Appendix A

Heat Exchange Program

Introduction

The CH3D hydrodynamic model requires surface heat exchange and wind speed inputs to compute water temperature and wind-driven water circulation. The CE-QUAL-ICM water quality model requires similar inputs to compute water temperature, algal production, and reaeration. A FORTRAN program developed by ACOE-ERDC for the development of the Lake Washington model (Cerco and Noel 2004) was modified to use observed solar radiation in the calculation of equilibrium surface heat exchange values and write out required wind and heat exchange files for CH3D and the meteorological file for CE-QUAL-ICM. The program was also modified to scale the observed wind speed to the appropriate heights for use in the evaporation and surface wind shear stress algorithms and implement that use of a Wind Adjustment Factor (WAF) in model calibration.

The WAF (sometimes referred to as a wind sheltering factor) has been used in many lake and reservoir temperature modeling applications (see p. 460 of Martin and McCutcheon 1999). Available meteorological data are often only available from an offsite location and may not be representative of local lake conditions. Even on-site data may not be completely representative of the conditions over the entire lake, especially winds experienced over large lakes and/or lakes with complex configurations.

Surface heat exchange (Hn) is the result of the balance among incident short wave solar radiation (Hs), long wave atmospheric radiation (Ha), which are independent of the temperature of the water, and heat exchange resulting from evaporation (He), conduction (Hc), and long wave black-body radiation (Hb) emitted radiated back to the atmosphere from the water. The latter 3 heat exchange mechanisms are dependent on the temperature of the water. A small portion of the incoming short and long wave radiation is also reflected from the water surface (Hsr and Har, respectively). The overall heat balance can be formulated as:

$$Hn = Hs + Ha + Hb - (Hsr + Har + Hb)$$

Mathematical formulations have been developed for each of these terms, which allows for an explicit calculation of the net surface heat exchange (sometimes referred to as a “term-by-term” approach) during each model time step. However, an analytical solution was developed in the early 1970s that eliminated the water-dependent terms and allows for the calculation of equilibrium temperature and heat exchange coefficients that can be used as the model inputs for temperature modeling (Edinger et al. 1974). This “Equilibrium Temperature” approach is currently the one used in the CH3D and CE-QUAL-ICM models.

The Equilibrium Temperature approach requires inputs for solar radiation, air temperature, dew point temperature, wind speed and cloud cover in tenths. Hourly data are readily available from local meteorological stations and were considered to be the appropriate frequency for the development of these models.

Hourly solar radiation can be calculated with using the solar constant, algorithms that provide the position of sun at any time of day and year, and the reduction of the solar radiation at the edge of the atmosphere due to absorption and scattering due to particulates, aerosols, and clouds. The hourly solar radiation predicted by the ACOE-ERDC heat exchange program was compared to

local observations and was found to over-predict solar radiation by about 30 % on average. Since local solar radiation data were readily available for the selected calibration period, the program was modified to allow use of observed rather than predicted values. The original solar radiation algorithms were also replaced by the one used in CE-QUAL-W2 (Cole and Wells 2003), which was found to be capable of predicting local solar radiation to within 3 % on a clear summer day. An algorithm was also added to the program to calculate the amount of short wave radiation reflected from the water surface as a function of the position of the sun above the horizon. Previously, a constant value of 6 % had been used.

There are a number of approaches to calculating long wave atmospheric radiation (Pelletier and Chapra 2004). Cloud cover and air temperature are used In the current program long wave atmospheric radiation is calculated using "Swinbank's formula," including the additional radiation emitted from clouds.

$$Ha = 0.937x10^{-5}(1 + 0.17\ C^2)\ Tabs^6$$

Where,

Ha	=	atmospheric radiation (kJ m-2 h-1)
σ	=	Stefan-Boltzman constant (2.04x10-7 kJ m-2 h-1 ^{o}K-4)
Tabs	=	absolute air temperature 2 m above water surface (^{o}K)

A constant value of 3% of the incoming long wave radiation is assumed to be reflected from the water surface.

The current program uses the wind function formulation preferred by Edinger et al. (1974), which was developed by Brady et al. (1969).

Appendix B

Appendix Figures

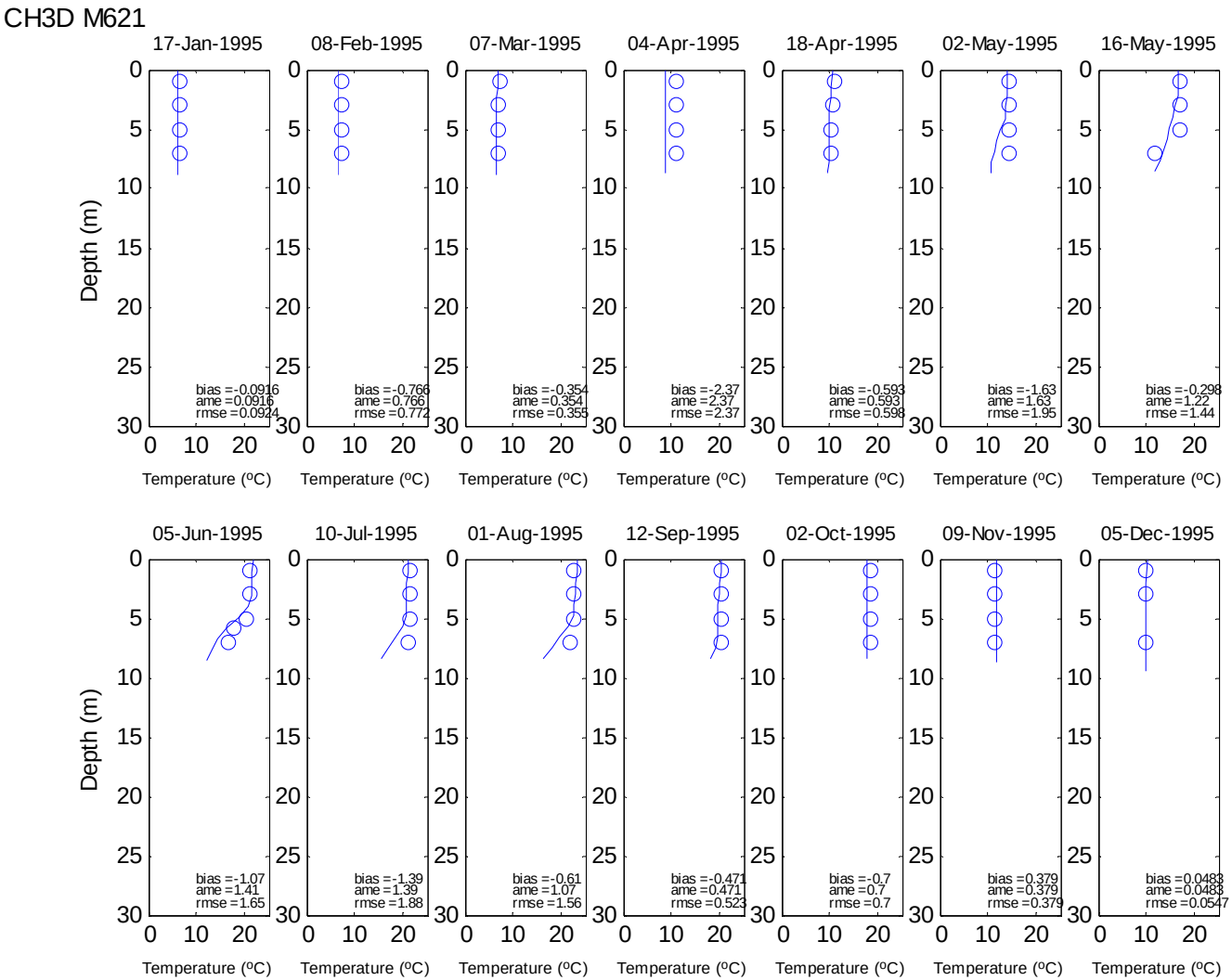


Figure B1. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station M621, 1995

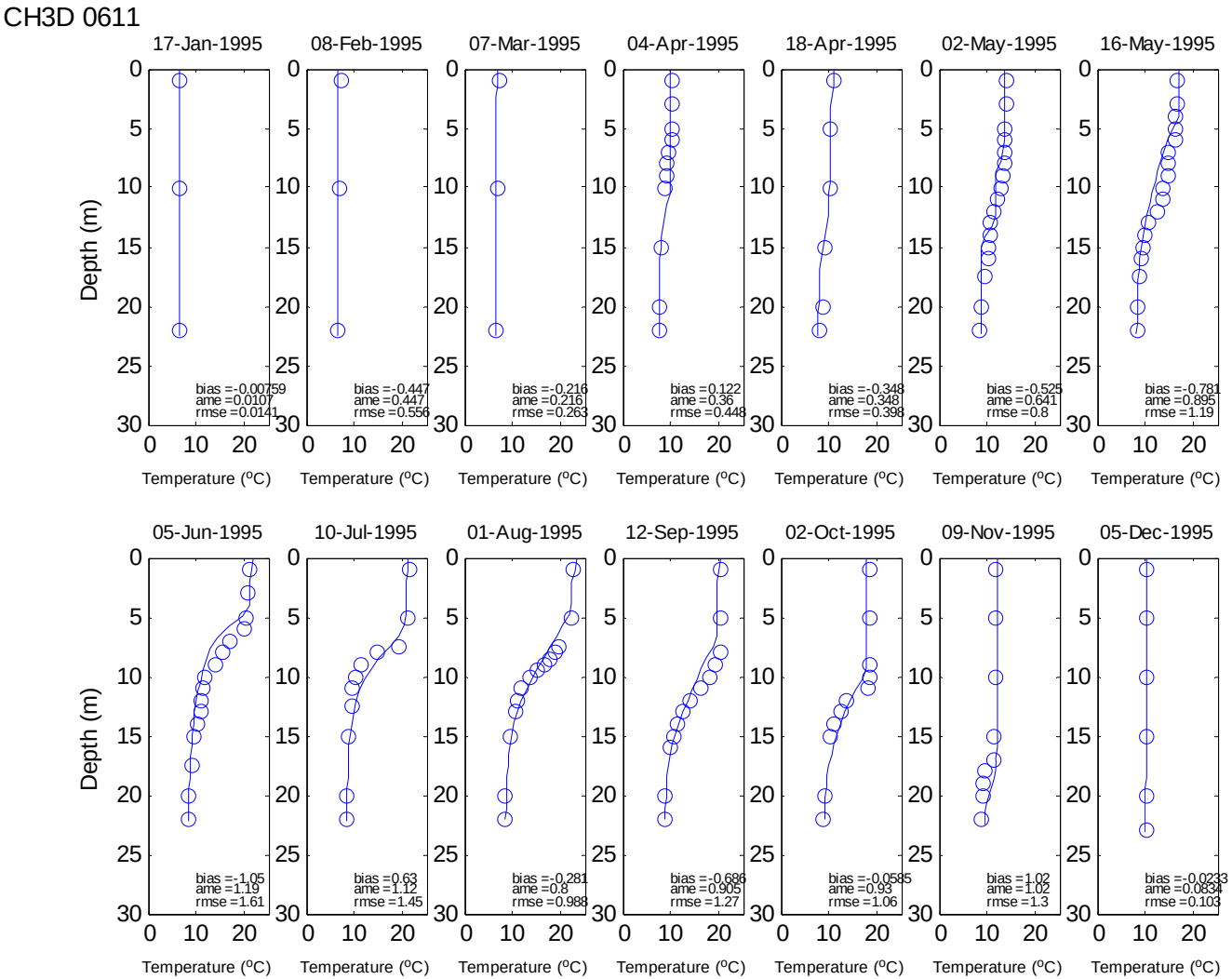


Figure B2. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station 0611, 1995

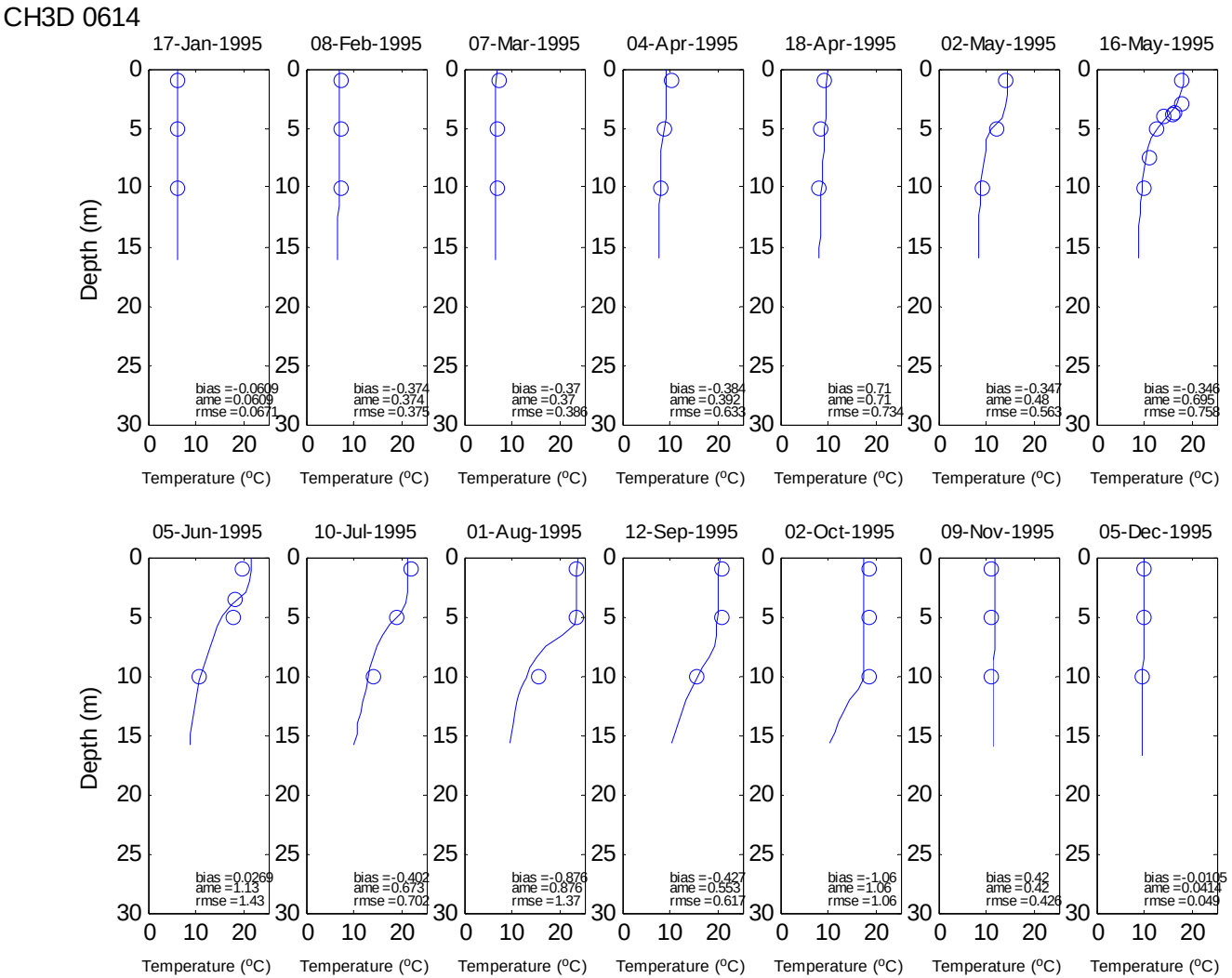


Figure B3. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station 0614, 1995

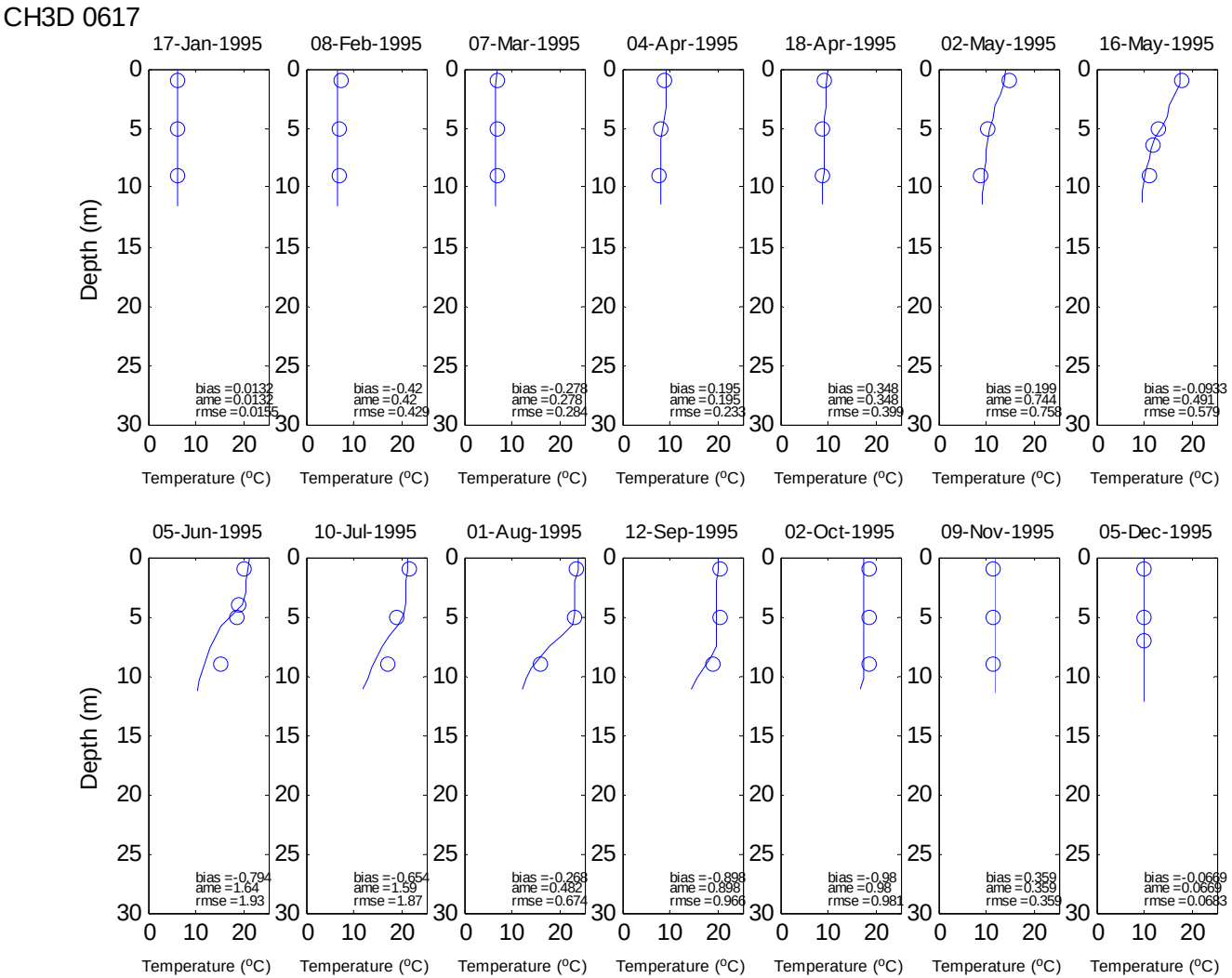


Figure B4. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station 0617, 1995

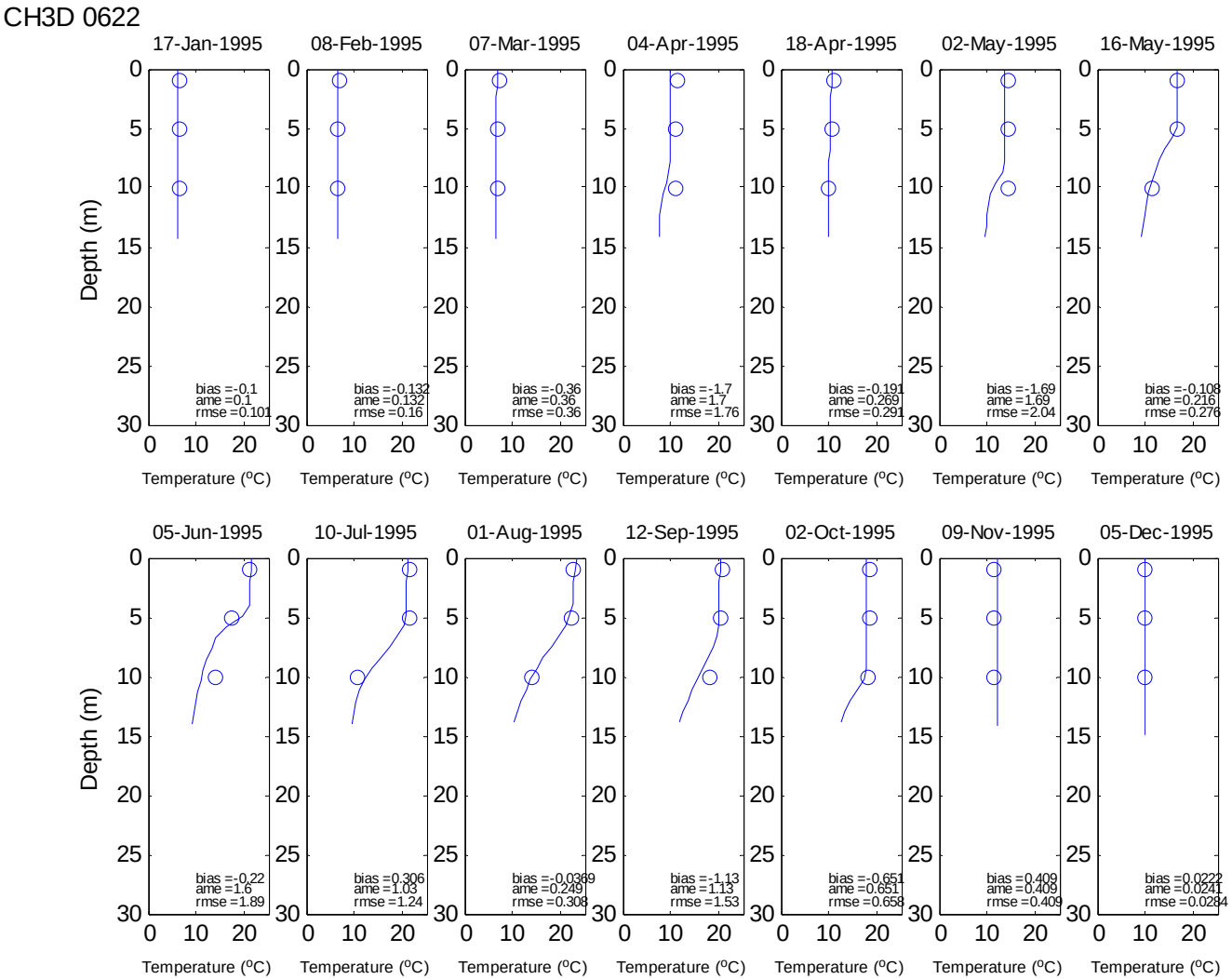


Figure B5. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station 0622, 1995

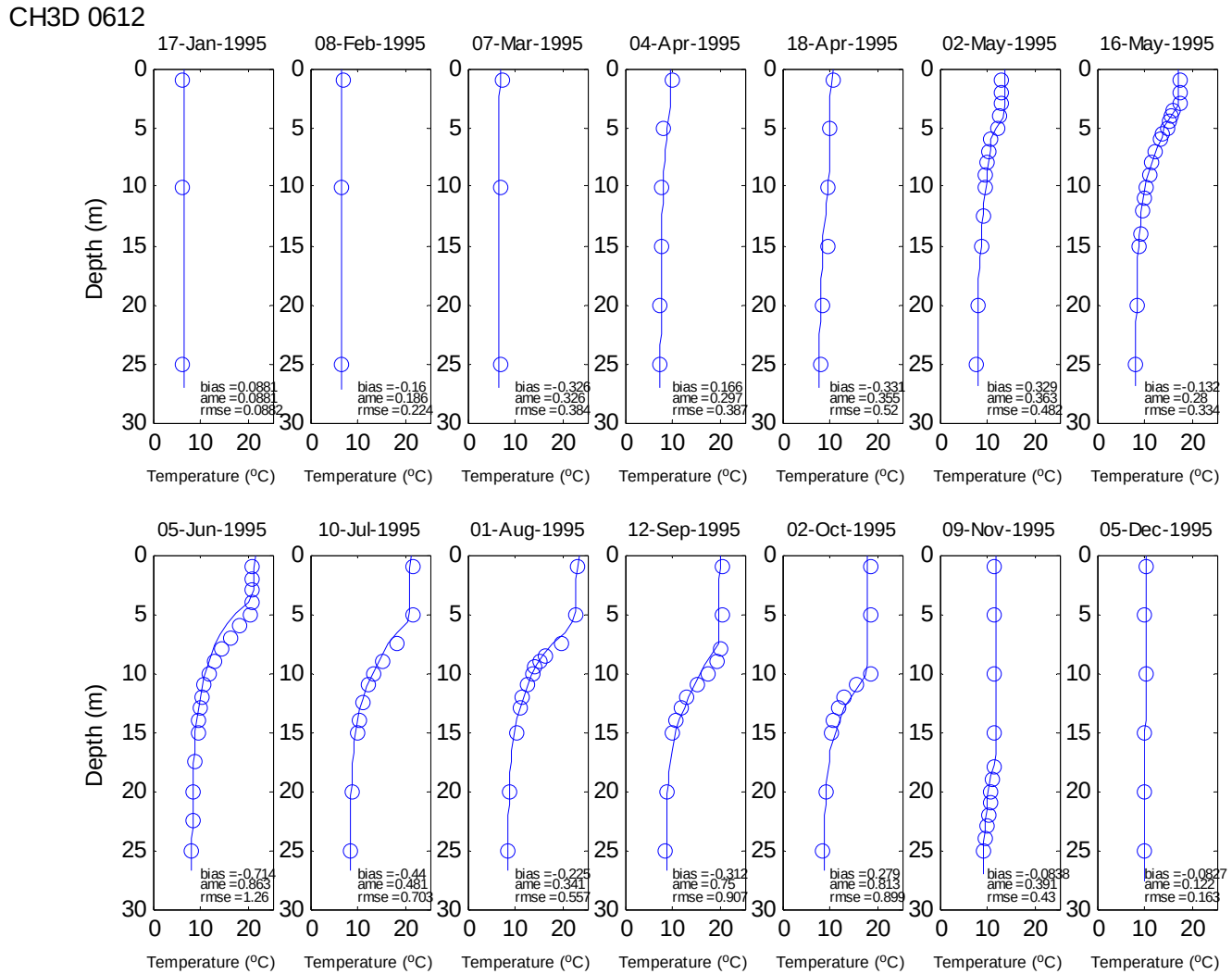
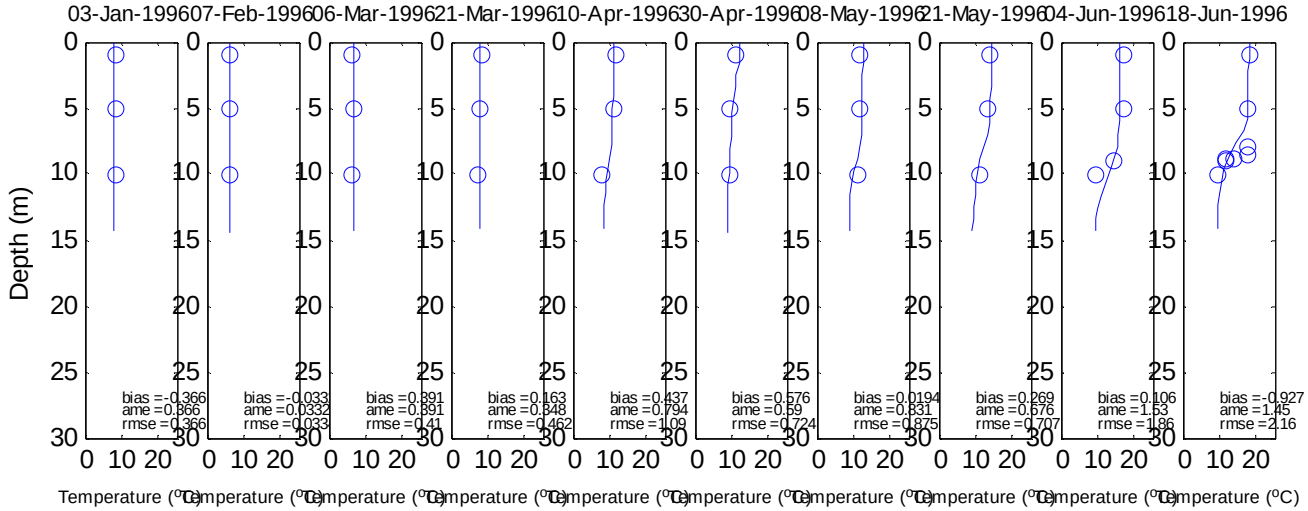


Figure B6. Modeled (solid lines) vs. observed (open circles) temperature profiles – Station 0612, 1995

CH3D 0622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07-Feb-1996
06-Mar-1996
21-Mar-1996
10-Apr-1996
30-Apr-1996
08-May-1996
21-May-1996
04-Jun-1996
18-Jun-1996
Depth (m)
bias =-0.366
ame =0.366
rmse =0.366
bias =-0.033
ame =0.0332
rmse =0.033
bias =0.891
ame =0.891
rmse =0.41
bias =0.163
ame =0.848
rmse =0.462
bias =0.437
ame =0.794
rmse =1.09
bias =0.576
ame =0.59
rmse =0.724
bias =0.0194
ame =0.831
rmse =0.875
bias =0.269
ame =0.676
rmse =0.707
bias =0.106
ame =1.53
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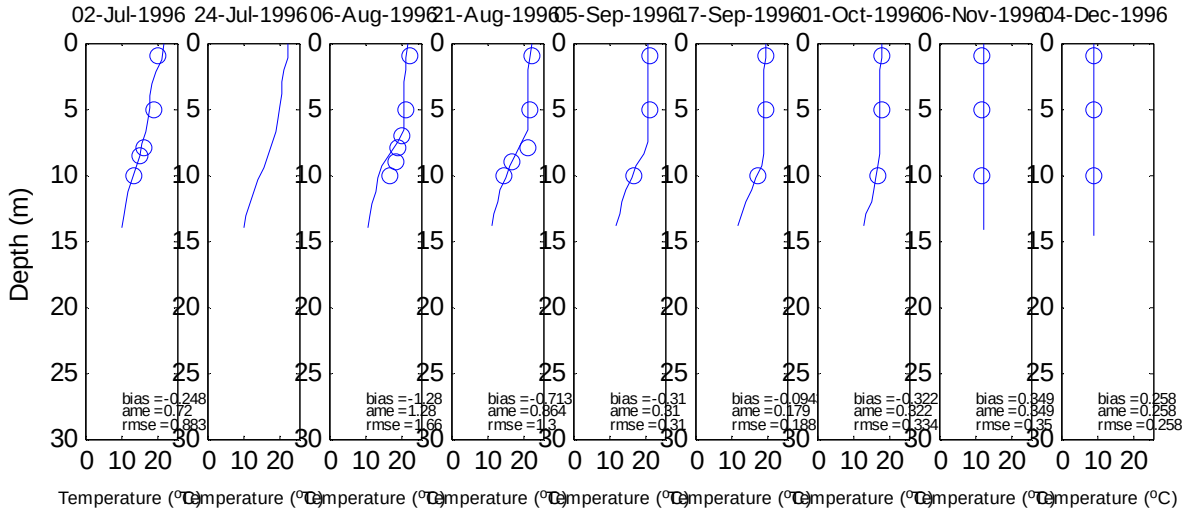
bias =-0.927
ame =1.45
rmse =2.16
Temperature (°C)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24-Jul-1996
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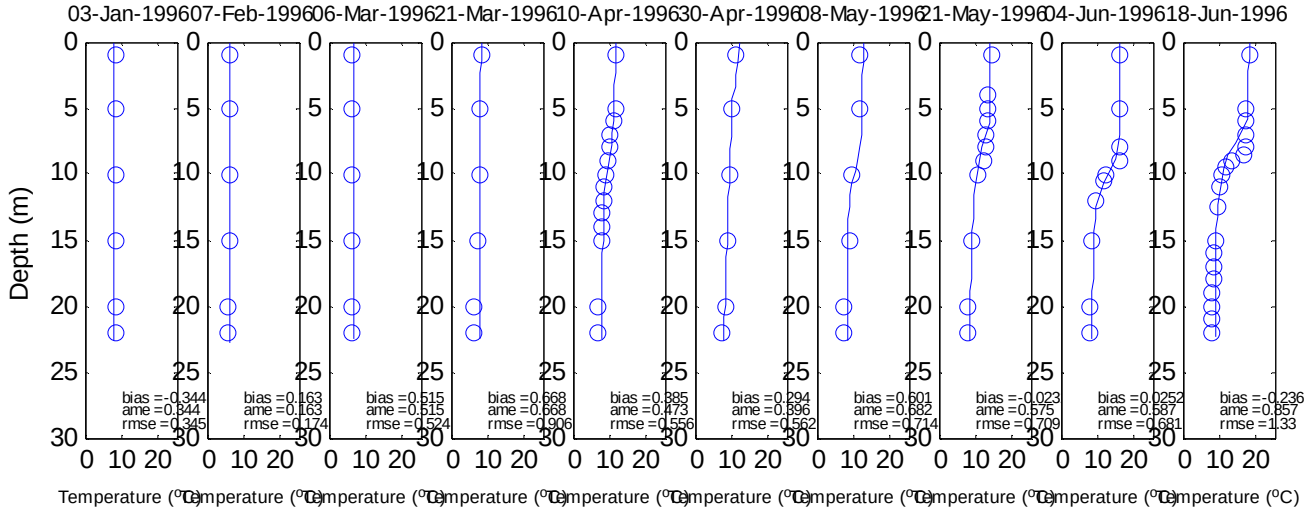
21-Aug-1996
05-Sep-1996
17-Sep-1996
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
bias =-0.248
ame =0.72
rmse =0.883
bias =-1.28
ame =1.28
rmse =1.66
bias =-0.713
ame =0.864
rmse =1.3
bias =-0.31
ame =0.31
rmse =0.31
bias =-0.094
ame =0.179
rmse =0.188
bias =-0.322
ame =0.322
rmse =0.334
bias =0.349
ame =0.349
rmse =0.35
bias =0.258
ame =0.258
rmse =0.258
Temperature (°C)

CH3D 0611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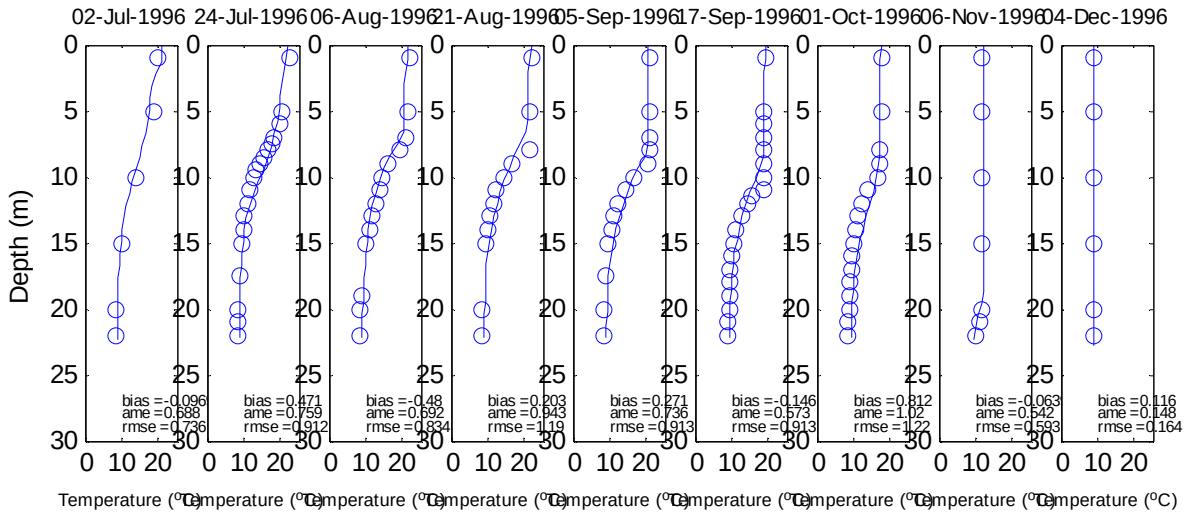
21-May-1996
04-Jun-1996
18-Jun-1996
Depth (m)
Temperature (°C)
bias =-0.344
ame =0.344
rmse =0.345
bias =0.163
ame =0.163
rmse =0.174
bias =0.515
ame =0.515
rmse =0.524
bias =0.668
ame =0.668
rmse =0.906
bias =0.385
ame =0.473
rmse =0.556
bias =0.294
ame =0.396
rmse =0.562
bias =0.601
ame =0.682
rmse =0.714
bias =-0.023
ame =0.575
rmse =0.709
bias =0.0252
ame =0.587
rmse =0.681
bias =-0.236
ame =0.857
rmse =1.33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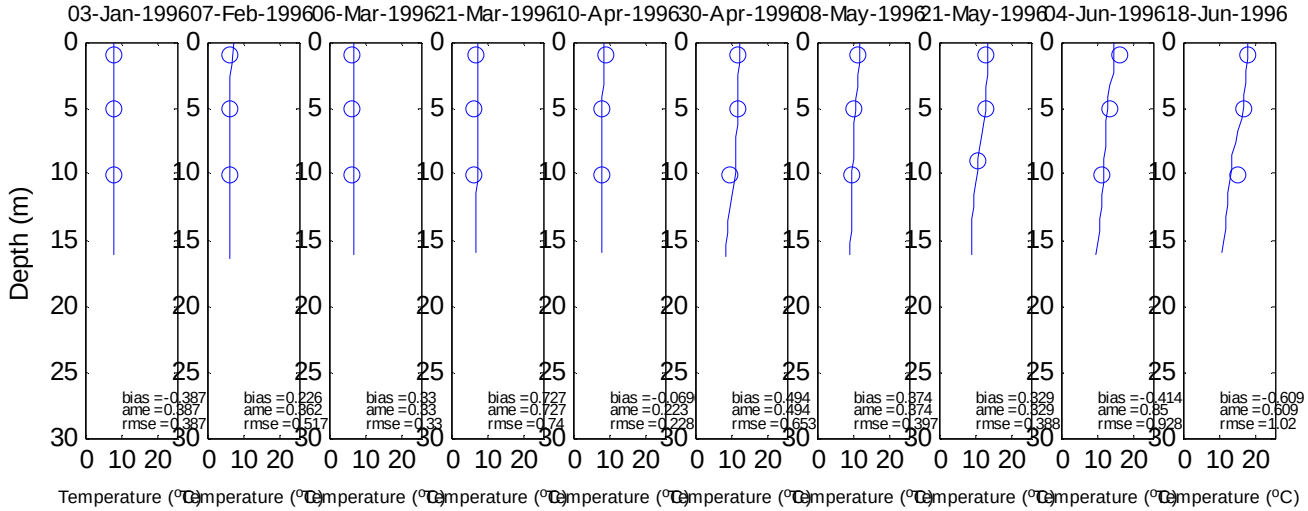
24-Jul-1996
06-Aug-1996
21-Aug-1996
05-Sep-1996
17-Sep-1996
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
Temperature (°C)
bias =-0.096
ame =0.688
rmse =0.736
bias =0.471
ame =0.759
rmse =0.912
bias =-0.48
ame =0.692
rmse =0.834
bias =0.203
ame =0.943
rmse =1.19
bias =0.271
ame =0.736
rmse =0.913
bias =-0.146
ame =0.573
rmse =0.913
bias =0.812
ame =1.02
rmse =1.22
bias =-0.063
ame =0.542
rmse =0.593
bias =0.116
ame =0.148
rmse =0.164

CH3D 0614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30-Apr-1996
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21-May-1996
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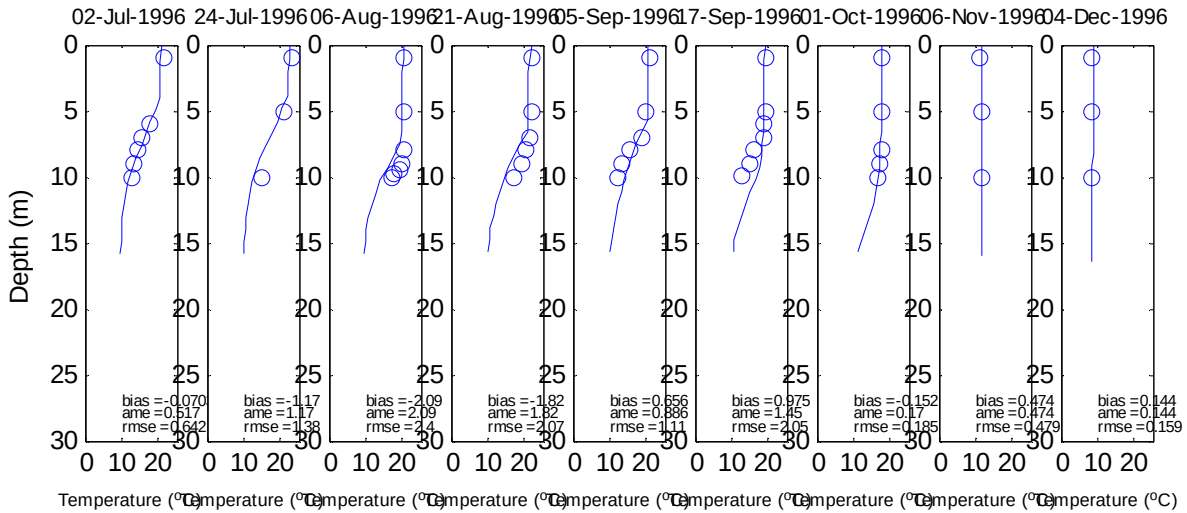
18-Jun-1996
Depth (m)
bias =-0.387
ame =0.387
rmse =0.387
bias =0.226
ame =0.362
rmse =0.517
bias =0.33
ame =0.33
rmse =0.33
bias =0.727
ame =0.727
rmse =0.74
bias =-0.069
ame =0.223
rmse =0.228
bias =0.494
ame =0.494
rmse =0.653
bias =0.374
ame =0.374
rmse =0.397
bias =0.329
ame =0.329
rmse =0.388
bias =-0.414
ame =0.85
rmse =0.928
bias =-0.609
ame =0.609
rmse =1.02
Temperature (°C)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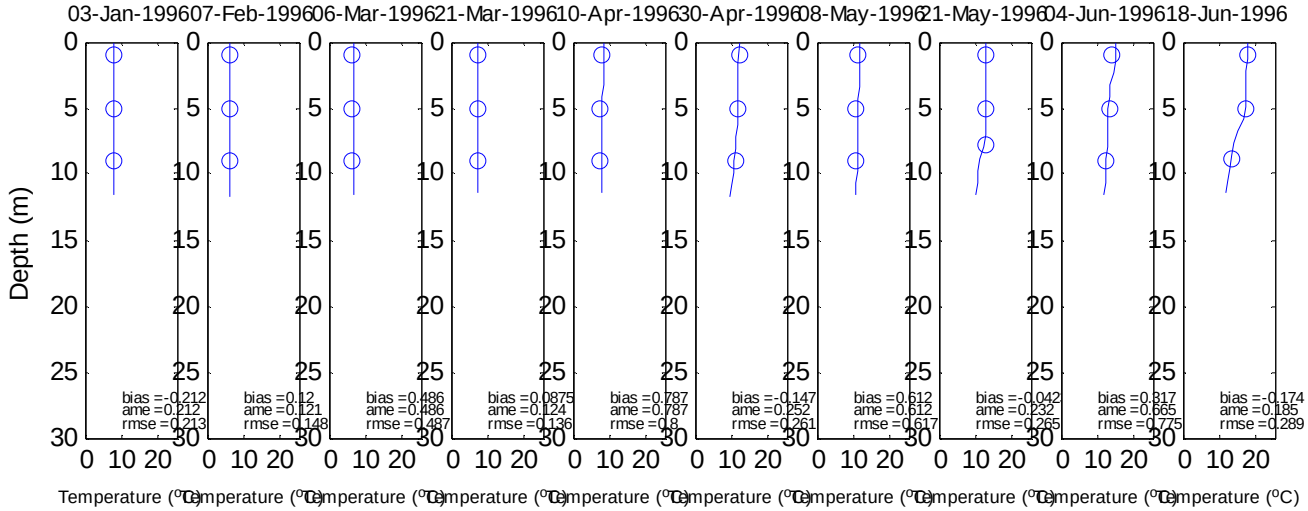
21-Aug-1996
05-Sep-1996
17-Sep-1996
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
bias =-0.070
ame =0.517
rmse =0.642
bias =-1.17
ame =1.17
rmse =1.38
bias =-2.09
ame =2.09
rmse =2.4
bias =-1.82
ame =1.82
rmse =2.07
bias =0.656
ame =0.886
rmse =1.11
bias =0.975
ame =1.45
rmse =2.05
bias =-0.152
ame =0.17
rmse =0.185
bias =0.474
ame =0.474
rmse =0.479
bias =0.144
ame =0.144
rmse =0.159
Temperature (°C)

CH3D 0617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21-May-1996
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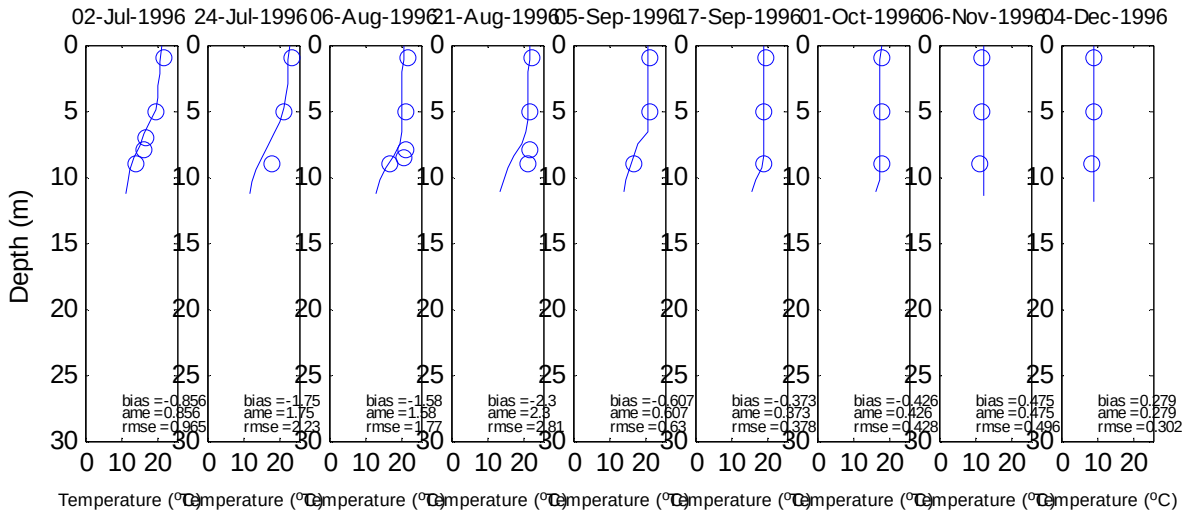
18-Jun-1996
Depth (m)
bias =-0.212
ame =0.212
rmse =0.213
bias =0.12
ame =0.121
rmse =0.148
bias =0.486
ame =0.486
rmse =0.487
bias =0.0875
ame =0.124
rmse =0.136
bias =0.787
ame =0.787
rmse =0.8
bias =-0.147
ame =0.252
rmse =0.261
bias =0.612
ame =0.612
rmse =0.617
bias =-0.042
ame =0.232
rmse =0.265
bias =0.817
ame =0.665
rmse =0.775
bias =-0.174
ame =0.185
rmse =0.289
Temperature (°C)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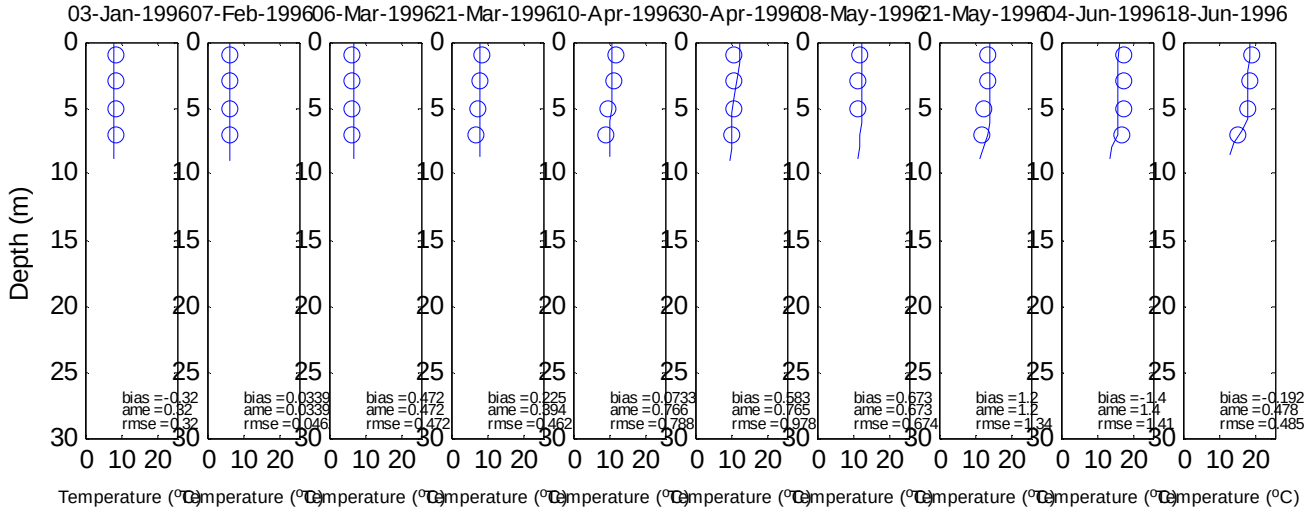
21-Aug-1996
05-Sep-1996
17-Sep-1996
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
bias =-0.856
ame =0.856
rmse =0.965
bias =-1.75
ame =1.75
rmse =2.23
bias =-1.58
ame =1.58
rmse =1.77
bias =-2.3
ame =2.3
rmse =2.81
bias =-0.607
ame =0.607
rmse =0.63
bias =-0.373
ame =0.373
rmse =0.378
bias =-0.426
ame =0.426
rmse =0.428
bias =0.475
ame =0.475
rmse =0.496
bias =0.279
ame =0.279
rmse =0.302
Temperature (°C)

CH3D M621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07-Feb-1996
06-Mar-1996
21-Mar-1996
10-Apr-1996
30-Apr-1996
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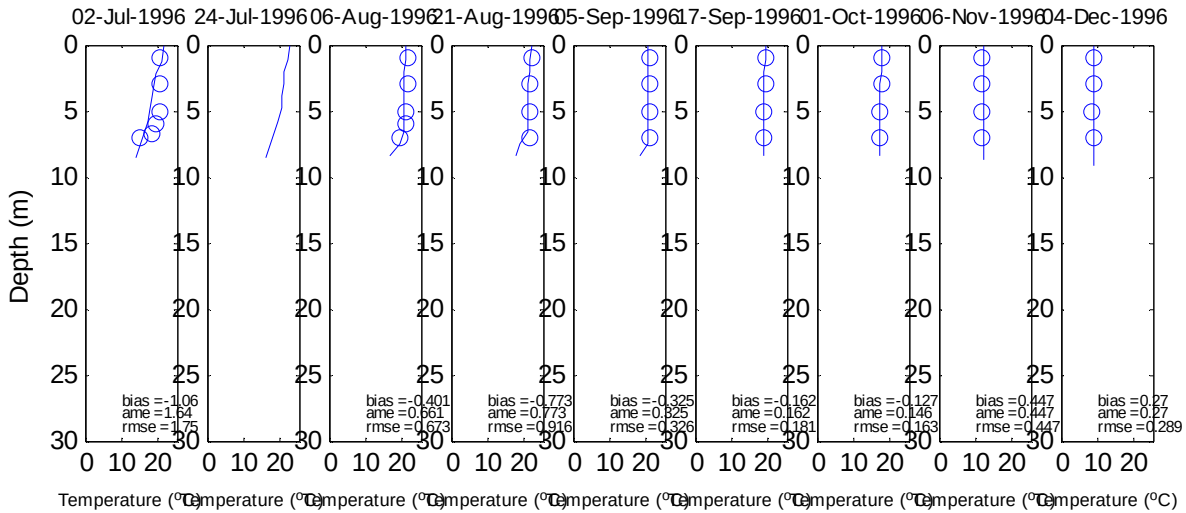
21-May-1996
04-Jun-1996
18-Jun-1996
Depth (m)
bias =-0.32
ame =0.32
rmse =0.32
bias =0.0339
ame =0.0339
rmse =0.046
bias =0.472
ame =0.472
rmse =0.472
bias =0.225
ame =0.394
rmse =0.462
bias =0.0733
ame =0.766
rmse =0.788
bias =0.583
ame =0.765
rmse =0.978
bias =0.673
ame =0.673
rmse =0.674
bias =1.2
ame =1.2
rmse =1.34
bias =-1.4
ame =1.4
rmse =1.41
bias =-0.192
ame =0.478
rmse =0.485
Temperature (°C)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21-Aug-1996
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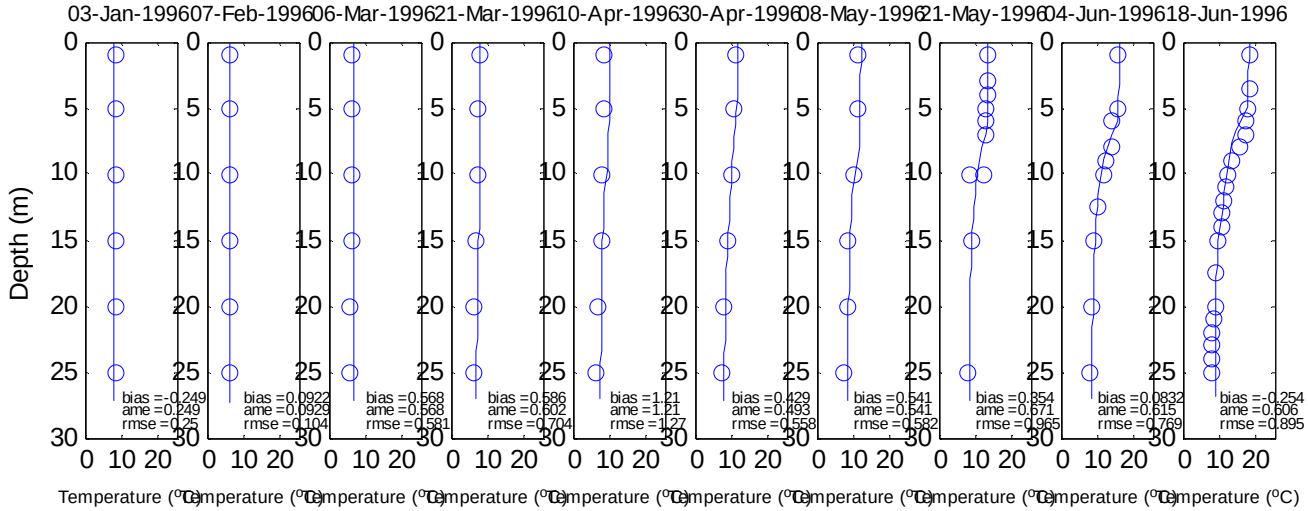
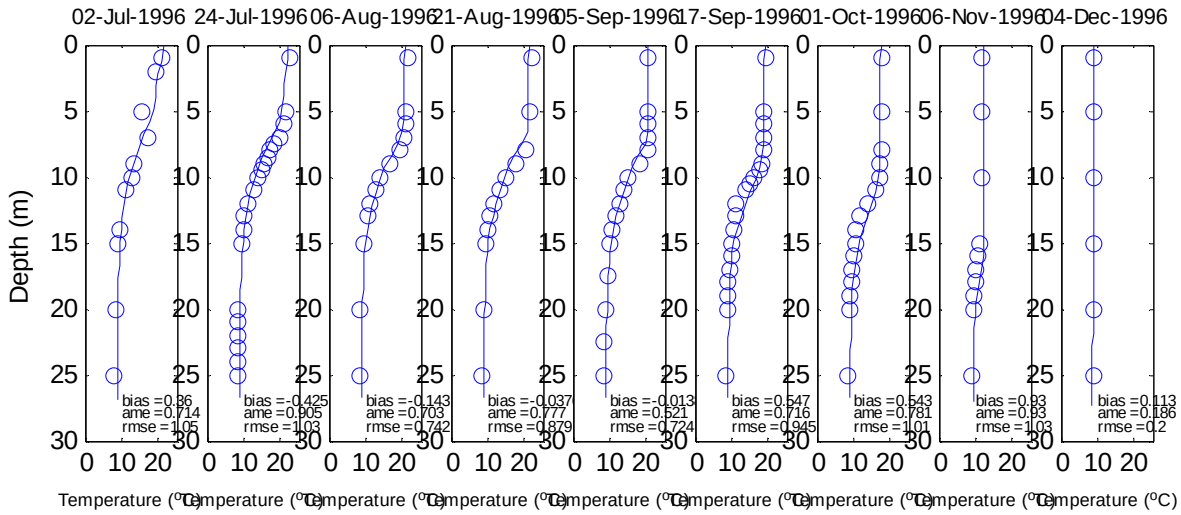
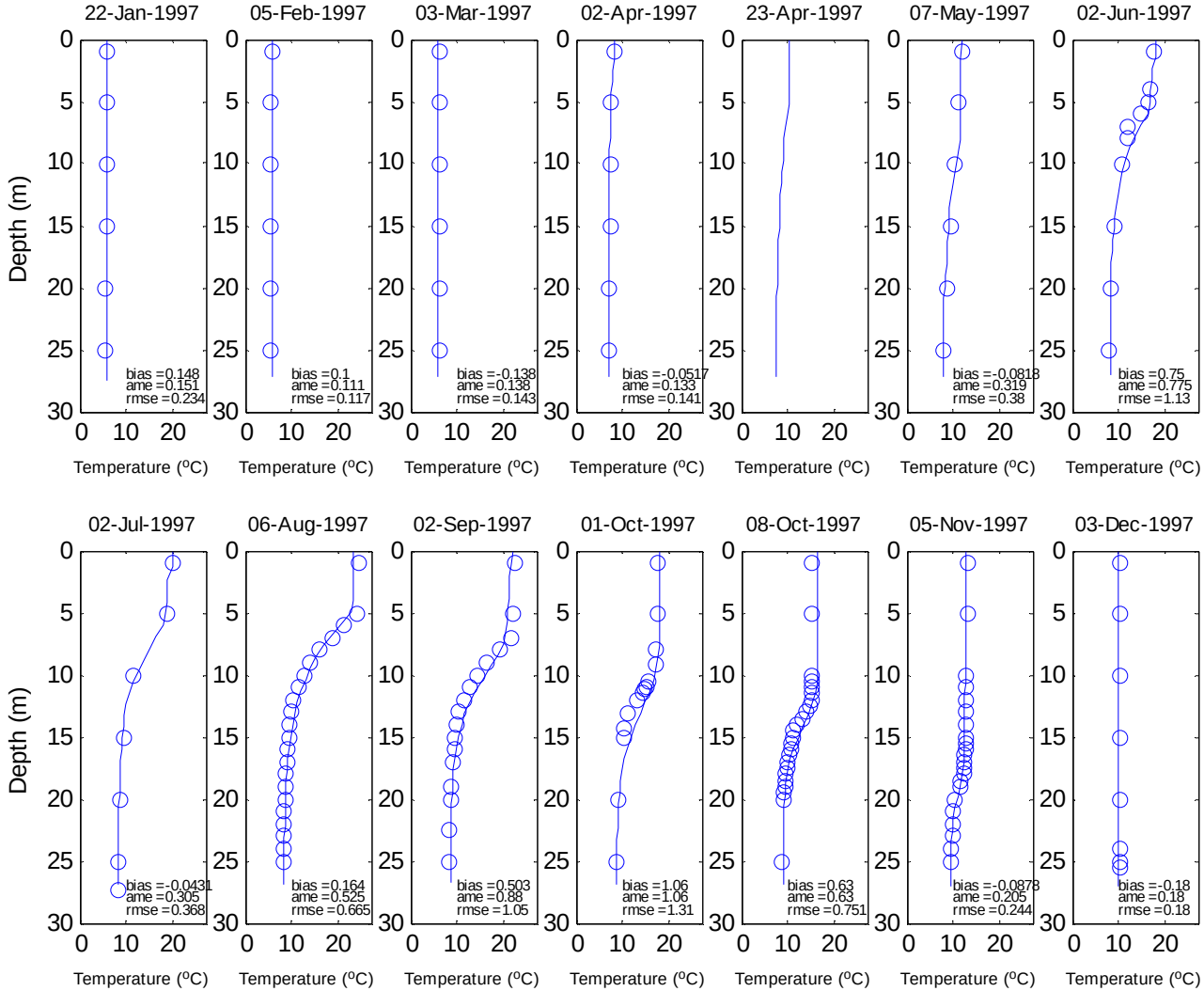
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
bias =-1.06
ame =1.64
rmse =1.75
bias =-0.401
ame =0.661
rmse =0.673
bias =-0.773
ame =0.773
rmse =0.916
bias =-0.325
ame =0.325
rmse =0.326
bias =-0.162
ame =0.162
rmse =0.181
bias =-0.127
ame =0.146
rmse =0.163
bias =0.447
ame =0.447
rmse =0.447
bias =0.27
ame =0.27
rmse =0.289
Temperature (°C)

CH3D 0612


03-Jan-1996
07-Feb-1996
06-Mar-1996
21-Mar-1996
10-Apr-1996
30-Apr-1996
08-May-1996
21-May-1996
04-Jun-1996
18-Jun-1996
Depth (m)
bias =-0.249
ame =0.249
rmse =0.25
bias =0.0922
ame =0.0929
rmse =0.104
bias =0.568
ame =0.568
rmse =0.581
bias =0.586
ame =0.602
rmse =0.704
bias =1.21
ame =1.21
rmse =1.27
bias =0.429
ame =0.493
rmse =0.558
bias =0.541
ame =0.541
rmse =0.582
bias =0.854
ame =0.671
rmse =0.965
bias =0.0832
ame =0.615
rmse =0.769
bias =-0.254
ame =0.606
rmse =0.895
Temperature (°C)


02-Jul-1996
24-Jul-1996
06-Aug-1996
21-Aug-1996
05-Sep-1996
17-Sep-1996
01-Oct-1996
06-Nov-1996
04-Dec-1996
Depth (m)
bias =0.36
ame =0.714
rmse =1.05
bias =-0.425
ame =0.905
rmse =1.03
bias =-0.143
ame =0.703
rmse =0.742
bias =-0.037
ame =0.777
rmse =0.879
bias =-0.013
ame =0.521
rmse =0.724
bias =0.547
ame =0.716
rmse =0.945
bias =0.543
ame =0.781
rmse =1.01
bias =0.93
ame =0.93
rmse =1.03
bias =0.113
ame =0.186
rmse =0.2
Temperature (°C)

CH3D 0612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bias =0.148
ame =0.151
rmse =0.234
05-Feb-1997
bias =0.1
ame =0.111
rmse =0.117
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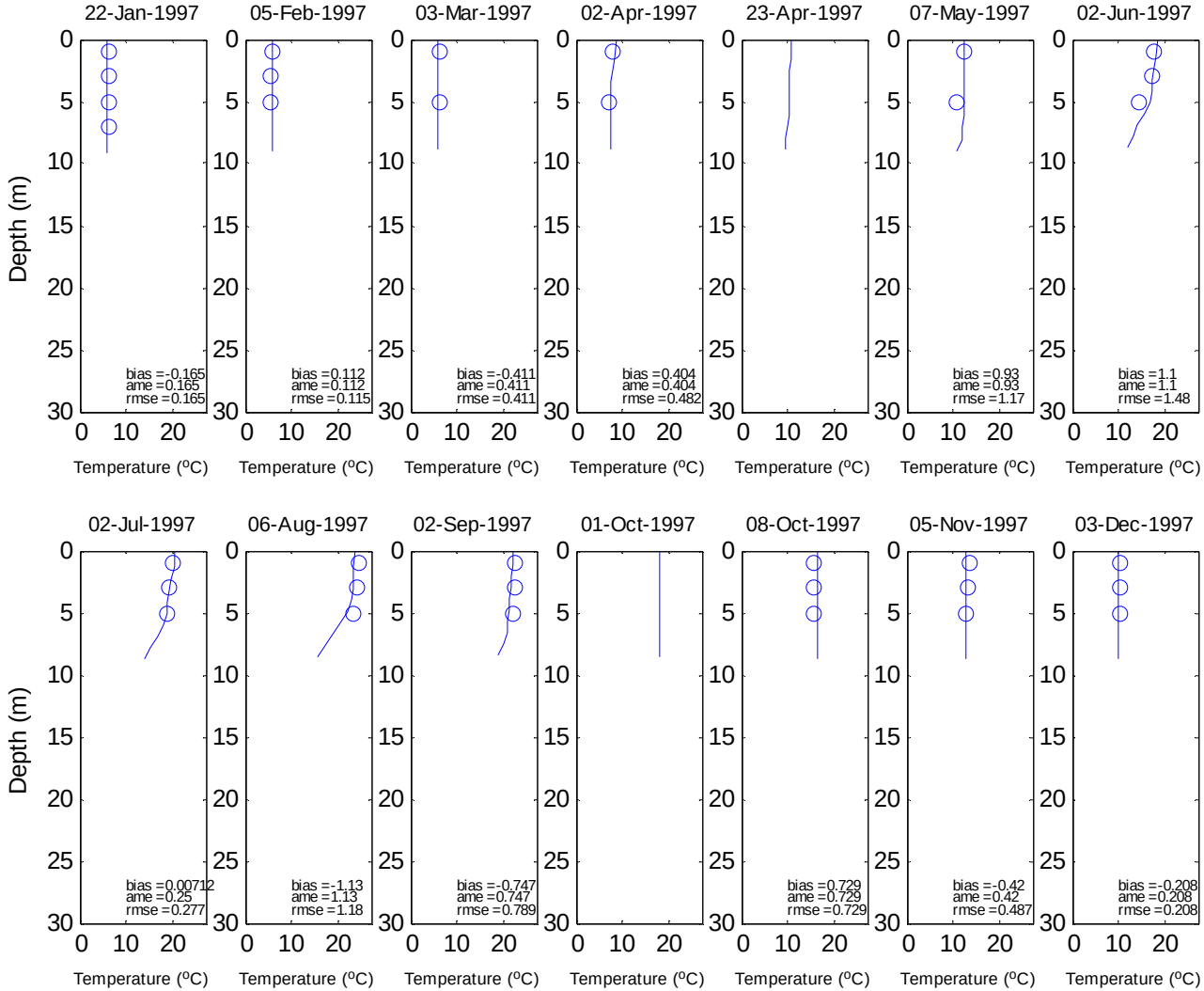
bias =-0.138
ame =0.138
rmse =0.143
02-Apr-1997
bias =-0.0517
ame =0.133
rmse =0.141
23-Apr-1997
07-May-1997
bias =-0.0818
ame =0.319
rmse =0.38
02-Jun-1997
bias =0.75
ame =0.775
rmse =1.13
02-Jul-1997
bias =-0.0431
ame =0.305
rmse =0.368
06-Aug-1997
bias =0.164
ame =0.525
rmse =0.665
02-Sep-1997
bias =0.503
ame =0.88
rmse =1.05
01-Oct-1997
bias =1.06
ame =1.06
rmse =1.31
08-Oct-1997
bias =0.63
ame =0.63
rmse =0.751
05-Nov-1997
bias =-0.0878
ame =0.205
rmse =0.244
03-Dec-1997
bias =-0.18
ame =0.18
rmse =0.18
Depth (m)
Temperature (°C)

CH3D M621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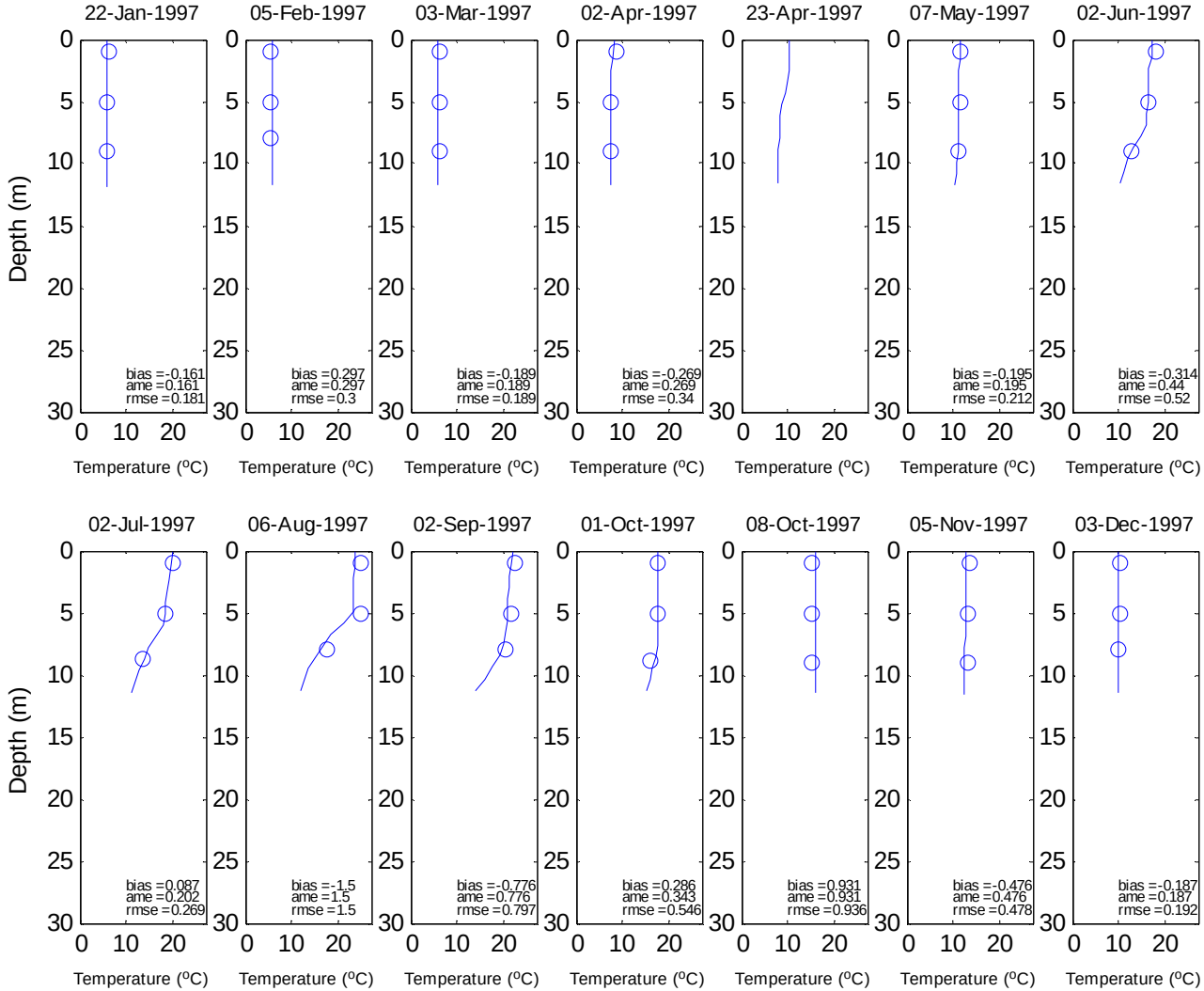
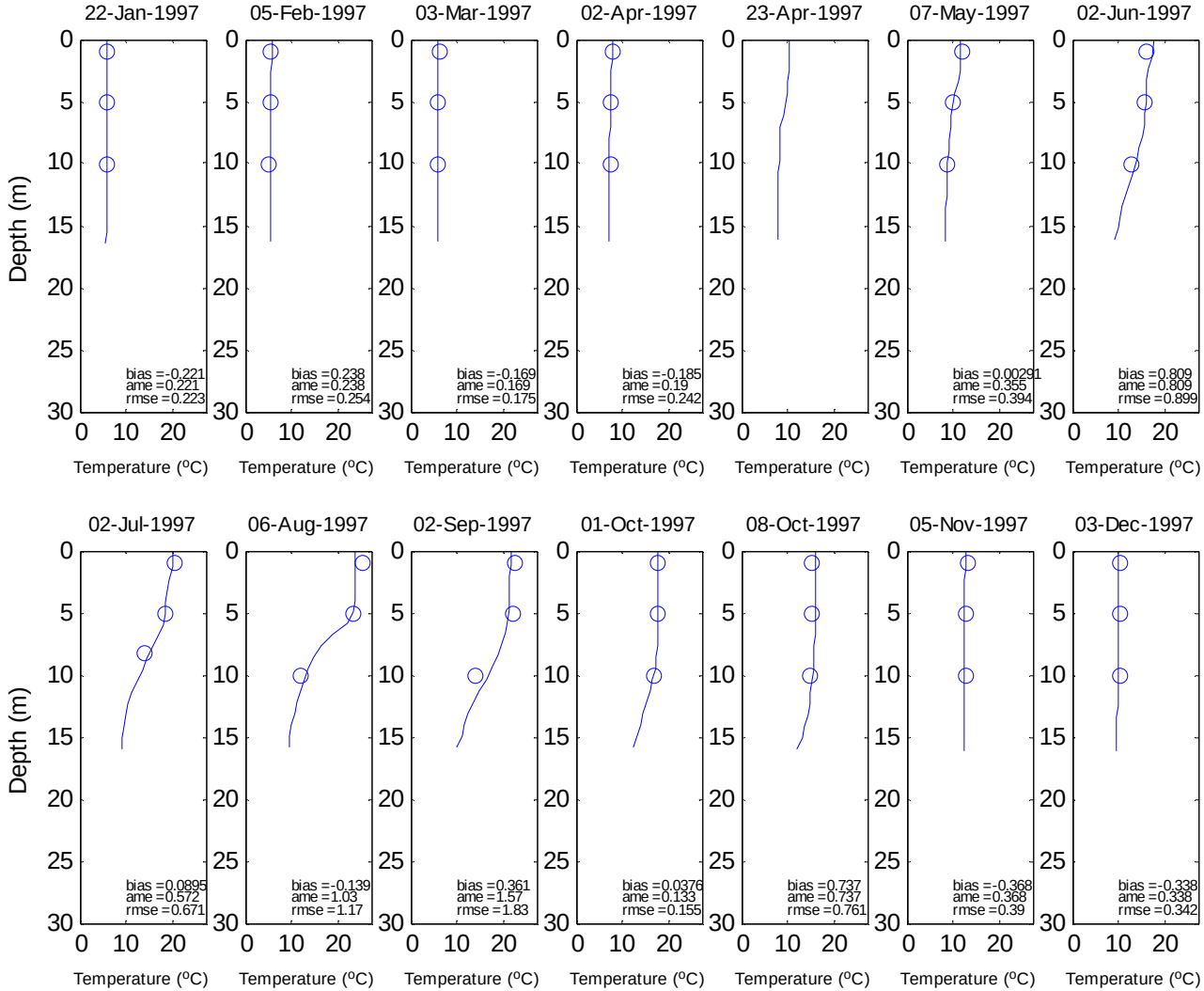
bias =-0.165
ame =0.165
rmse =0.165
05-Feb-1997
bias =0.112
ame =0.112
rmse =0.115
03-Mar-1997
bias =-0.411
ame =0.411
rmse =0.411
02-Apr-1997
bias =0.404
ame =0.404
rmse =0.482
23-Apr-1997
07-May-1997
bias =0.93
ame =0.93
rmse =1.17
02-Jun-1997
bias =1.1
ame =1.1
rmse =1.48
02-Jul-1997
bias =0.00712
ame =0.25
rmse =0.277
06-Aug-1997
bias =-1.13
ame =1.13
rmse =1.18
02-Sep-1997
bias =-0.747
ame =0.747
rmse =0.789
01-Oct-1997
08-Oct-1997
bias =0.729
ame =0.729
rmse =0.729
05-Nov-1997
bias =-0.42
ame =0.42
rmse =0.487
03-Dec-1997
bias =-0.208
ame =0.208
rmse =0.208
Depth (m)
Temperature (°C)

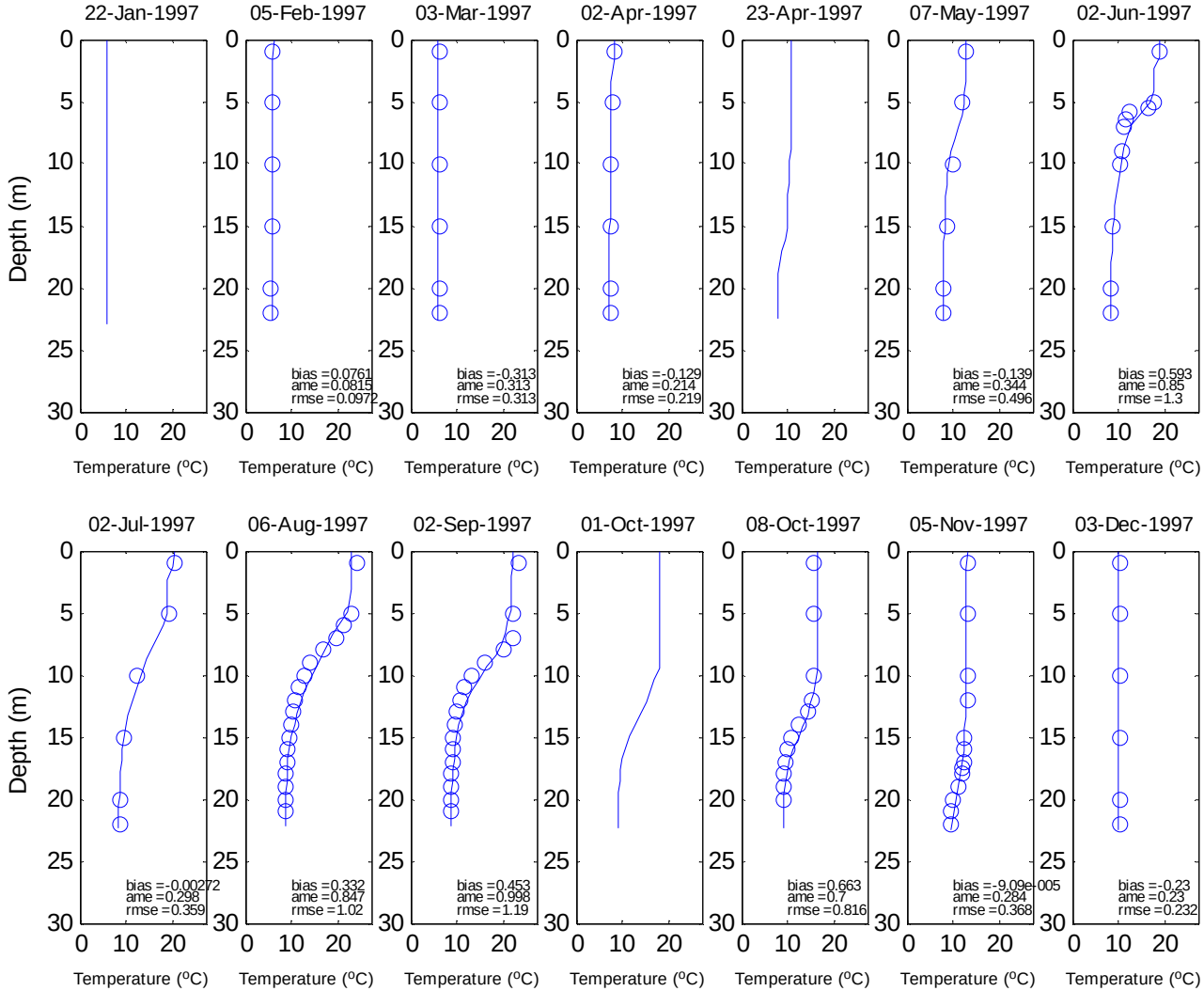
CH3D 0617


22-Jan-1997
bias =-0.161
ame =0.161
rmse =0.181
05-Feb-1997
bias =0.297
ame =0.297
rmse =0.3
03-Mar-1997
bias =-0.189
ame =0.189
rmse =0.189
02-Apr-1997
bias =-0.269
ame =0.269
rmse =0.34
23-Apr-1997
07-May-1997
bias =-0.195
ame =0.195
rmse =0.212
02-Jun-1997
bias =-0.314
ame =0.44
rmse =0.52
02-Jul-1997
bias =0.087
ame =0.202
rmse =0.269
06-Aug-1997
bias =-1.5
ame =1.5
rmse =1.5
02-Sep-1997
bias =-0.776
ame =0.776
rmse =0.797
01-Oct-1997
bias =0.286
ame =0.343
rmse =0.546
08-Oct-1997
bias =0.931
ame =0.931
rmse =0.936
05-Nov-1997
bias =-0.476
ame =0.476
rmse =0.478
03-Dec-1997
bias =-0.187
ame =0.187
rmse =0.192
Depth (m)
Temperature (°C)

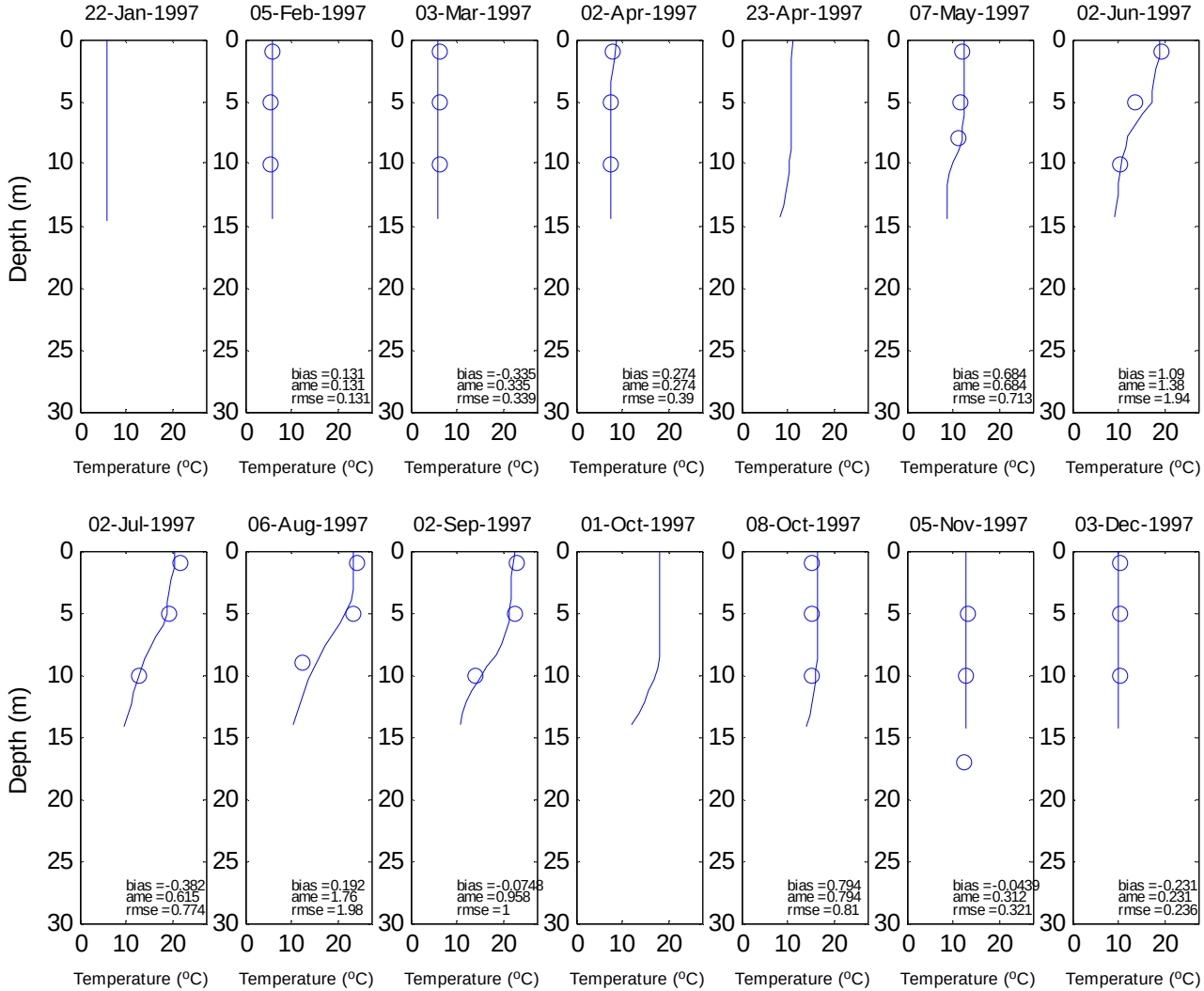
CH3D 0614


22-Jan-1997
bias =-0.221
ame =0.221
rmse =0.223
05-Feb-1997
bias =0.238
ame =0.238
rmse =0.254
03-Mar-1997
bias =-0.169
ame =0.169
rmse =0.175
02-Apr-1997
bias =-0.185
ame =0.19
rmse =0.242
23-Apr-1997
07-May-1997
bias =0.00291
ame =0.355
rmse =0.394
02-Jun-1997
bias =0.809
ame =0.809
rmse =0.899
02-Jul-1997
bias =0.0895
ame =0.572
rmse =0.671
06-Aug-1997
bias =-0.139
ame =1.03
rmse =1.17
02-Sep-1997
bias =0.361
ame =1.57
rmse =1.83
01-Oct-1997
bias =0.0376
ame =0.133
rmse =0.155
08-Oct-1997
bias =0.737
ame =0.737
rmse =0.761
05-Nov-1997
bias =-0.368
ame =0.368
rmse =0.39
03-Dec-1997
bias =-0.338
ame =0.338
rmse =0.342
Depth (m)
Temperature (°C)

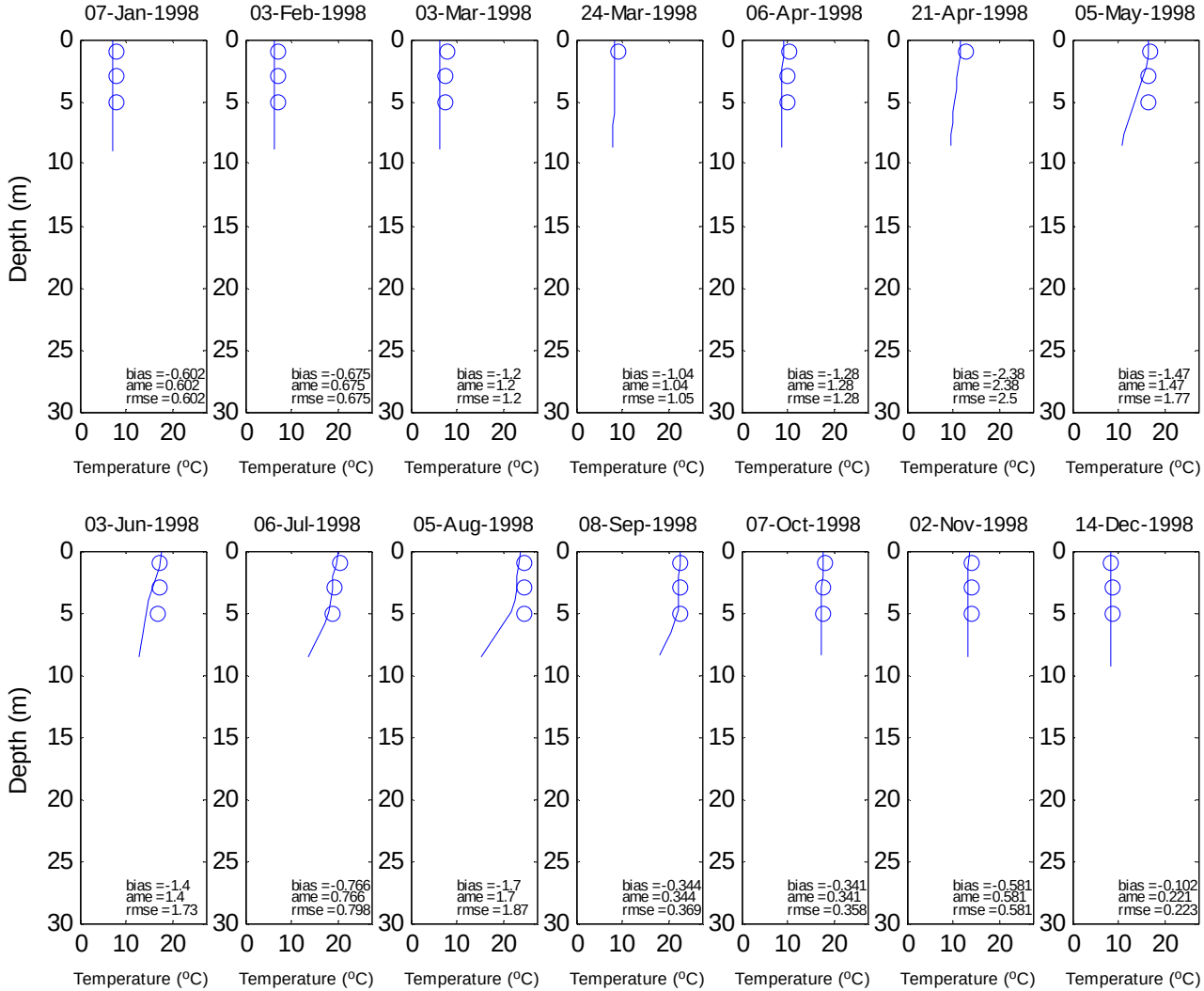
CH3D 0611


22-Jan-1997
05-Feb-1997
03-Mar-1997
02-Apr-1997
23-Apr-1997
07-May-1997
02-Jun-1997
02-Jul-1997
06-Aug-1997
02-Sep-1997
01-Oct-1997
08-Oct-1997
05-Nov-1997
03-Dec-1997
Depth (m)
Temperature (°C)
bias =0.0761
ame =0.0815
rmse =0.0972
bias =-0.313
ame =0.313
rmse =0.313
bias =-0.129
ame =0.214
rmse =0.219
bias =-0.139
ame =0.344
rmse =0.496
bias =0.593
ame =0.85
rmse =1.3
bias =-0.00272
ame =0.298
rmse =0.359
bias =0.332
ame =0.847
rmse =1.02
bias =0.453
ame =0.998
rmse =1.19
bias =0.663
ame =0.7
rmse =0.816
bias =-9.09e-005
ame =0.284
rmse =0.368
bias =-0.23
ame =0.23
rmse =0.232

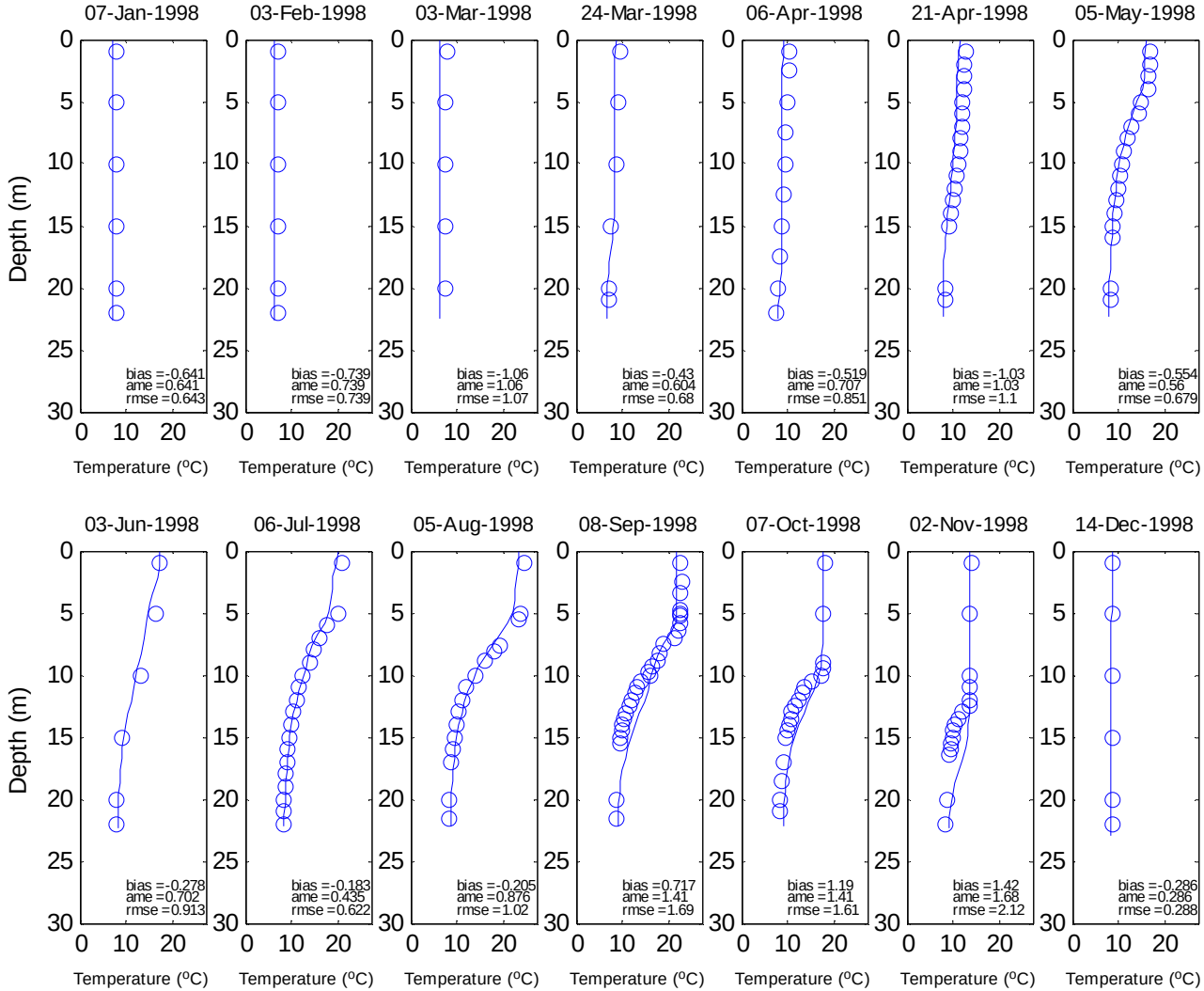
CH3D 0622


22-Jan-1997
05-Feb-1997
03-Mar-1997
02-Apr-1997
23-Apr-1997
07-May-1997
02-Jun-1997
02-Jul-1997
06-Aug-1997
02-Sep-1997
01-Oct-1997
08-Oct-1997
05-Nov-1997
03-Dec-1997
Depth (m)
Temperature (°C)
bias =0.131
ame =0.131
rmse =0.131
bias =-0.335
ame =0.335
rmse =0.339
bias =0.274
ame =0.274
rmse =0.39
bias =0.684
ame =0.684
rmse =0.713
bias =1.09
ame =1.38
rmse =1.94
bias =-0.382
ame =0.615
rmse =0.774
bias =0.192
ame =1.76
rmse =1.98
bias =-0.0748
ame =0.958
rmse =1
bias =0.794
ame =0.794
rmse =0.81
bias =-0.0439
ame =0.312
rmse =0.321
bias =-0.231
ame =0.231
rmse =0.236

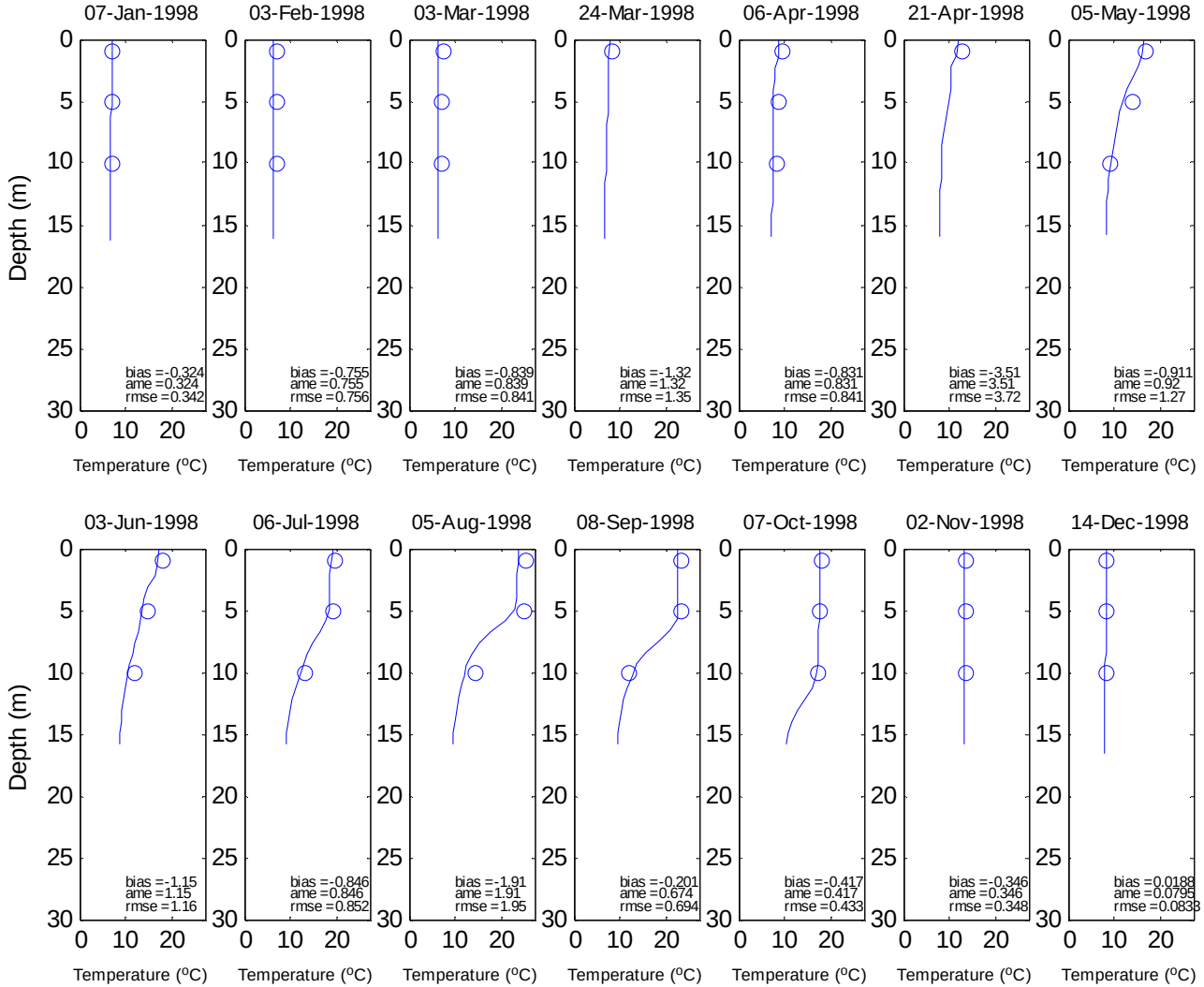
CH3D M621


07-Jan-1998
bias =-0.602
ame =0.602
rmse =0.602
03-Feb-1998
bias =-0.675
ame =0.675
rmse =0.675
03-Mar-1998
bias =-1.2
ame =1.2
rmse =1.2
24-Mar-1998
bias =-1.04
ame =1.04
rmse =1.05
06-Apr-1998
bias =-1.28
ame =1.28
rmse =1.28
21-Apr-1998
bias =-2.38
ame =2.38
rmse =2.5
05-May-1998
bias =-1.47
ame =1.47
rmse =1.77
03-Jun-1998
bias =-1.4
ame =1.4
rmse =1.73
06-Jul-1998
bias =-0.766
ame =0.766
rmse =0.798
05-Aug-1998
bias =-1.7
ame =1.7
rmse =1.87
08-Sep-1998
bias =-0.344
ame =0.344
rmse =0.369
07-Oct-1998
bias =-0.341
ame =0.341
rmse =0.358
02-Nov-1998
bias =-0.581
ame =0.581
rmse =0.581
14-Dec-1998
bias =-0.102
ame =0.221
rmse =0.223
Depth (m)
Temperature (°C)

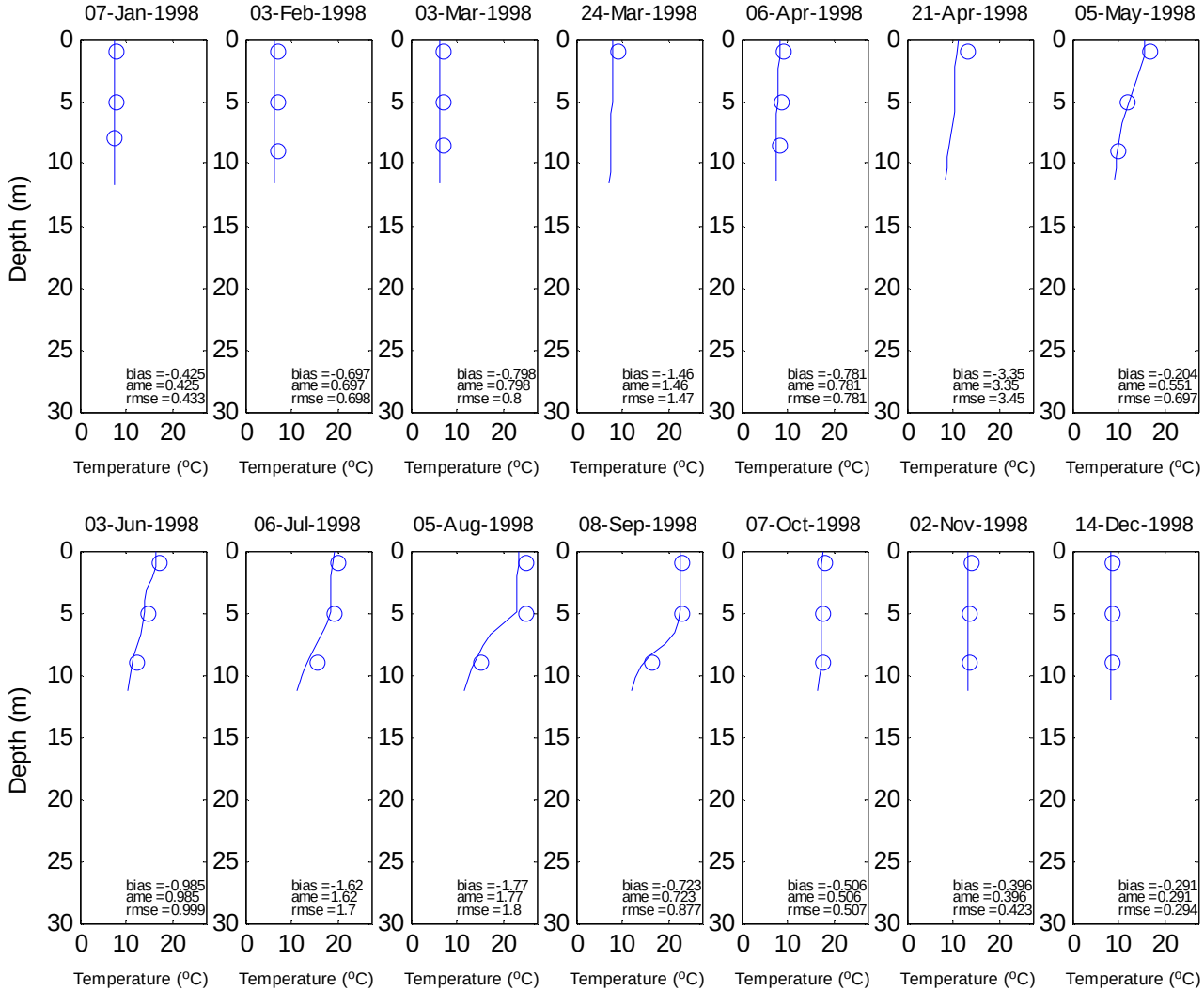
CH3D 0611


07-Jan-1998
bias =-0.641
ame =0.641
rmse =0.643
03-Feb-1998
bias =-0.739
ame =0.739
rmse =0.739
03-Mar-1998
bias =-1.06
ame =1.06
rmse =1.07
24-Mar-1998
bias =-0.43
ame =0.604
rmse =0.68
06-Apr-1998
bias =-0.519
ame =0.707
rmse =0.851
21-Apr-1998
bias =-1.03
ame =1.03
rmse =1.1
05-May-1998
bias =-0.554
ame =0.56
rmse =0.679
03-Jun-1998
bias =-0.278
ame =0.702
rmse =0.913
06-Jul-1998
bias =-0.183
ame =0.435
rmse =0.622
05-Aug-1998
bias =-0.205
ame =0.876
rmse =1.02
08-Sep-1998
bias =0.717
ame =1.41
rmse =1.69
07-Oct-1998
bias =1.19
ame =1.41
rmse =1.61
02-Nov-1998
bias =1.42
ame =1.68
rmse =2.12
14-Dec-1998
bias =-0.286
ame =0.286
rmse =0.288
Depth (m)
Temperature (ºC)

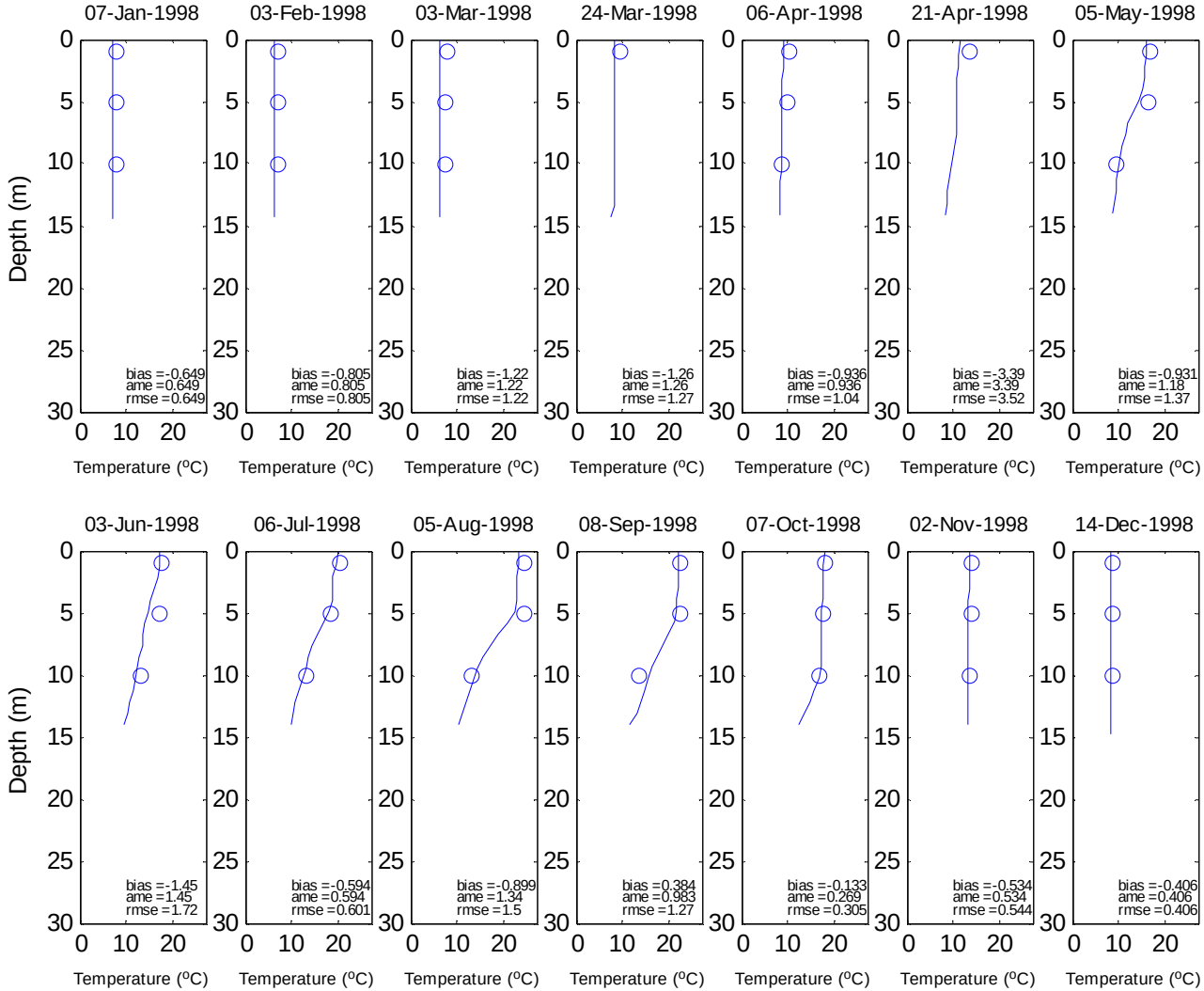
CH3D 0614


07-Jan-1998
bias =-0.324
ame =0.324
rmse =0.342
03-Feb-1998
bias =-0.755
ame =0.755
rmse =0.756
03-Mar-1998
bias =-0.839
ame =0.839
rmse =0.841
24-Mar-1998
bias =-1.32
ame =1.32
rmse =1.35
06-Apr-1998
bias =-0.831
ame =0.831
rmse =0.841
21-Apr-1998
bias =-3.51
ame =3.51
rmse =3.72
05-May-1998
bias =-0.911
ame =0.92
rmse =1.27
03-Jun-1998
bias =-1.15
ame =1.15
rmse =1.16
06-Jul-1998
bias =-0.846
ame =0.846
rmse =0.852
05-Aug-1998
bias =-1.91
ame =1.91
rmse =1.95
08-Sep-1998
bias =-0.201
ame =0.674
rmse =0.694
07-Oct-1998
bias =-0.417
ame =0.417
rmse =0.433
02-Nov-1998
bias =-0.346
ame =0.346
rmse =0.348
14-Dec-1998
bias =0.0188
ame =0.0795
rmse =0.0838
Depth (m)
Temperature (°C)

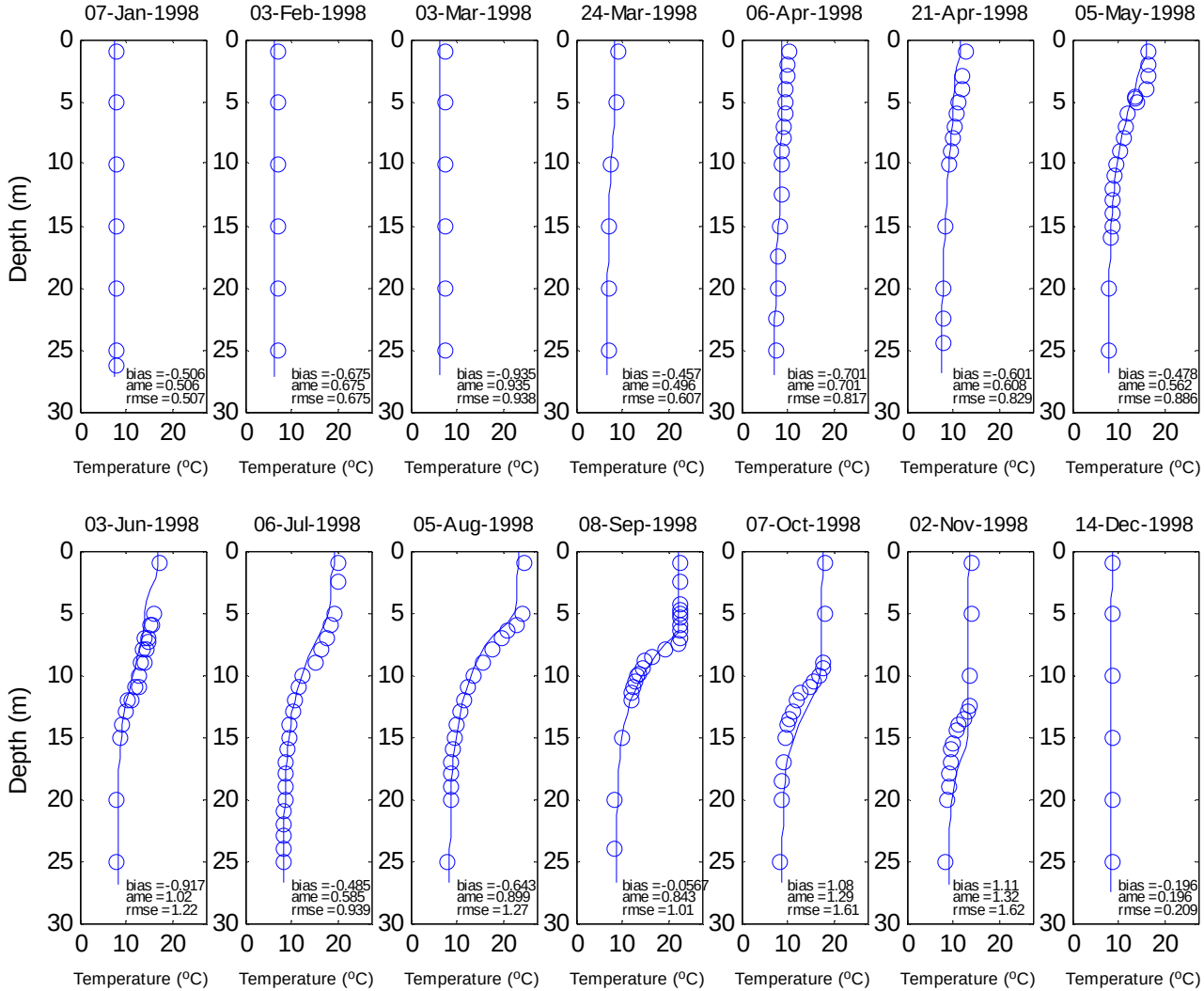
CH3D 0617


07-Jan-1998
bias =-0.425
ame =0.425
rmse =0.433
03-Feb-1998
bias =-0.697
ame =0.697
rmse =0.698
03-Mar-1998
bias =-0.798
ame =0.798
rmse =0.8
24-Mar-1998
bias =-1.46
ame =1.46
rmse =1.47
06-Apr-1998
bias =-0.781
ame =0.781
rmse =0.781
21-Apr-1998
bias =-3.35
ame =3.35
rmse =3.45
05-May-1998
bias =-0.204
ame =0.551
rmse =0.697
03-Jun-1998
bias =-0.985
ame =0.985
rmse =0.999
06-Jul-1998
bias =-1.62
ame =1.62
rmse =1.7
05-Aug-1998
bias =-1.77
ame =1.77
rmse =1.8
08-Sep-1998
bias =-0.723
ame =0.723
rmse =0.877
07-Oct-1998
bias =-0.506
ame =0.506
rmse =0.507
02-Nov-1998
bias =-0.396
ame =0.396
rmse =0.423
14-Dec-1998
bias =-0.291
ame =0.291
rmse =0.294
Depth (m)
Temperature (°C)

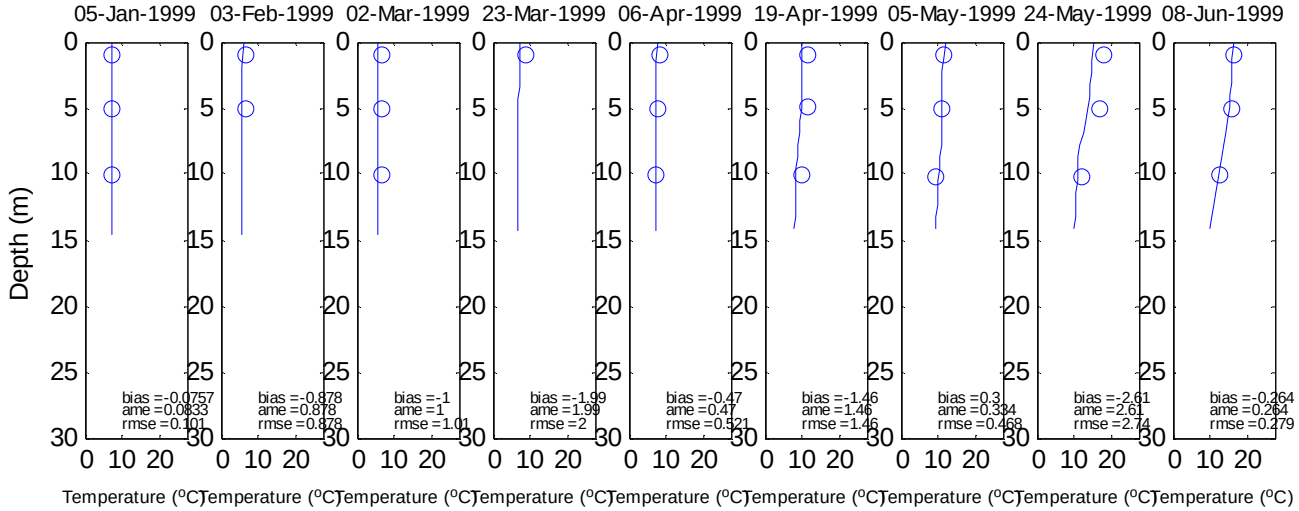
CH3D 0622

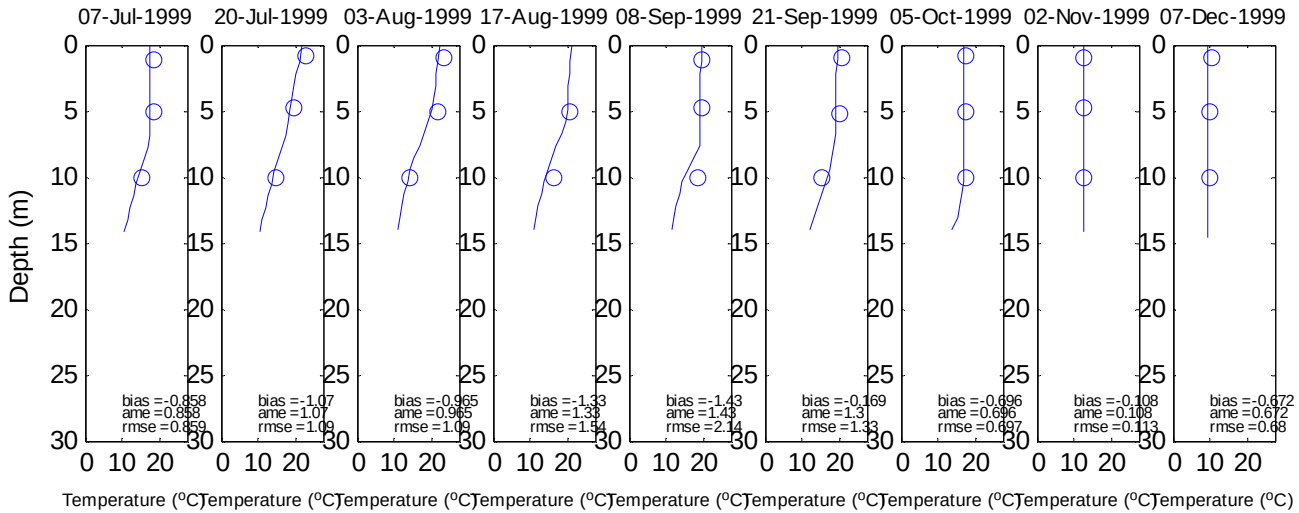

07-Jan-1998
bias =-0.649
ame =0.649
rmse =0.649
03-Feb-1998
bias =-0.805
ame =0.805
rmse =0.805
03-Mar-1998
bias =-1.22
ame =1.22
rmse =1.22
24-Mar-1998
bias =-1.26
ame =1.26
rmse =1.27
06-Apr-1998
bias =-0.936
ame =0.936
rmse =1.04
21-Apr-1998
bias =-3.39
ame =3.39
rmse =3.52
05-May-1998
bias =-0.931
ame =1.18
rmse =1.37
03-Jun-1998
bias =-1.45
ame =1.45
rmse =1.72
06-Jul-1998
bias =-0.594
ame =0.594
rmse =0.601
05-Aug-1998
bias =-0.899
ame =1.34
rmse =1.5
08-Sep-1998
bias =0.384
ame =0.983
rmse =1.27
07-Oct-1998
bias =-0.133
ame =0.269
rmse =0.305
02-Nov-1998
bias =-0.534
ame =0.534
rmse =0.544
14-Dec-1998
bias =-0.406
ame =0.406
rmse =0.406
Depth (m)
Temperature (°C)

CH3D 0612

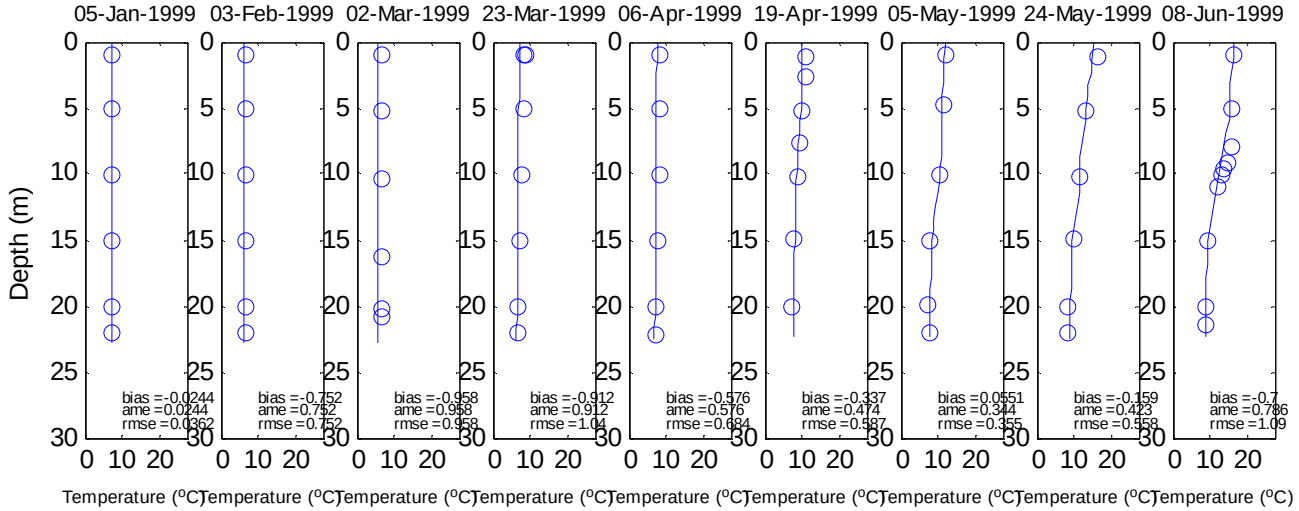

07-Jan-1998
bias =-0.506
ame =0.506
rmse =0.507
03-Feb-1998
bias =-0.675
ame =0.675
rmse =0.675
03-Mar-1998
bias =-0.935
ame =0.935
rmse =0.938
24-Mar-1998
bias =-0.457
ame =0.496
rmse =0.607
06-Apr-1998
bias =-0.701
ame =0.701
rmse =0.817
21-Apr-1998
bias =-0.601
ame =0.608
rmse =0.829
05-May-1998
bias =-0.478
ame =0.562
rmse =0.886
03-Jun-1998
bias =-0.917
ame =1.02
rmse =1.22
06-Jul-1998
bias =-0.485
ame =0.585
rmse =0.939
05-Aug-1998
bias =-0.643
ame =0.899
rmse =1.27
08-Sep-1998
bias =-0.0567
ame =0.843
rmse =1.01
07-Oct-1998
bias =1.08
ame =1.29
rmse =1.61
02-Nov-1998
bias =1.11
ame =1.32
rmse =1.62
14-Dec-1998
bias =-0.196
ame =0.196
rmse =0.209
Depth (m)
Temperature (°C)

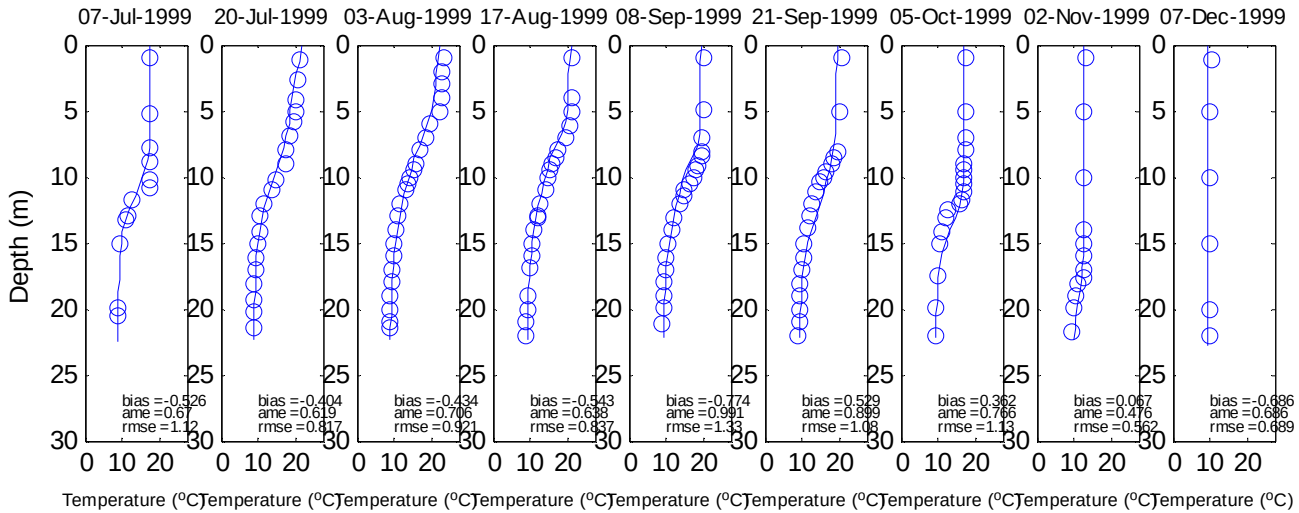
CH3D 0622


05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =-0.0757
ame =0.0833
rmse =0.101
bias =-0.878
ame =0.878
rmse =0.878
bias =-1
ame =1
rmse =1.01
bias =-1.99
ame =1.99
rmse =2
bias =-0.47
ame =0.47
rmse =0.521
bias =-1.46
ame =1.46
rmse =1.46
bias =0.3
ame =0.334
rmse =0.468
bias =-2.61
ame =2.61
rmse =2.74
bias =-0.264
ame =0.264
rmse =0.279
Temperature (ºC)

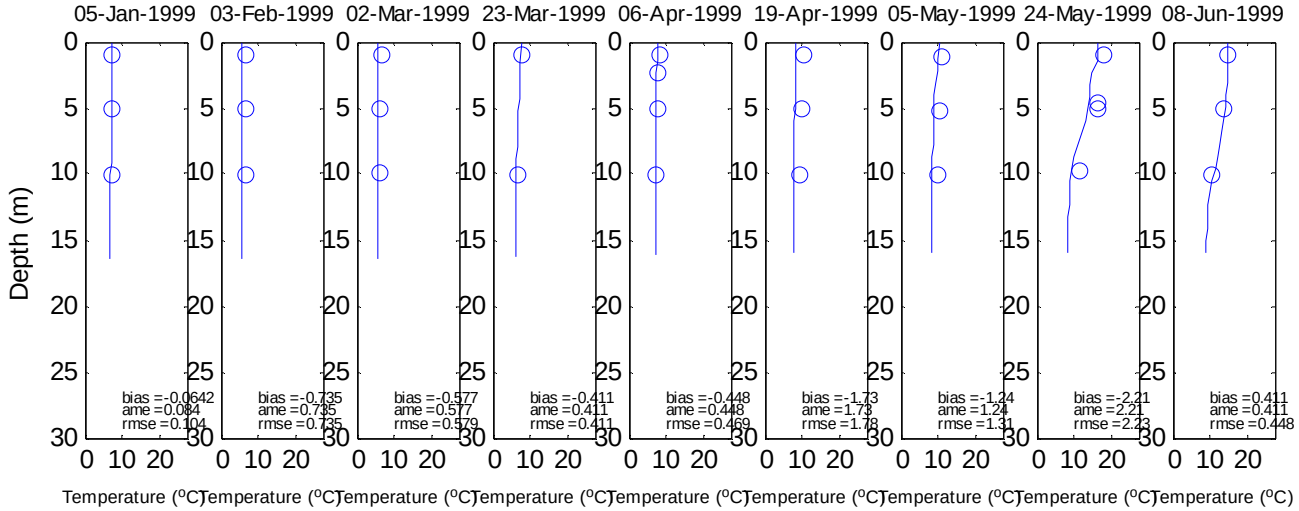

07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.858
ame =0.858
rmse =0.859
bias =-1.07
ame =1.07
rmse =1.09
bias =-0.965
ame =0.965
rmse =1.09
bias =-1.33
ame =1.33
rmse =1.54
bias =-1.43
ame =1.43
rmse =2.14
bias =-0.169
ame =1.3
rmse =1.33
bias =-0.696
ame =0.696
rmse =0.837
bias =-0.108
ame =0.108
rmse =0.113
bias =-0.672
ame =0.672
rmse =0.68
Temperature (ºC)

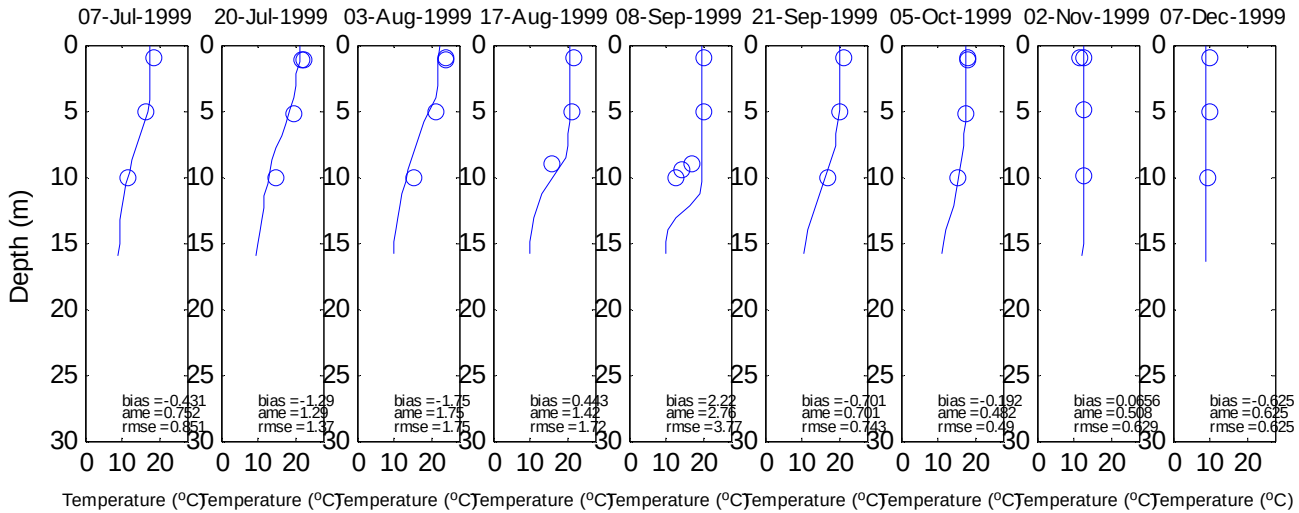
CH3D 0611


05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =-0.0244
ame =0.0244
rmse =0.0362
bias =-0.752
ame =0.752
rmse =0.752
bias =-0.958
ame =0.958
rmse =0.958
bias =-0.912
ame =0.912
rmse =1.04
bias =-0.576
ame =0.576
rmse =0.684
bias =-0.337
ame =0.474
rmse =0.587
bias =0.0551
ame =0.344
rmse =0.355
bias =-0.159
ame =0.423
rmse =0.558
bias =-0.7
ame =0.786
rmse =1.09
Temperature (°C)

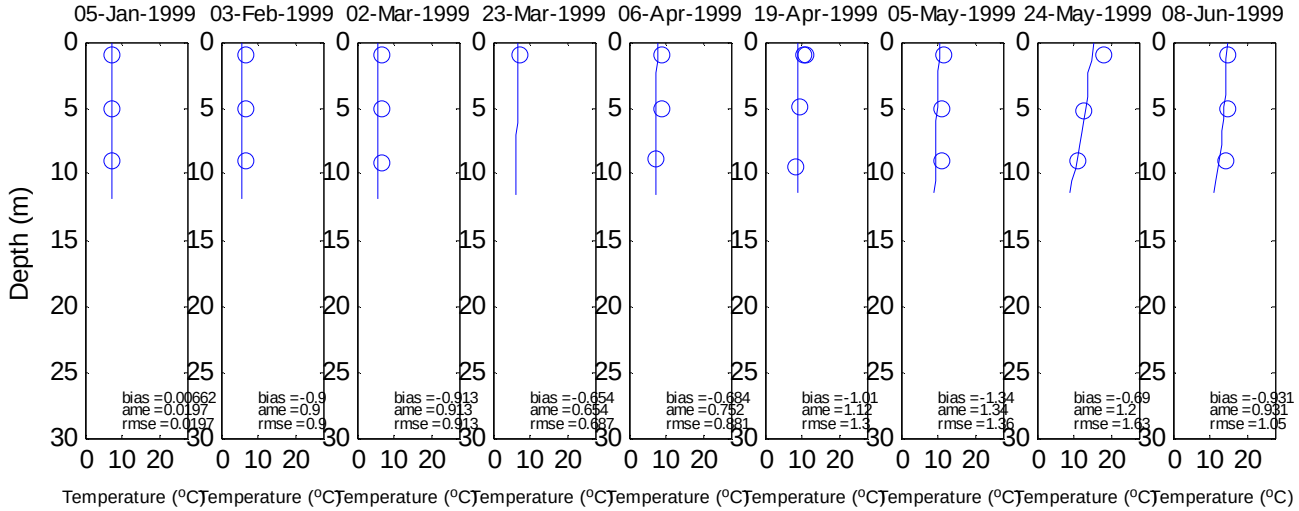

07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.526
ame =0.67
rmse =1.12
bias =-0.404
ame =0.619
rmse =0.817
bias =-0.434
ame =0.706
rmse =0.921
bias =-0.543
ame =0.638
rmse =0.837
bias =-0.774
ame =0.991
rmse =1.33
bias =0.529
ame =0.899
rmse =1.08
bias =0.362
ame =0.766
rmse =1.13
bias =0.067
ame =0.476
rmse =0.562
bias =-0.686
ame =0.686
rmse =0.689
Temperature (°C)

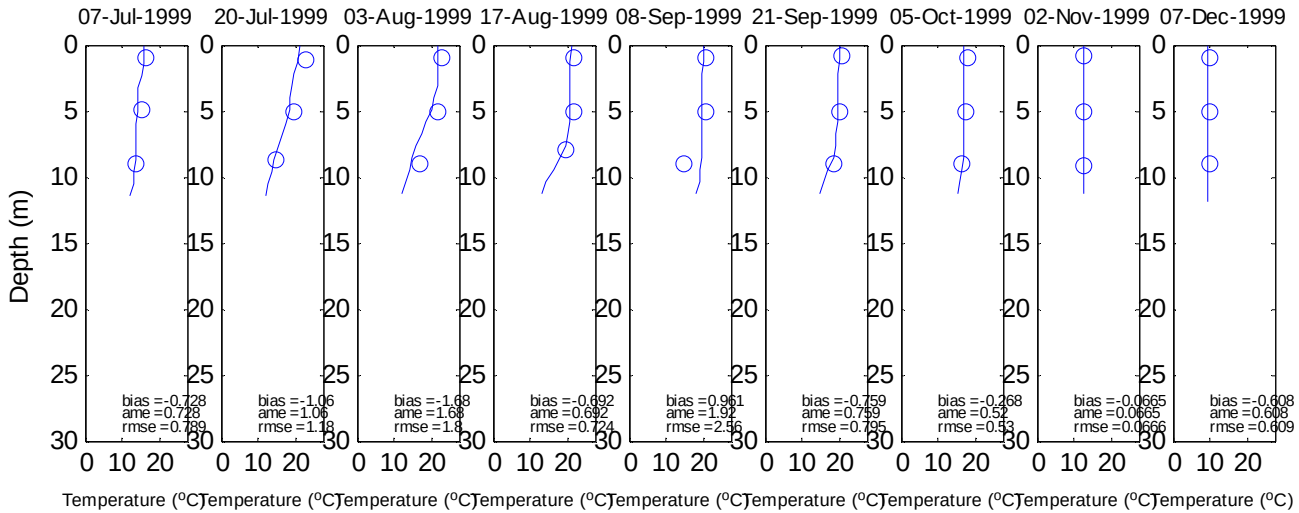
CH3D 0614


05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =-0.0642
ame =0.084
rmse =0.104
bias =-0.735
ame =0.735
rmse =0.735
bias =-0.577
ame =0.577
rmse =0.579
bias =-0.411
ame =0.411
rmse =0.411
bias =-0.448
ame =0.448
rmse =0.469
bias =-1.73
ame =1.73
rmse =1.78
bias =-1.24
ame =1.24
rmse =1.31
bias =-2.21
ame =2.21
rmse =2.23
bias =0.411
ame =0.411
rmse =0.448
Temperature (°C)

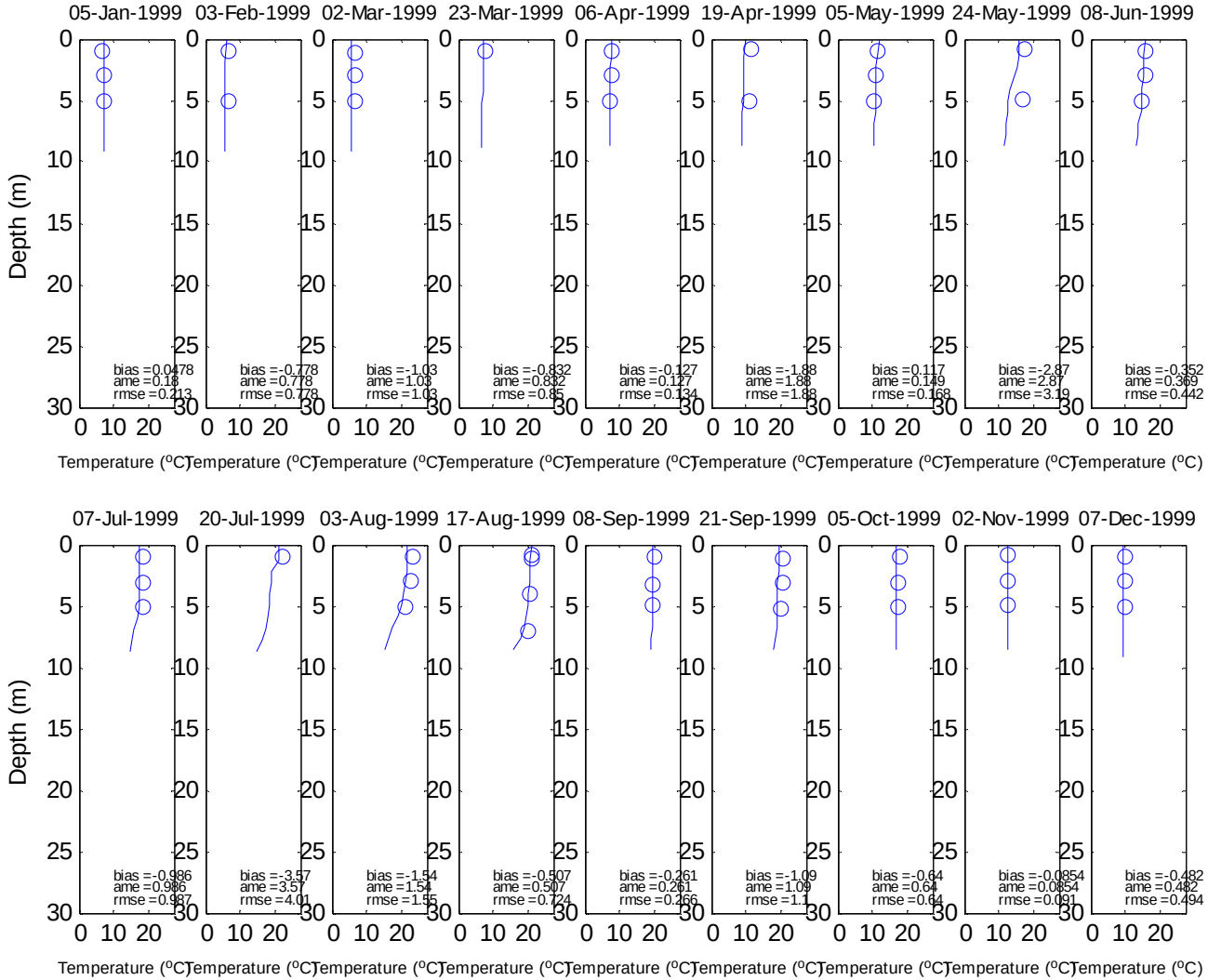

07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.431
ame =0.752
rmse =0.851
bias =-1.29
ame =1.29
rmse =1.37
bias =-1.75
ame =1.75
rmse =1.75
bias =0.443
ame =1.42
rmse =1.72
bias =2.22
ame =2.76
rmse =3.77
bias =-0.701
ame =0.701
rmse =0.743
bias =-0.192
ame =0.482
rmse =0.49
bias =0.0656
ame =0.508
rmse =0.629
bias =-0.625
ame =0.625
rmse =0.625
Temperature (°C)

CH3D 0617

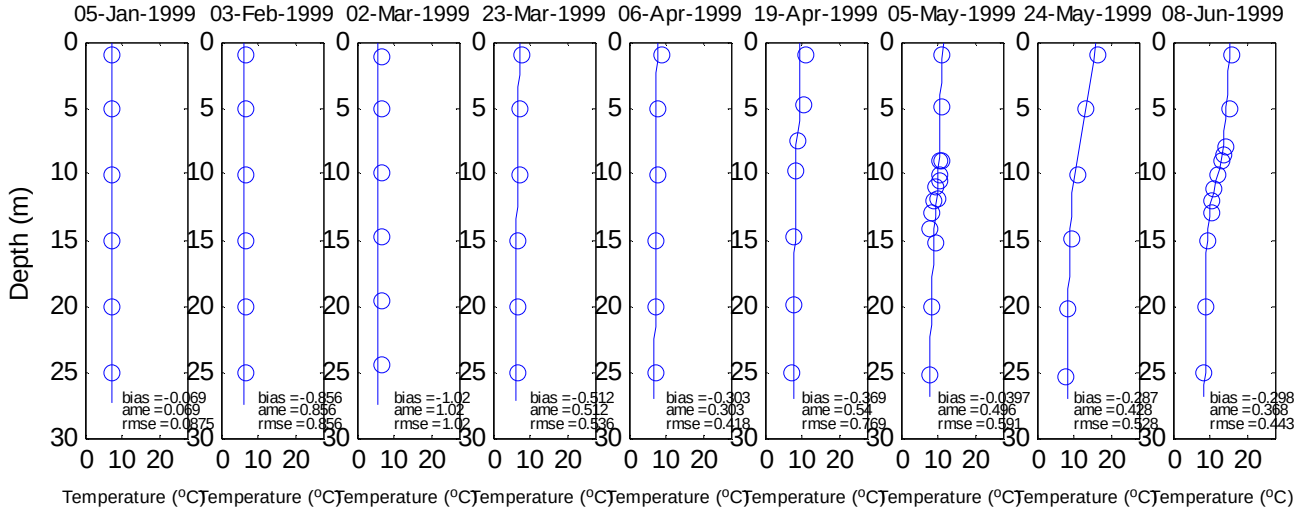

05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =0.00662
ame =0.0197
rmse =0.0197
bias =-0.9
ame =0.9
rmse =0.9
bias =-0.913
ame =0.913
rmse =0.913
bias =-0.654
ame =0.654
rmse =0.687
bias =-0.684
ame =0.752
rmse =0.881
bias =-1.01
ame =1.12
rmse =1.3
bias =-1.34
ame =1.34
rmse =1.36
bias =-0.69
ame =1.2
rmse =1.63
bias =-0.931
ame =0.931
rmse =1.05
Temperature (ºC)

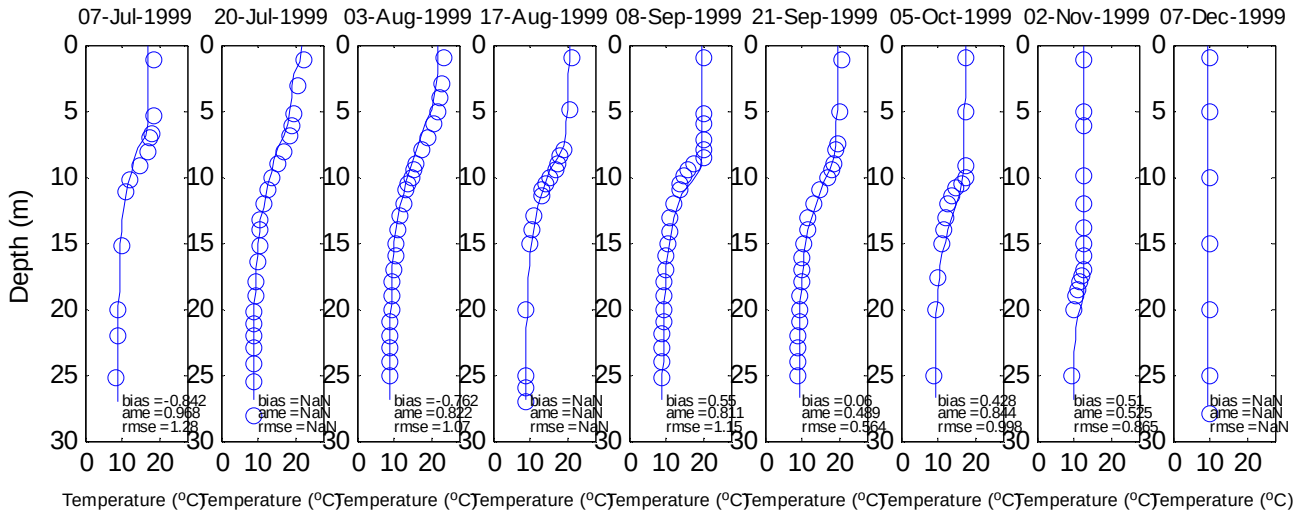

07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.728
ame =0.728
rmse =0.789
bias =-1.06
ame =1.06
rmse =1.18
bias =-1.68
ame =1.68
rmse =1.8
bias =-0.692
ame =0.692
rmse =0.724
bias =0.961
ame =1.92
rmse =2.56
bias =-0.759
ame =0.759
rmse =0.795
bias =-0.268
ame =0.52
rmse =0.53
bias =-0.0665
ame =0.0665
rmse =0.0666
bias =-0.608
ame =0.608
rmse =0.609
Temperature (ºC)

CH3D M621

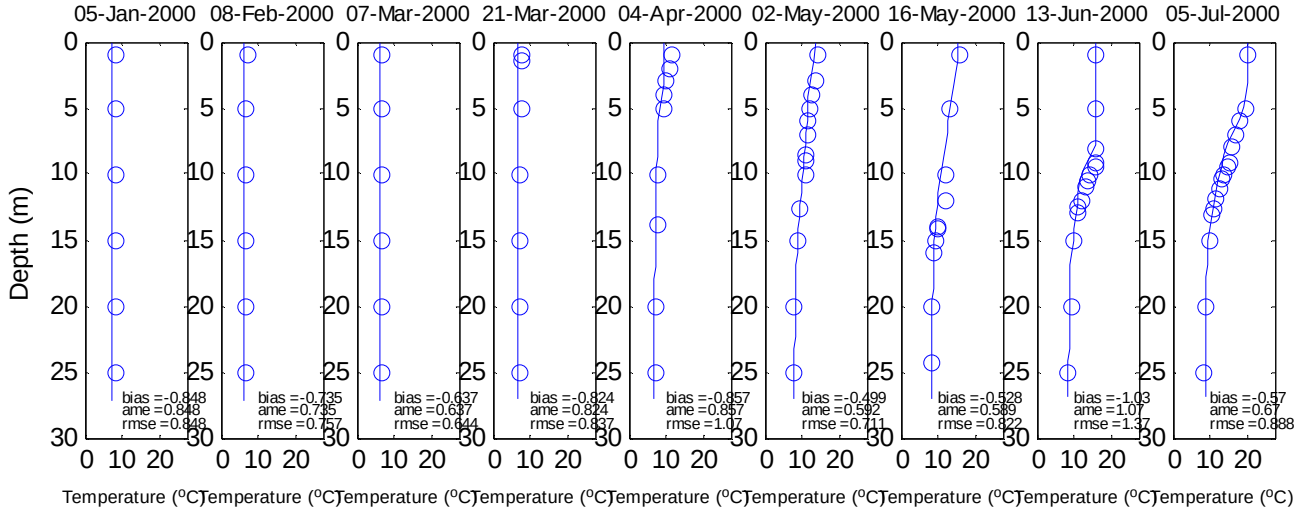

05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =0.0478
ame =0.18
rmse =0.213
bias =-0.778
ame =0.778
rmse =0.778
bias =-1.03
ame =1.03
rmse =1.03
bias =-0.832
ame =0.832
rmse =0.85
bias =-0.127
ame =0.127
rmse =0.134
bias =-1.88
ame =1.88
rmse =1.88
bias =0.117
ame =0.149
rmse =0.168
bias =-2.87
ame =2.87
rmse =3.19
bias =-0.352
ame =0.369
rmse =0.442
Temperature (°C)
07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.986
ame =0.986
rmse =0.987
bias =-3.57
ame =3.57
rmse =4.01
bias =-1.54
ame =1.54
rmse =1.55
bias =-0.507
ame =0.507
rmse =0.724
bias =-0.261
ame =0.261
rmse =0.266
bias =-1.09
ame =1.09
rmse =1.1
bias =-0.64
ame =0.64
rmse =0.64
bias =-0.0854
ame =0.0854
rmse =0.091
bias =-0.482
ame =0.482
rmse =0.494
Temperature (°C)

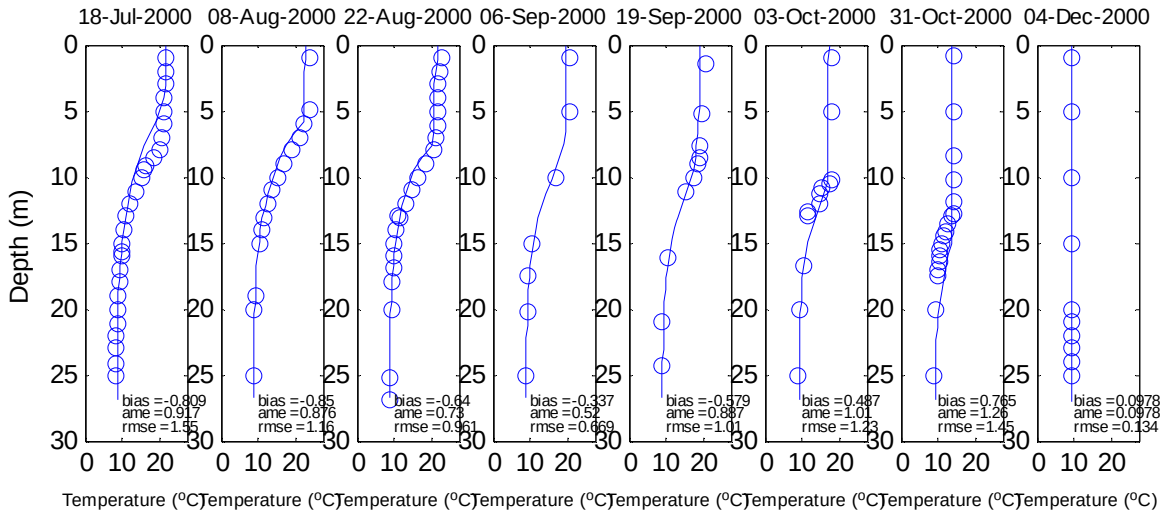
CH3D 0612


05-Jan-1999
03-Feb-1999
02-Mar-1999
23-Mar-1999
06-Apr-1999
19-Apr-1999
05-May-1999
24-May-1999
08-Jun-1999
Depth (m)
bias =-0.069
ame =0.069
rmse =0.0875
bias =-0.856
ame =0.856
rmse =0.856
bias =-1.02
ame =1.02
rmse =1.02
bias =-0.512
ame =0.512
rmse =0.536
bias =-0.303
ame =0.303
rmse =0.418
bias =-0.369
ame =0.54
rmse =0.769
bias =-0.0397
ame =0.496
rmse =0.591
bias =-0.287
ame =0.428
rmse =0.528
bias =-0.298
ame =0.368
rmse =0.443
Temperature (°C)

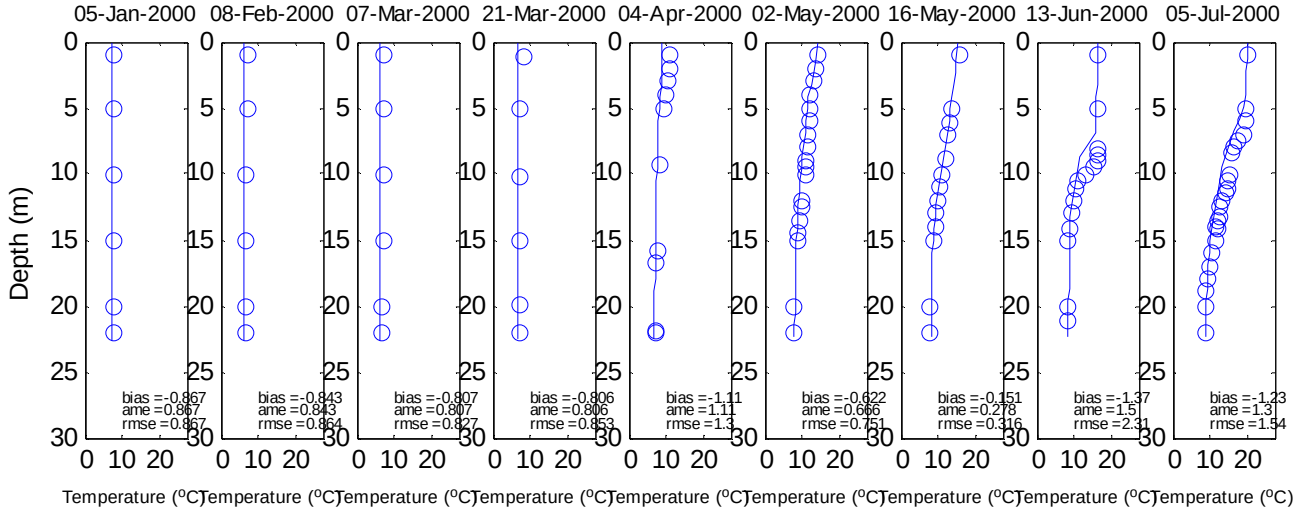

07-Jul-1999
20-Jul-1999
03-Aug-1999
17-Aug-1999
08-Sep-1999
21-Sep-1999
05-Oct-1999
02-Nov-1999
07-Dec-1999
Depth (m)
bias =-0.842
ame =0.968
rmse =1.28
bias =NaN
ame =NaN
rmse =NaN
bias =-0.762
ame =0.822
rmse =1.07
bias =NaN
ame =NaN
rmse =NaN
bias =0.55
ame =0.811
rmse =1.15
bias =0.06
ame =0.489
rmse =0.564
bias =0.428
ame =0.844
rmse =0.998
bias =0.51
ame =0.525
rmse =0.865
bias =NaN
ame =NaN
rmse =NaN
Temperature (°C)

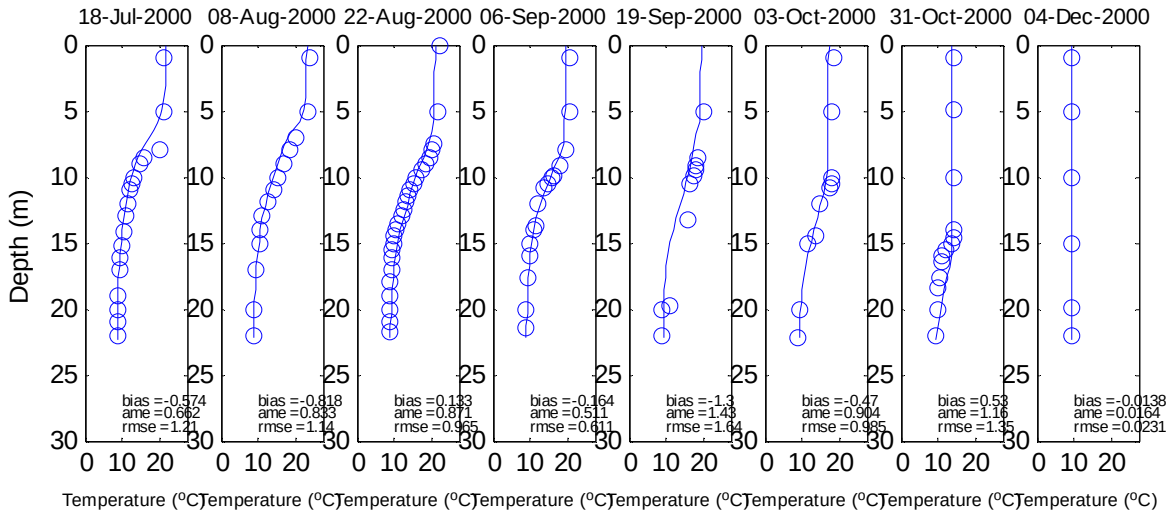
CH3D 0612


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-0.848
ame =0.848
rmse =0.848
bias =-0.735
ame =0.735
rmse =0.757
bias =-0.637
ame =0.637
rmse =0.644
bias =-0.824
ame =0.824
rmse =0.837
bias =-0.857
ame =0.857
rmse =1.07
bias =-0.499
ame =0.592
rmse =0.711
bias =-0.528
ame =0.589
rmse =0.822
bias =-1.03
ame =1.07
rmse =1.37
bias =-0.57
ame =0.67
rmse =0.888
Temperature (°C)

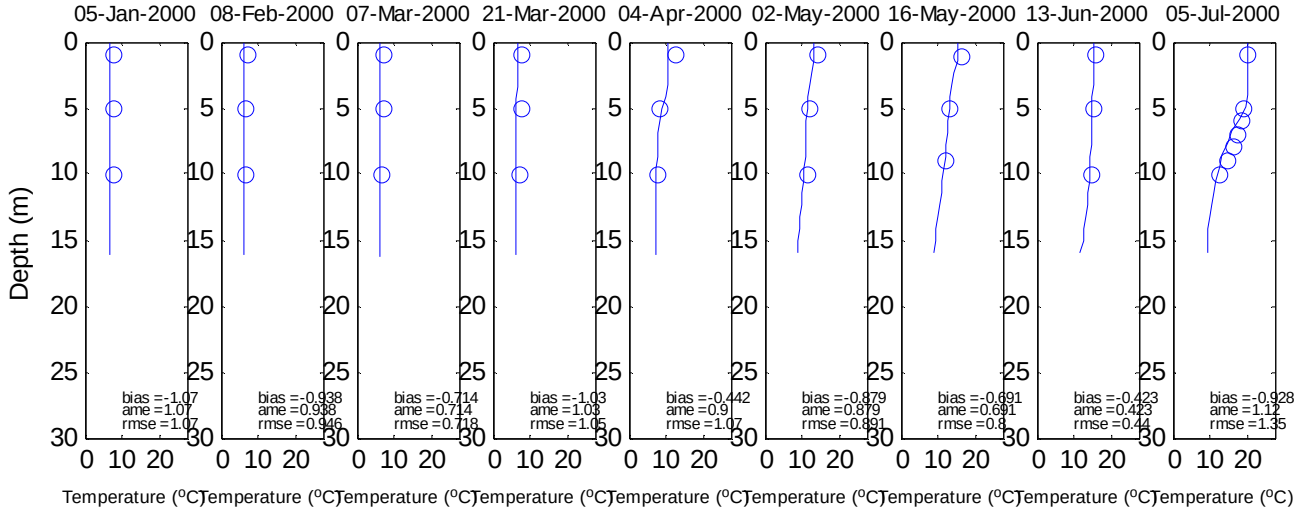

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-0.809
ame =0.917
rmse =1.55
bias =-0.85
ame =0.876
rmse =1.16
bias =-0.64
ame =0.73
rmse =0.961
bias =-0.337
ame =0.52
rmse =0.669
bias =-0.579
ame =0.887
rmse =1.01
bias =0.487
ame =1.01
rmse =1.23
bias =0.765
ame =1.26
rmse =1.45
bias =0.0978
ame =0.0978
rmse =0.134
Temperature (°C)

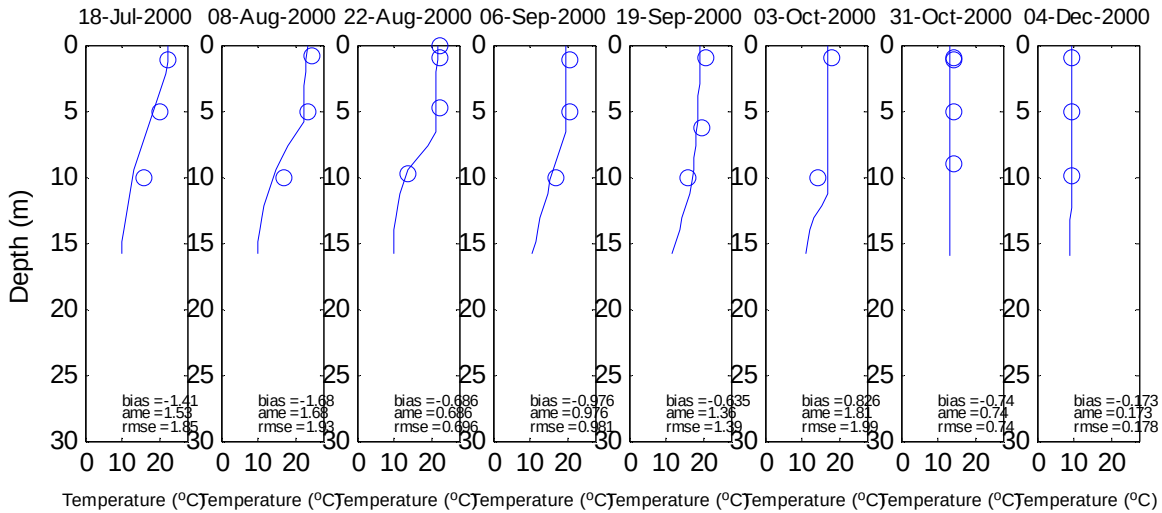
CH3D 0611


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-0.867
ame =0.867
rmse =0.867
bias =-0.843
ame =0.843
rmse =0.864
bias =-0.807
ame =0.807
rmse =0.827
bias =-0.806
ame =0.806
rmse =0.853
bias =-1.11
ame =1.11
rmse =1.3
bias =-0.622
ame =0.666
rmse =0.751
bias =-0.151
ame =0.278
rmse =0.316
bias =-1.37
ame =1.5
rmse =2.31
bias =-1.23
ame =1.3
rmse =1.54
Temperature (°C)

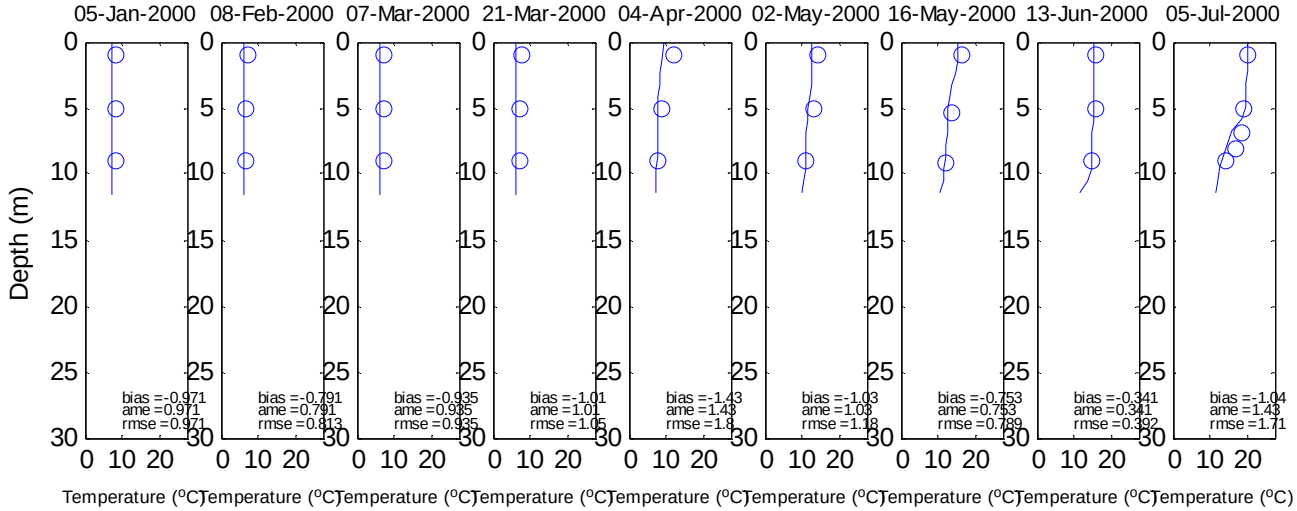

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-0.574
ame =0.662
rmse =1.21
bias =-0.818
ame =0.833
rmse =1.14
bias =0.133
ame =0.871
rmse =0.965
bias =-0.164
ame =0.511
rmse =0.611
bias =-1.3
ame =1.43
rmse =1.64
bias =-0.47
ame =0.904
rmse =0.985
bias =0.53
ame =1.16
rmse =1.35
bias =-0.0138
ame =0.0164
rmse =0.0231
Temperature (°C)

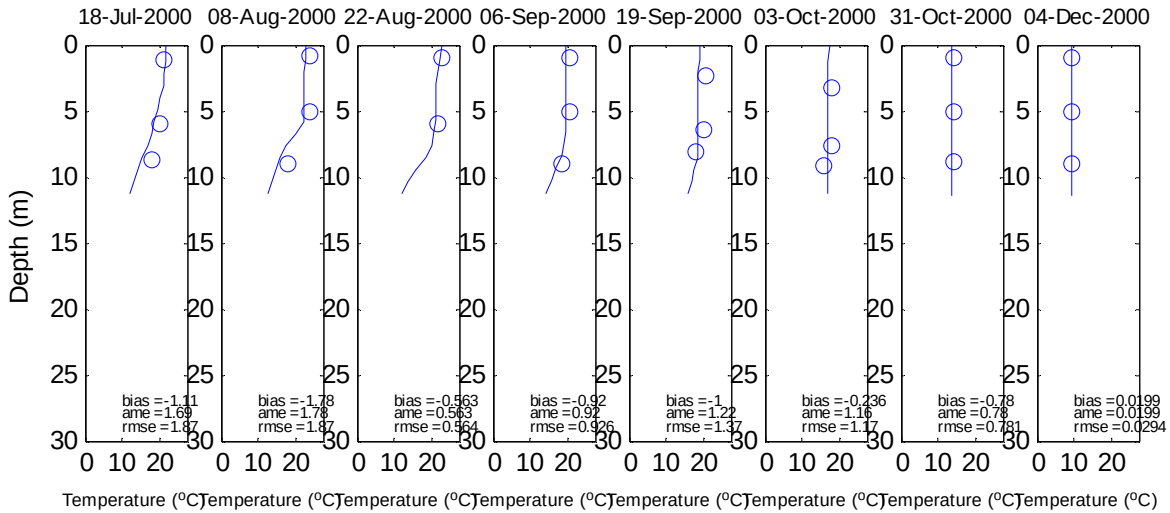
CH3D 0614


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-1.07
ame =1.07
rmse =1.07
bias =-0.938
ame =0.938
rmse =0.946
bias =-0.714
ame =0.714
rmse =0.718
bias =-1.03
ame =1.03
rmse =1.05
bias =-0.442
ame =0.9
rmse =1.07
bias =-0.879
ame =0.879
rmse =0.891
bias =-0.691
ame =0.691
rmse =0.8
bias =-0.423
ame =0.423
rmse =0.44
bias =-0.928
ame =1.12
rmse =1.35
Temperature (°C)

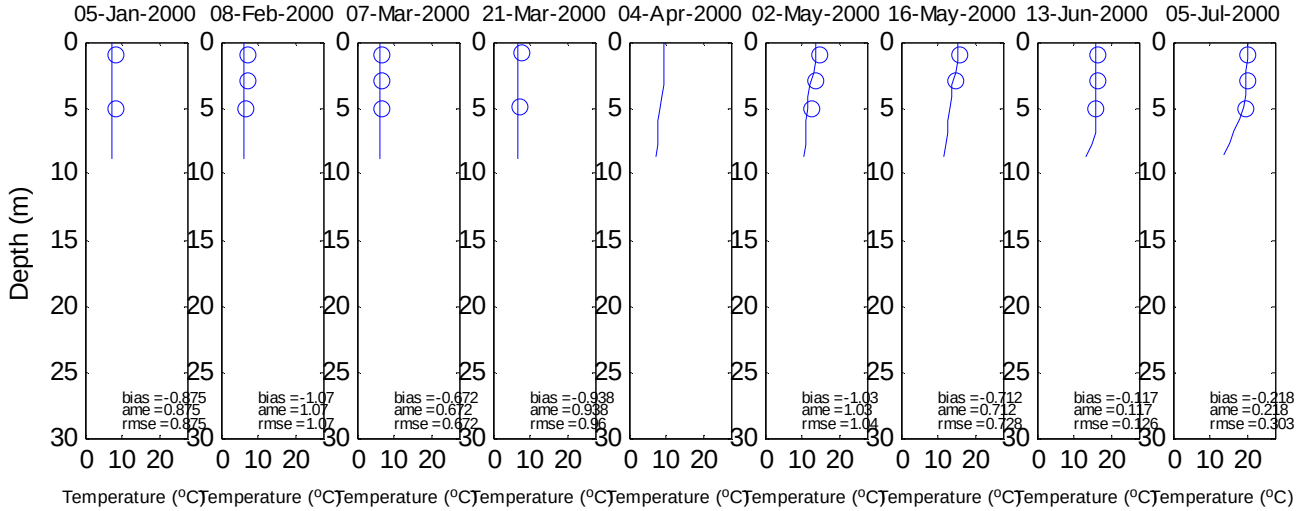

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-1.41
ame =1.53
rmse =1.85
bias =-1.68
ame =1.68
rmse =1.93
bias =-0.686
ame =0.686
rmse =0.696
bias =-0.976
ame =0.976
rmse =0.991
bias =-0.635
ame =1.36
rmse =1.39
bias =0.826
ame =1.81
rmse =1.99
bias =-0.74
ame =0.74
rmse =0.74
bias =-0.173
ame =0.173
rmse =0.178
Temperature (°C)

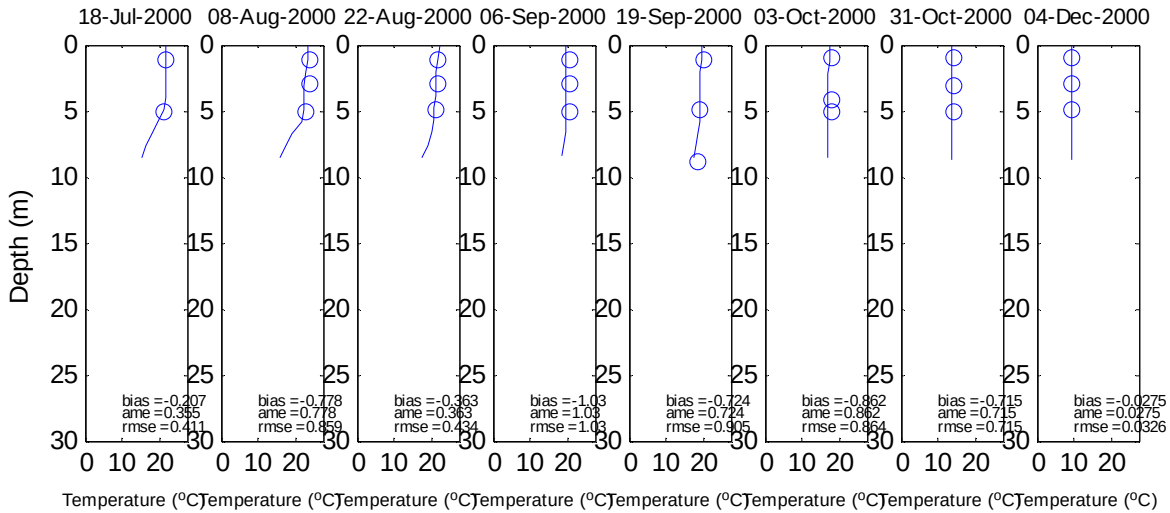
CH3D 0617


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-0.971
ame =0.971
rmse =0.971
bias =-0.791
ame =0.791
rmse =0.813
bias =-0.935
ame =0.935
rmse =0.935
bias =-1.01
ame =1.01
rmse =1.05
bias =-1.43
ame =1.43
rmse =1.8
bias =-1.03
ame =1.03
rmse =1.18
bias =-0.753
ame =0.753
rmse =0.789
bias =-0.341
ame =0.341
rmse =0.392
bias =-1.04
ame =1.43
rmse =1.71
Temperature (°C)

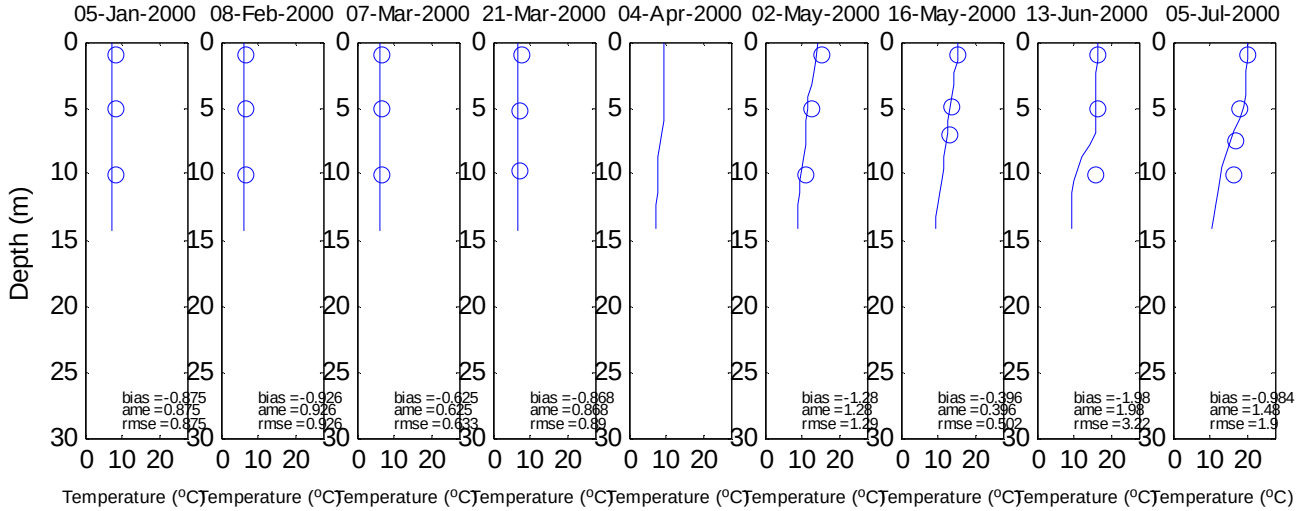

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-1.11
ame =1.69
rmse =1.87
bias =-1.78
ame =1.78
rmse =1.87
bias =-0.563
ame =0.563
rmse =0.564
bias =-0.92
ame =0.92
rmse =0.926
bias =-1
ame =1.22
rmse =1.37
bias =-0.236
ame =1.16
rmse =1.17
bias =-0.78
ame =0.78
rmse =0.781
bias =0.0199
ame =0.0199
rmse =0.0294
Temperature (°C)

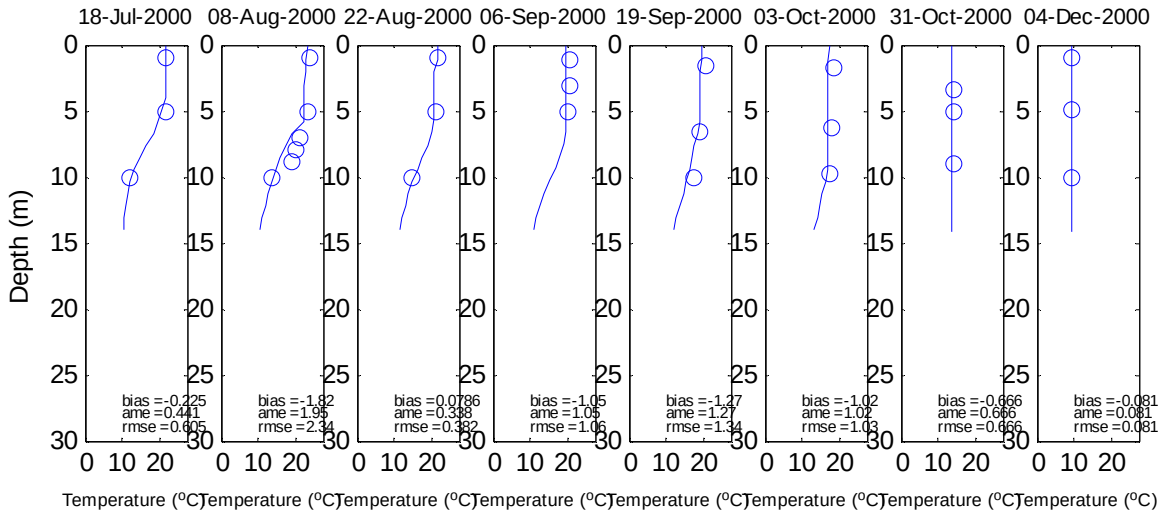
CH3D M621


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-0.875
ame =0.875
rmse =0.875
bias =-1.07
ame =1.07
rmse =1.07
bias =-0.672
ame =0.672
rmse =0.672
bias =-0.938
ame =0.938
rmse =0.95
bias =-1.03
ame =1.03
rmse =1.04
bias =-0.712
ame =0.712
rmse =0.728
bias =-0.117
ame =0.117
rmse =0.126
bias =-0.218
ame =0.218
rmse =0.303
Temperature (°C)

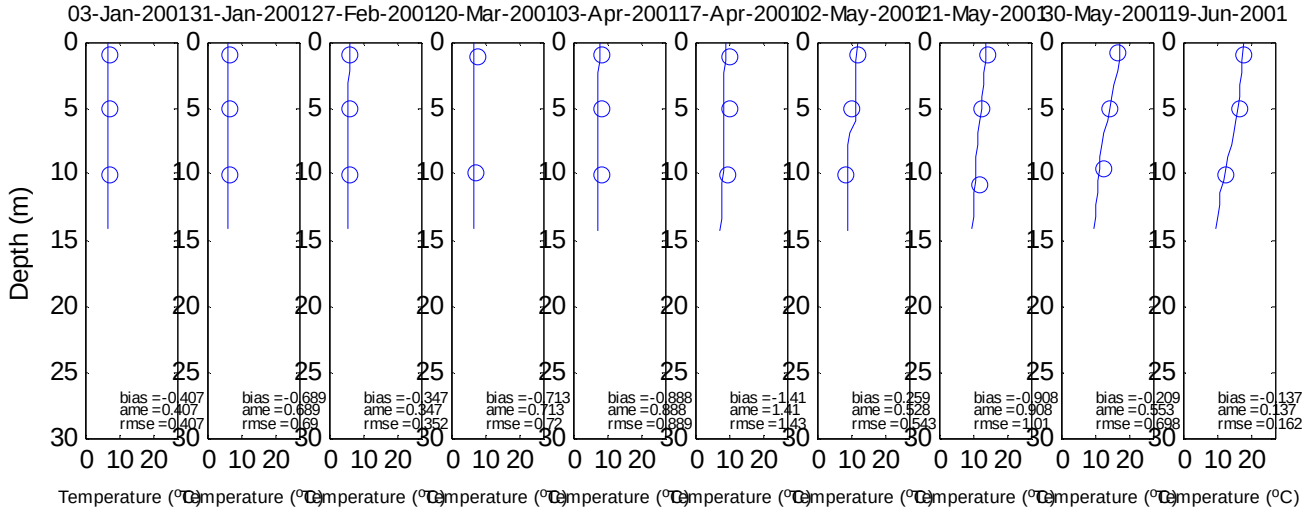

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-0.207
ame =0.355
rmse =0.411
bias =-0.778
ame =0.778
rmse =0.859
bias =-0.363
ame =0.363
rmse =0.434
bias =-1.03
ame =1.03
rmse =1.03
bias =-0.724
ame =0.724
rmse =0.905
bias =-0.862
ame =0.862
rmse =0.864
bias =-0.715
ame =0.715
rmse =0.715
bias =-0.0275
ame =0.0275
rmse =0.0326
Temperature (°C)

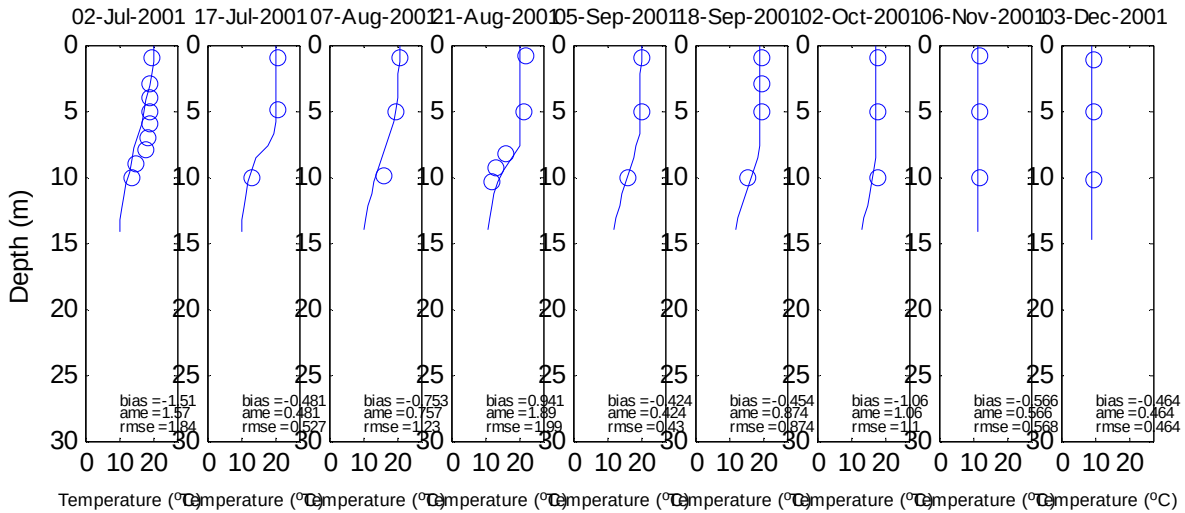
CH3D 0622


05-Jan-2000
08-Feb-2000
07-Mar-2000
21-Mar-2000
04-Apr-2000
02-May-2000
16-May-2000
13-Jun-2000
05-Jul-2000
Depth (m)
bias =-0.875
ame =0.875
rmse =0.875
bias =-0.926
ame =0.926
rmse =0.926
bias =-0.625
ame =0.625
rmse =0.633
bias =-0.868
ame =0.868
rmse =0.89
bias =-1.28
ame =1.28
rmse =1.29
bias =-0.396
ame =0.396
rmse =0.502
bias =-1.98
ame =1.98
rmse =3.22
bias =-0.984
ame =1.48
rmse =1.9
Temperature (°C)

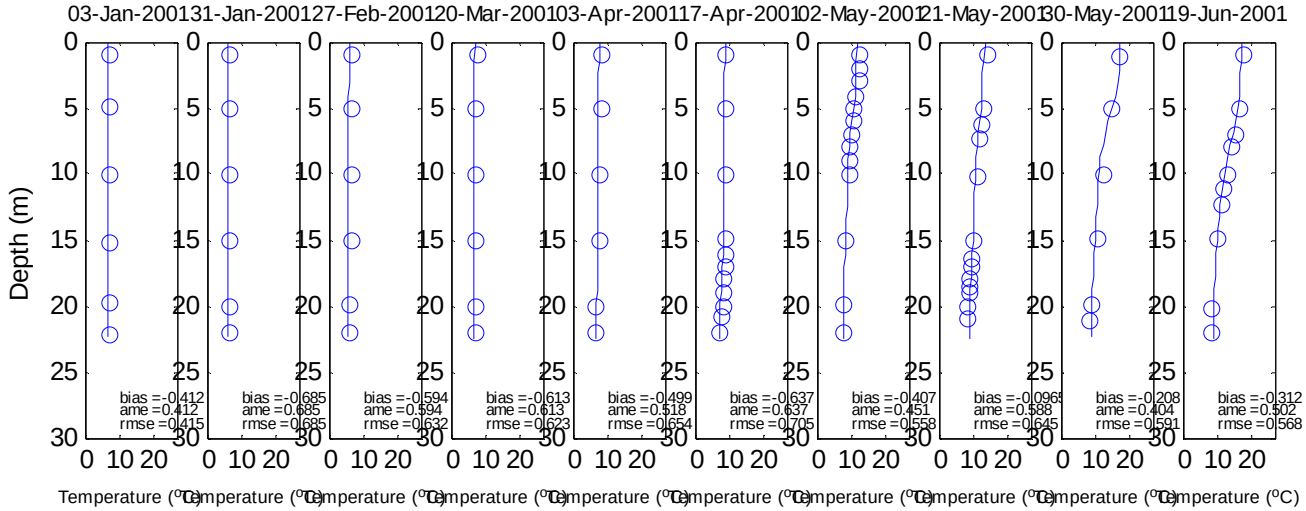

18-Jul-2000
08-Aug-2000
22-Aug-2000
06-Sep-2000
19-Sep-2000
03-Oct-2000
31-Oct-2000
04-Dec-2000
Depth (m)
bias =-0.225
ame =0.441
rmse =0.605
bias =-1.92
ame =1.95
rmse =2.34
bias =0.0786
ame =0.338
rmse =0.382
bias =-1.05
ame =1.05
rmse =1.06
bias =-1.27
ame =1.27
rmse =1.34
bias =-1.02
ame =1.02
rmse =1.03
bias =-0.666
ame =0.666
rmse =0.666
bias =-0.081
ame =0.081
rmse =0.081
Temperature (°C)

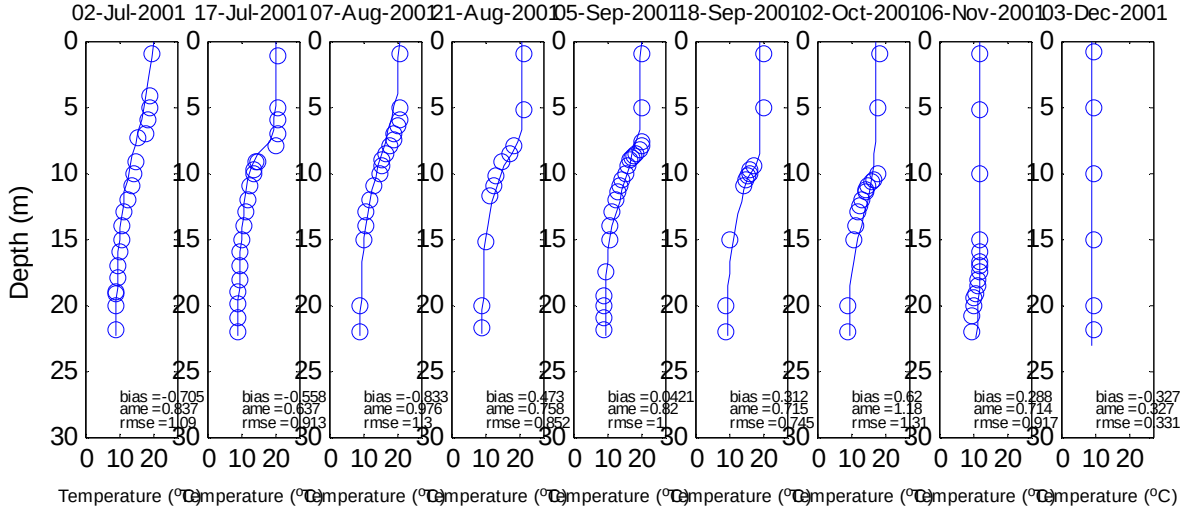
CH3D 0622


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.407
ame =0.407
rmse =0.407
bias =-0.689
ame =0.689
rmse =0.69
bias =-0.347
ame =0.347
rmse =0.352
bias =-0.713
ame =0.713
rmse =0.72
bias =-0.888
ame =0.888
rmse =0.889
bias =-1.41
ame =1.41
rmse =1.43
bias =0.259
ame =0.528
rmse =0.543
bias =-0.908
ame =0.908
rmse =1.01
bias =-0.209
ame =0.553
rmse =0.698
bias =-0.137
ame =0.137
rmse =0.162

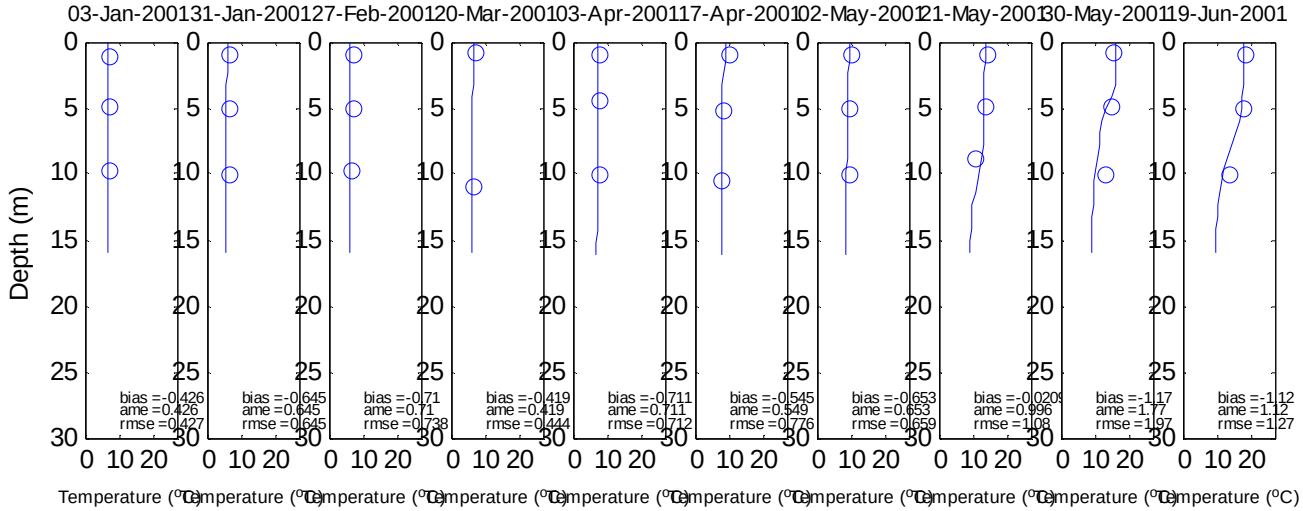

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-1.51
ame =1.57
rmse =1.84
bias =-0.481
ame =0.481
rmse =0.527
bias =-0.753
ame =0.757
rmse =1.23
bias =0.941
ame =1.89
rmse =1.99
bias =-0.424
ame =0.424
rmse =0.43
bias =-0.454
ame =0.874
rmse =0.874
bias =-1.06
ame =1.06
rmse =1.1
bias =-0.566
ame =0.566
rmse =0.568
bias =-0.464
ame =0.464
rmse =0.464

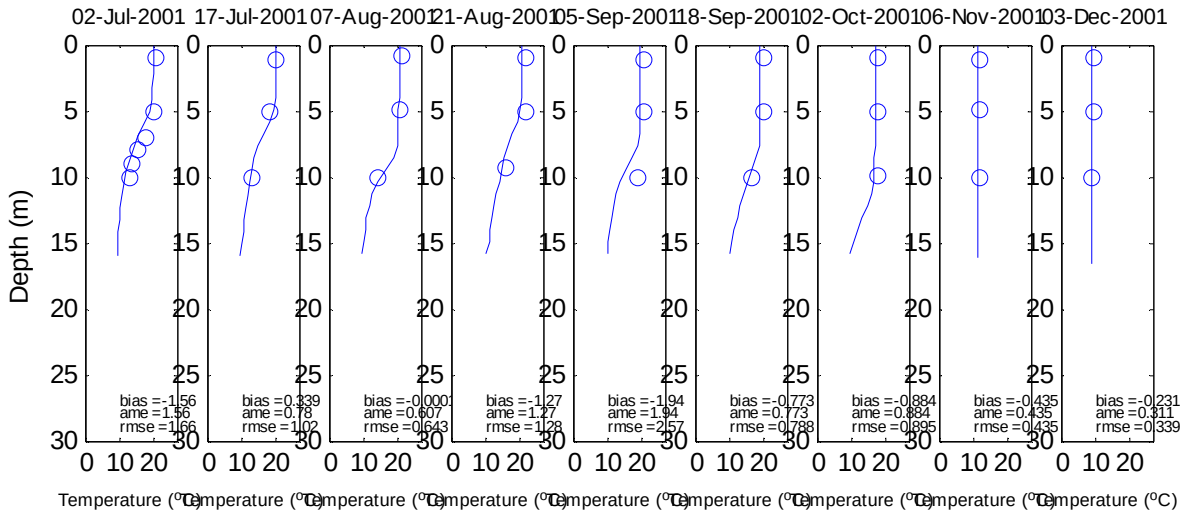
CH3D 0611


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.412
ame =0.412
rmse =0.415
bias =-0.685
ame =0.685
rmse =0.685
bias =-0.594
ame =0.594
rmse =0.632
bias =-0.613
ame =0.613
rmse =0.623
bias =-0.499
ame =0.518
rmse =0.654
bias =-0.637
ame =0.637
rmse =0.705
bias =-0.407
ame =0.451
rmse =0.558
bias =-0.0965
ame =0.588
rmse =0.645
bias =-0.208
ame =0.404
rmse =0.591
bias =-0.312
ame =0.502
rmse =0.568

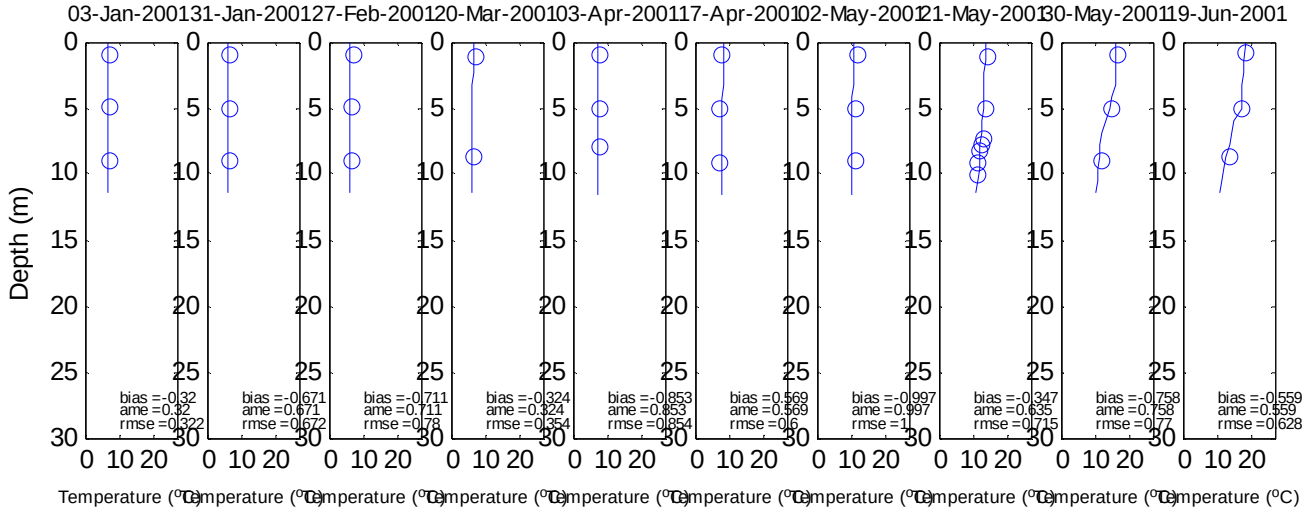

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-0.705
ame =0.837
rmse =1.09
bias =-0.558
ame =0.637
rmse =0.913
bias =-0.833
ame =0.976
rmse =1.3
bias =0.473
ame =0.758
rmse =0.852
bias =0.0421
ame =0.82
rmse =1
bias =0.312
ame =0.715
rmse =0.745
bias =0.62
ame =1.18
rmse =1.31
bias =0.288
ame =0.714
rmse =0.917
bias =-0.327
ame =0.327
rmse =0.331

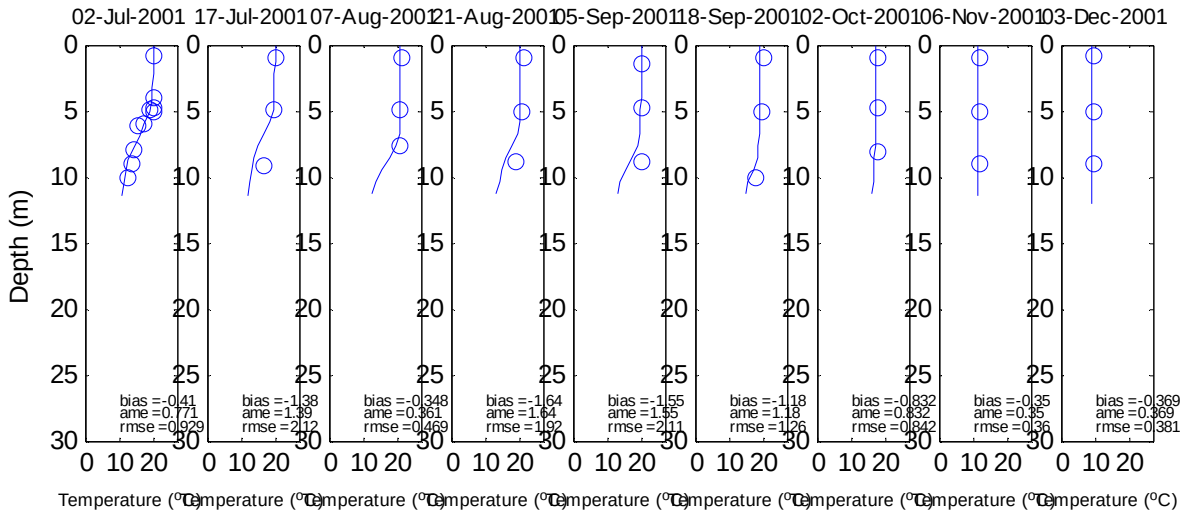
CH3D 0614


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.426
ame =0.426
rmse =0.427
bias =-0.645
ame =0.645
rmse =0.645
bias =-0.71
ame =0.71
rmse =0.738
bias =-0.419
ame =0.419
rmse =0.444
bias =-0.711
ame =0.711
rmse =0.712
bias =-0.545
ame =0.549
rmse =0.776
bias =-0.653
ame =0.653
rmse =0.659
bias =-0.0209
ame =0.996
rmse =1.08
bias =-1.17
ame =1.77
rmse =1.97
bias =-1.12
ame =1.12
rmse =1.27

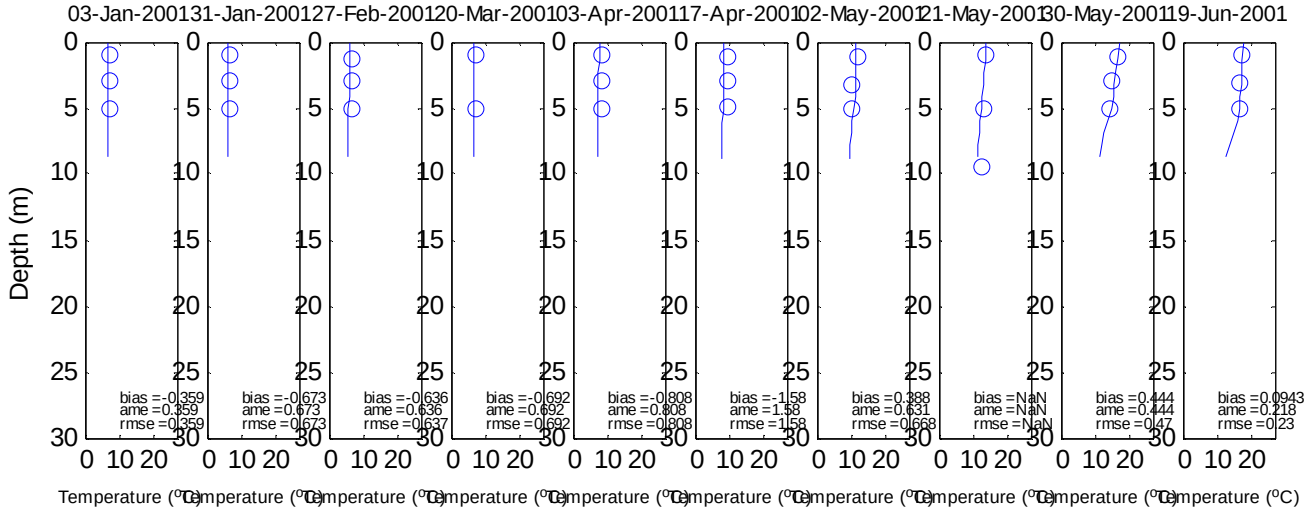

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-1.56
ame =1.56
rmse =1.66
bias =0.339
ame =0.78
rmse =1.02
bias =-0.0001
ame =0.607
rmse =0.643
bias =-1.27
ame =1.27
rmse =1.28
bias =-1.94
ame =1.94
rmse =2.57
bias =-0.773
ame =0.773
rmse =0.788
bias =-0.884
ame =0.884
rmse =0.895
bias =-0.435
ame =0.435
rmse =0.435
bias =-0.231
ame =0.311
rmse =0.339

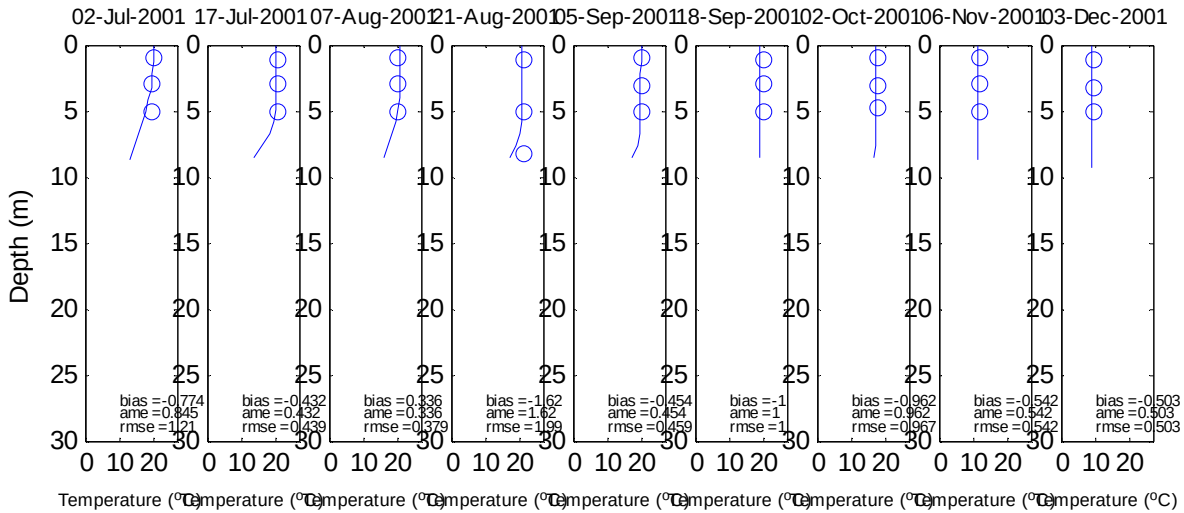
CH3D 0617


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.32
ame =0.32
rmse =0.322
bias =-0.671
ame =0.671
rmse =0.672
bias =-0.711
ame =0.711
rmse =0.78
bias =-0.324
ame =0.324
rmse =0.354
bias =-0.853
ame =0.853
rmse =0.854
bias =0.569
ame =0.569
rmse =0.6
bias =-0.997
ame =0.997
rmse =1
bias =-0.347
ame =0.635
rmse =0.715
bias =-0.758
ame =0.758
rmse =0.77
bias =-0.559
ame =0.559
rmse =0.628

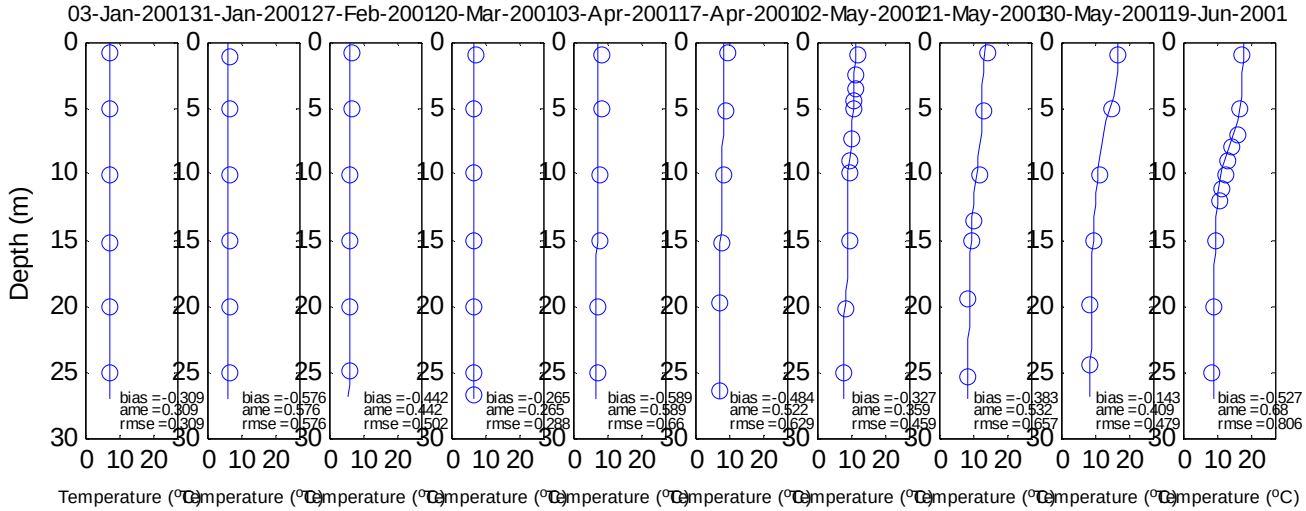

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-0.41
ame =0.771
rmse =0.929
bias =-1.38
ame =1.39
rmse =2.12
bias =-0.348
ame =0.361
rmse =0.469
bias =-1.64
ame =1.64
rmse =1.92
bias =-1.55
ame =1.55
rmse =2.11
bias =-1.18
ame =1.18
rmse =1.26
bias =-0.832
ame =0.832
rmse =0.842
bias =-0.35
ame =0.35
rmse =0.36
bias =-0.369
ame =0.369
rmse =0.381

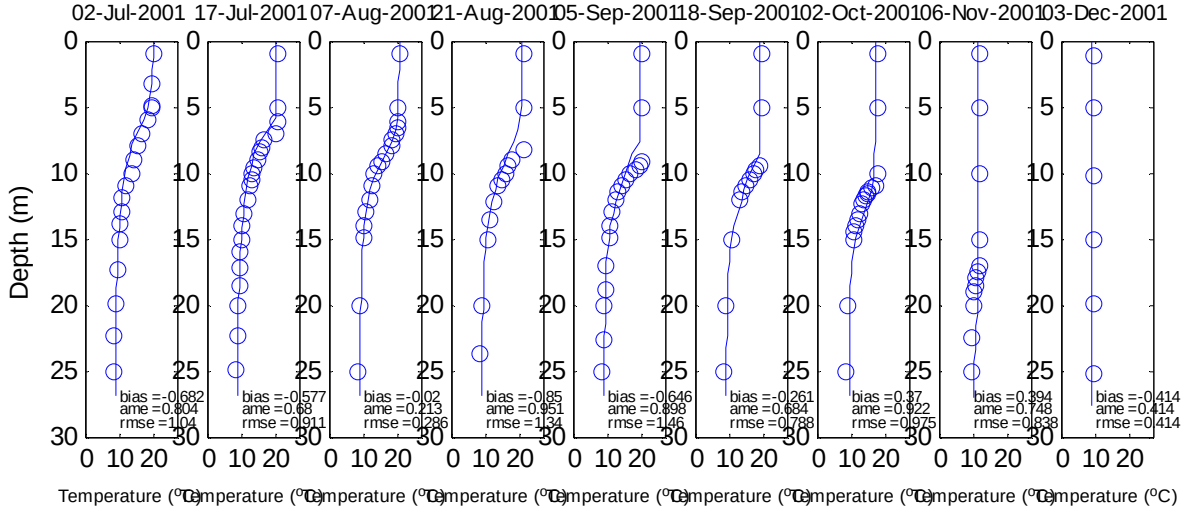
CH3D M621


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.359
ame =0.359
rmse =0.359
bias =-0.673
ame =0.673
rmse =0.673
bias =-0.636
ame =0.636
rmse =0.637
bias =-0.692
ame =0.692
rmse =0.692
bias =-0.808
ame =0.808
rmse =0.808
bias =-1.58
ame =1.58
rmse =1.58
bias =0.388
ame =0.631
rmse =0.668
bias =NaN
ame =NaN
rmse =NaN
bias =0.444
ame =0.444
rmse =0.47
bias =0.0943
ame =0.218
rmse =0.23

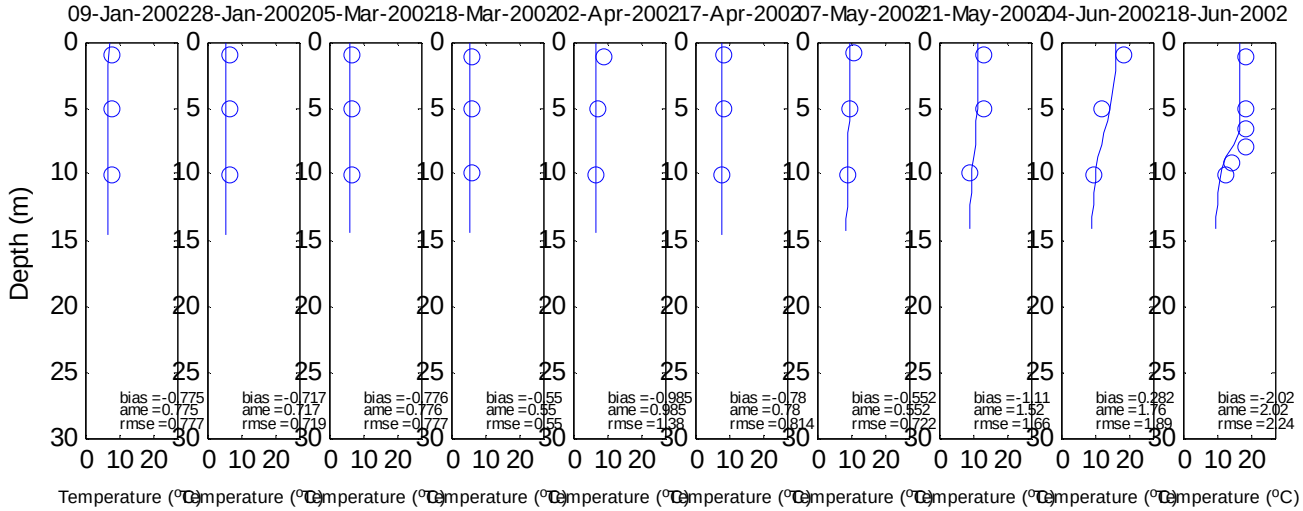

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-0.774
ame =0.845
rmse =1.21
bias =-0.432
ame =0.432
rmse =0.439
bias =0.336
ame =0.336
rmse =0.379
bias =-1.62
ame =1.62
rmse =1.99
bias =-0.454
ame =0.454
rmse =0.459
bias =-1
ame =1
rmse =1
bias =-0.962
ame =0.962
rmse =0.967
bias =-0.542
ame =0.542
rmse =0.542
bias =-0.503
ame =0.503
rmse =0.503

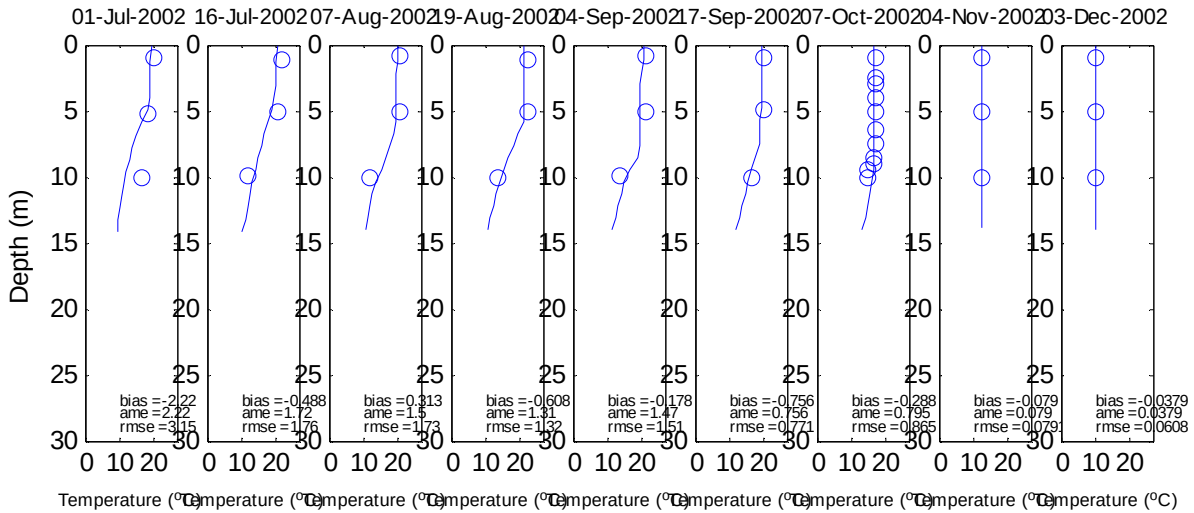
CH3D 0612


03-Jan-2001
31-Jan-2001
27-Feb-2001
20-Mar-2001
03-Apr-2001
17-Apr-2001
02-May-2001
21-May-2001
30-May-2001
19-Jun-2001
Depth (m)
Temperature (°C)
bias =-0.309
ame =0.309
rmse =0.309
bias =-0.576
ame =0.576
rmse =0.576
bias =-0.442
ame =0.442
rmse =0.502
bias =-0.265
ame =0.265
rmse =0.288
bias =-0.589
ame =0.589
rmse =0.66
bias =-0.484
ame =0.522
rmse =0.629
bias =-0.327
ame =0.359
rmse =0.459
bias =-0.383
ame =0.532
rmse =0.657
bias =-0.143
ame =0.409
rmse =0.479
bias =-0.527
ame =0.68
rmse =0.806

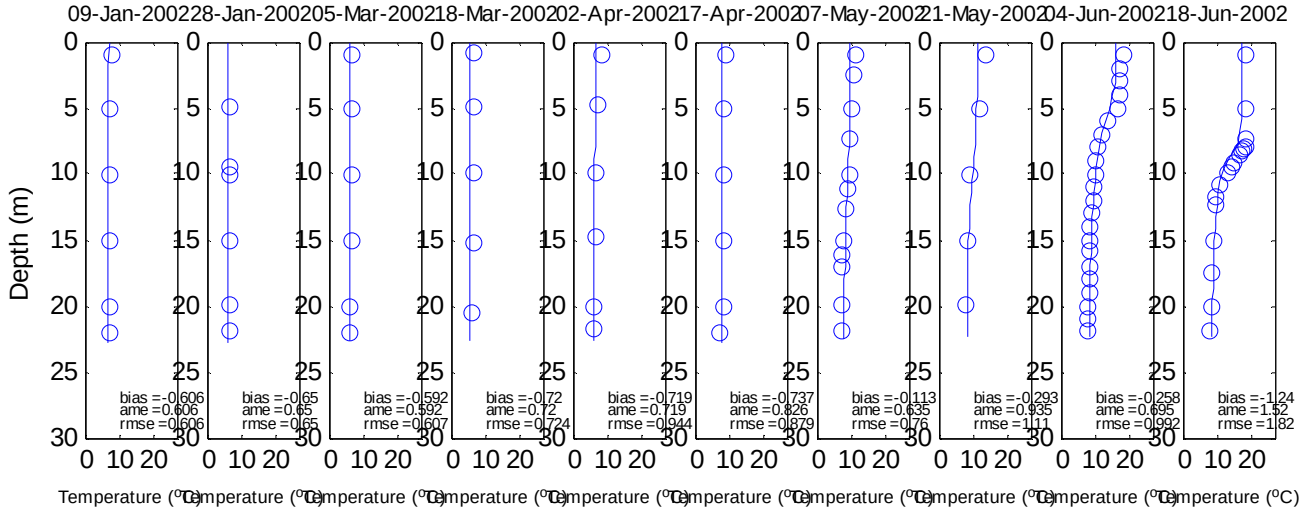

02-Jul-2001
17-Jul-2001
07-Aug-2001
21-Aug-2001
05-Sep-2001
18-Sep-2001
02-Oct-2001
06-Nov-2001
03-Dec-2001
Depth (m)
Temperature (°C)
bias =-0.682
ame =0.804
rmse =1.04
bias =-0.577
ame =0.68
rmse =0.911
bias =-0.02
ame =0.213
rmse =0.286
bias =-0.85
ame =0.951
rmse =1.34
bias =-0.646
ame =0.898
rmse =1.06
bias =-0.261
ame =0.684
rmse =0.788
bias =0.37
ame =0.922
rmse =0.975
bias =0.394
ame =0.748
rmse =0.838
bias =-0.414
ame =0.414
rmse =0.414

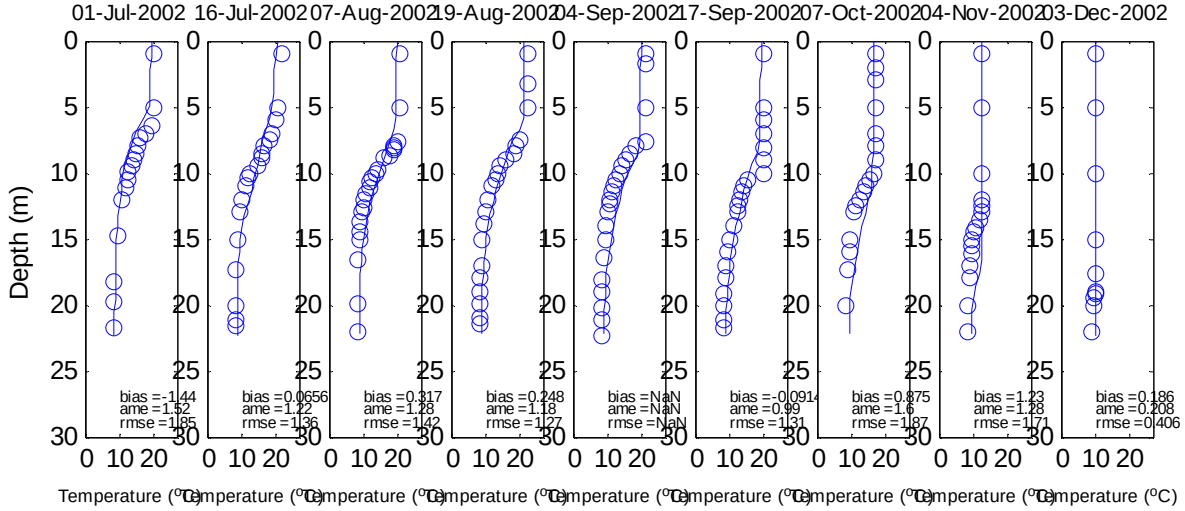
CH3D 0622


09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-0.775
ame =0.775
rmse =0.777
bias =-0.717
ame =0.717
rmse =0.719
bias =-0.776
ame =0.776
rmse =0.777
bias =-0.55
ame =0.55
rmse =0.55
bias =-0.985
ame =0.985
rmse =1.08
bias =-0.78
ame =0.78
rmse =0.814
bias =-0.552
ame =0.552
rmse =0.722
bias =-1.11
ame =1.52
rmse =1.66
bias =0.282
ame =1.76
rmse =1.89
bias =-2.02
ame =2.02
rmse =2.24

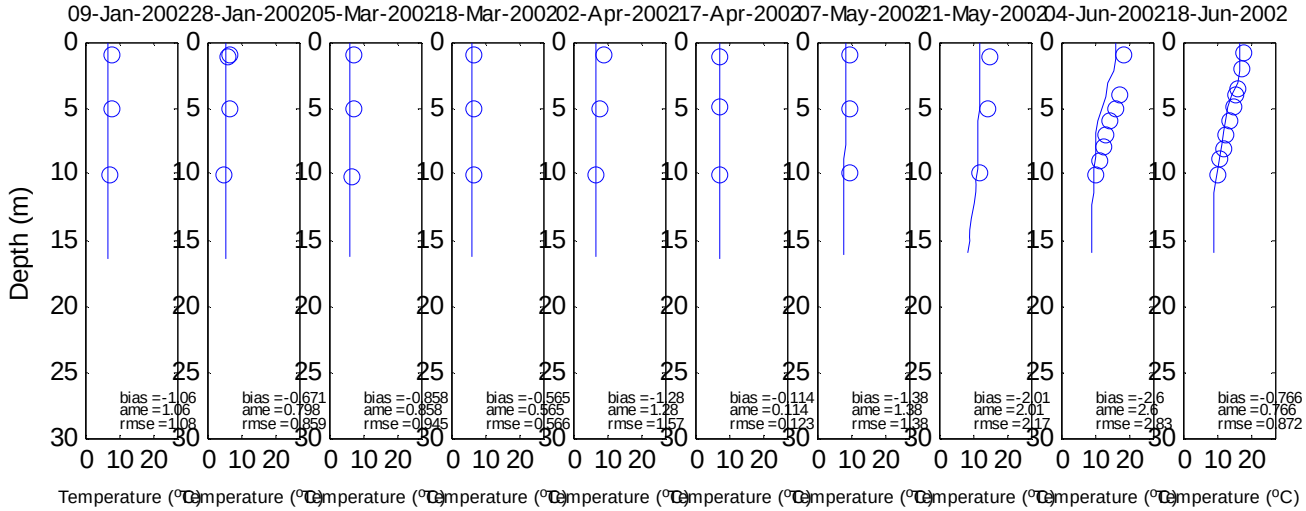

01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =-2.22
ame =2.22
rmse =3.15
bias =-0.488
ame =1.72
rmse =1.76
bias =0.313
ame =1.5
rmse =1.73
bias =-0.608
ame =1.31
rmse =1.32
bias =-0.178
ame =1.47
rmse =1.51
bias =-0.756
ame =0.756
rmse =0.771
bias =-0.288
ame =0.795
rmse =0.865
bias =-0.079
ame =0.079
rmse =0.0791
bias =-0.0379
ame =0.0379
rmse =0.0608

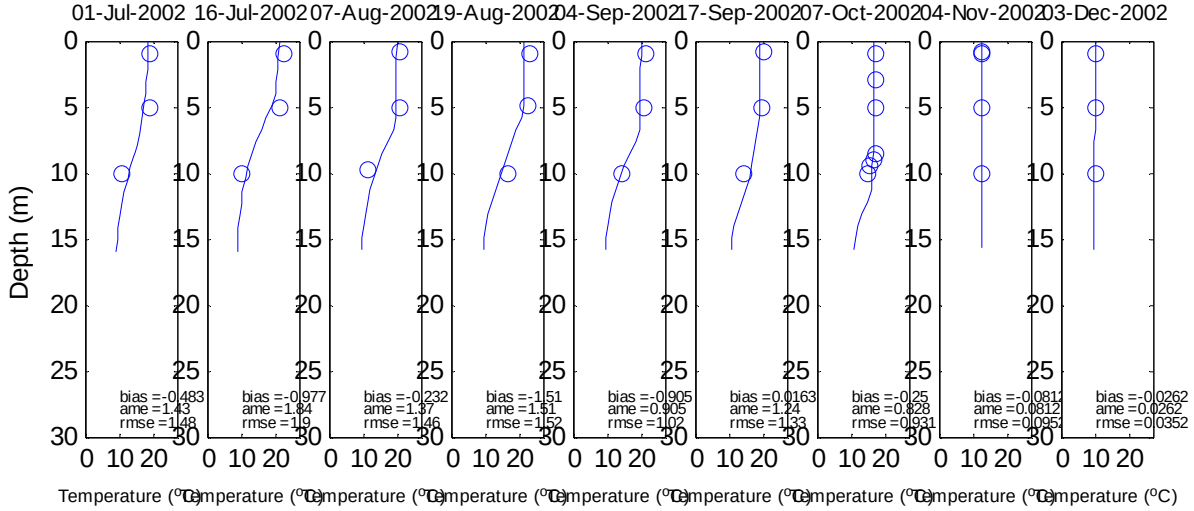
CH3D 0611


09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-0.606
ame =0.606
rmse =0.606
bias =-0.65
ame =0.65
rmse =0.65
bias =-0.592
ame =0.592
rmse =0.607
bias =-0.72
ame =0.72
rmse =0.724
bias =-0.719
ame =0.719
rmse =0.944
bias =-0.737
ame =0.826
rmse =0.879
bias =-0.113
ame =0.635
rmse =0.76
bias =-0.293
ame =0.935
rmse =1.11
bias =-0.258
ame =0.695
rmse =0.992
bias =-1.24
ame =1.52
rmse =1.82

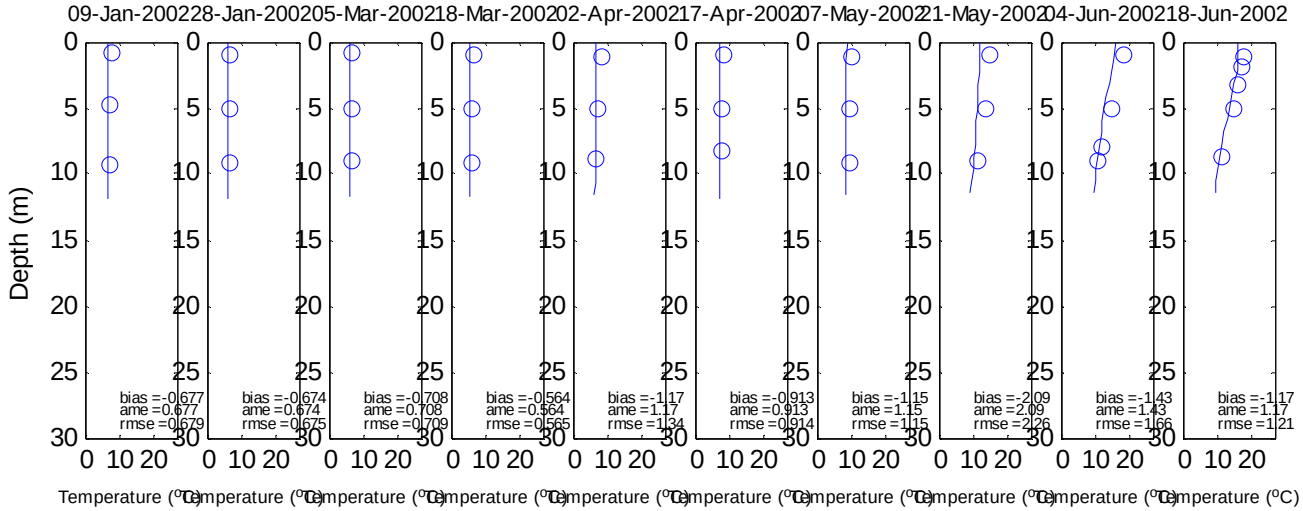

01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =-1.44
ame =1.52
rmse =1.85
bias =0.0656
ame =1.22
rmse =1.36
bias =0.317
ame =1.28
rmse =1.42
bias =0.248
ame =1.18
rmse =1.27
bias =NaN
ame =NaN
rmse =NaN
bias =-0.0914
ame =0.99
rmse =1.31
bias =0.875
ame =1.6
rmse =1.87
bias =1.23
ame =1.28
rmse =1.71
bias =0.186
ame =0.208
rmse =0.406

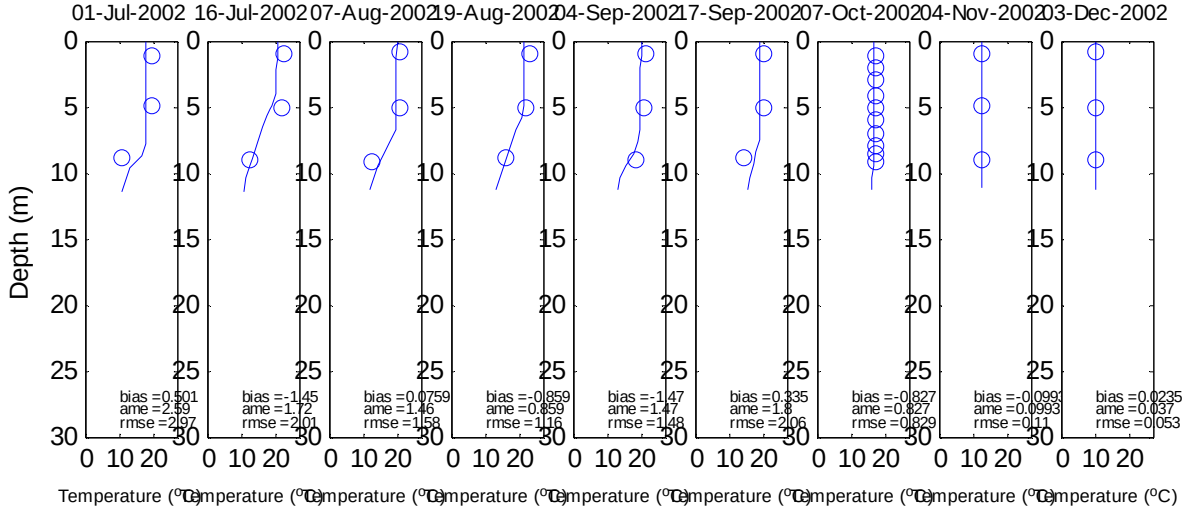
CH3D 0614


09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-1.06
ame =1.06
rmse =1.08
bias =-0.671
ame =0.798
rmse =0.859
bias =-0.858
ame =0.858
rmse =0.945
bias =-0.565
ame =0.565
rmse =0.566
bias =-1.28
ame =1.28
rmse =1.57
bias =-0.114
ame =0.114
rmse =0.123
bias =-1.38
ame =1.38
rmse =1.38
bias =-2.01
ame =2.01
rmse =2.17
bias =-2.6
ame =2.6
rmse =2.83
bias =-0.766
ame =0.766
rmse =0.872

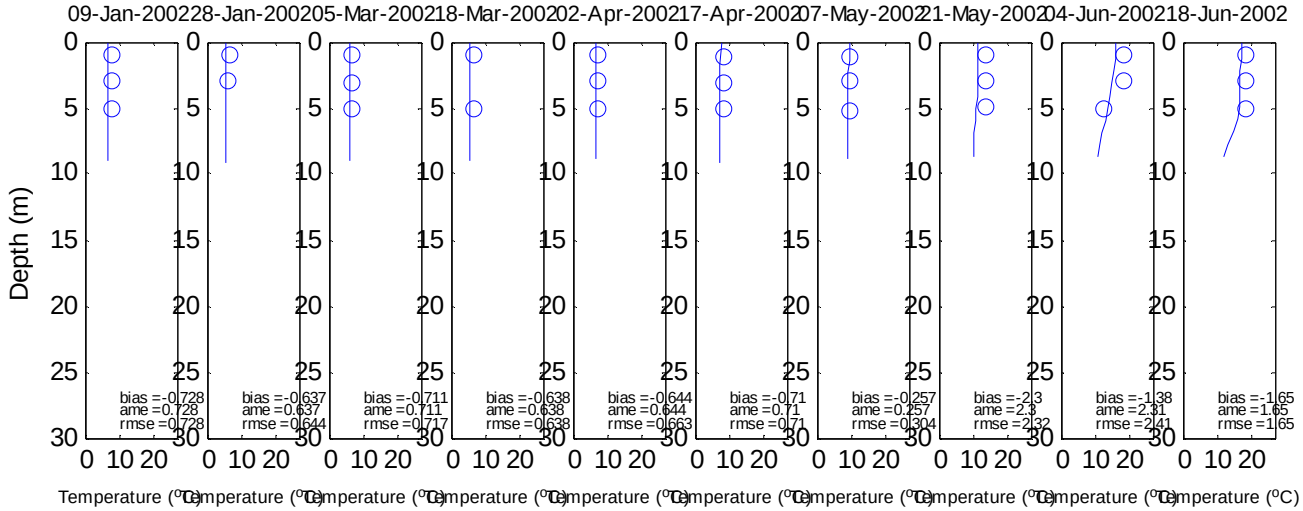

01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =-0.483
ame =1.43
rmse =1.48
bias =-0.977
ame =1.84
rmse =1.9
bias =-0.232
ame =1.37
rmse =1.46
bias =-1.51
ame =1.51
rmse =1.52
bias =-0.905
ame =0.905
rmse =1.02
bias =0.0163
ame =1.24
rmse =1.33
bias =-0.25
ame =0.828
rmse =0.931
bias =-0.0812
ame =0.0812
rmse =0.0951
bias =-0.0262
ame =0.0262
rmse =0.0352

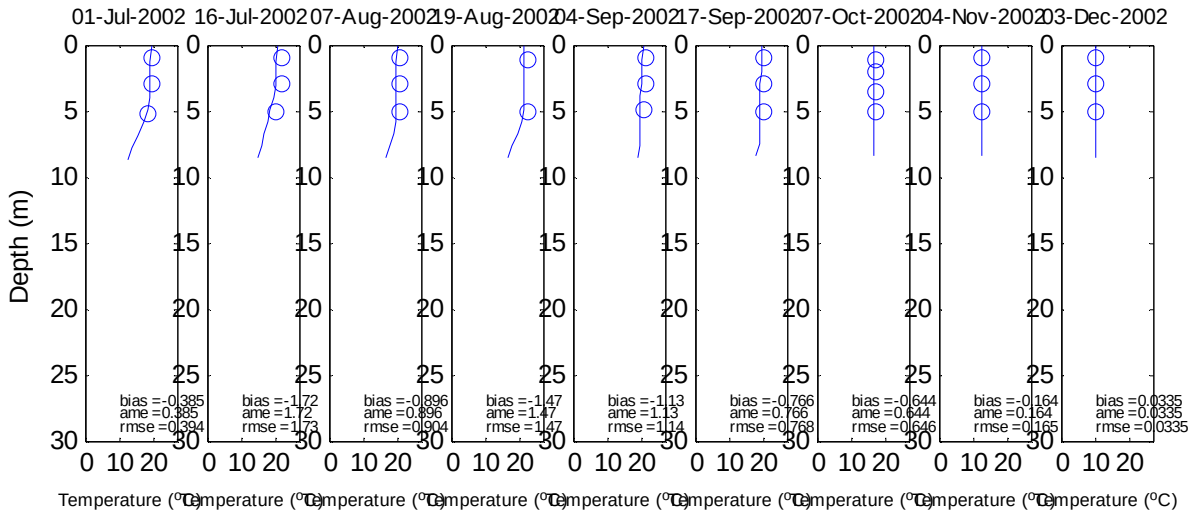
CH3D 0617


09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-0.677
ame =0.677
rmse =0.679
bias =-0.674
ame =0.674
rmse =0.675
bias =-0.708
ame =0.708
rmse =0.709
bias =-0.564
ame =0.564
rmse =0.565
bias =-1.17
ame =1.17
rmse =1.34
bias =-0.913
ame =0.913
rmse =0.914
bias =-1.15
ame =1.15
rmse =1.15
bias =-2.09
ame =2.09
rmse =2.26
bias =-1.43
ame =1.43
rmse =1.66
bias =-1.17
ame =1.17
rmse =1.21


01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =0.501
ame =2.59
rmse =2.97
bias =-1.45
ame =1.72
rmse =2.01
bias =0.0759
ame =1.46
rmse =1.58
bias =-0.859
ame =0.859
rmse =1.16
bias =-1.47
ame =1.47
rmse =1.48
bias =0.335
ame =1.8
rmse =2.06
bias =-0.827
ame =0.827
rmse =0.829
bias =-0.0993
ame =0.0993
rmse =0.11
bias =0.0235
ame =0.037
rmse =0.053

CH3D M621


09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-0.728
ame =0.728
rmse =0.728
bias =-0.637
ame =0.637
rmse =0.644
bias =-0.711
ame =0.711
rmse =0.717
bias =-0.638
ame =0.638
rmse =0.638
bias =-0.644
ame =0.644
rmse =0.663
bias =-0.71
ame =0.71
rmse =0.71
bias =-0.257
ame =0.257
rmse =0.304
bias =-2.3
ame =2.3
rmse =2.32
bias =-1.38
ame =2.31
rmse =2.41
bias =-1.65
ame =1.65
rmse =1.65


01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =-0.385
ame =0.385
rmse =0.394
bias =-1.72
ame =1.72
rmse =1.73
bias =-0.896
ame =0.896
rmse =0.904
bias =-1.47
ame =1.47
rmse =1.47
bias =-1.13
ame =1.13
rmse =1.14
bias =-0.766
ame =0.766
rmse =0.768
bias =-0.644
ame =0.644
rmse =0.646
bias =-0.164
ame =0.164
rmse =0.165
bias =0.0335
ame =0.0335
rmse =0.0335

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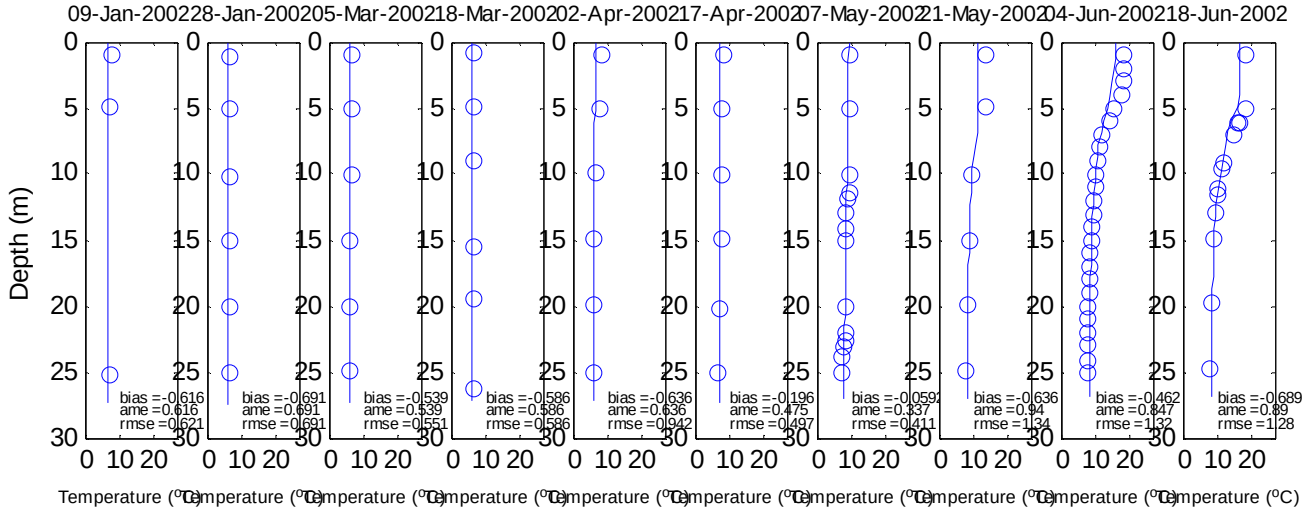
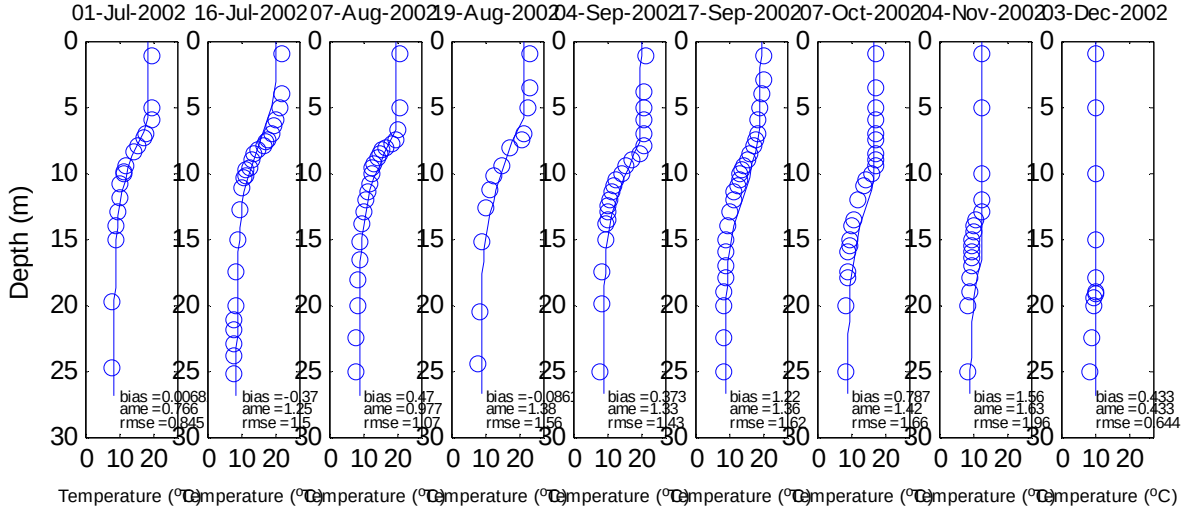

09-Jan-2002
28-Jan-2002
05-Mar-2002
18-Mar-2002
02-Apr-2002
17-Apr-2002
07-May-2002
21-May-2002
04-Jun-2002
18-Jun-2002
Depth (m)
Temperature (°C)
bias =-0.616
ame =0.616
rmse =0.621
bias =-0.691
ame =0.691
rmse =0.691
bias =-0.539
ame =0.539
rmse =0.551
bias =-0.586
ame =0.586
rmse =0.586
bias =-0.636
ame =0.636
rmse =0.642
bias =-0.196
ame =0.475
rmse =0.497
bias =-0.592
ame =0.337
rmse =0.411
bias =-0.636
ame =0.94
rmse =1.34
bias =-0.462
ame =0.847
rmse =1.32
bias =-0.689
ame =0.89
rmse =1.28


01-Jul-2002
16-Jul-2002
07-Aug-2002
19-Aug-2002
04-Sep-2002
17-Sep-2002
07-Oct-2002
04-Nov-2002
03-Dec-2002
Depth (m)
Temperature (°C)
bias =0.0068
ame =0.766
rmse =0.845
bias =-0.37
ame =1.25
rmse =1.5
bias =0.47
ame =0.977
rmse =1.07
bias =-0.0861
ame =1.38
rmse =1.56
bias =0.373
ame =1.33
rmse =1.43
bias =1.22
ame =1.36
rmse =1.62
bias =0.787
ame =1.42
rmse =1.66
bias =1.56
ame =1.63
rmse =1.96
bias =0.433
ame =0.433
rmse =0.644