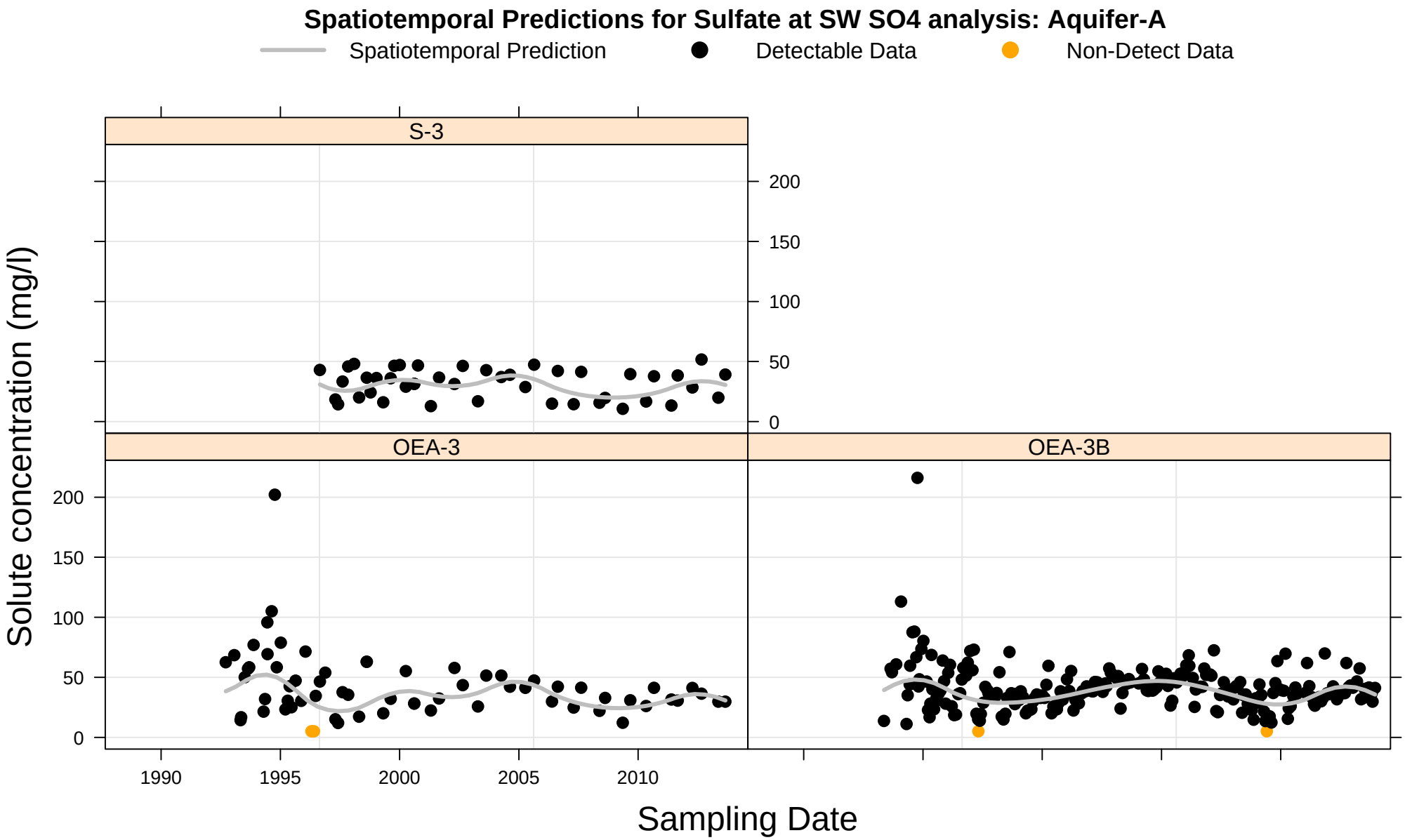
Appendix H.2

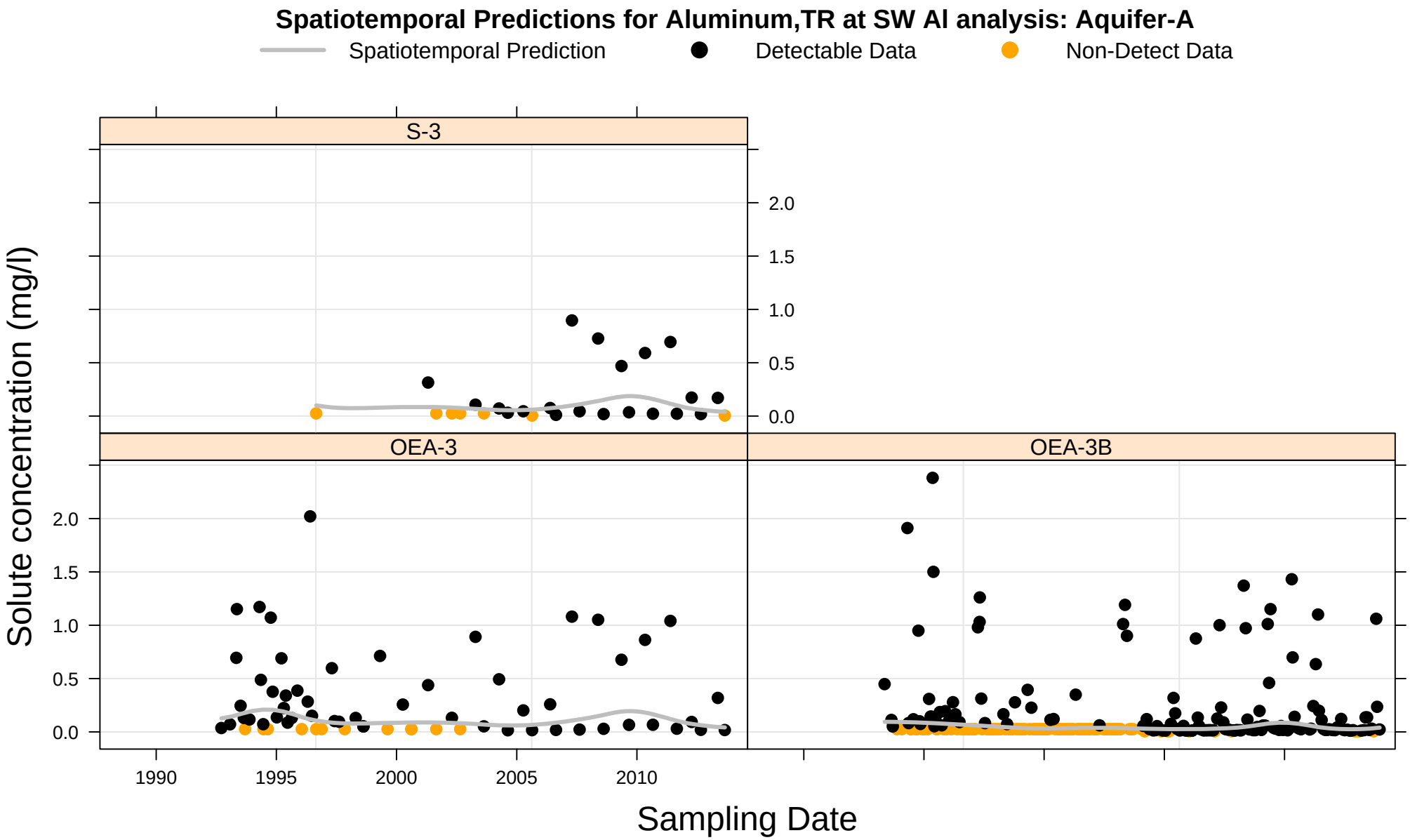
Cleopatra Creek:

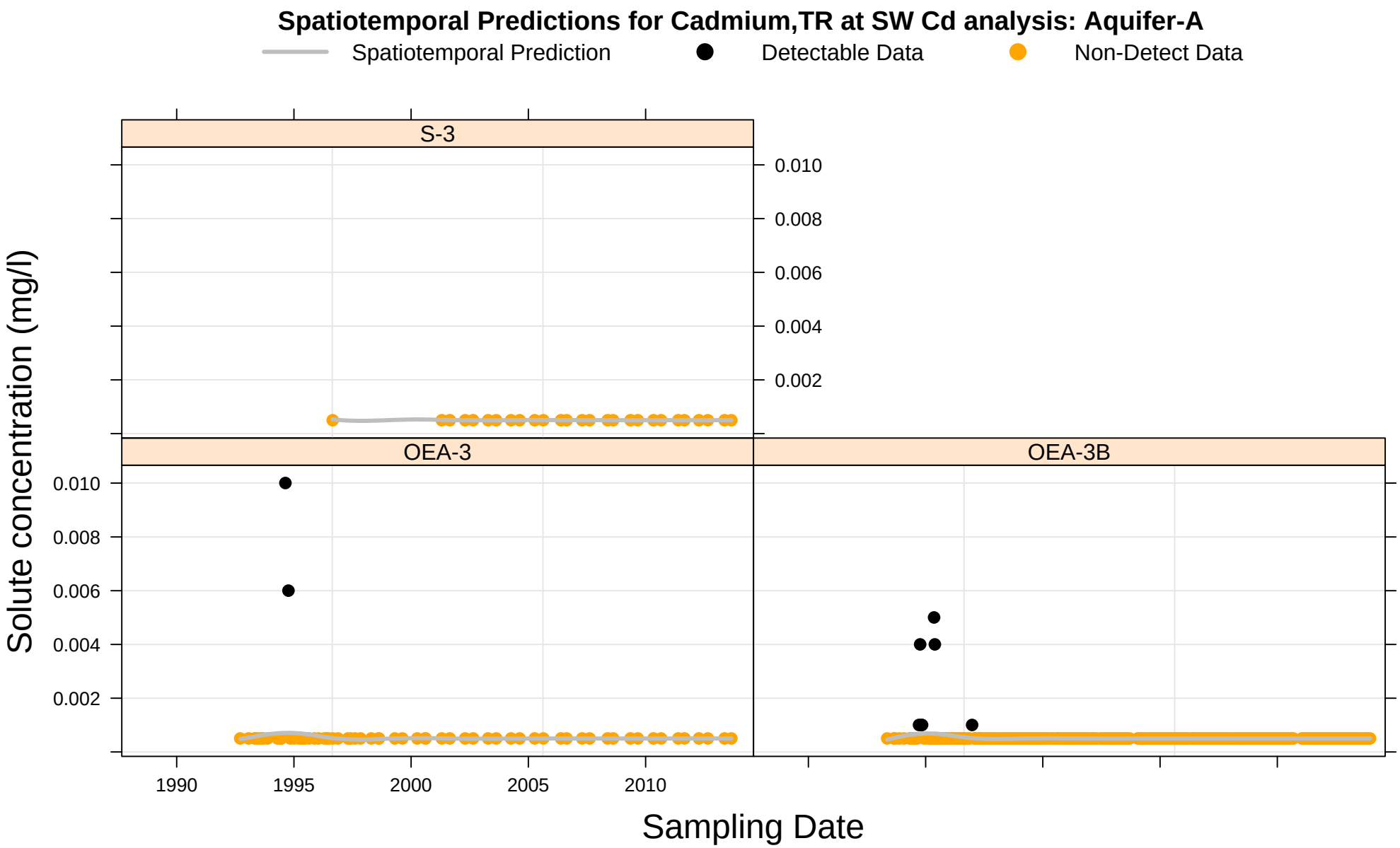
Surface Water Quality Graphs

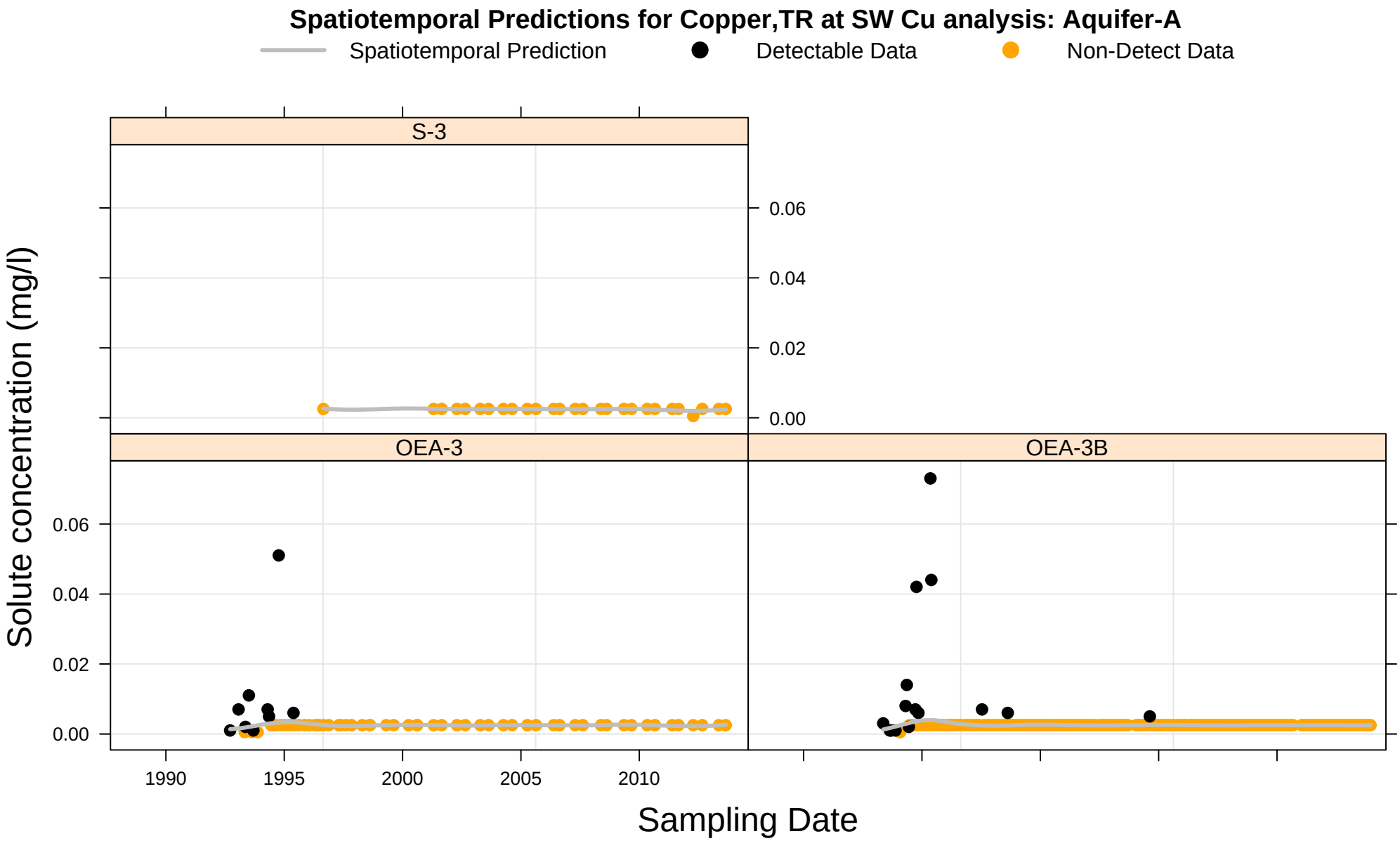
Sample sites for Cole Creek and below

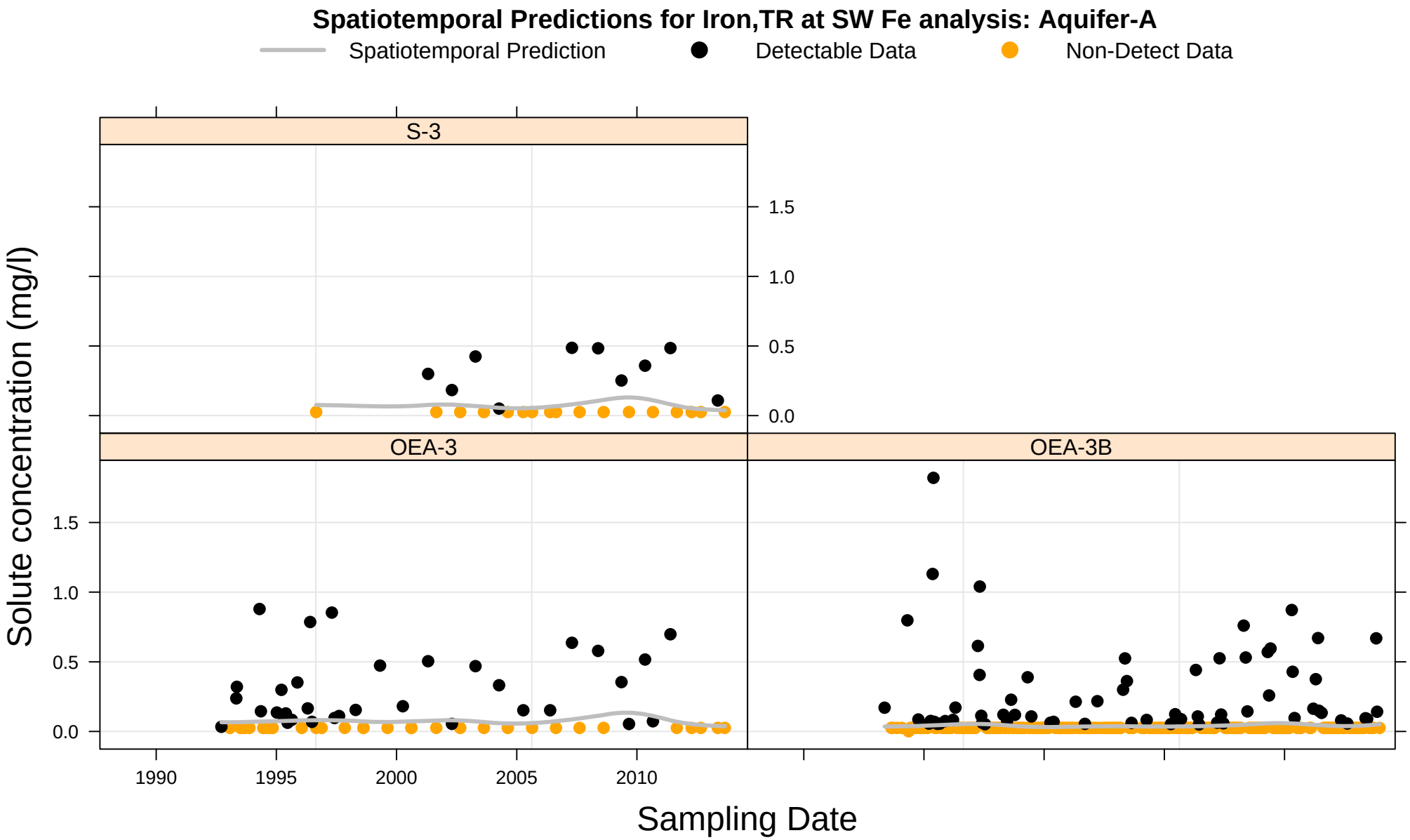

Spatiotemporal Predictions for pH at SW pH analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
9.0
8.5
8.0
7.5
7.0
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date

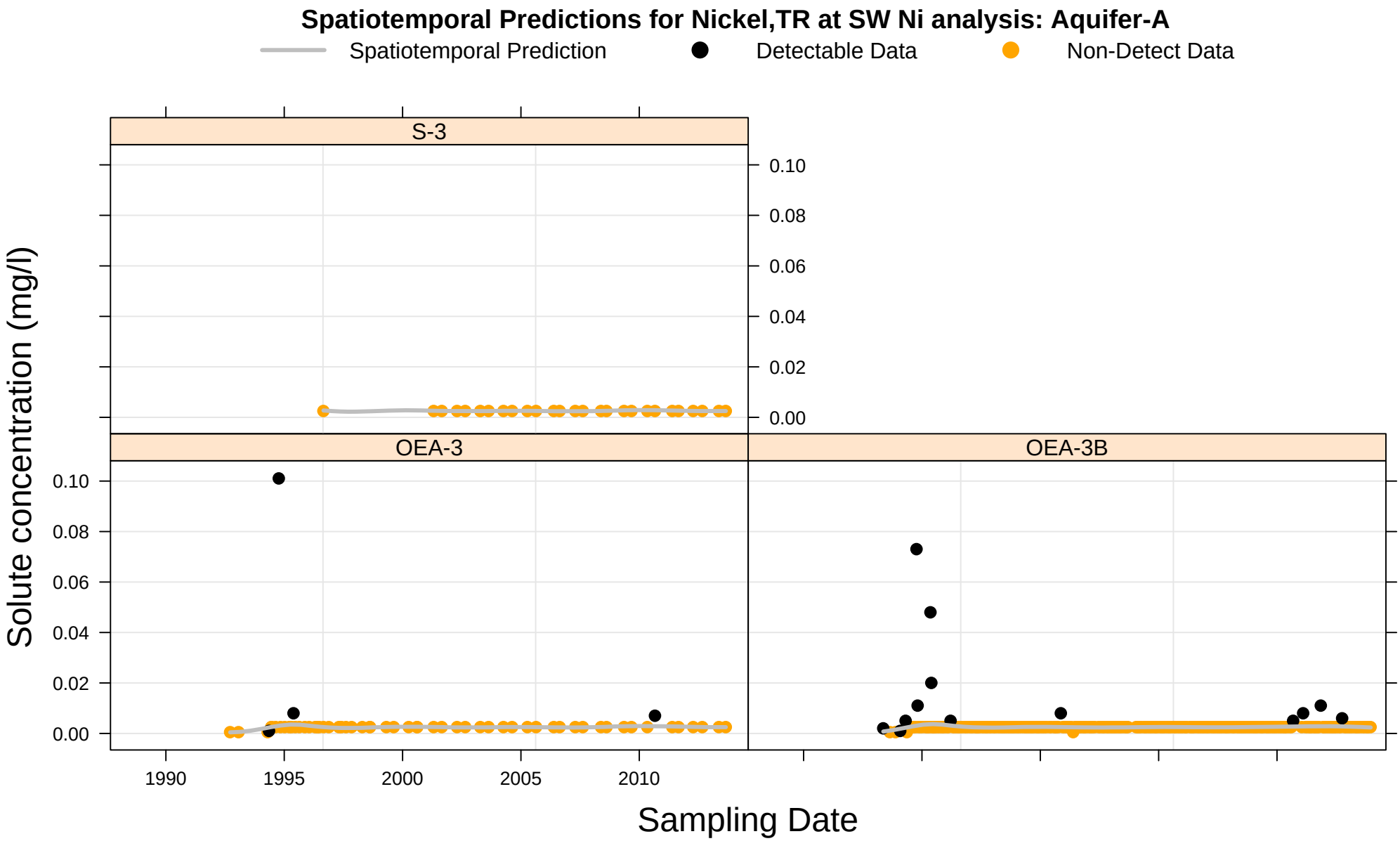

Spatiotemporal Predictions for Sulfate at SW SO4 analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
Solute concentration (mg/l)
0
50
100
150
200
1990
1995
2000
2005
2010
Sampling Date

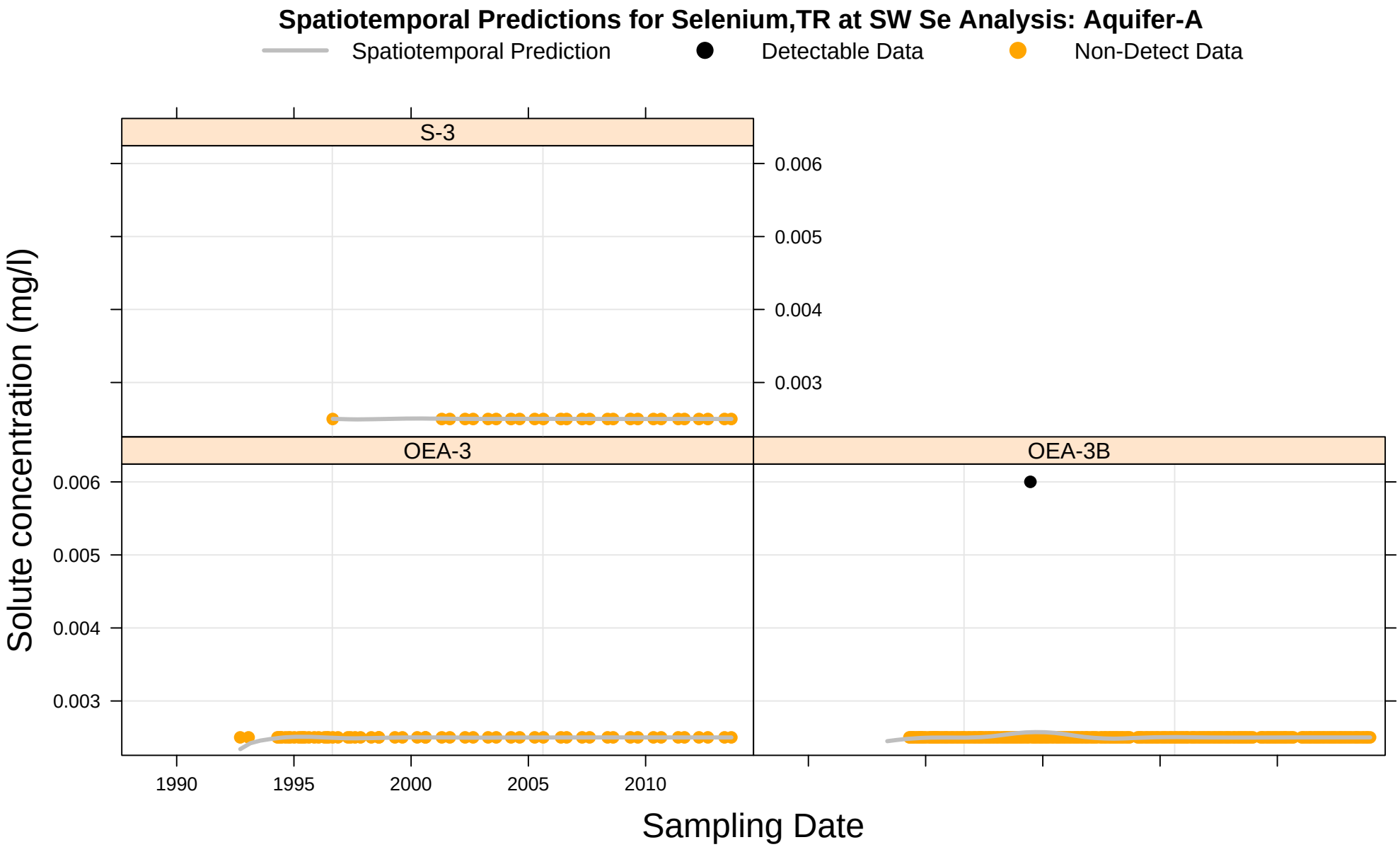

Spatiotemporal Predictions for Aluminum,TR at SW Al analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
Solute concentration (mg/l)
0.0
0.5
1.0
1.5
2.0
1990
1995
2000
2005
2010
Sampling Date

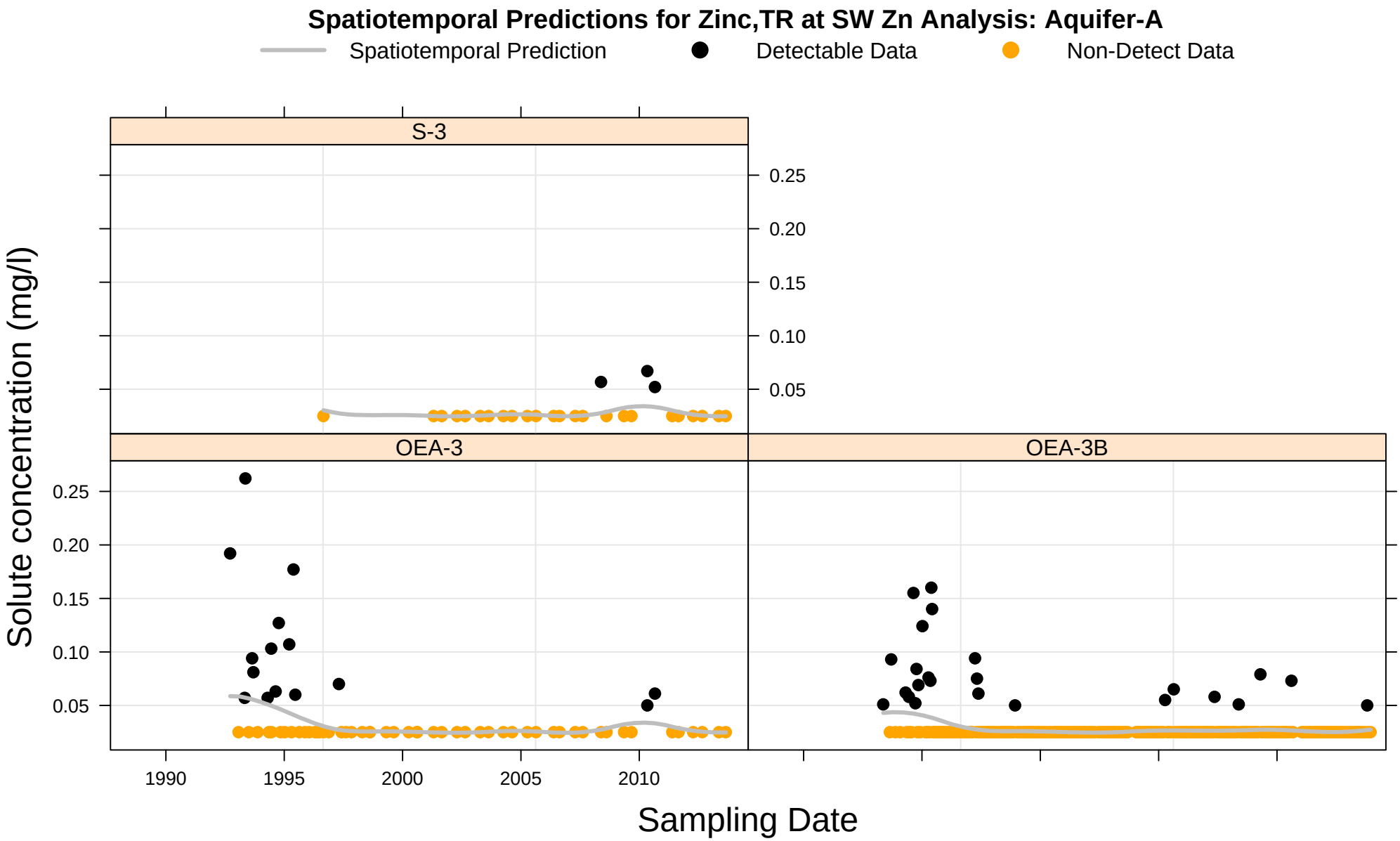

Spatiotemporal Predictions for Cadmium,TR at SW Cd analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
0.010
0.008
0.006
0.004
0.002
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Copper,TR at SW Cu analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
0.06
0.04
0.02
0.00
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Iron,TR at SW Fe analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
Solute concentration (mg/l)
0.0
0.5
1.0
1.5
1990
1995
2000
2005
2010
Sampling Date


Spatiotemporal Predictions for Nickel,TR at SW Ni analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
0.10
0.08
0.06
0.04
0.02
0.00
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Selenium,TR at SW Se Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
0.006
0.005
0.004
0.003
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date


Spatiotemporal Predictions for Zinc,TR at SW Zn Analysis: Aquifer-A
Spatiotemporal Prediction
Detectable Data
Non-Detect Data
S-3
OEA-3
OEA-3B
0.25
0.20
0.15
0.10
0.05
1990
1995
2000
2005
2010
Solute concentration (mg/l)
Sampling Date