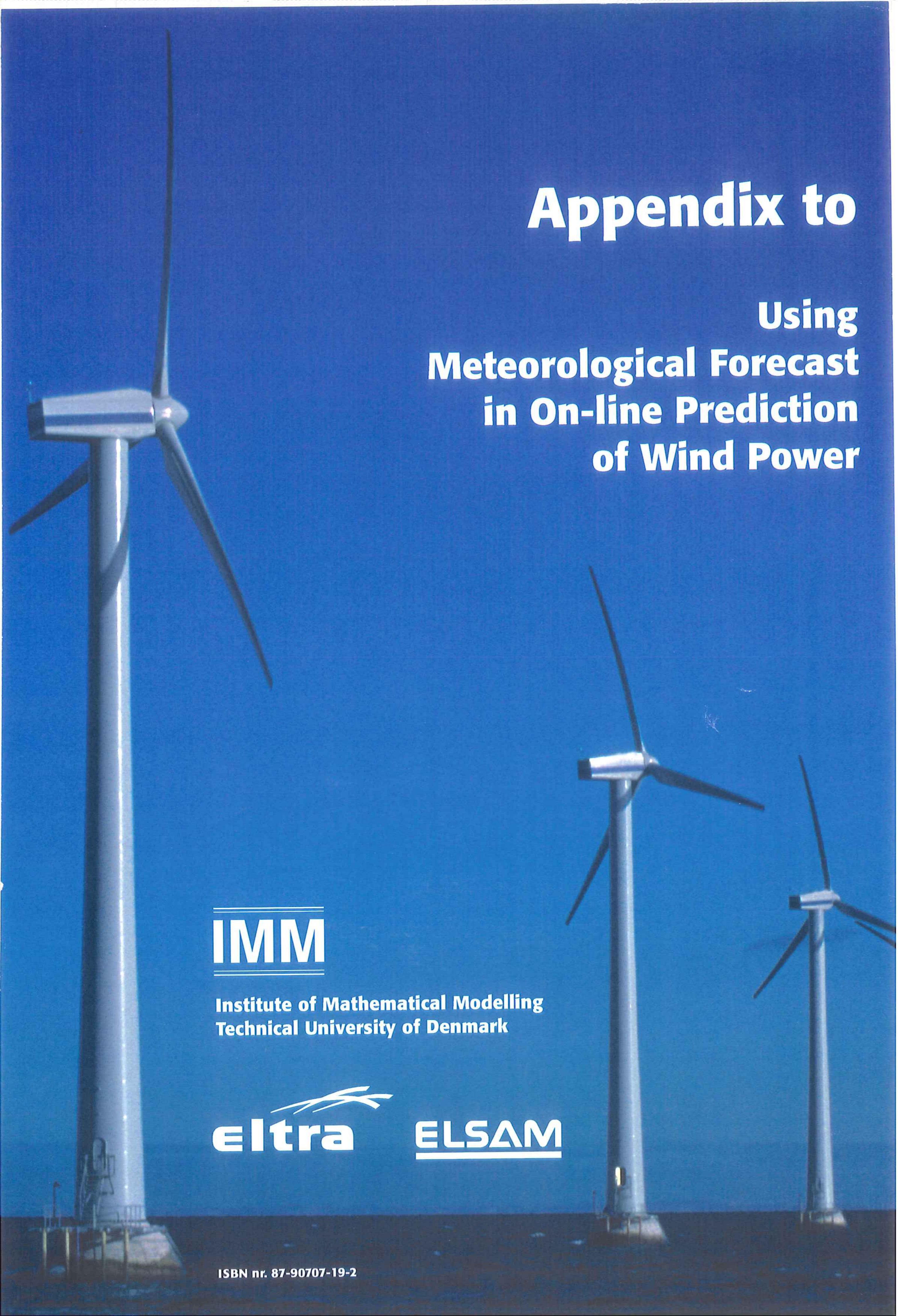

Appendix to

Using Meteorological Forecast in On-line Prediction of Wind Power

IMM

Institute of Mathematical Modelling
Technical University of Denmark

eltra ELSAM

ISBN nr. 87-90707-19-2

Appendix A

Wind farm data

A.1 Dræby

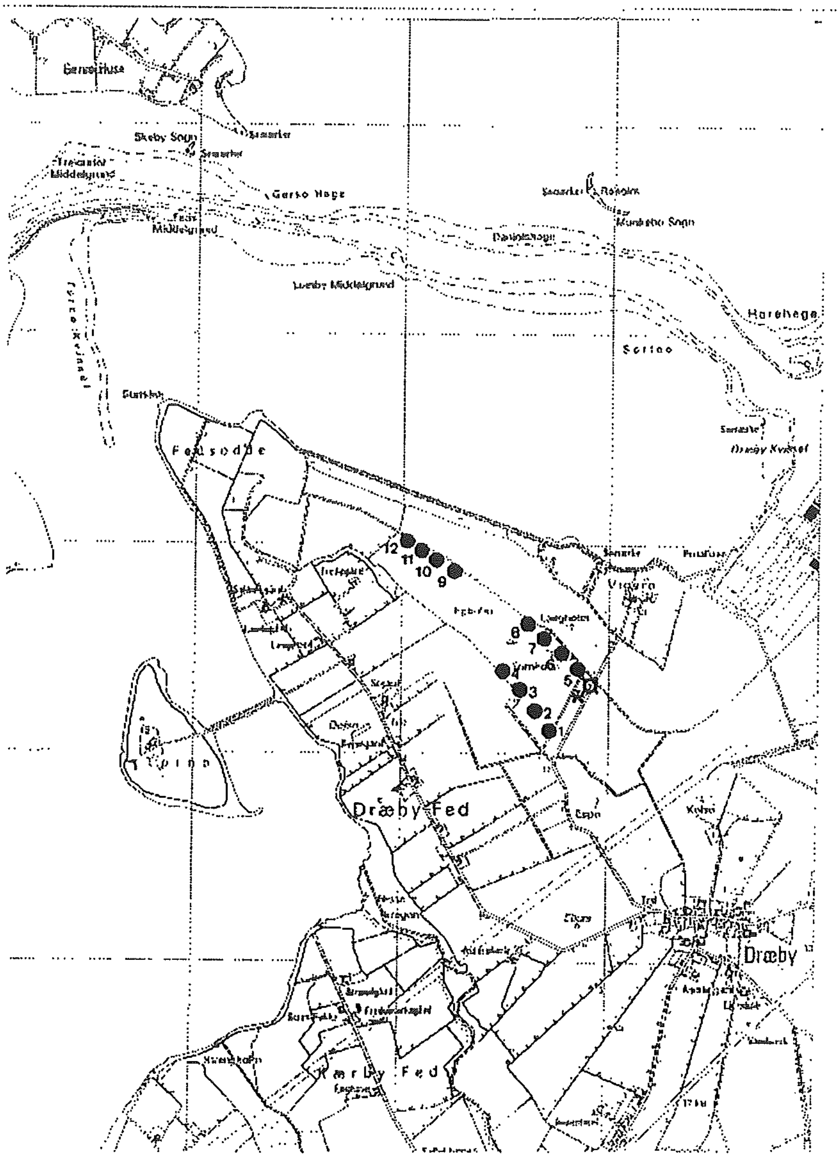

Figure A.1: *Layout of the Dræby wind farm. Wind turbines are marked by a •, the station by a □ and the meteorology tower by a ★ (approx. 1:37000).*

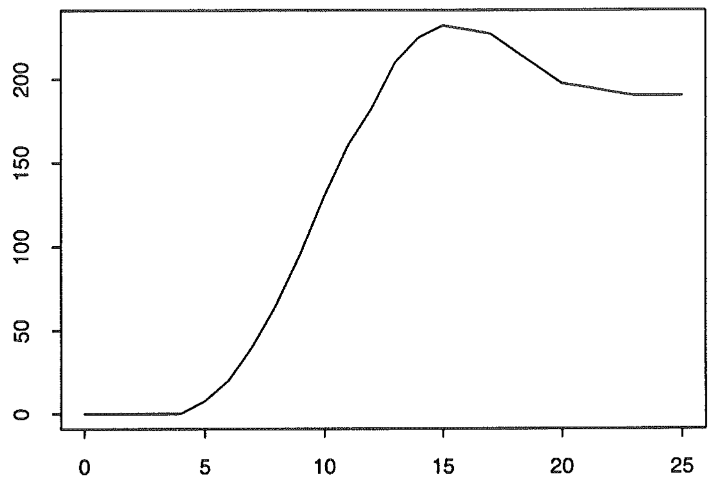

Figure A.2: *Stated power curve for the Wind World 220kW wind turbine in the Dræby wind farm (power production [kW] versus wind speed [m/s]).*

A.2 Fjaldene

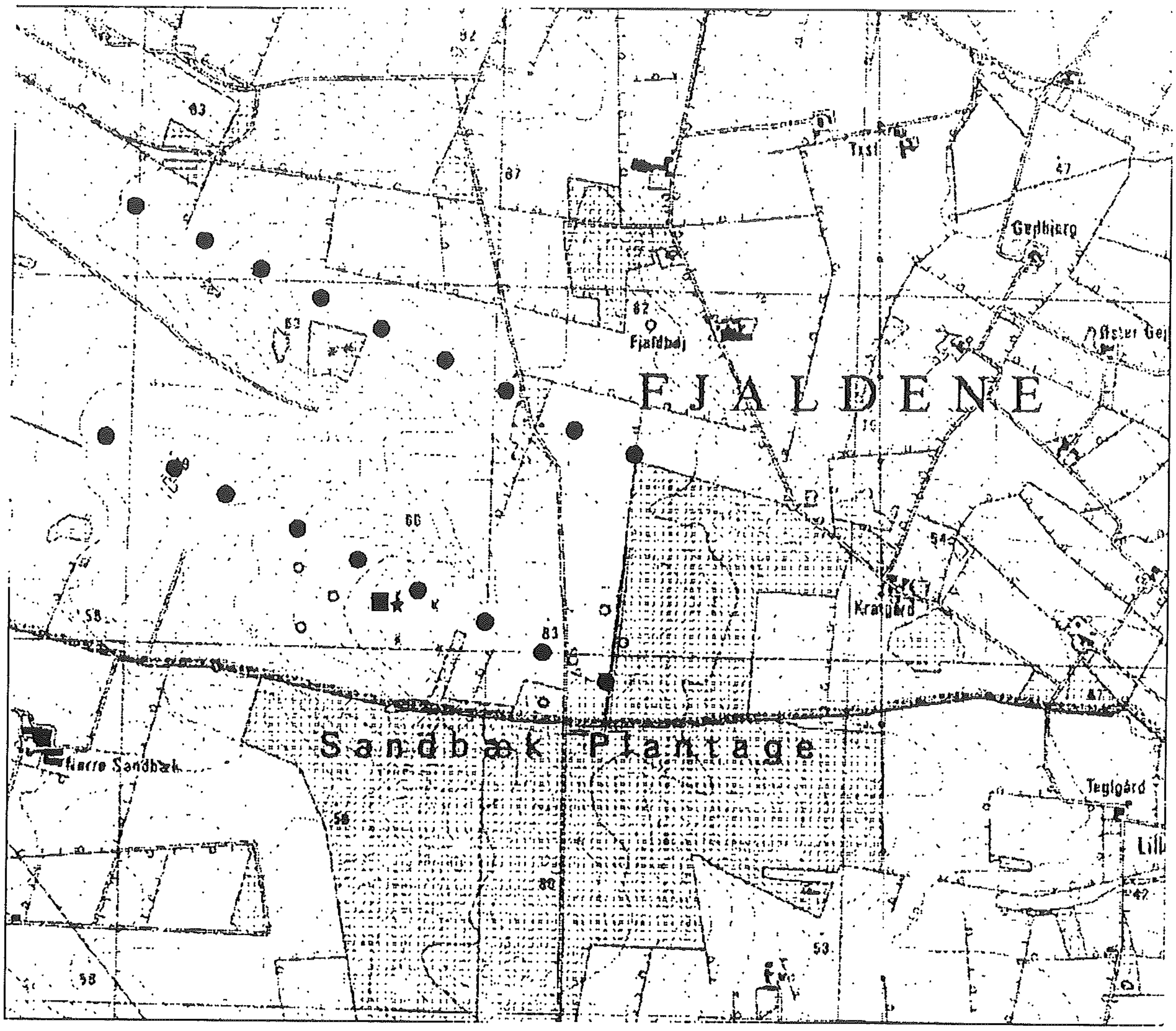

Figure A.3: *Layout of the Fjaldene wind farm. Wind turbines are marked by a •, the station by a ■ and the meteorology tower by a ★ (approx. 1:20000).*

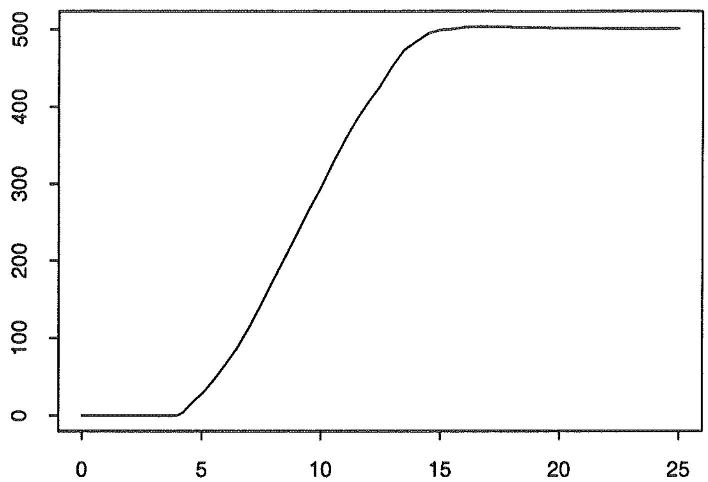

Figure A.4: *Stated power curve for the Vestas V39 wind turbine in the Fjaldene wind farm (power production [kW] versus wind speed [m/s]).*

A.3 Hollandsbjerg

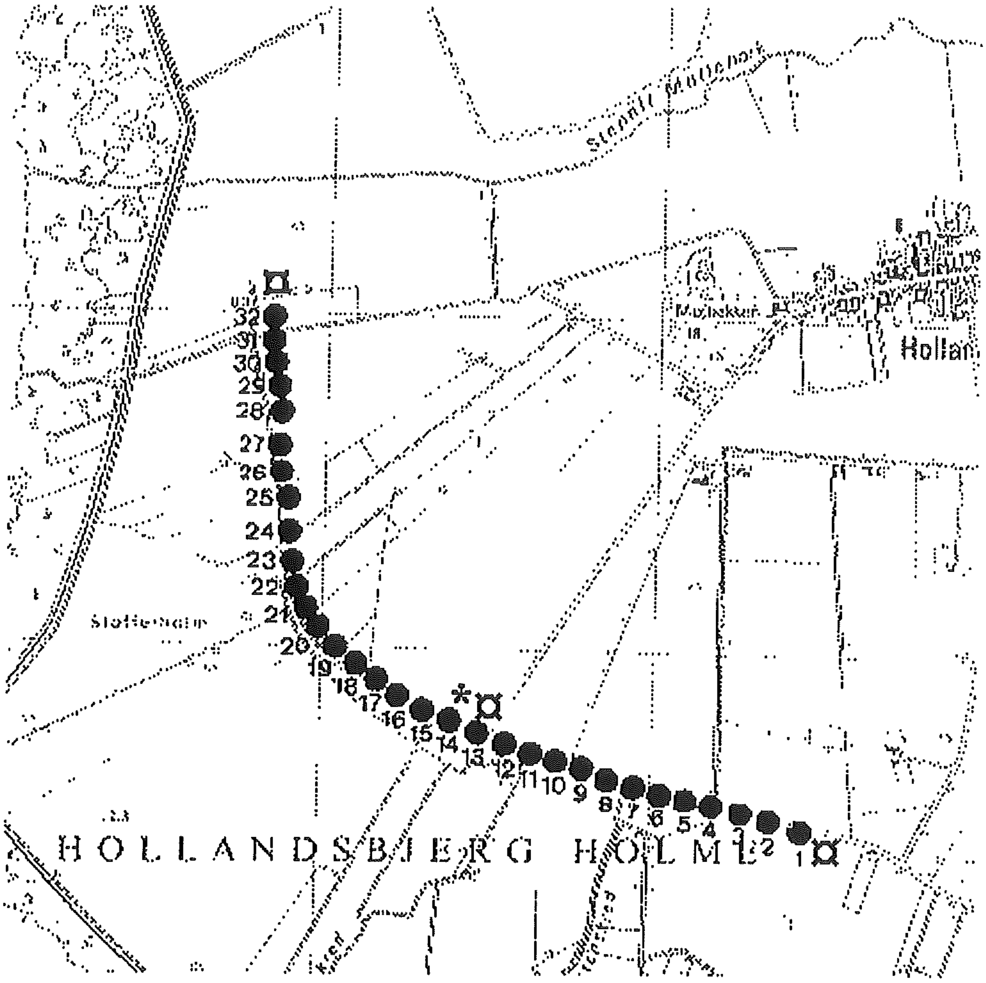

Figure A.5: *Layout of the Hollandsbjerg wind farm. Wind turbines are marked by a •, the station by a ■ and the meteorology tower by a ★ (approx. 1:22000).*

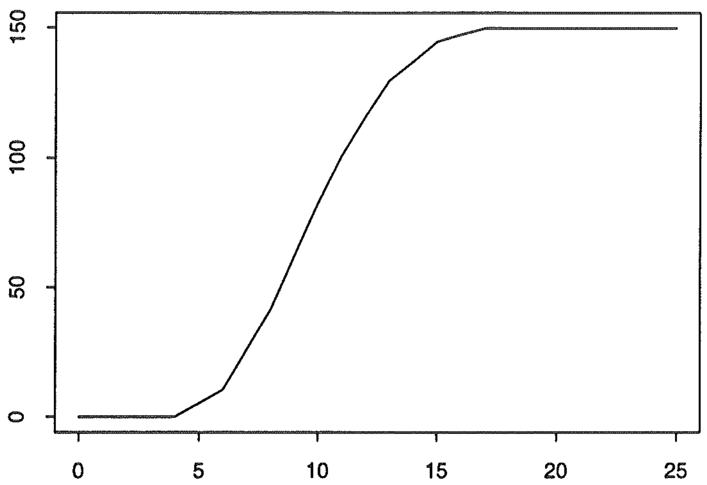

Figure A.6: *Stated power curve for the Nordtank 130kW wind turbine in the Hollandsbjerg wind farm (power production [kW] versus wind speed [m/s]).*

A.4 Rejsby

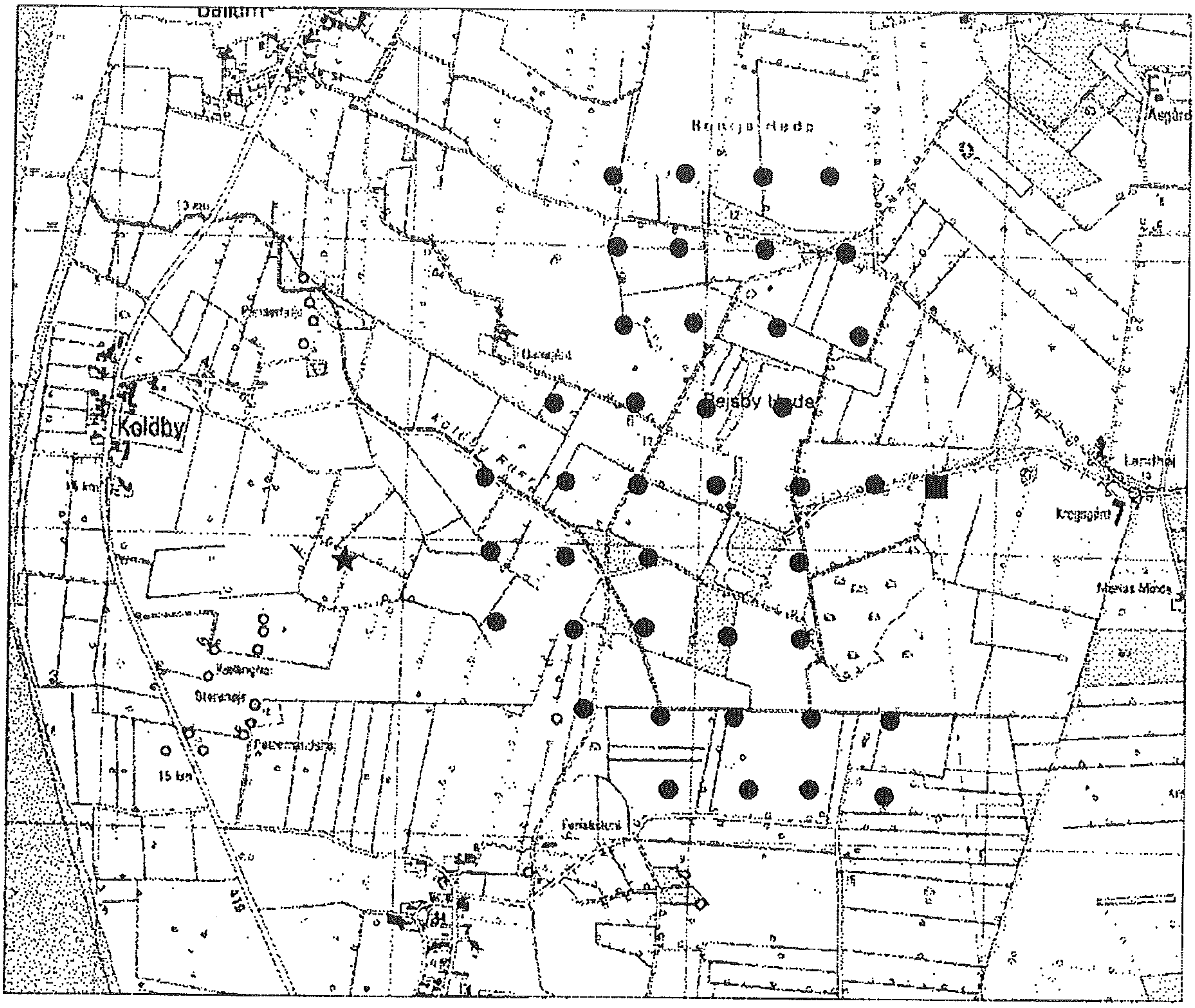

Figure A.7: *Layout of the Rejsby Hede wind farm. Wind turbines are marked by a •, the station by a ■ and the meteorology tower by a ★ (approx. 1:23000).*

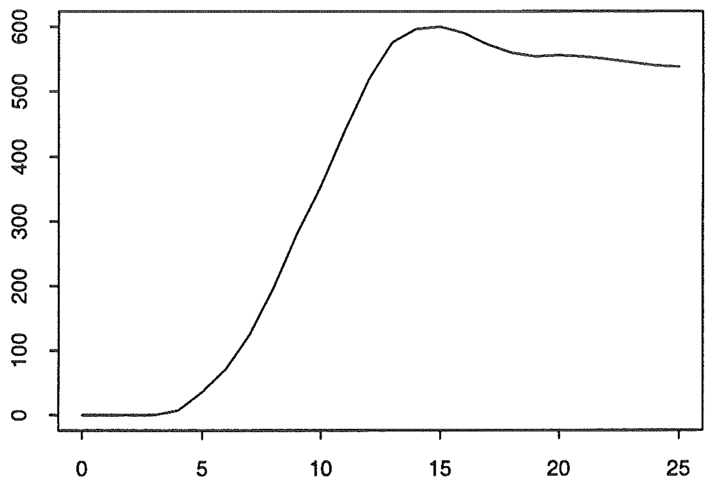

Figure A.8: *Stated power curve for the Micon M1500-600/150kW wind turbine in the Rejsby wind farm (power production [kW] versus wind speed [m/s]).*

A.5 Sydthy

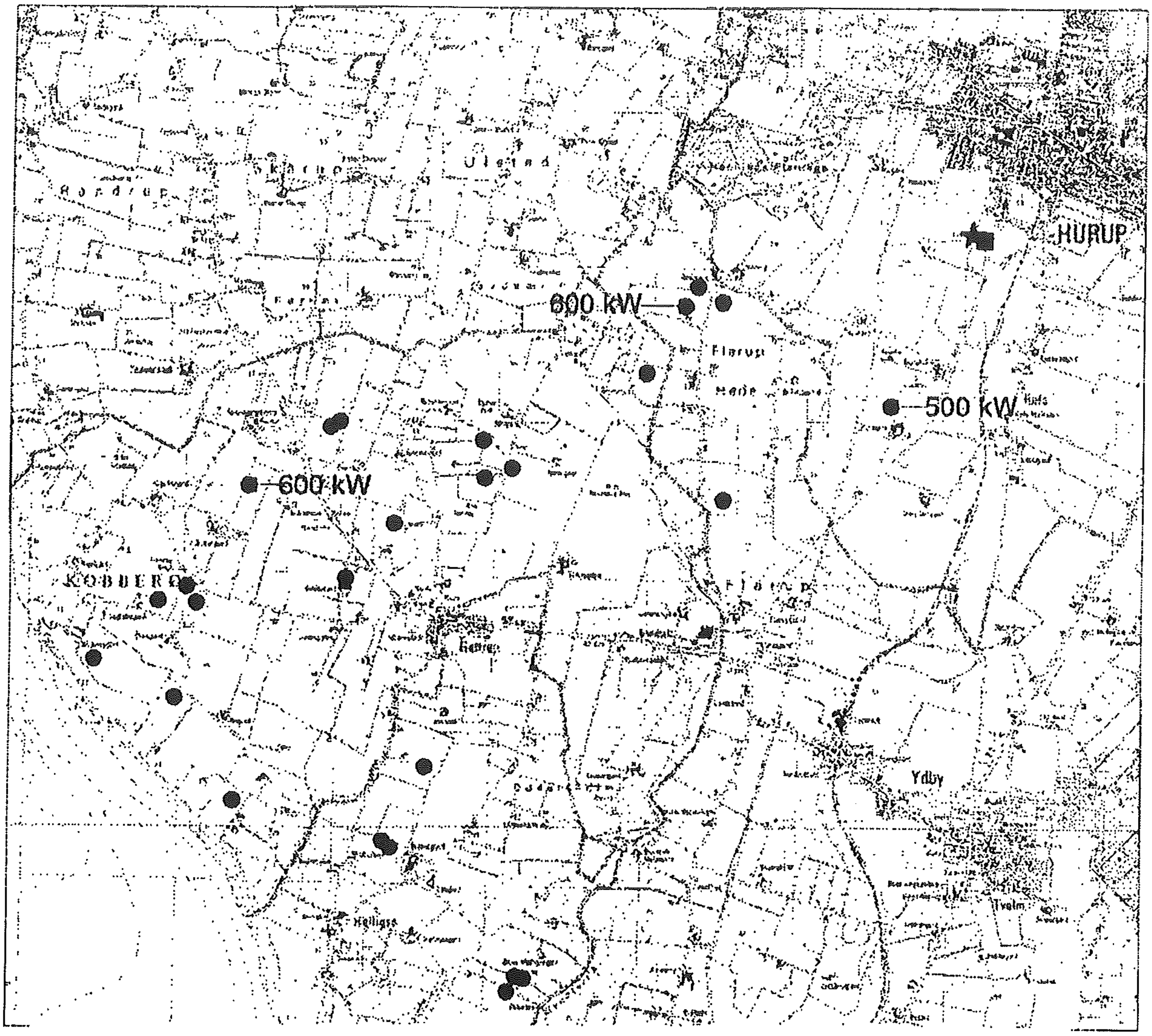

Figure A.9: *Layout of the Sydthy Kabellaug wind farm. Wind turbines are marked by a •, the station by a ■ and the meteorology tower by a ★ (approx. 1:46000).*

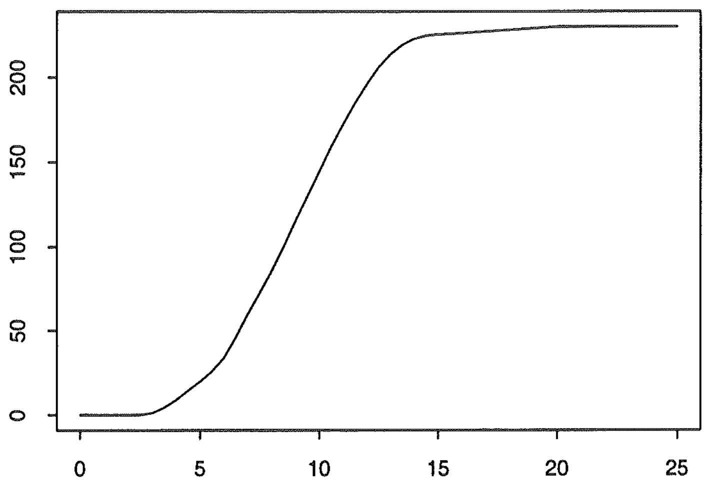

Figure A.10: *Stated power curve for the dominating Vestas V27 wind turbine in the Sydthy wind farm (power production [kW] versus wind speed [m/s]).*

Appendix B

Measured data

B.1 Dræby

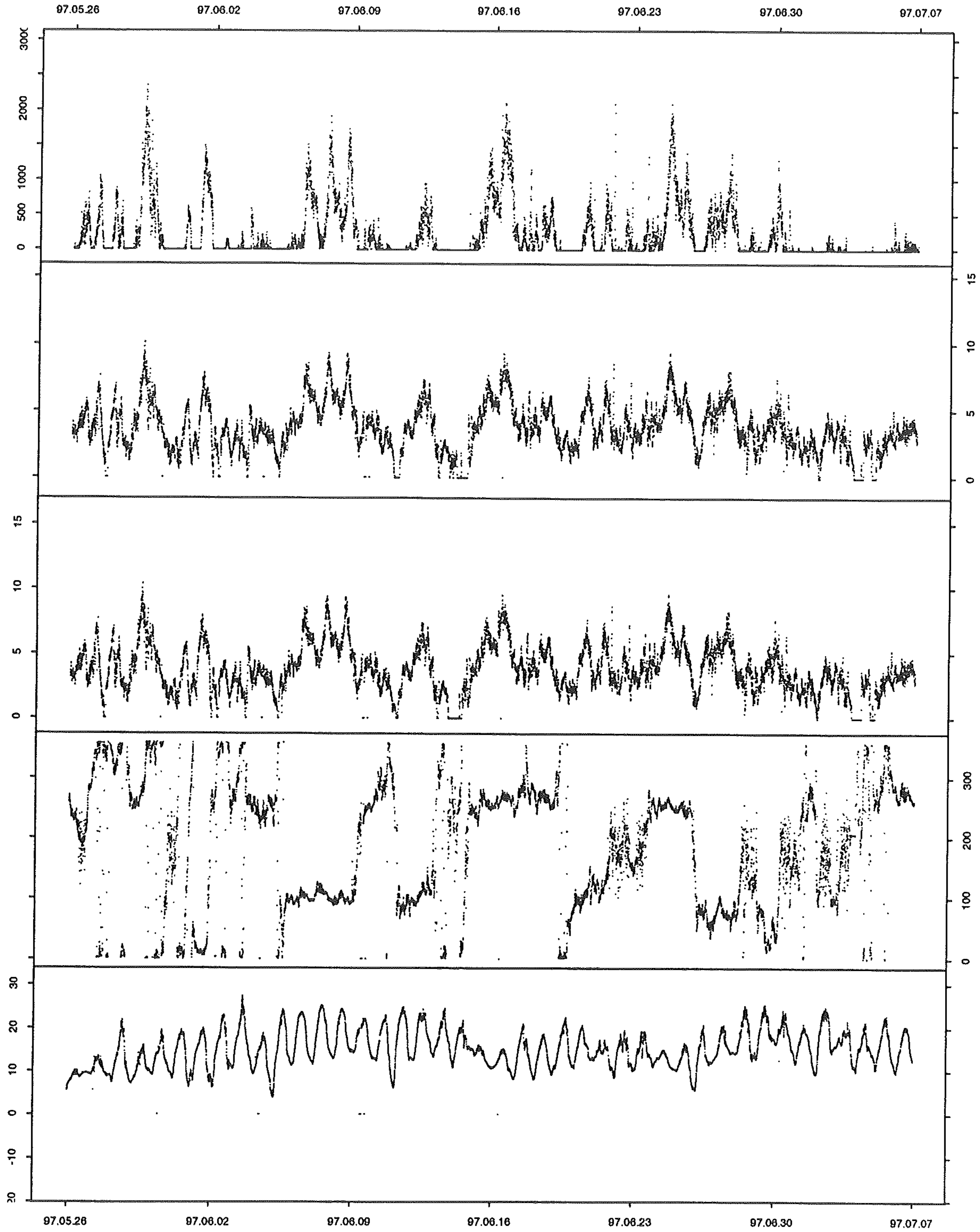

Figure B.1: *(Dræby) The wind farm measurements in the period from 97.05.26 to 97.07.07 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

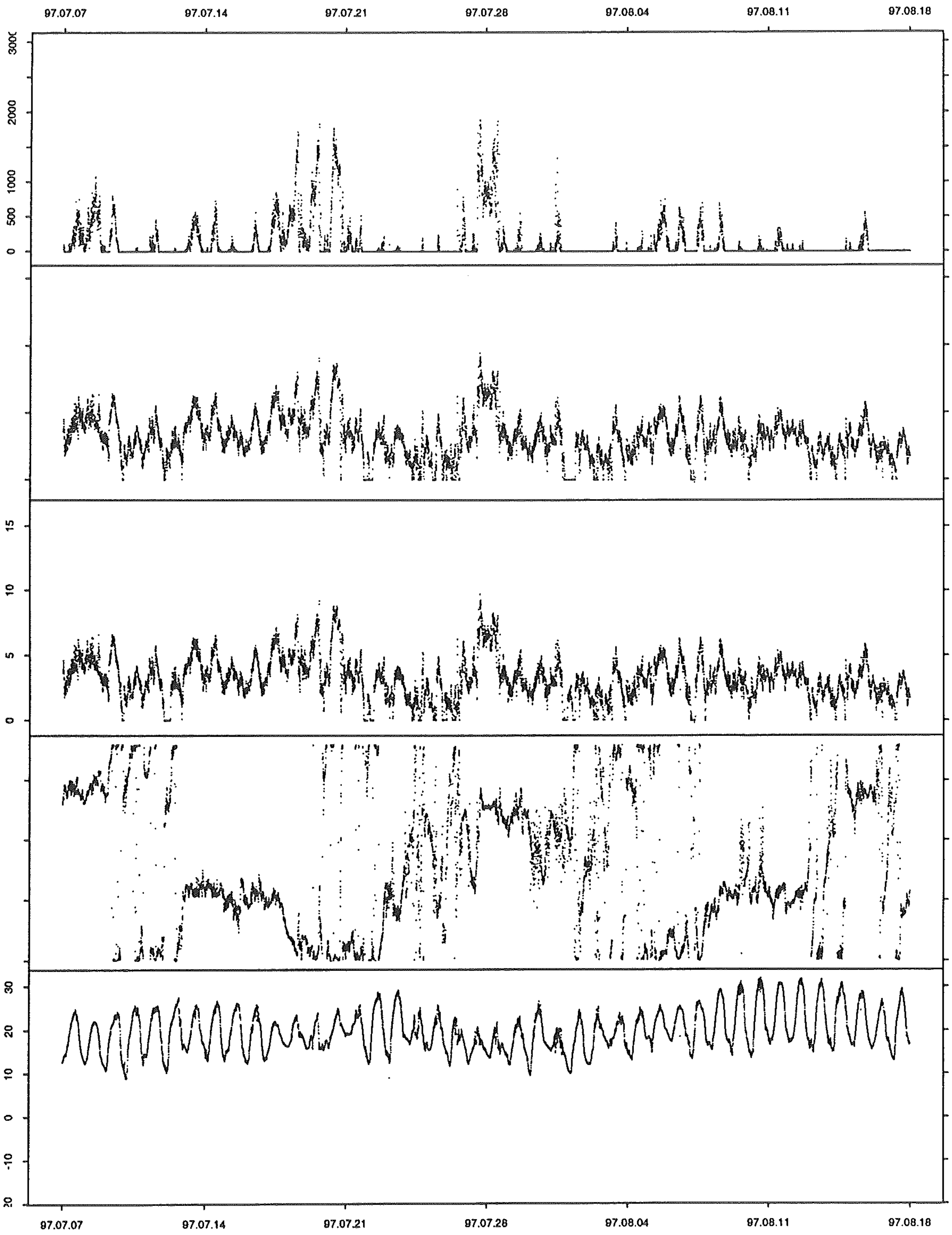

Figure B.2: *(Dræby) The wind farm measurements in the period from 97.07.07 to 97.08.18 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

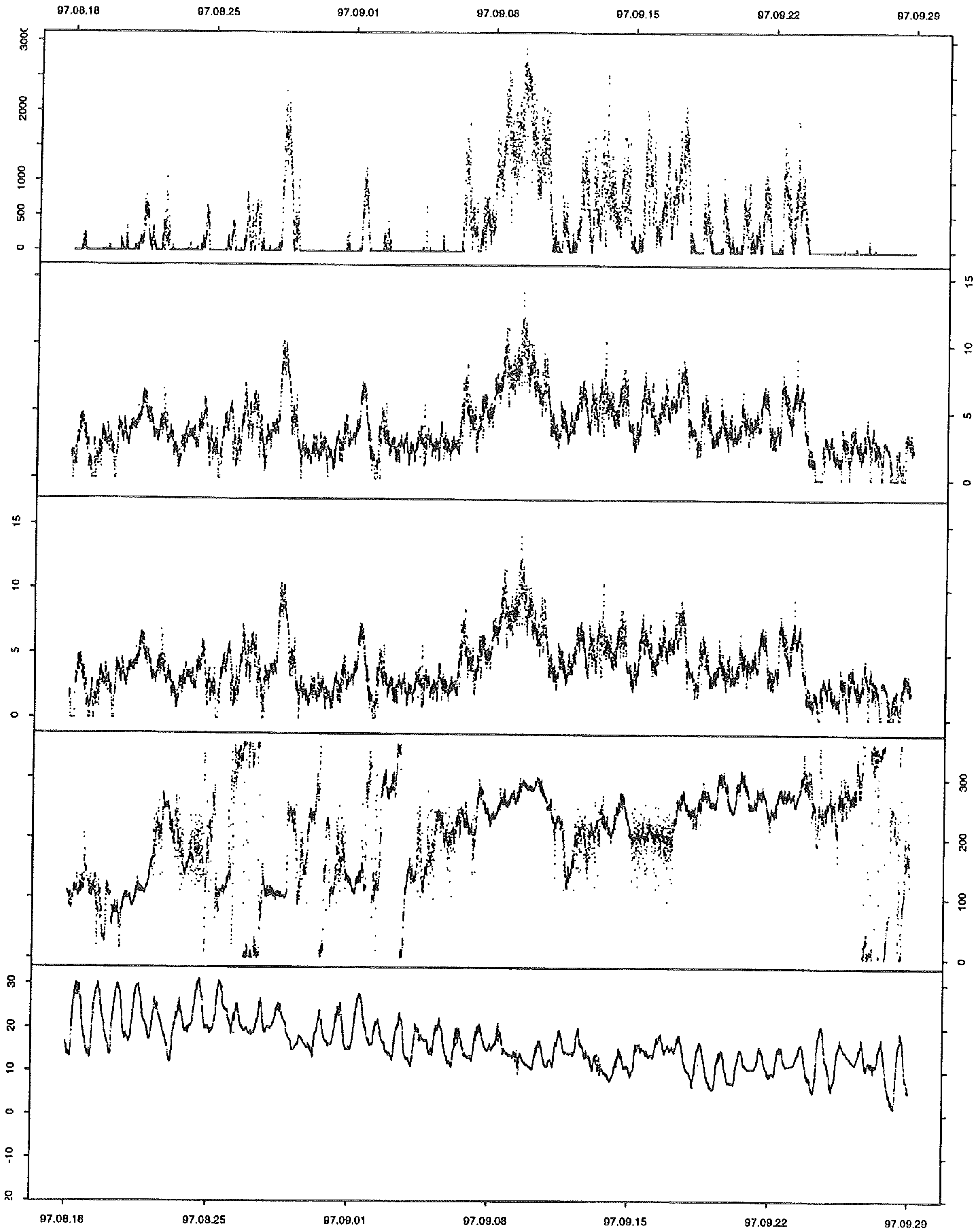

Figure B.3: *(Dræby) The wind farm measurements in the period from 97.08.18 to 97.09.29 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

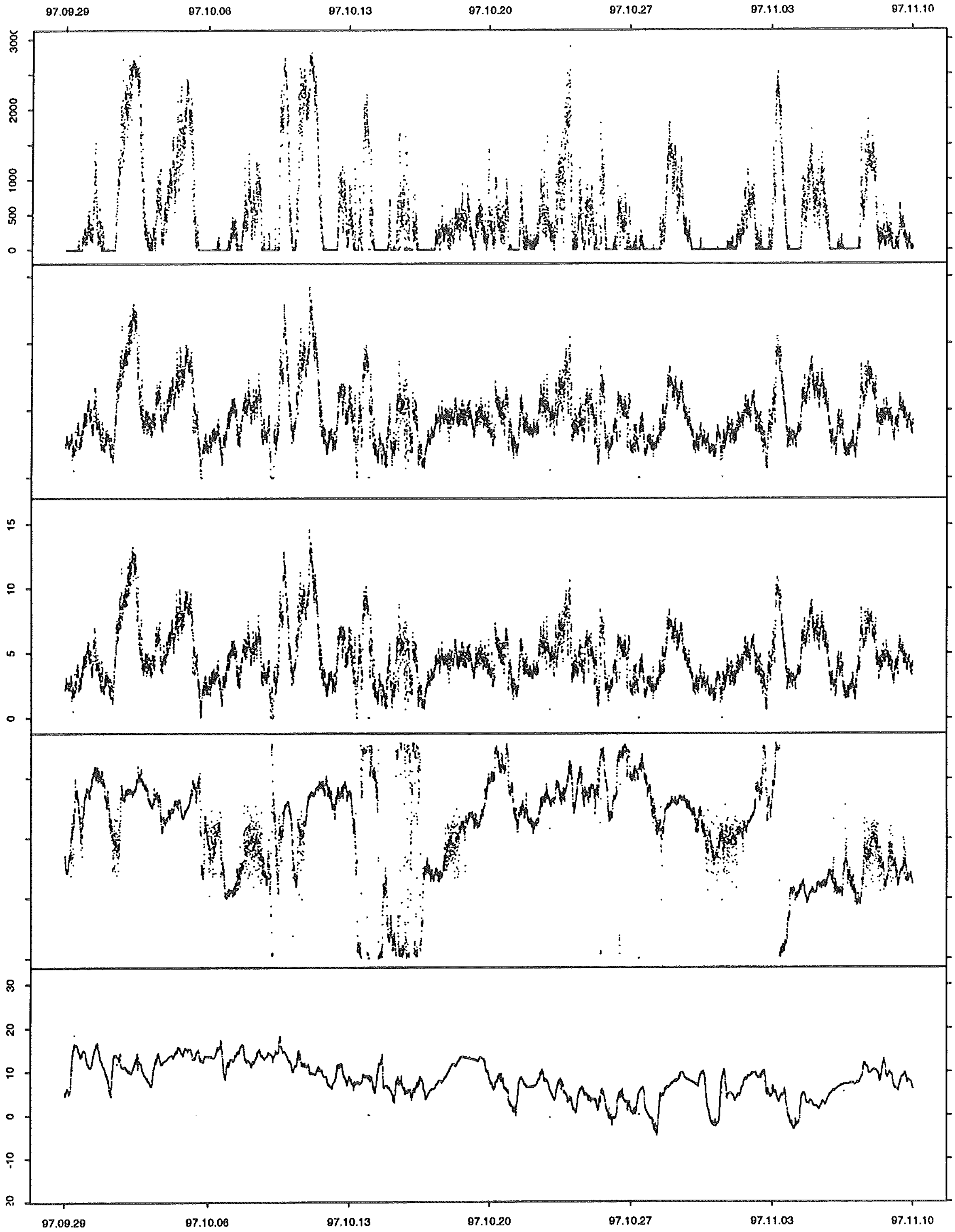

Figure B.4: *(Dræby) The wind farm measurements in the period from 97.09.29 to 97.11.10 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

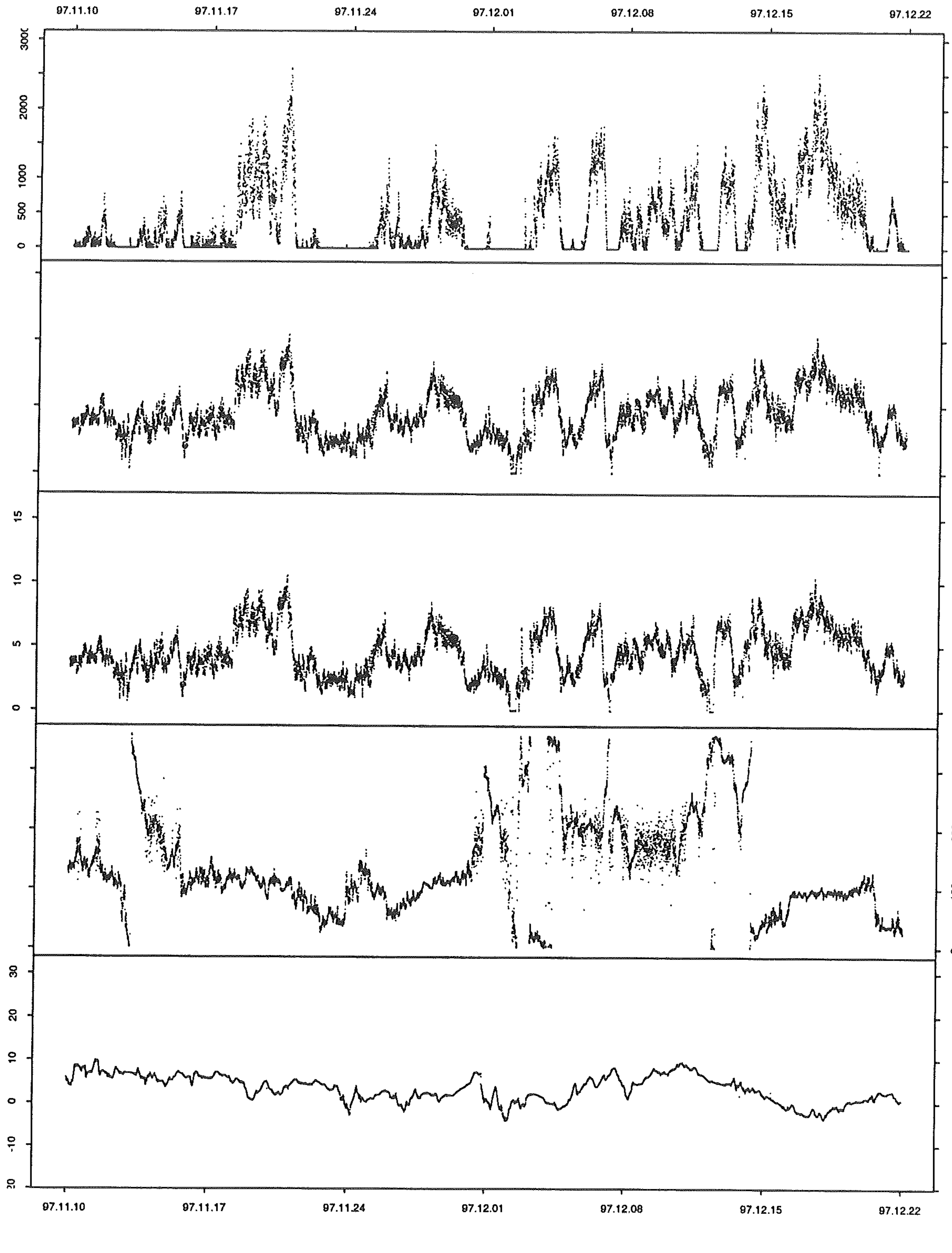

Figure B.5: *(Dræby) The wind farm measurements in the period from 97.11.10 to 97.12.22 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

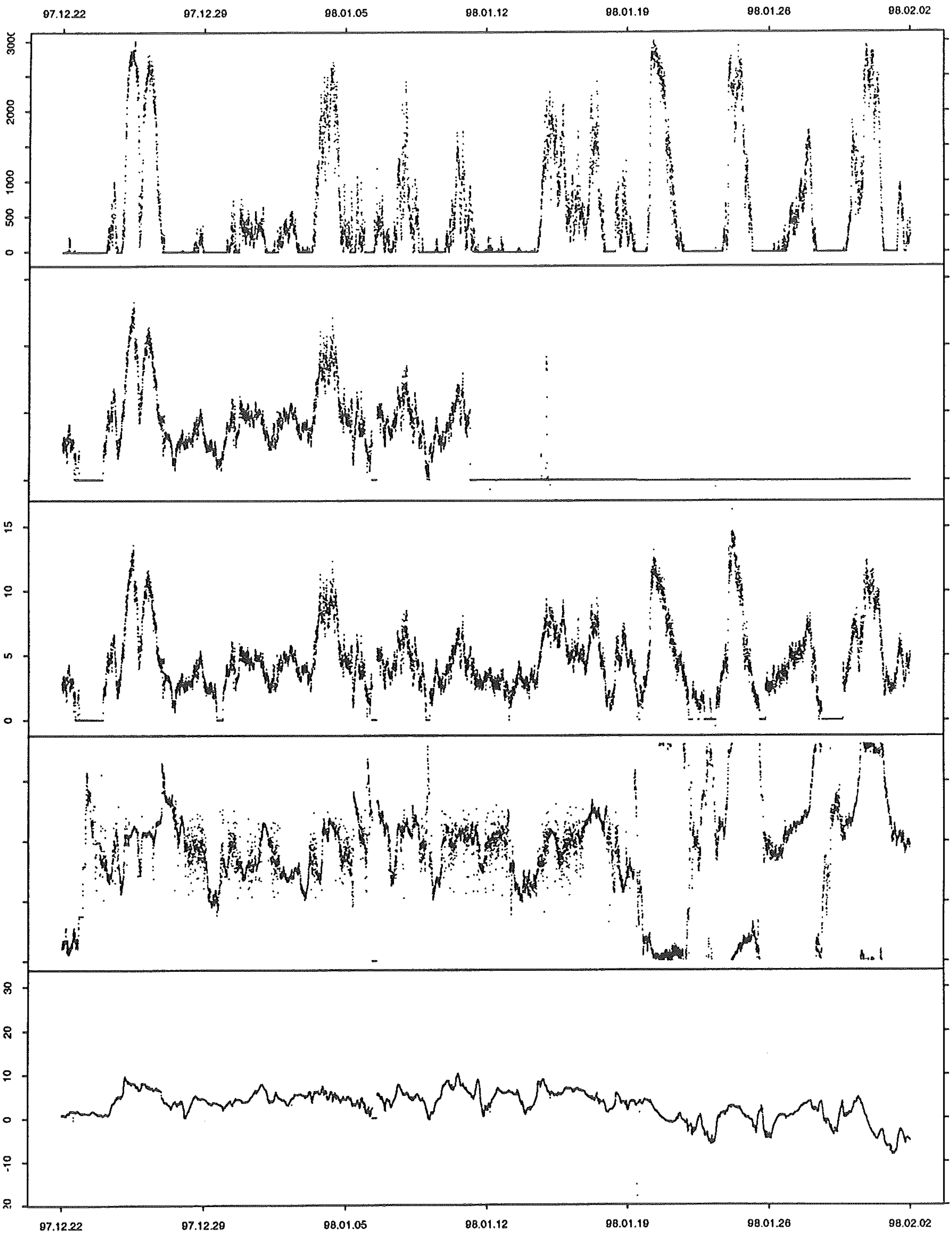

Figure B.6: *(Dræby) The wind farm measurements in the period from 97.12.22 to 98.02.02 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

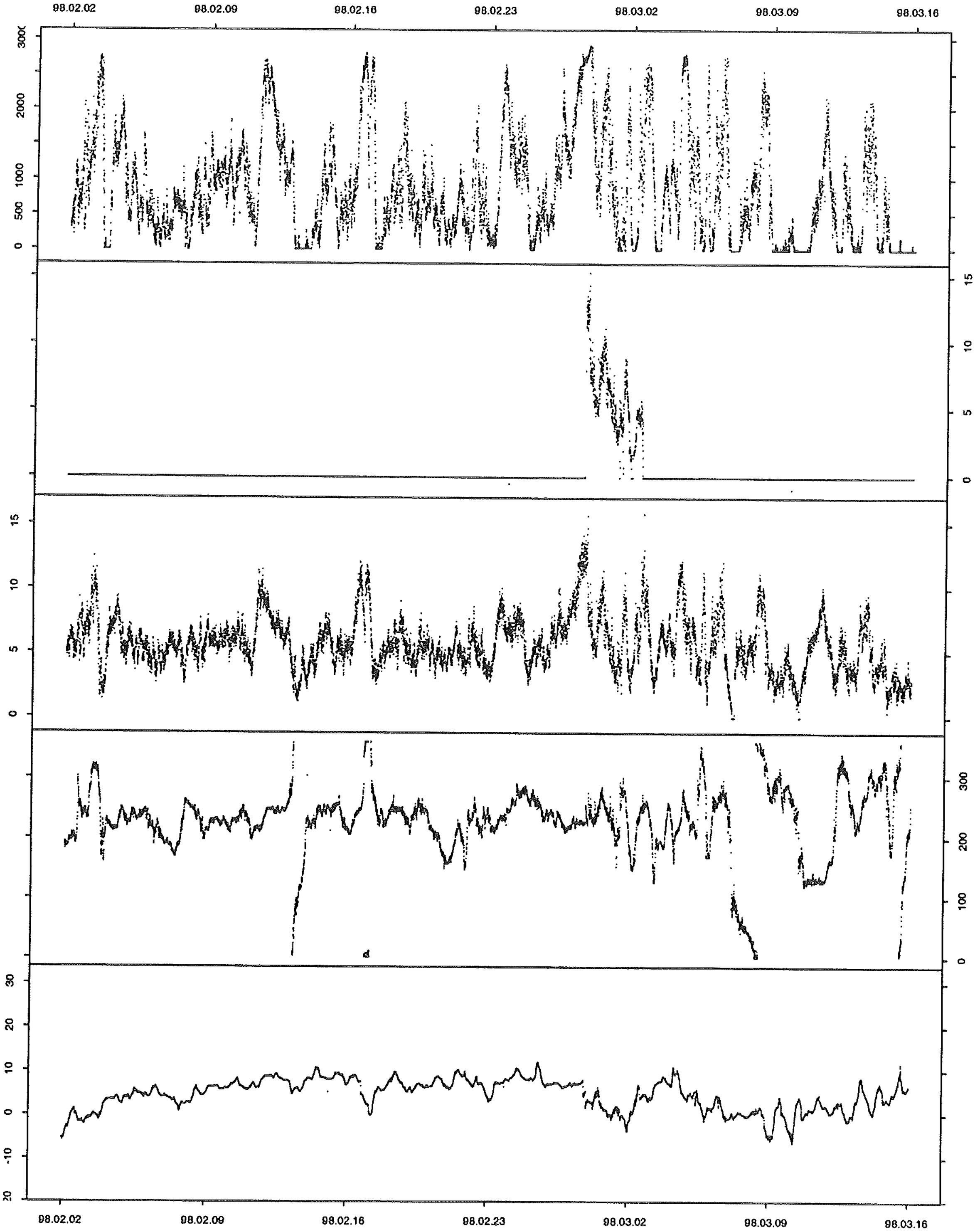

Figure B.7: *(Dræby) The wind farm measurements in the period from 98.02.02 to 98.03.16 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

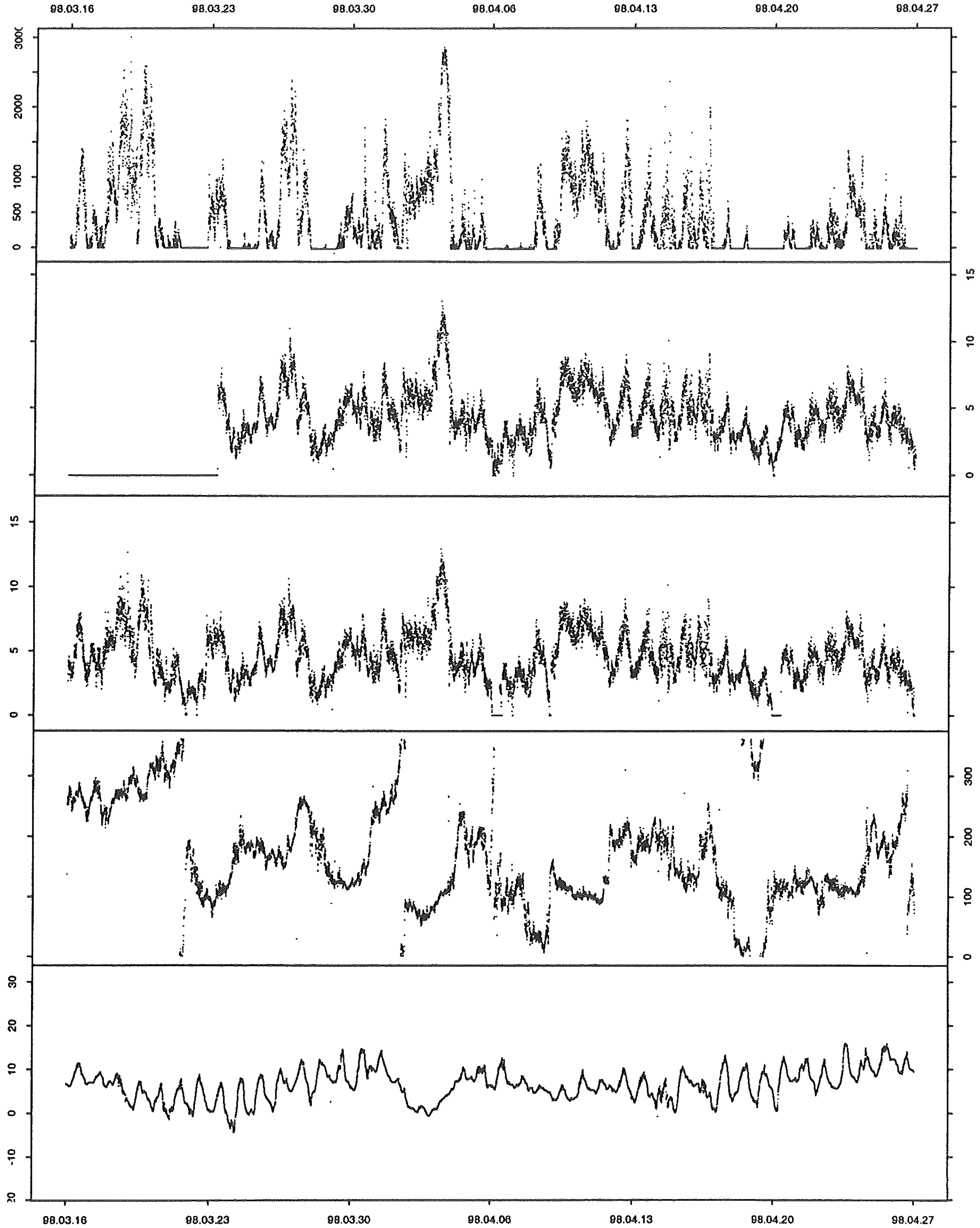

Figure B.8: *(Dræby) The wind farm measurements in the period from 98.03.16 to 98.04.27 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

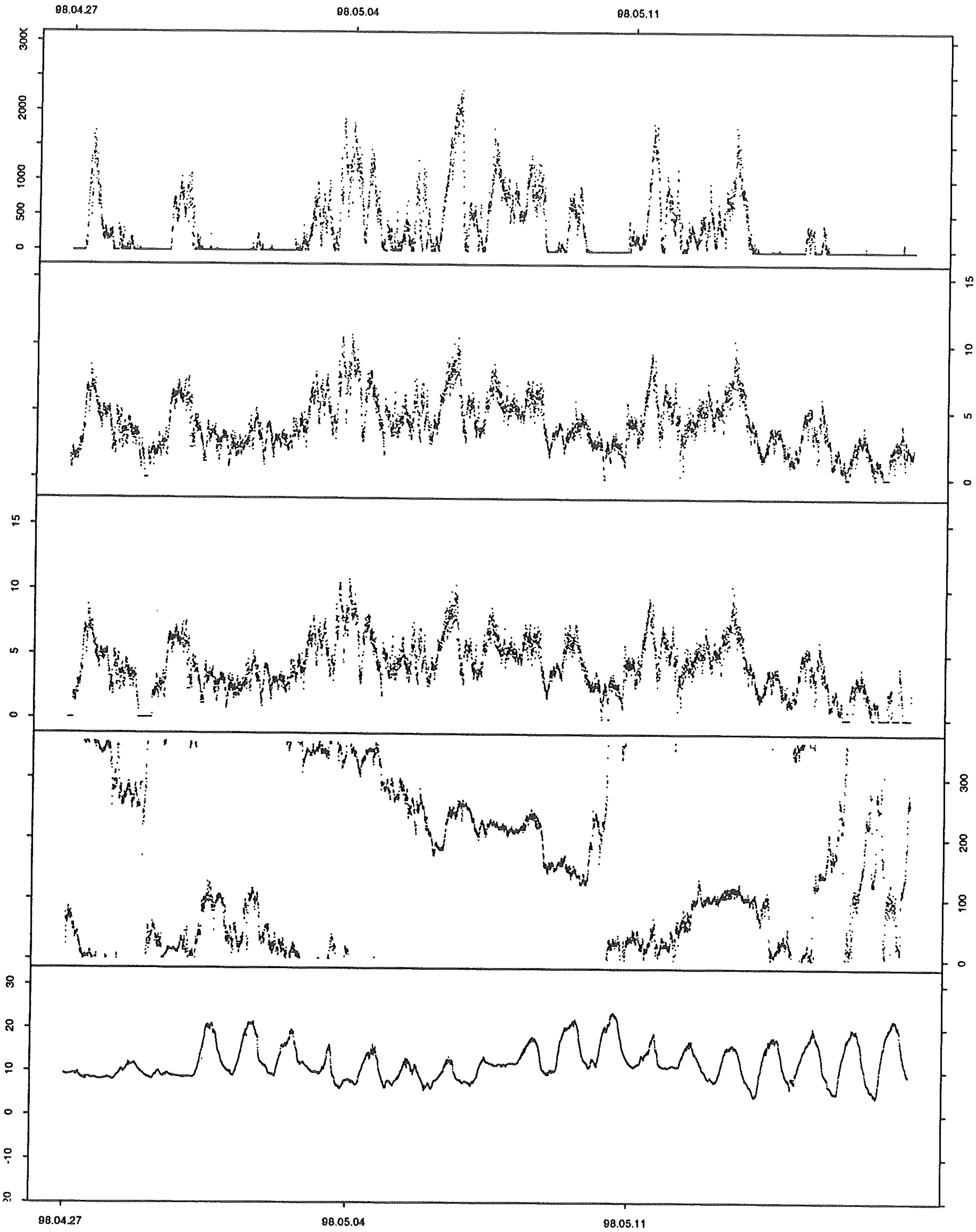

Figure B.9: *(Dræby) The wind farm measurements in the period from 98.04.27 to 98.05.17 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

B.2 Fjaldene

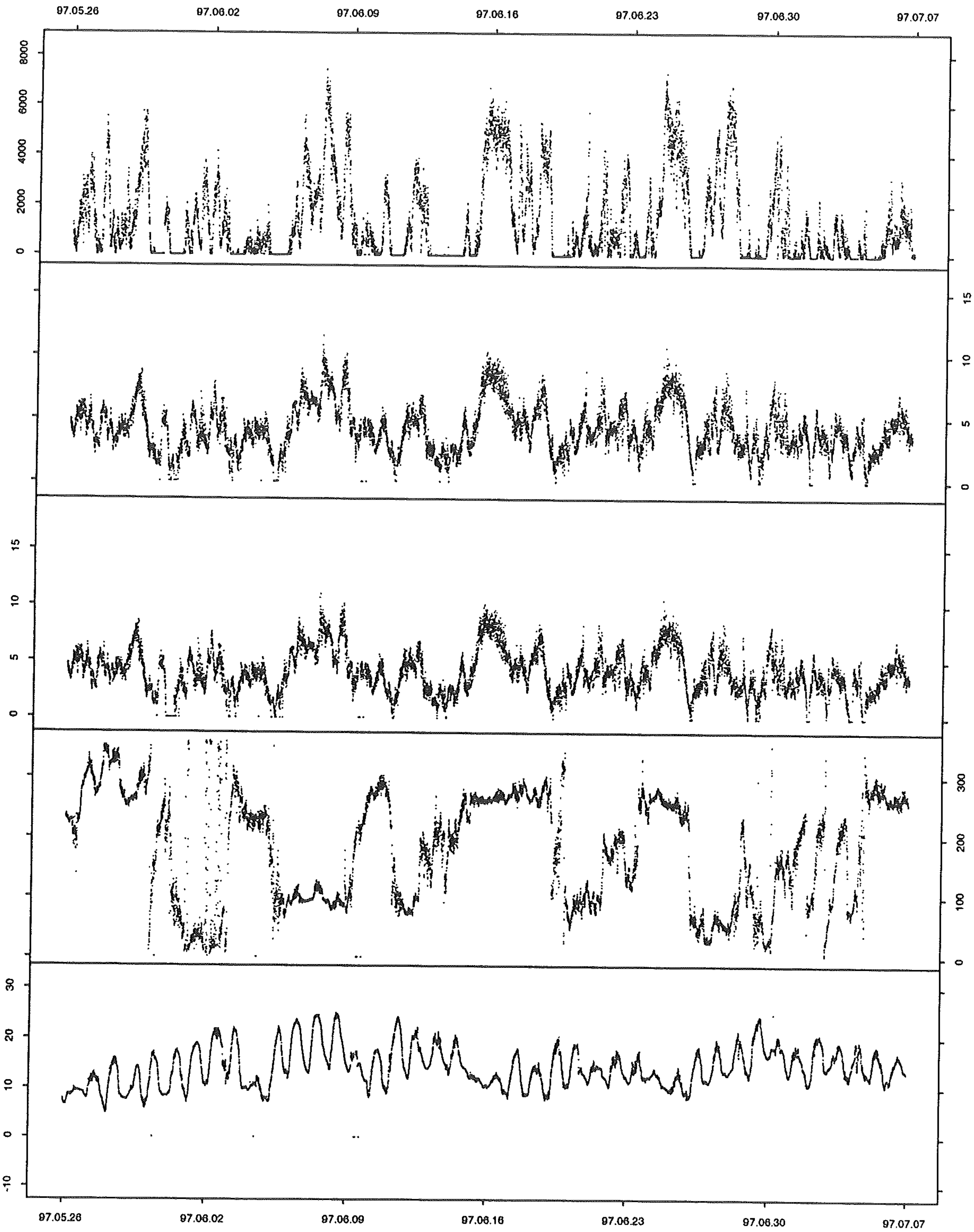

Figure B.10: *(Fjaldene) The wind farm measurements in the period from 97.05.26 to 97.07.07 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

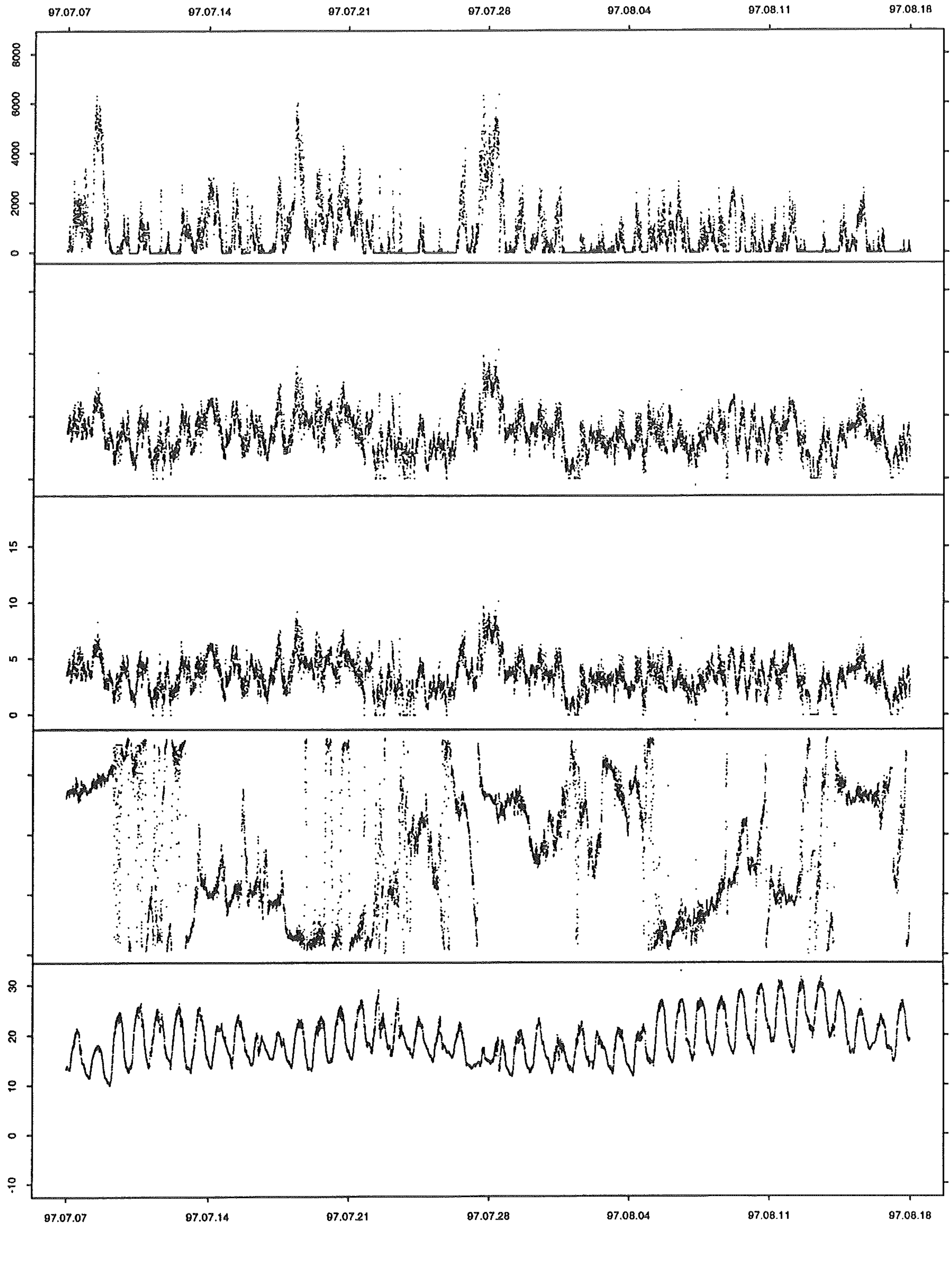

Figure B.11: *(Fjaldene) The wind farm measurements in the period from 97.07.07 to 97.08.18 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

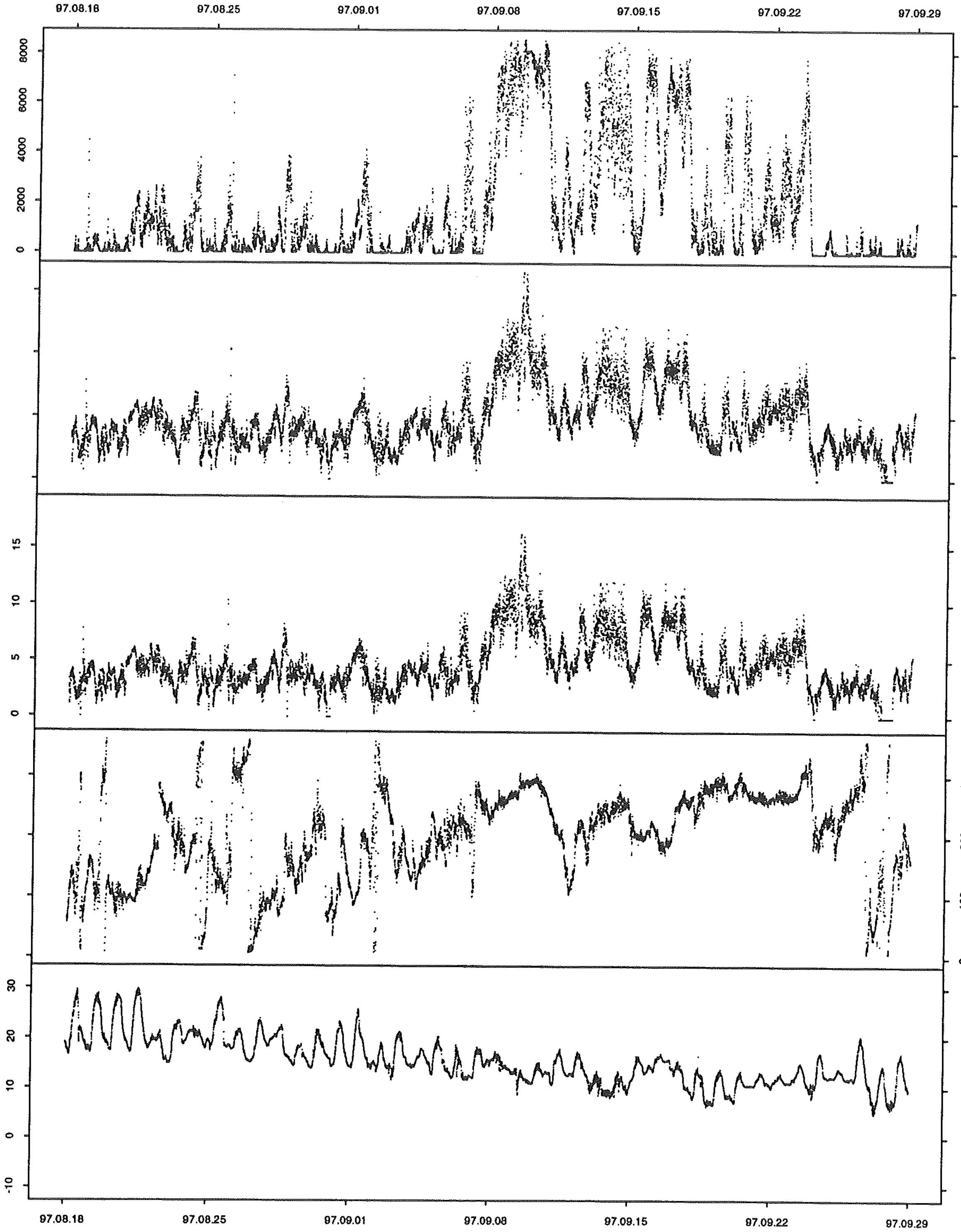

Figure B.12: *(Fjaldene) The wind farm measurements in the period from 97.08.18 to 97.09.29 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

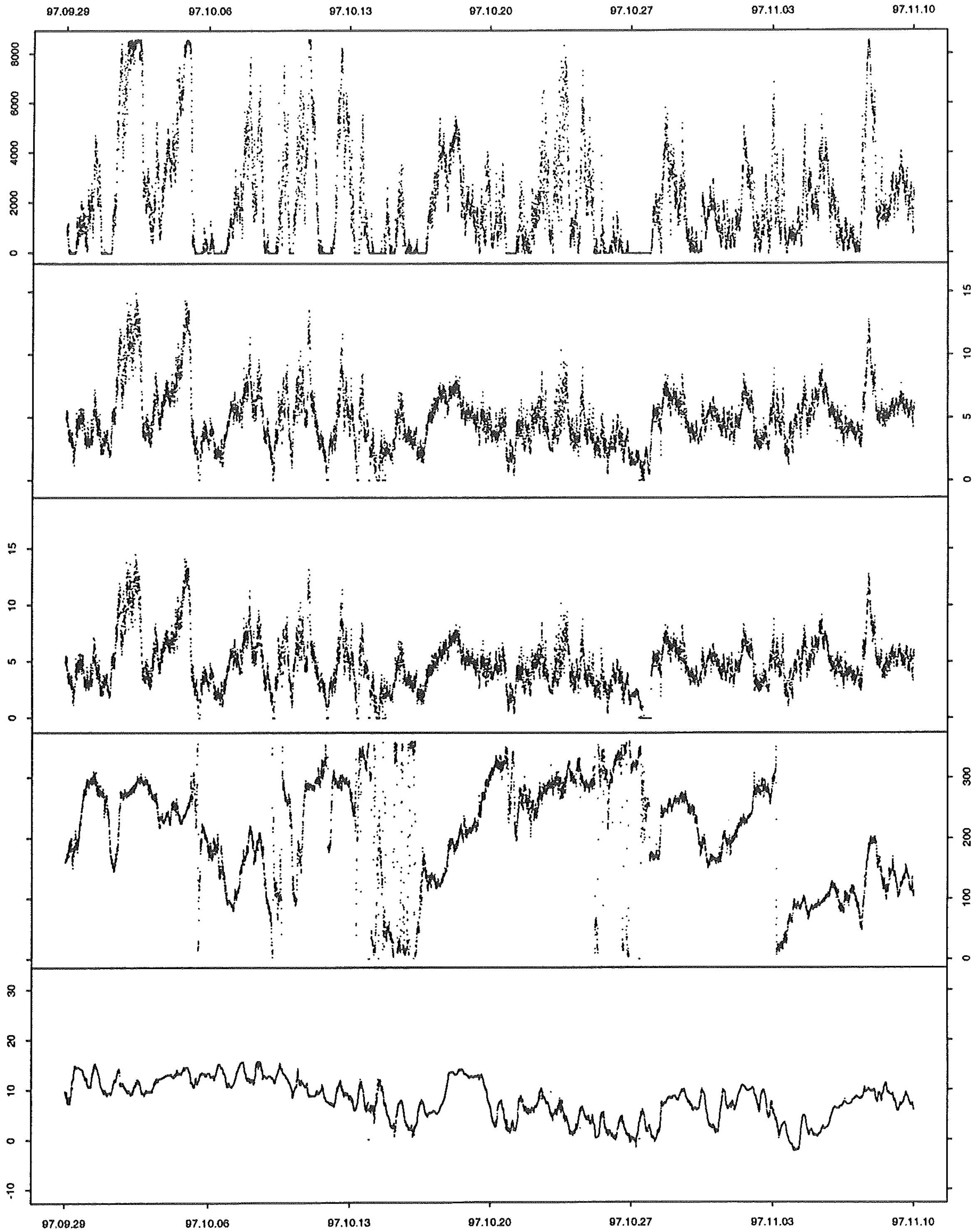

Figure B.13: *(Fjaldene) The wind farm measurements in the period from 97.09.29 to 97.11.10 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

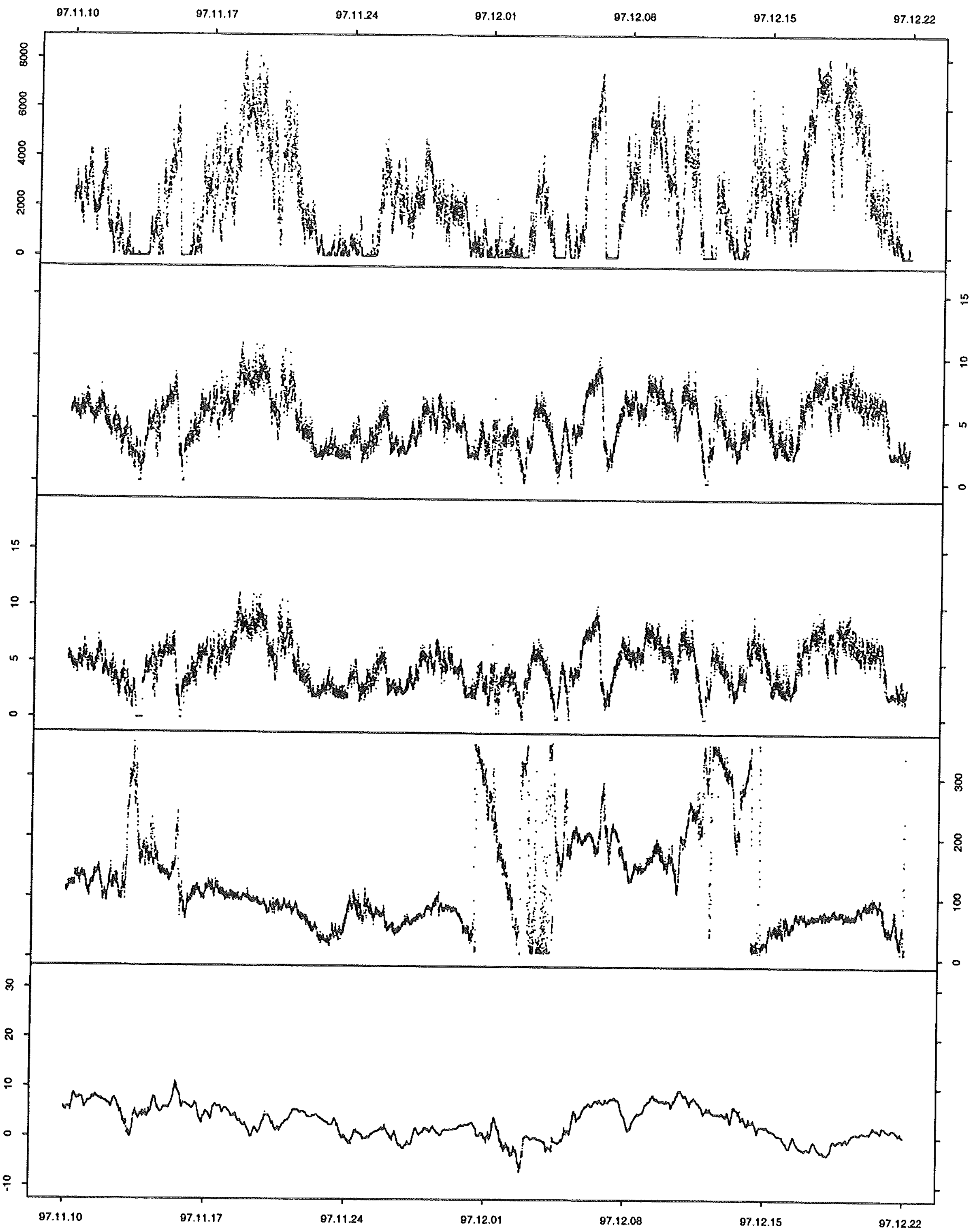

Figure B.14: *(Fjaldene) The wind farm measurements in the period from 97.11.10 to 97.12.22 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

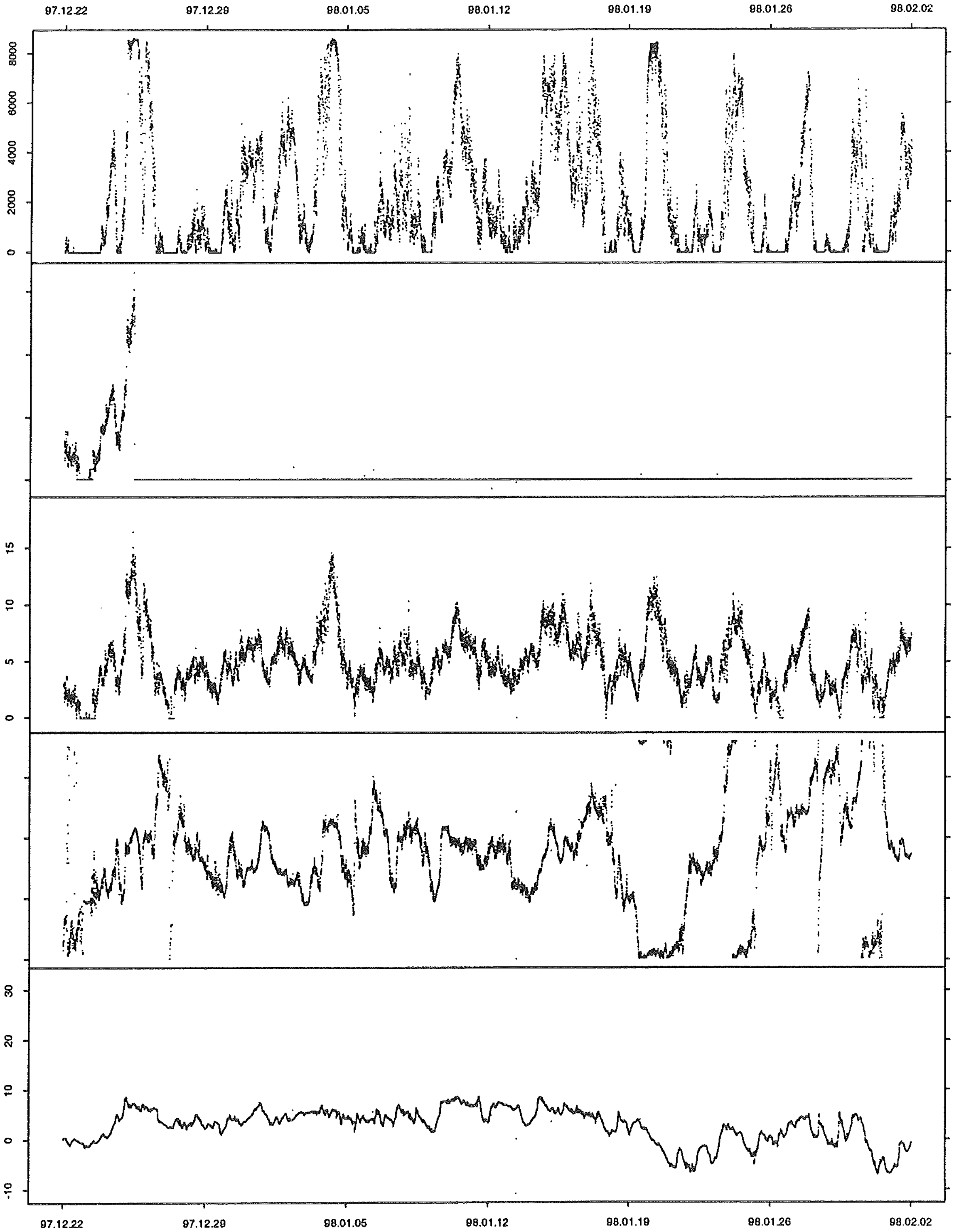

Figure B.15: *(Fjaldene) The wind farm measurements in the period from 97.12.22 to 98.02.02 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

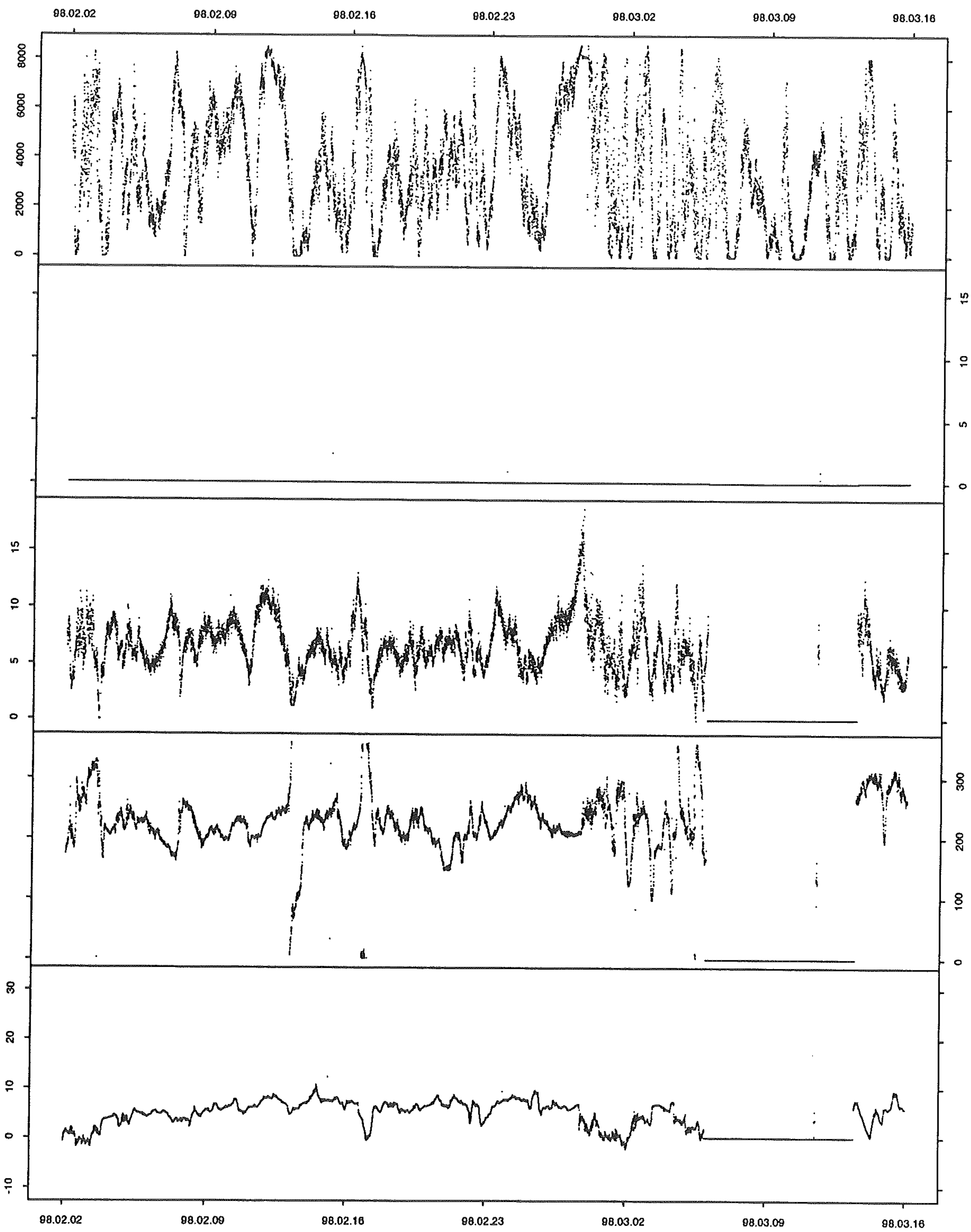

Figure B.16: *(Fjaldene) The wind farm measurements in the period from 98.02.02 to 98.03.16 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

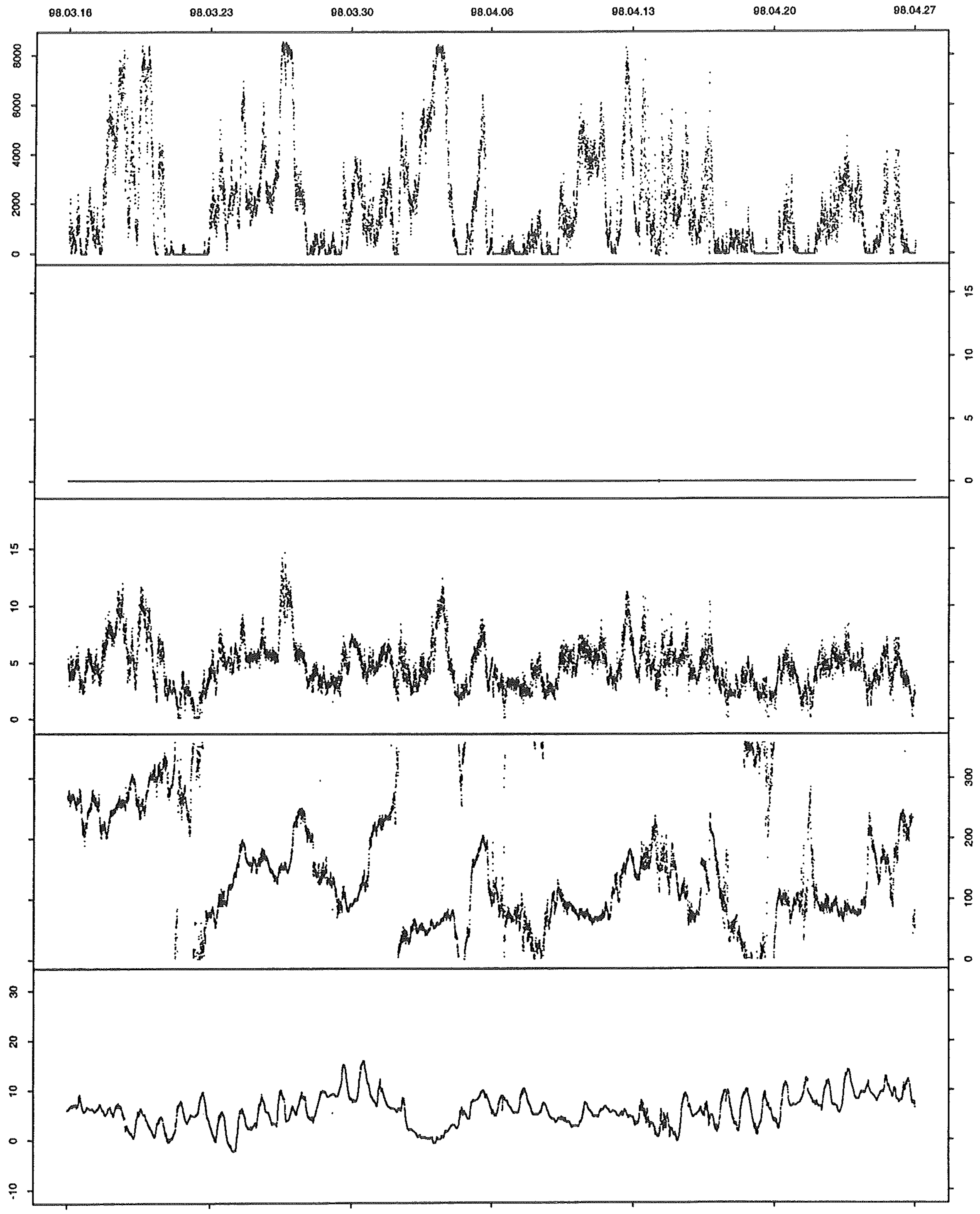

Figure B.17: *(Fjaldene) The wind farm measurements in the period from 98.03.16 to 98.04.27 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

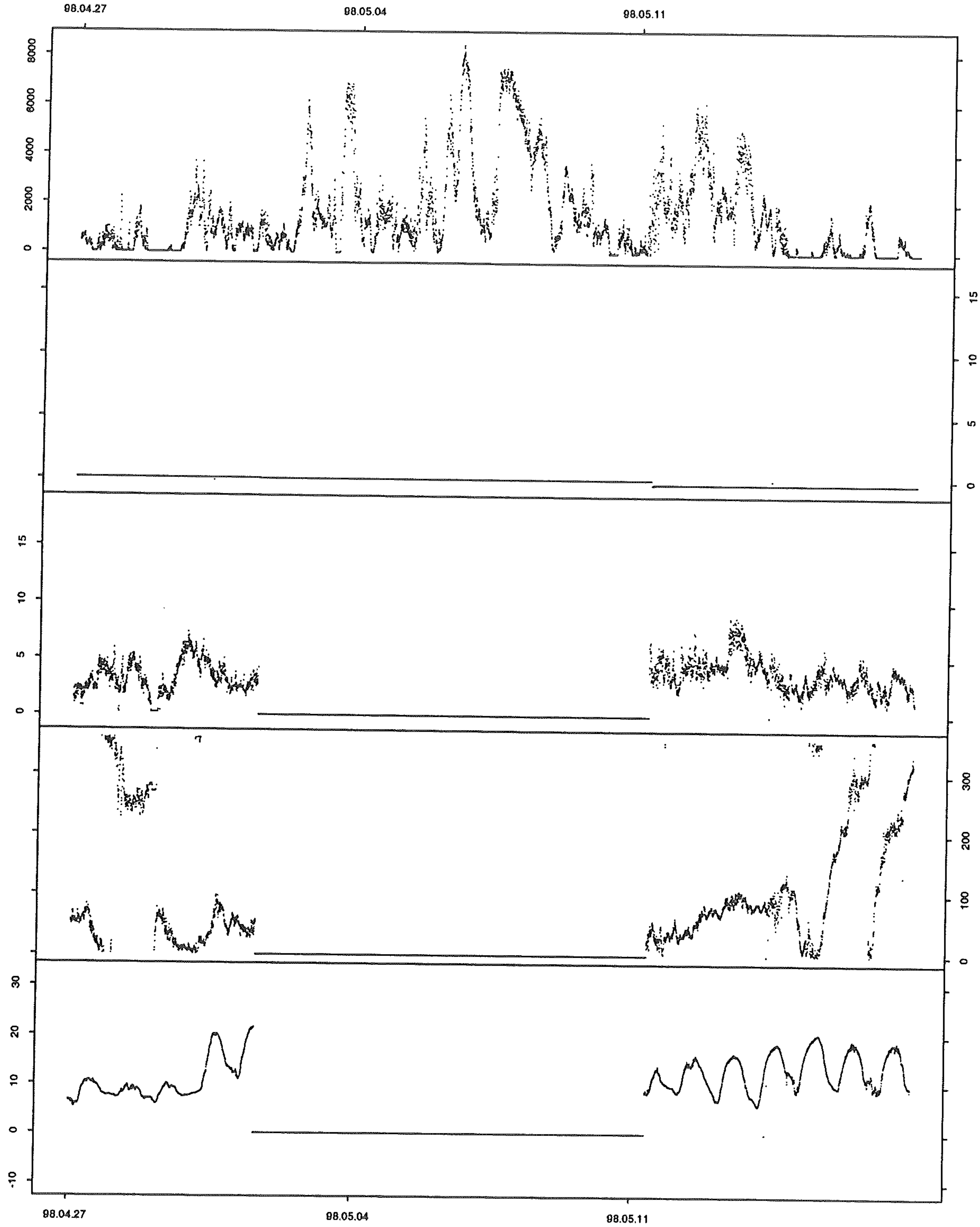

Figure B.18: *(Fjaldene) The wind farm measurements in the period from 98.04.27 to 98.05.17 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

B.3 Hollandsbjerg

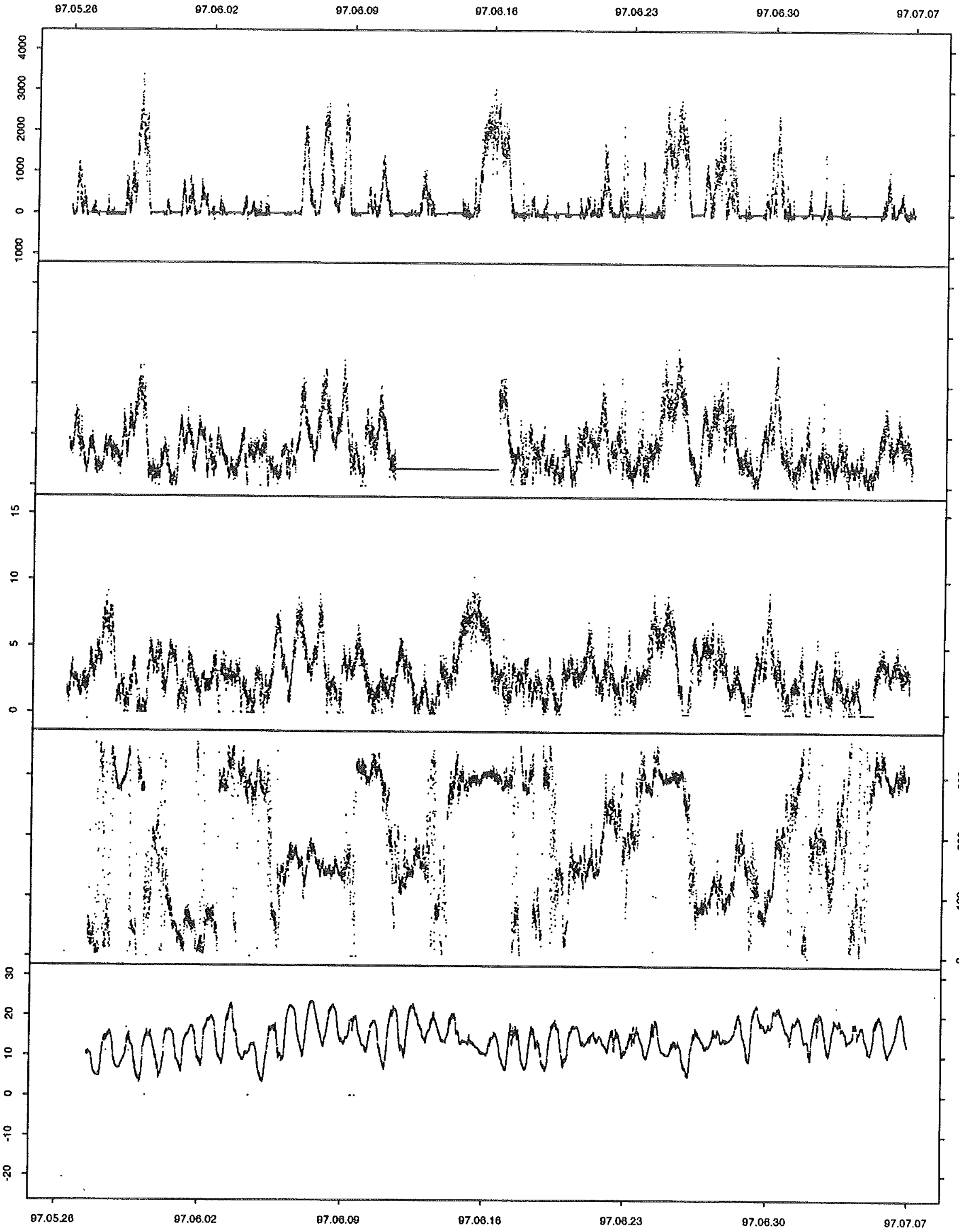

Figure B.19: *(Hollandsbjerg) The wind farm measurements in the period from 97.05.26 to 97.07.07 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

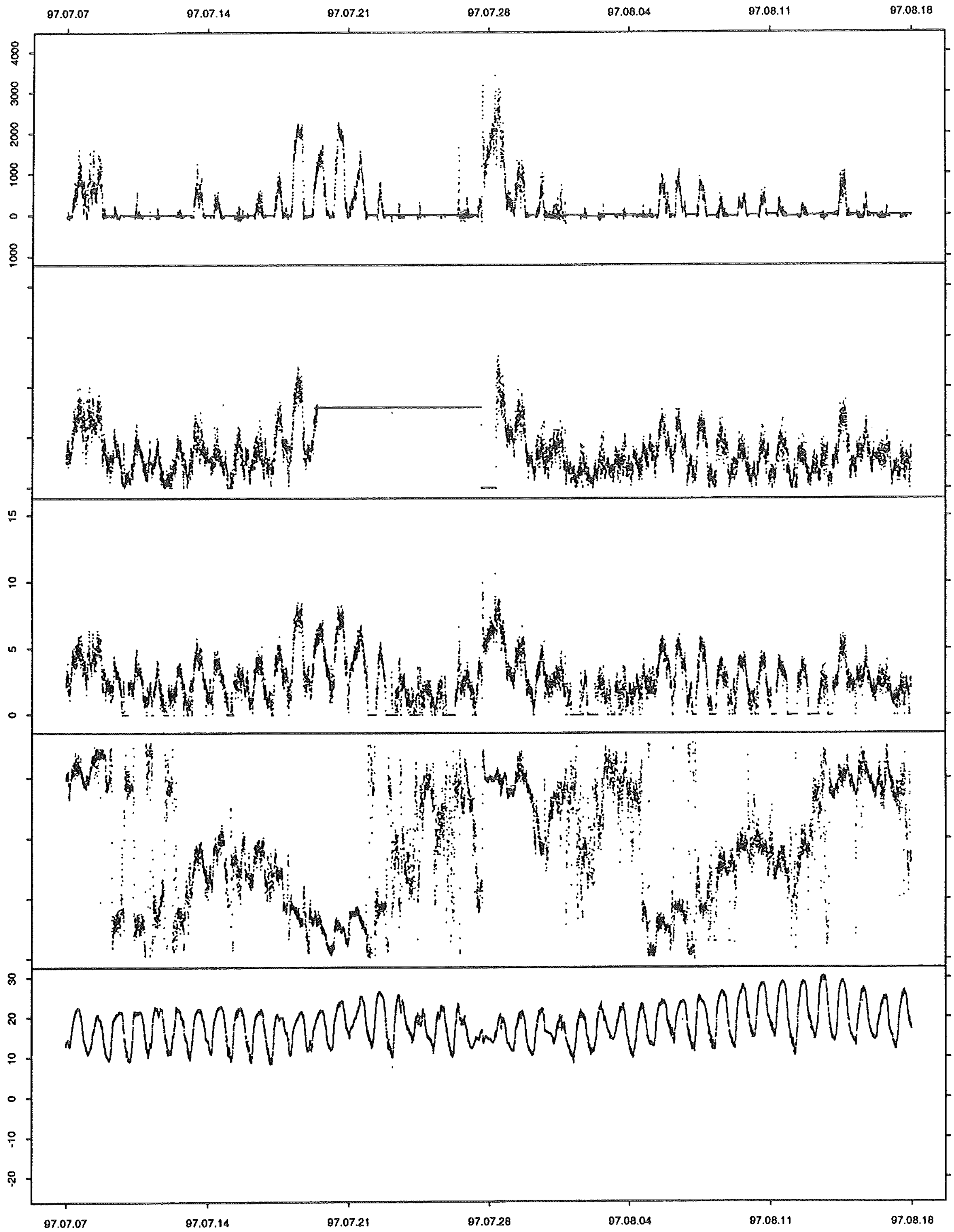

Figure B.20: *(Hollandsbjerg) The wind farm measurements in the period from 97.07.07 to 97.08.18 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

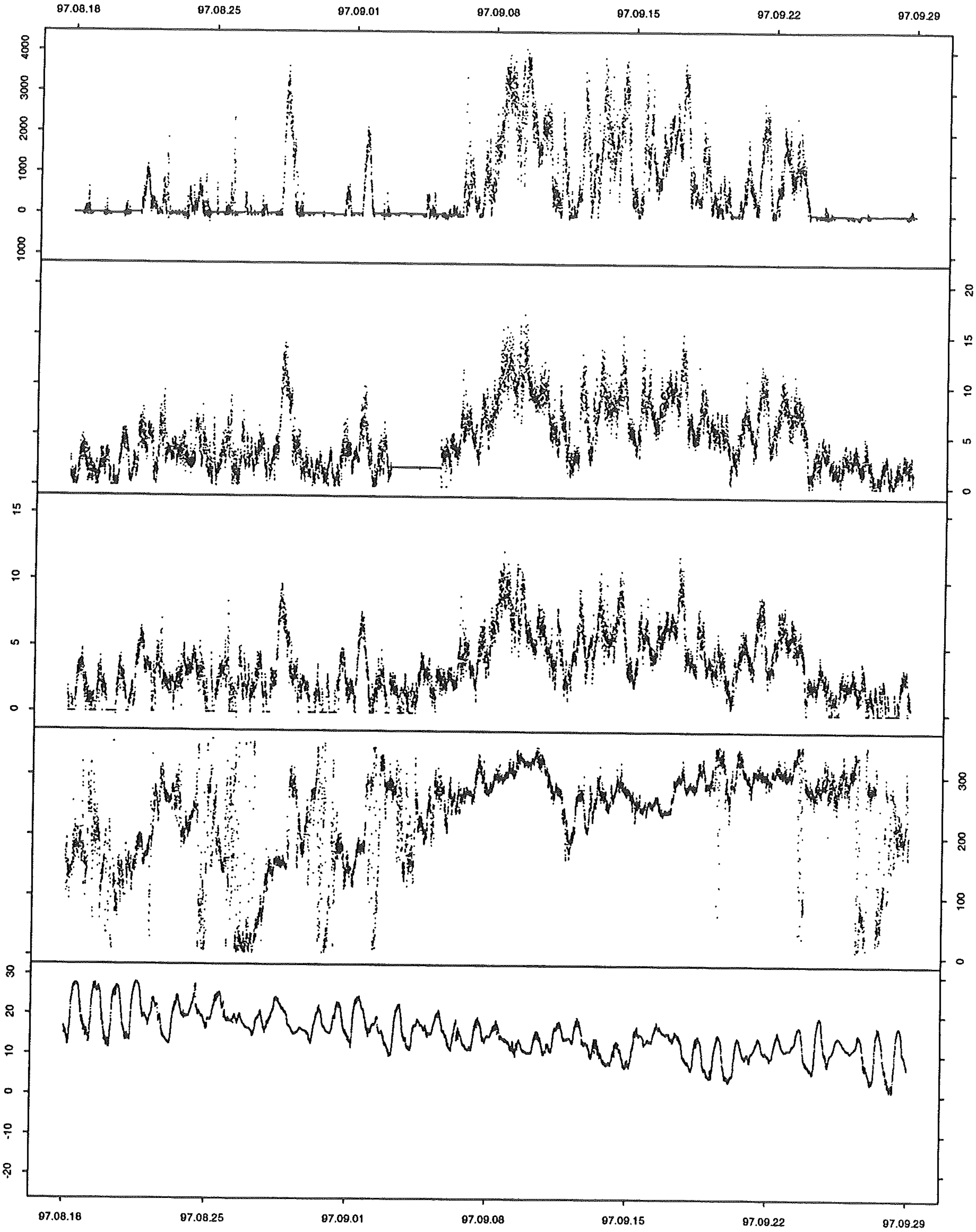

Figure B.21: *(Hollandsbjerg) The wind farm measurements in the period from 97.08.18 to 97.09.29 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

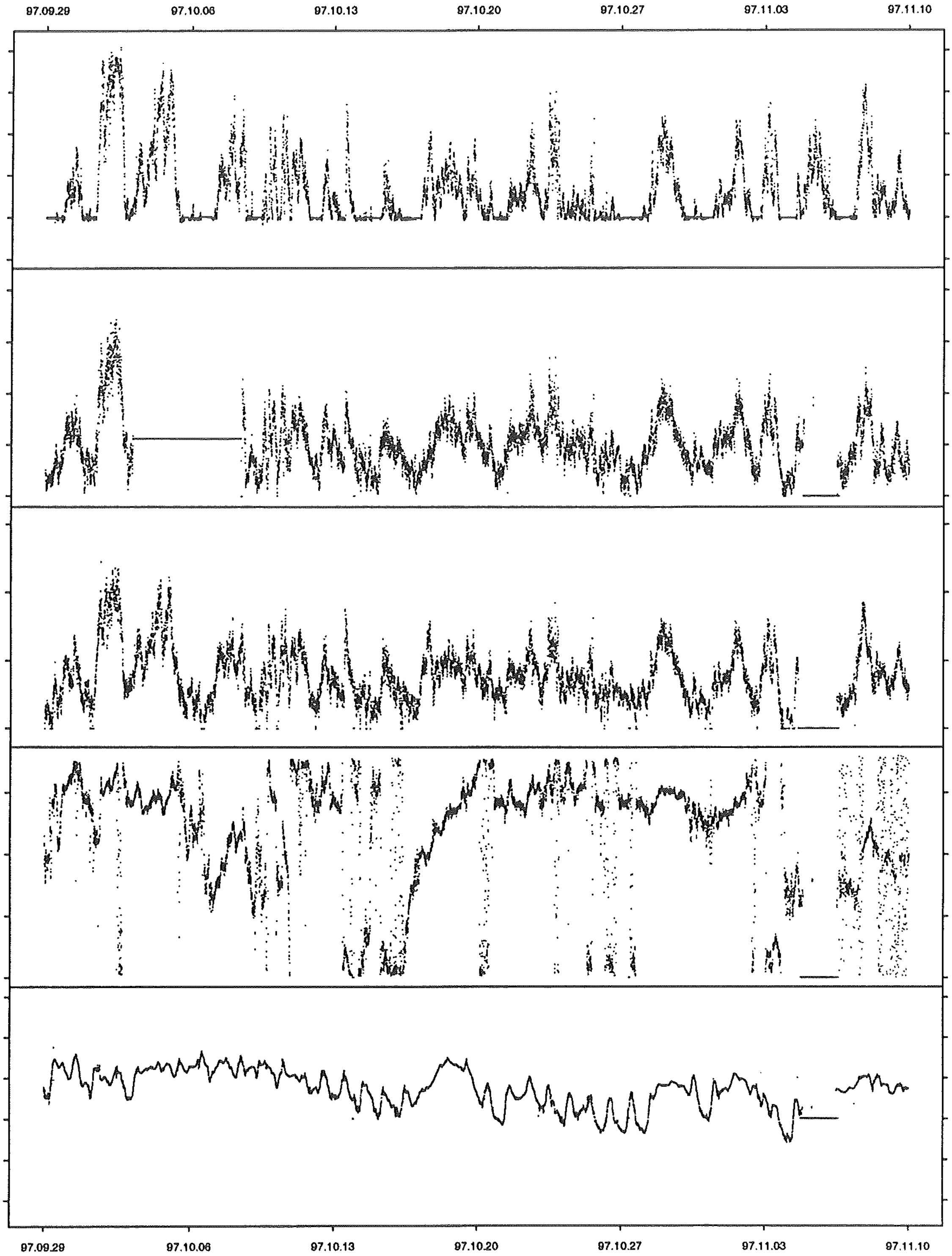

Figure B.22: *(Hollandsbjerg) The wind farm measurements in the period from 97.09.29 to 97.11.10 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

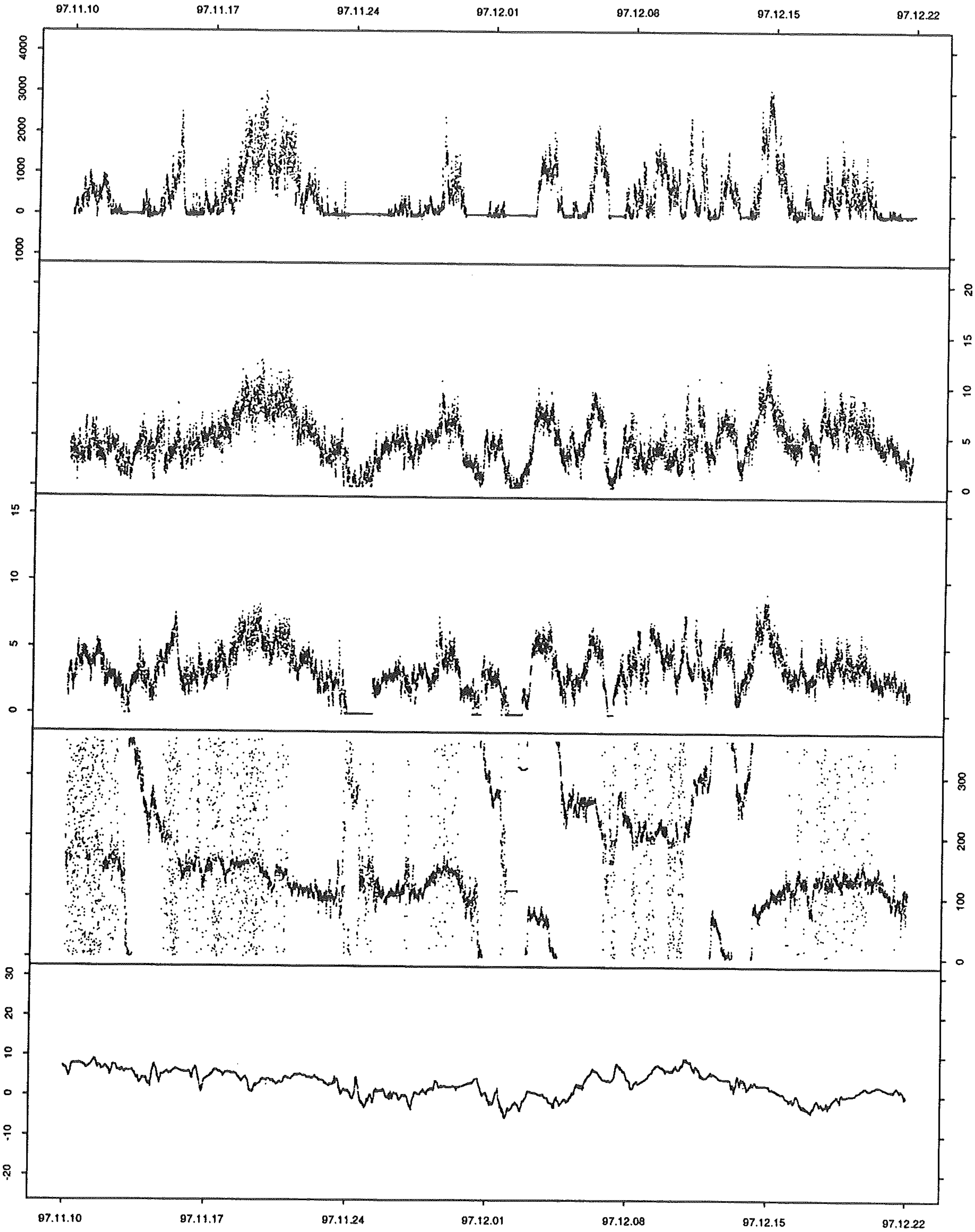

Figure B.23: *(Hollandsbjerg) The wind farm measurements in the period from 97.11.10 to 97.12.22 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

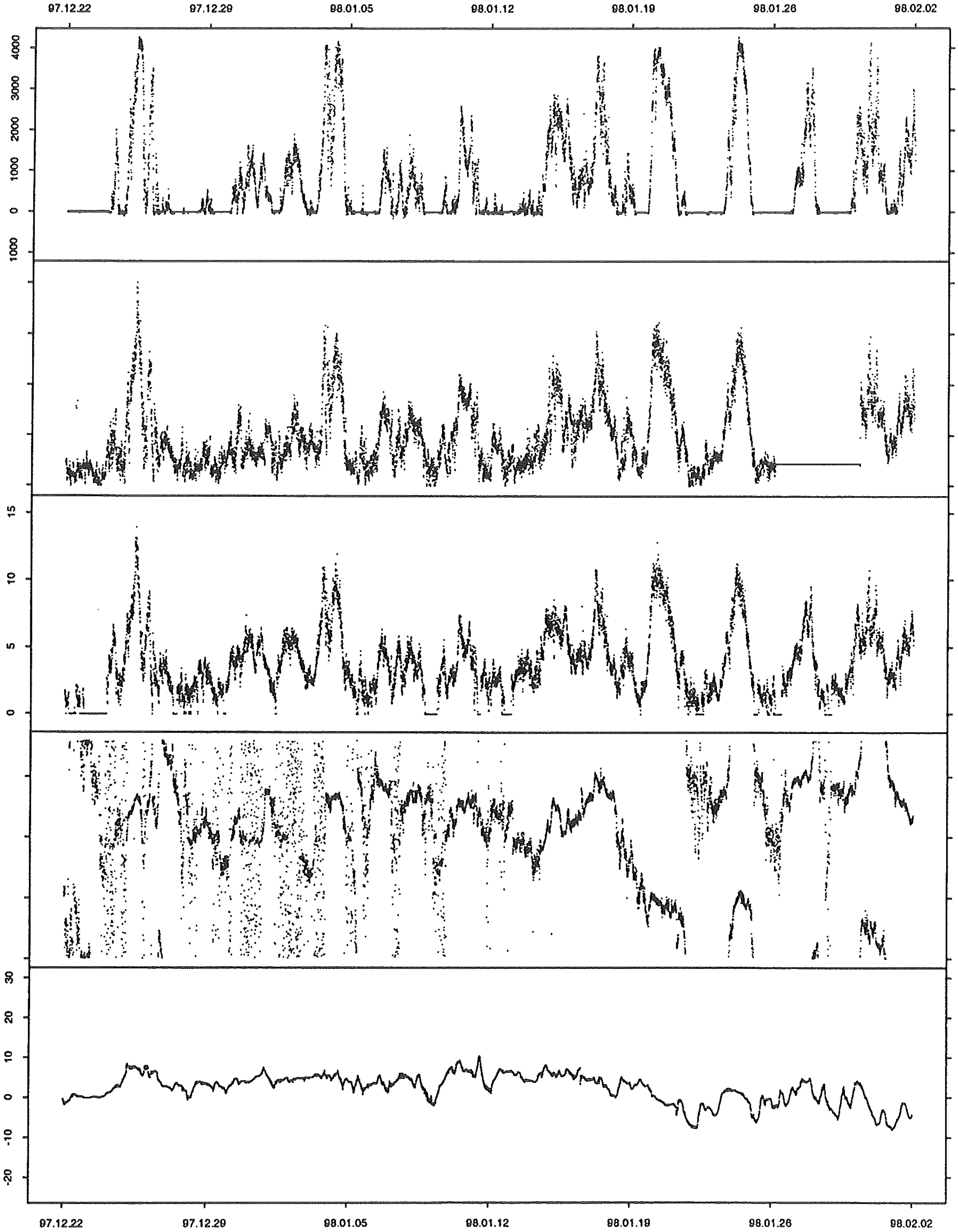

Figure B.24: *(Hollandsbjerg) The wind farm measurements in the period from 97.12.22 to 98.02.02 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

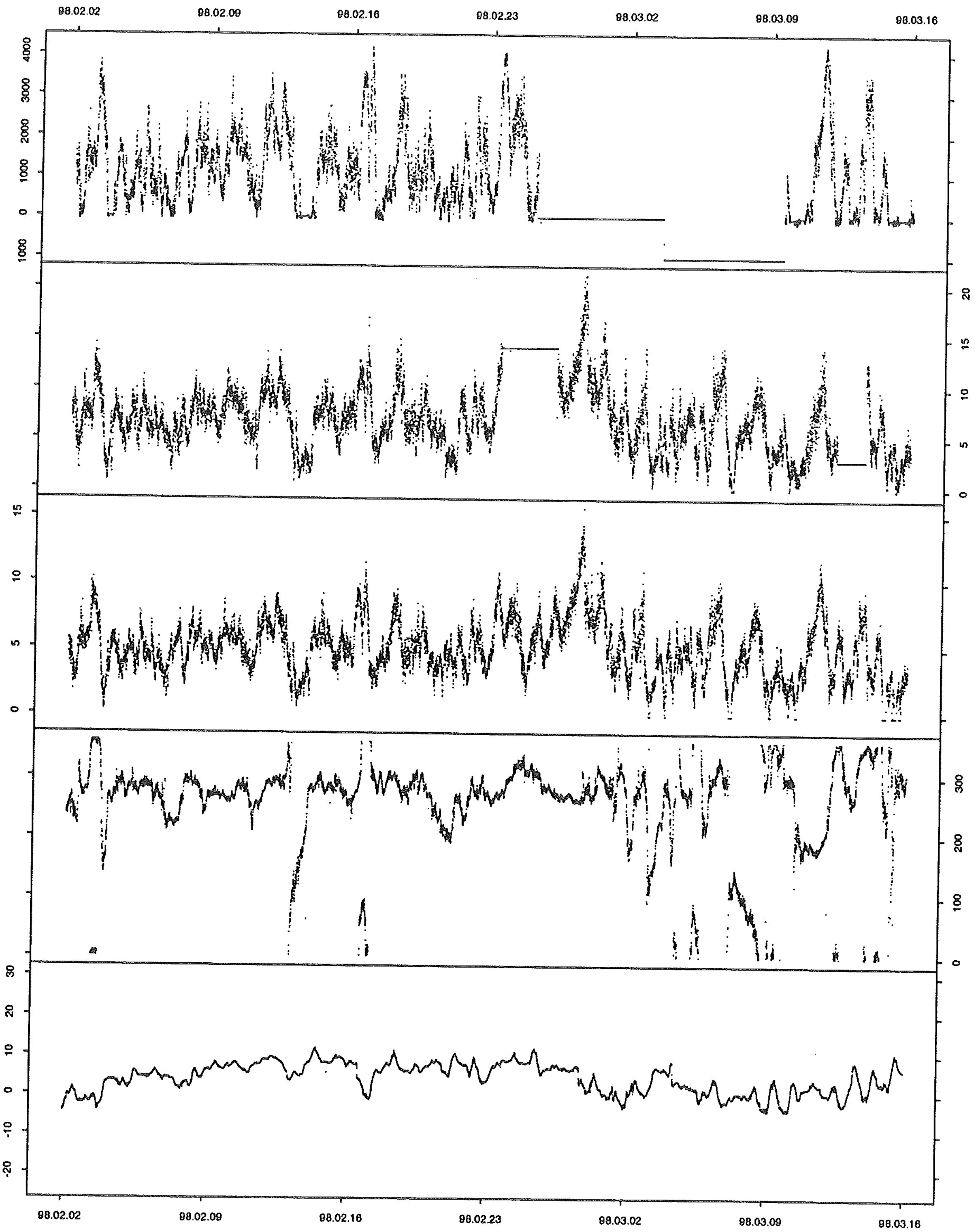

Figure B.25: *(Hollandsbjerg) The wind farm measurements in the period from 98.02.02 to 98.03.16 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

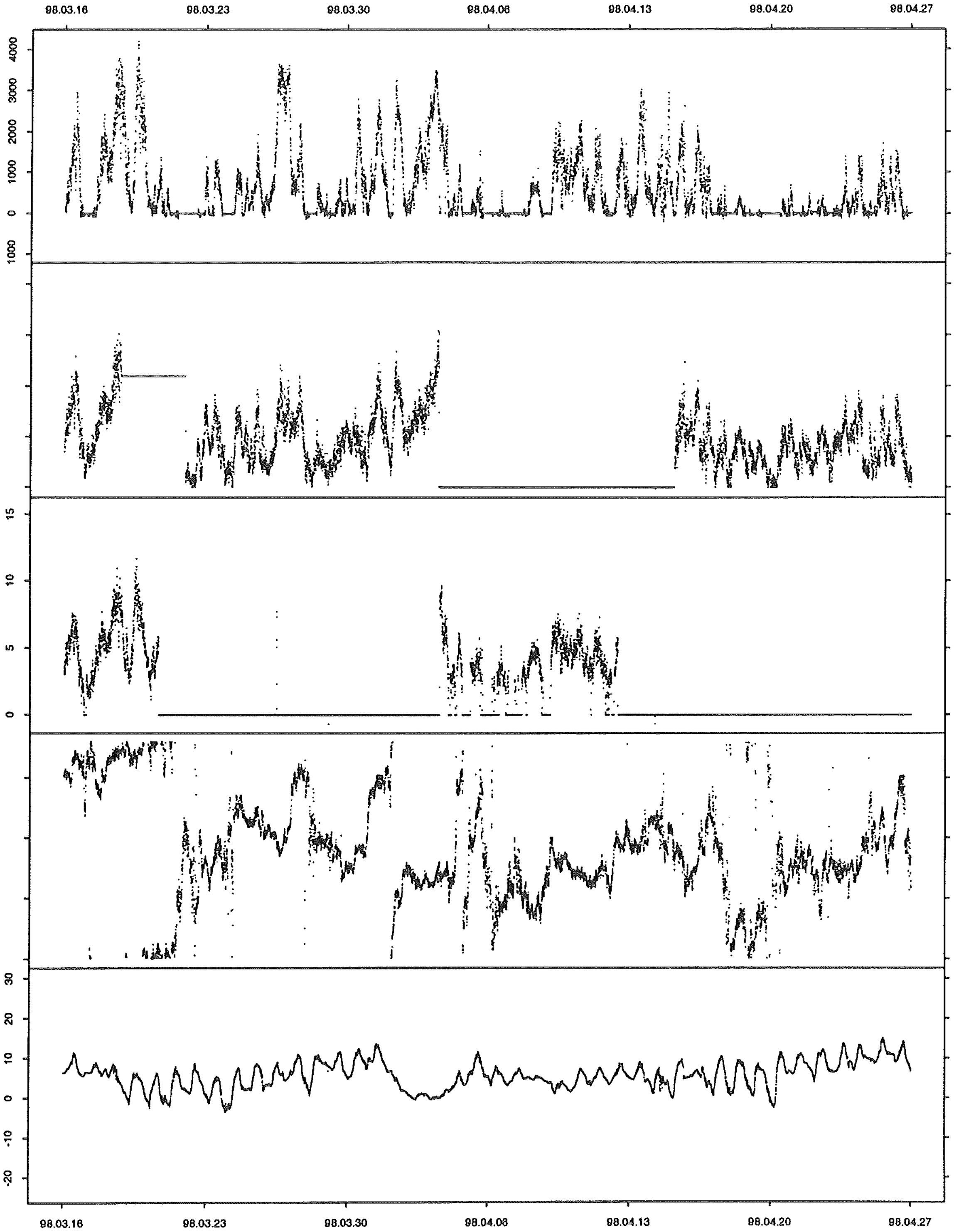

Figure B.26: *(Hollandsbjerg) The wind farm measurements in the period from 98.03.16 to 98.04.27 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

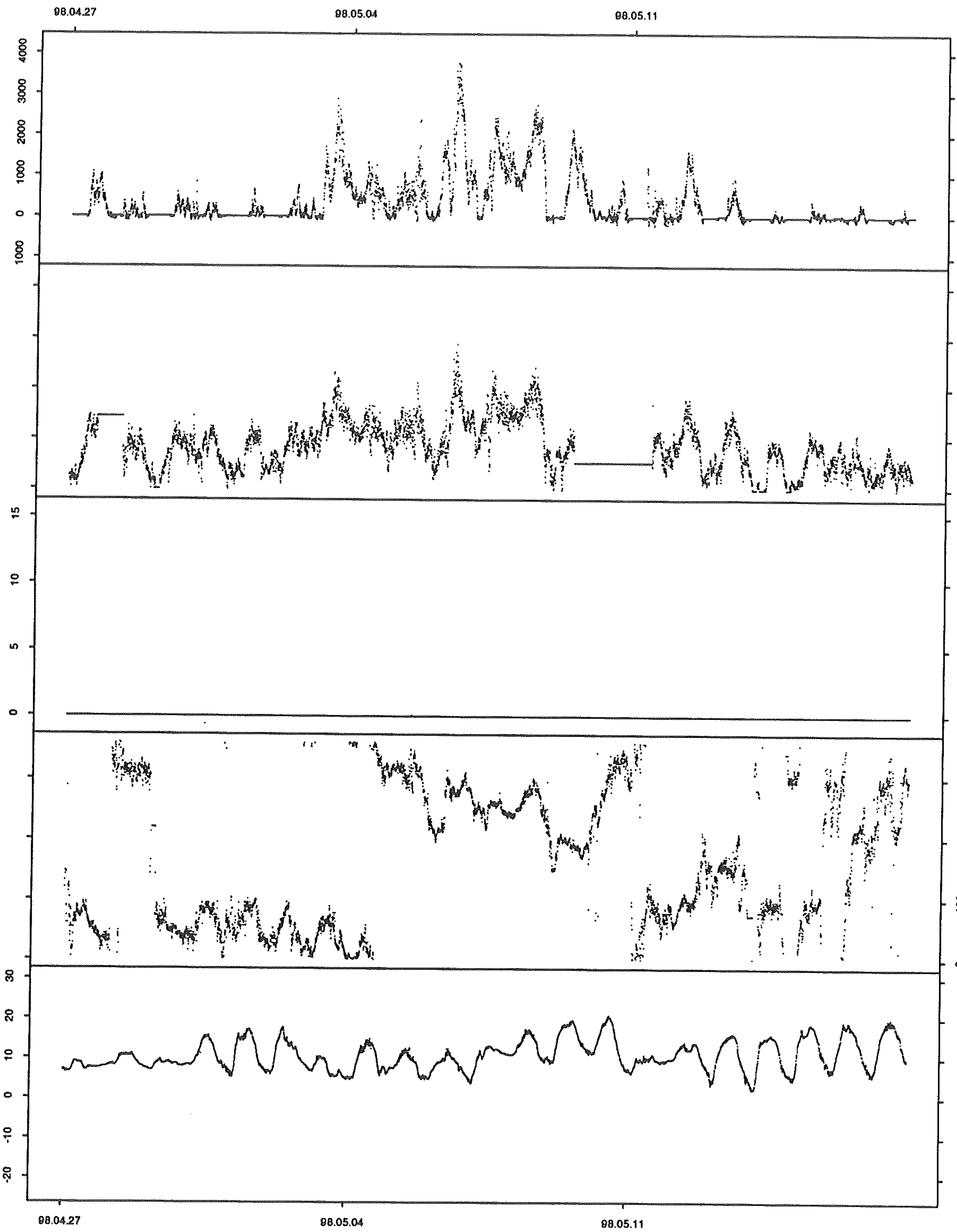

Figure B.27: *(Hollandsbjerg) The wind farm measurements in the period from 98.04.27 to 98.05.17 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

B.4 Rejsby

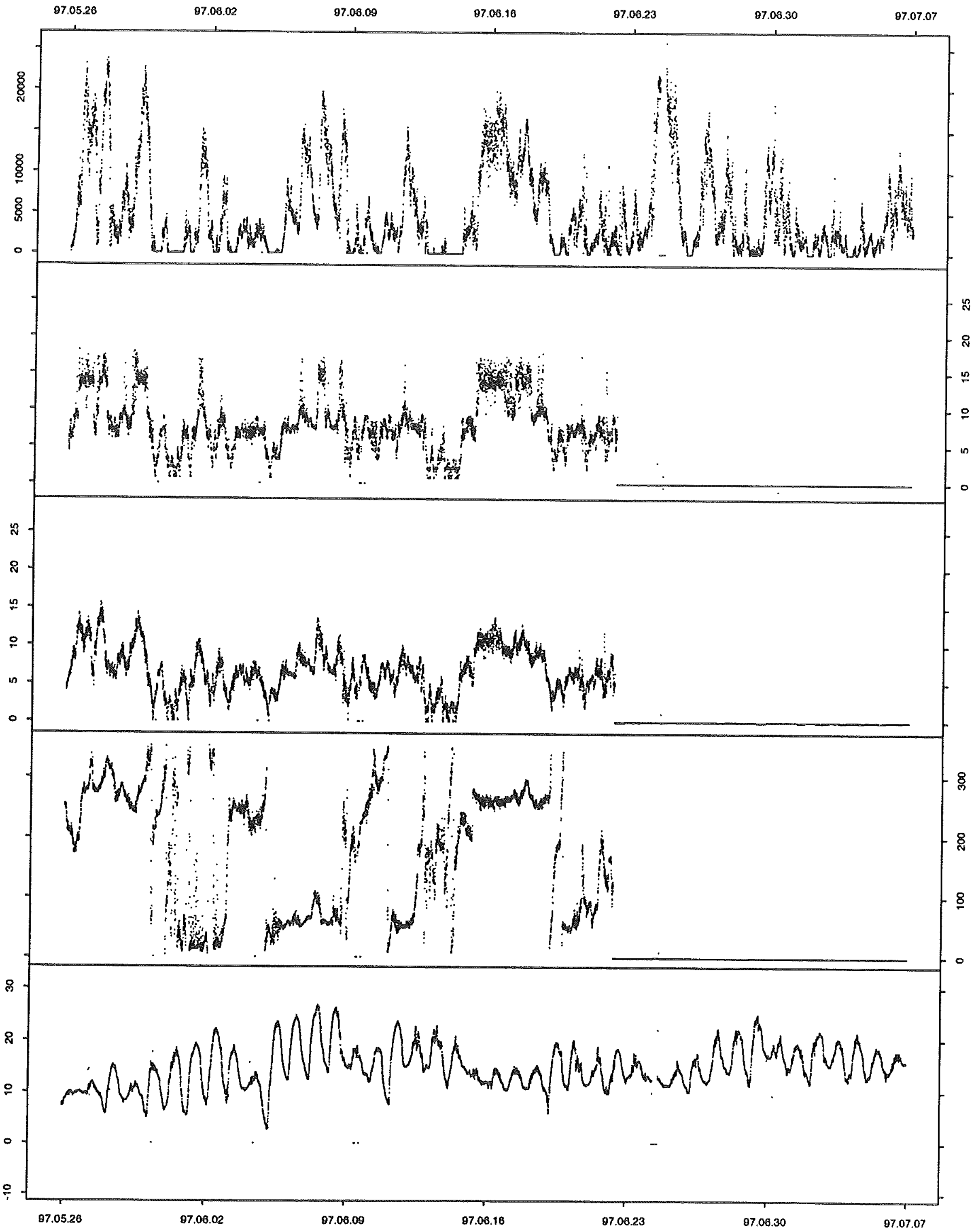

Figure B.28: *(Rejsby) The wind farm measurements in the period from 97.05.26 to 97.07.07 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

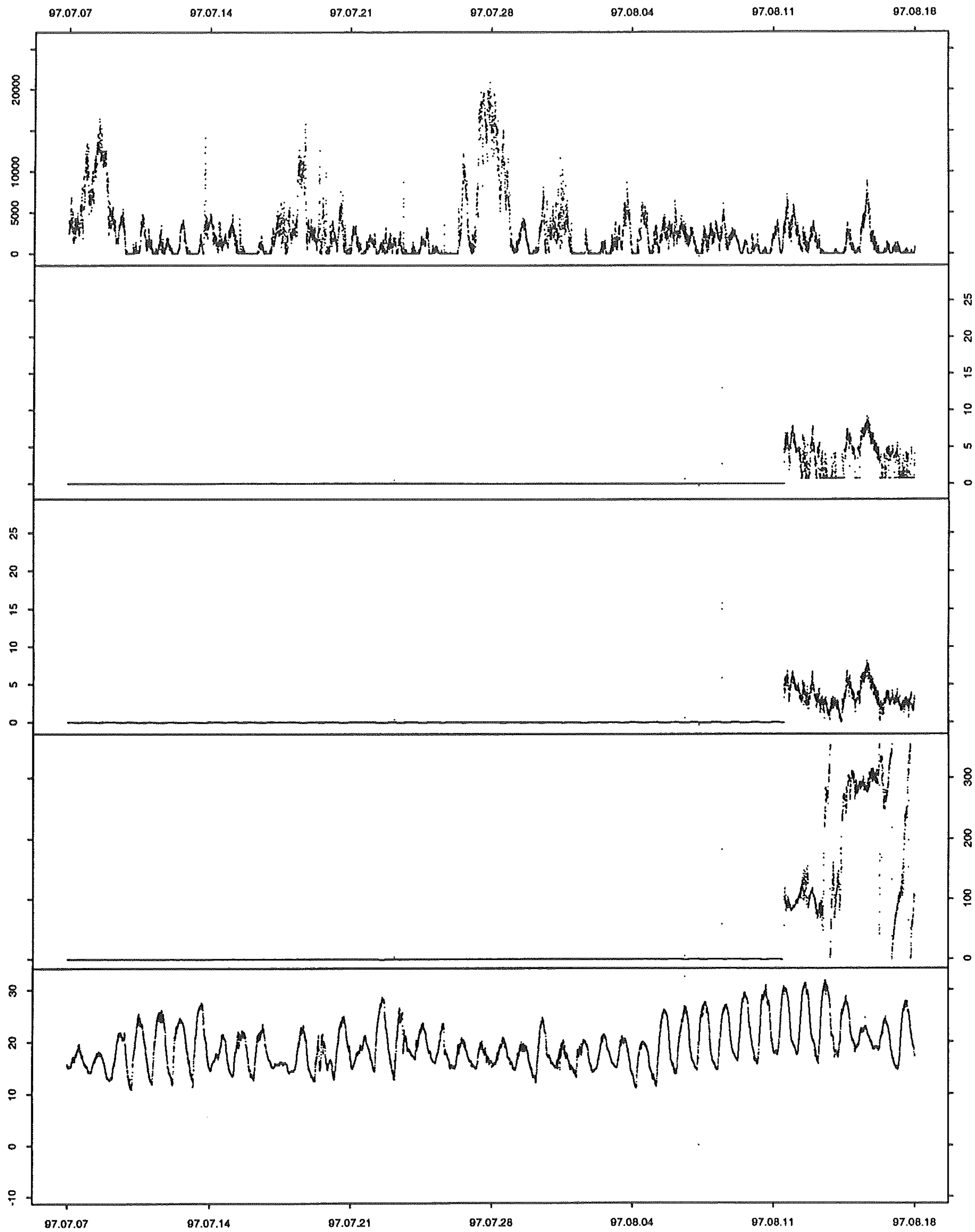

Figure B.29: *(Rejsby) The wind farm measurements in the period from 97.07.07 to 97.08.18 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

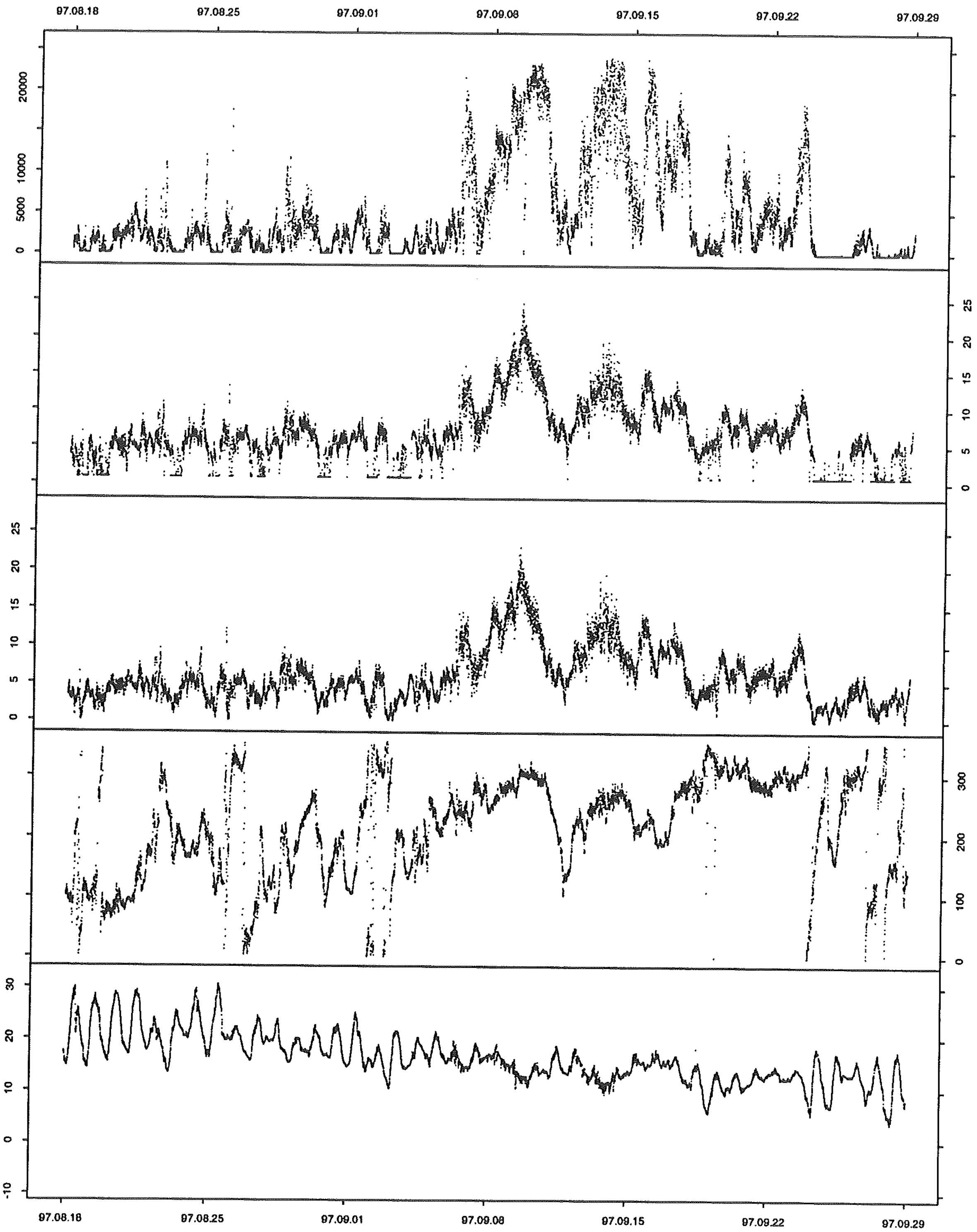

Figure B.30: *(Rejsby) The wind farm measurements in the period from 97.08.18 to 97.09.29 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

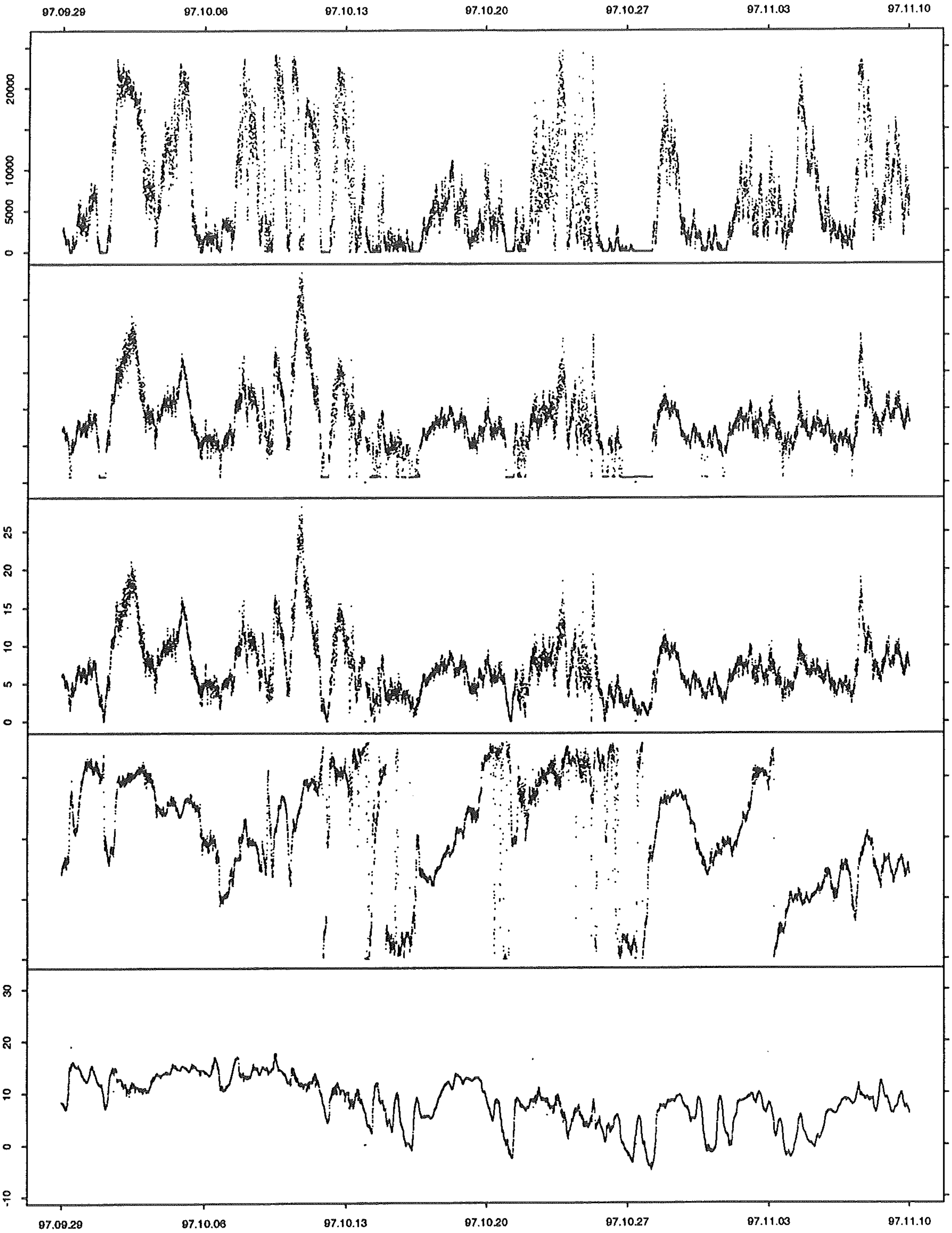

Figure B.31: *(Rejsby) The wind farm measurements in the period from 97.09.29 to 97.11.10 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

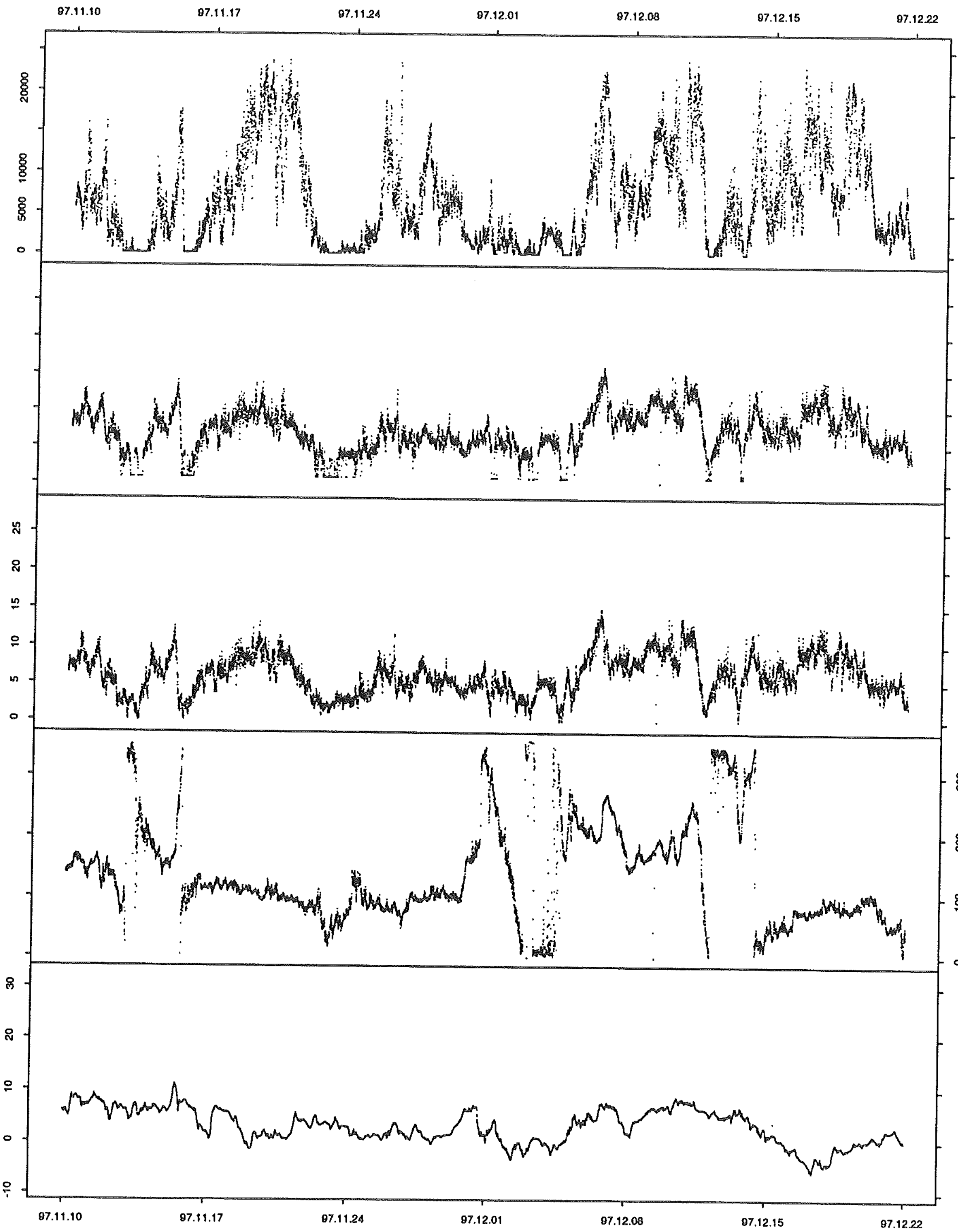

Figure B.32: *(Rejsby) The wind farm measurements in the period from 97.11.10 to 97.12.22 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

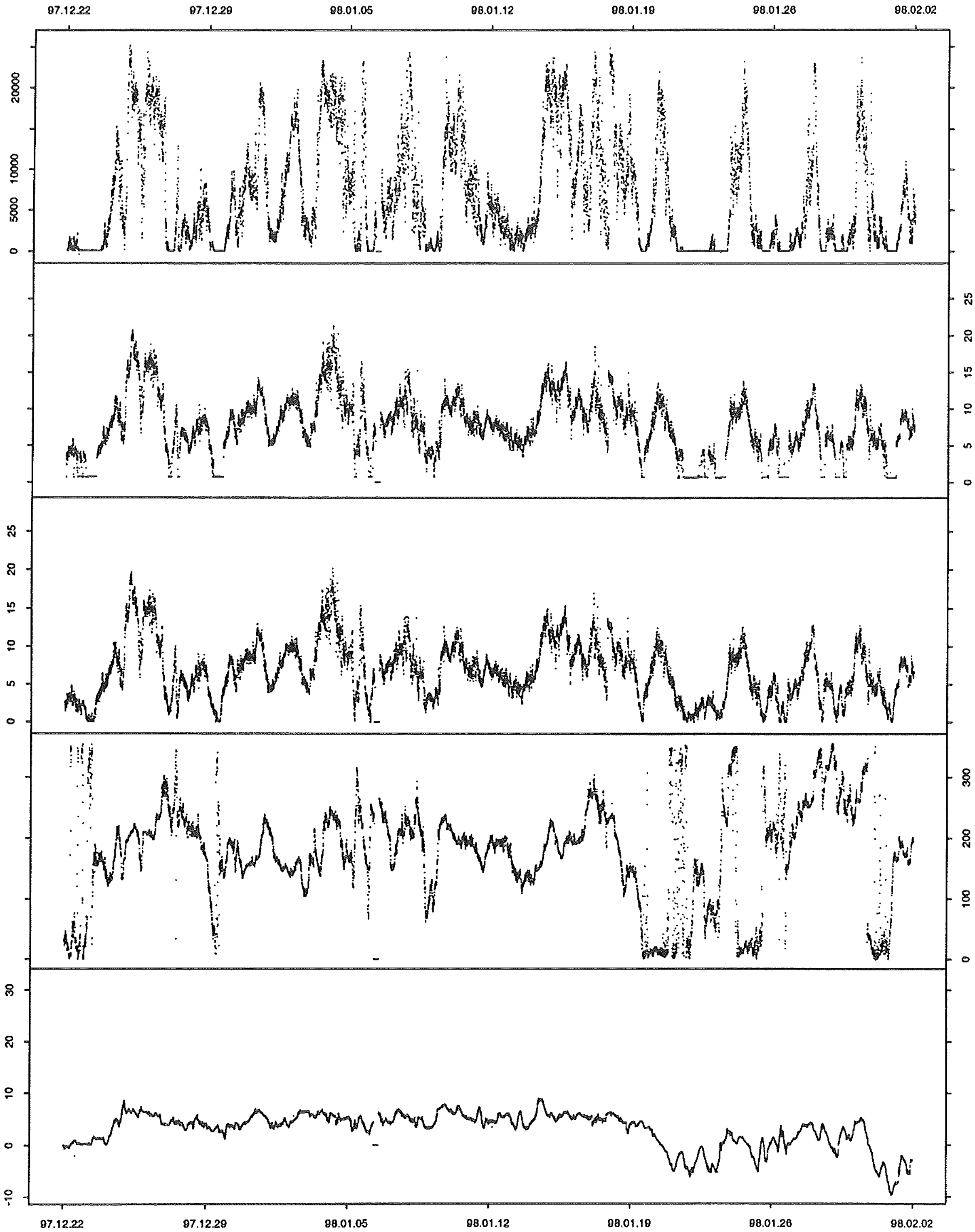

Figure B.33: *(Rejsby) The wind farm measurements in the period from 97.12.22 to 98.02.02 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

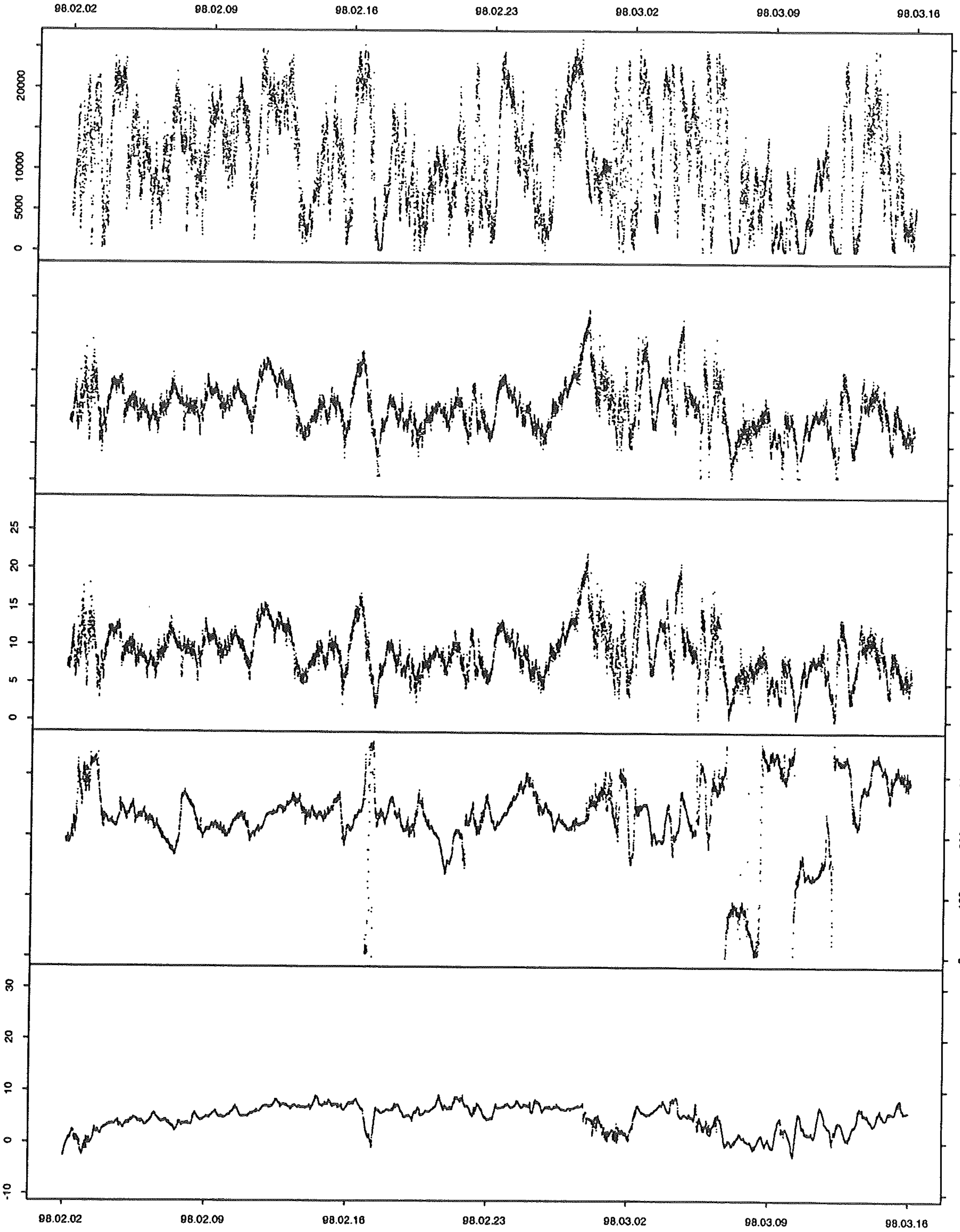

Figure B.34: *(Rejsby) The wind farm measurements in the period from 98.02.02 to 98.03.16 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

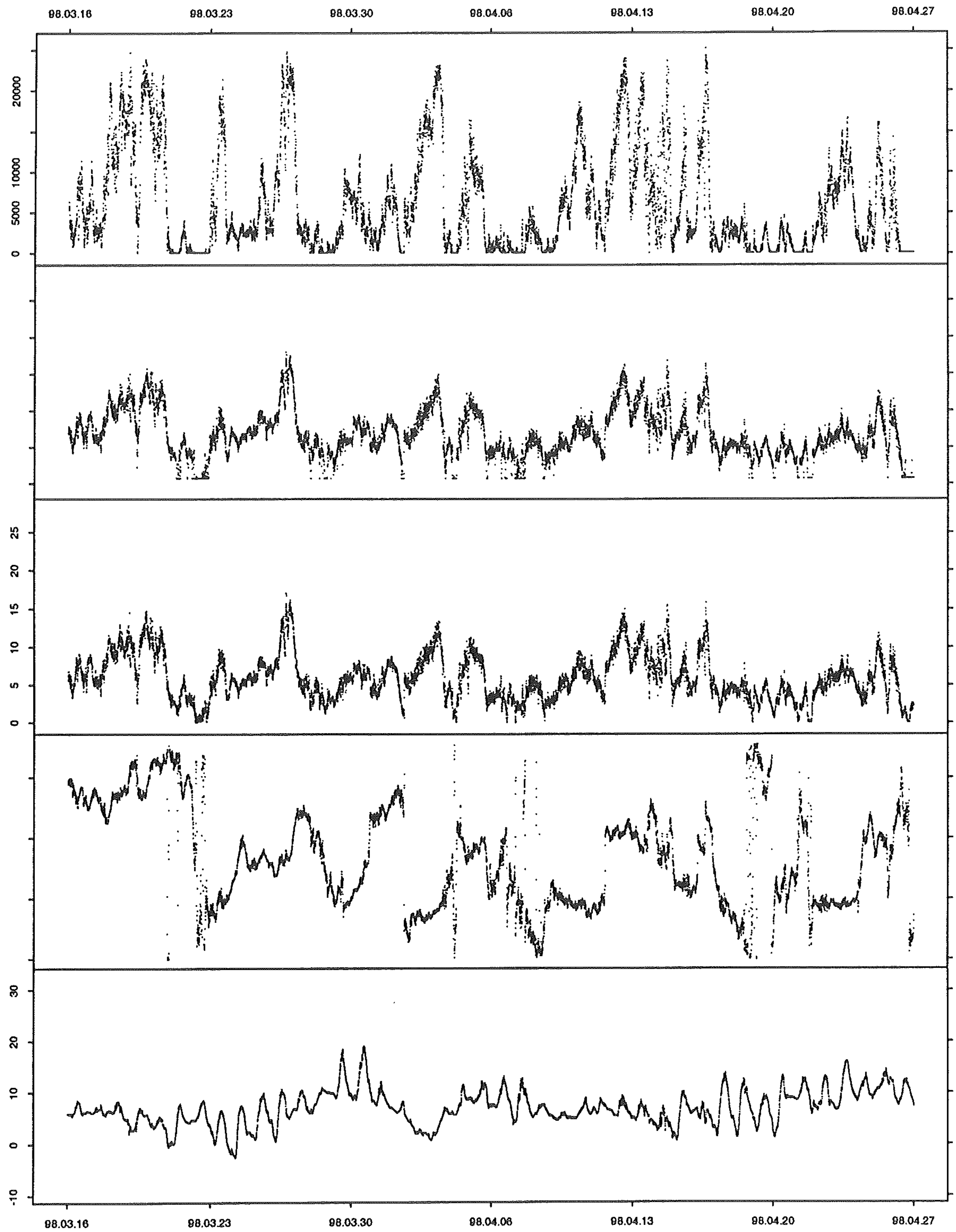

Figure B.35: *(Rejsby) The wind farm measurements in the period from 98.03.16 to 98.04.27 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

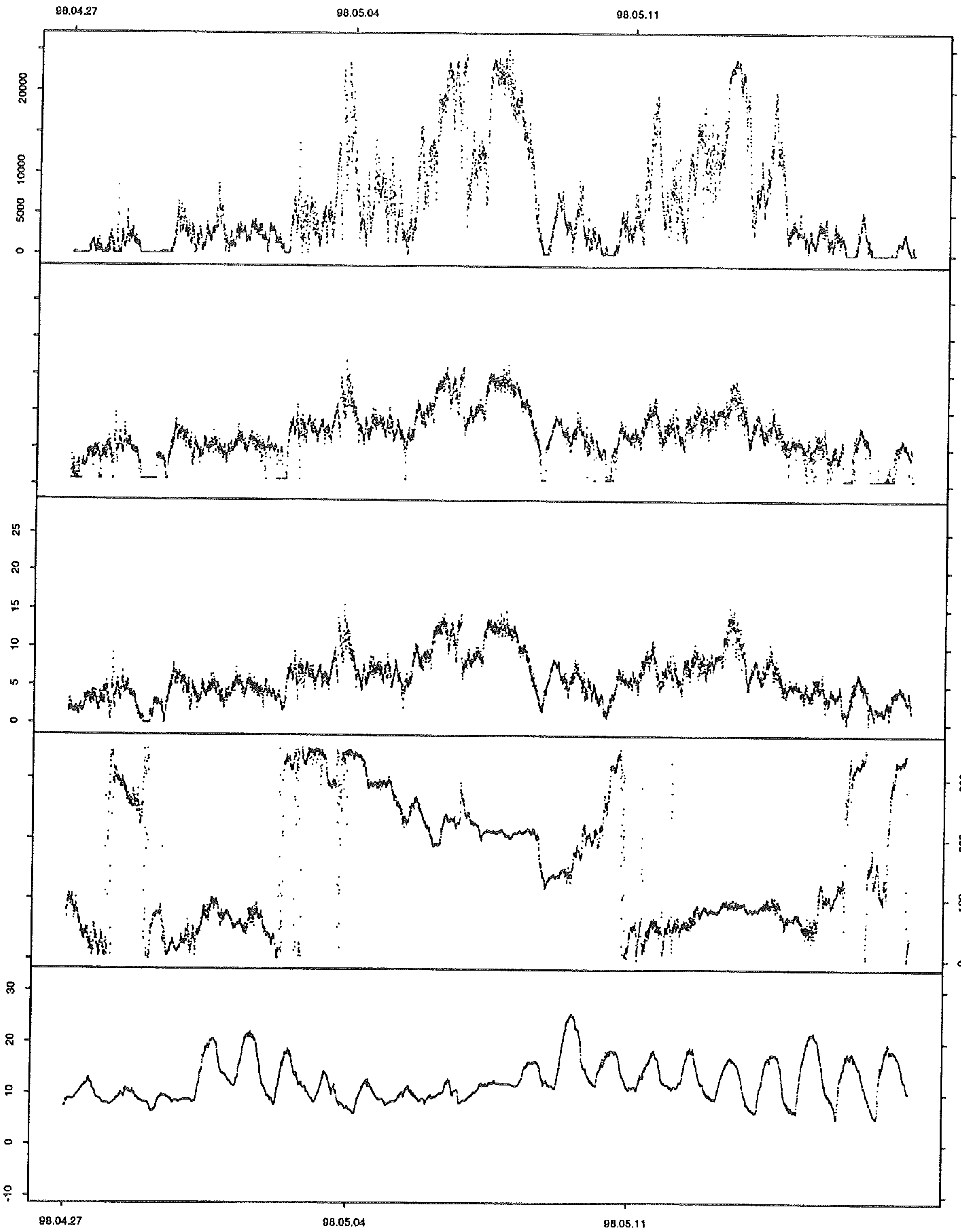

Figure B.36: *(Rejsby) The wind farm measurements in the period from 98.04.27 to 98.05.17 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

B.5 Sydthy

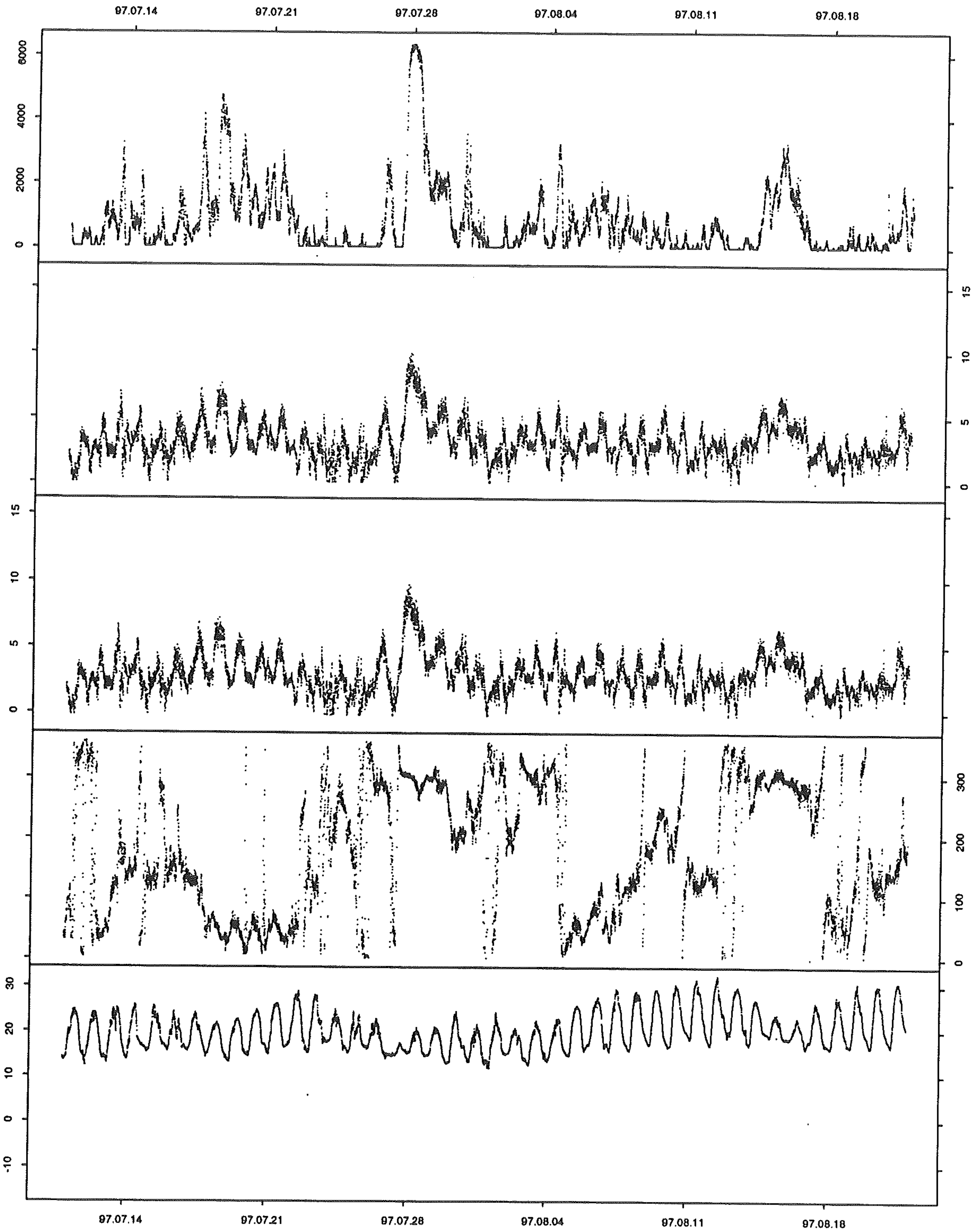

Figure B.37: *(Sydthy) The wind farm measurements in the period from 97.07.11 to 97.08.22 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

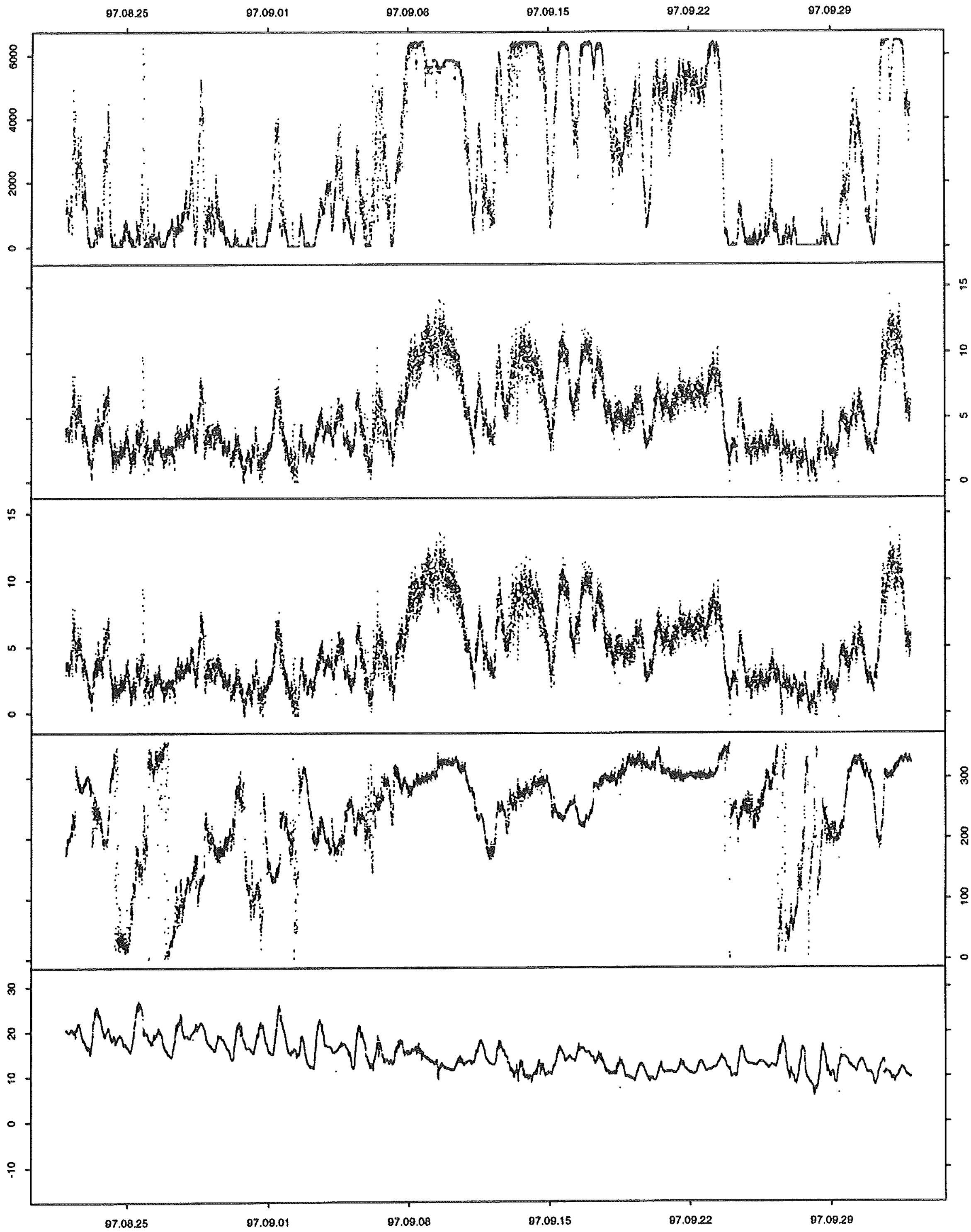

Figure B.38: *(Sydthy) The wind farm measurements in the period from 97.08.22 to 97.10.03 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

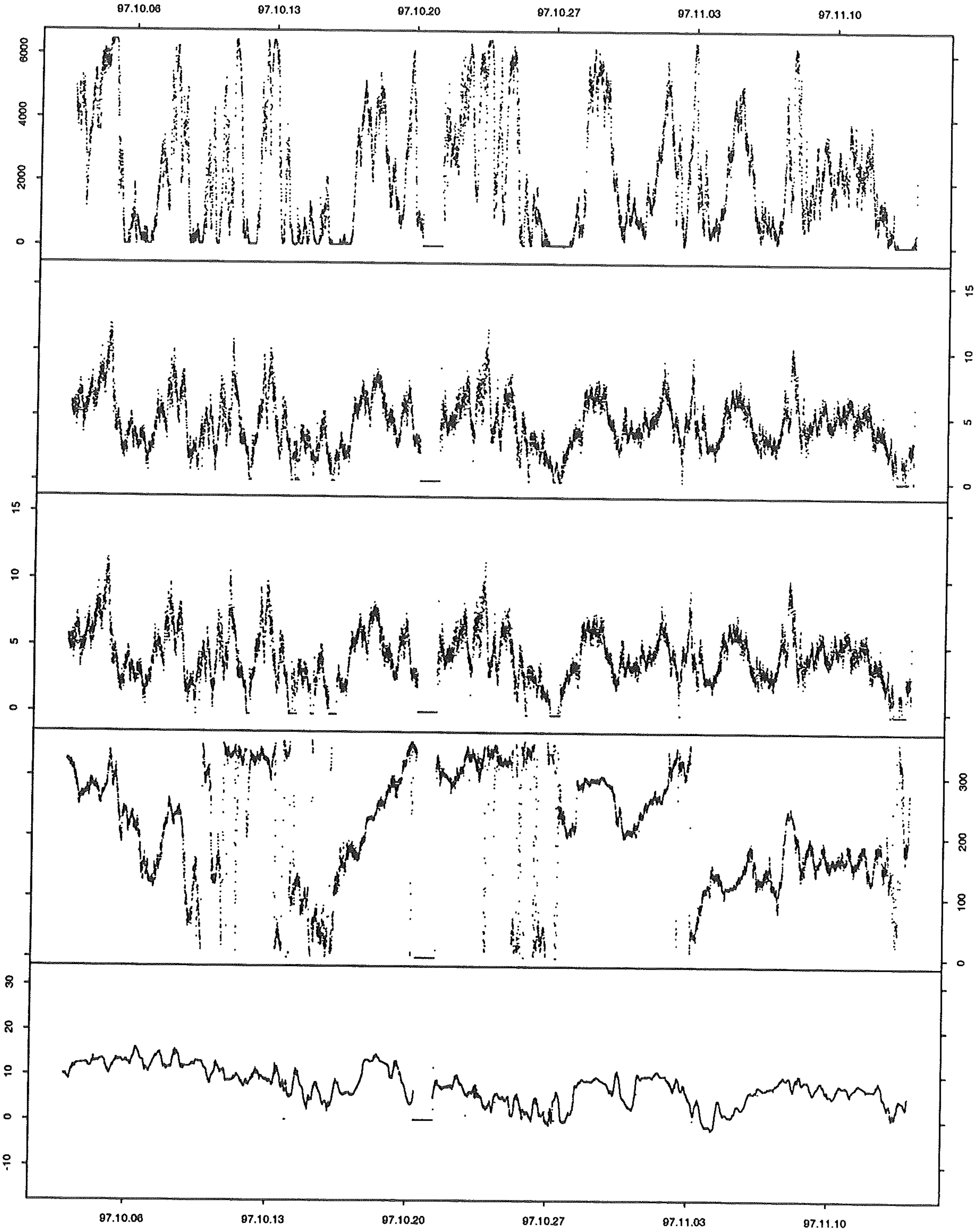

Figure B.39: *(Sydthy) The wind farm measurements in the period from 97.10.03 to 97.11.14 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

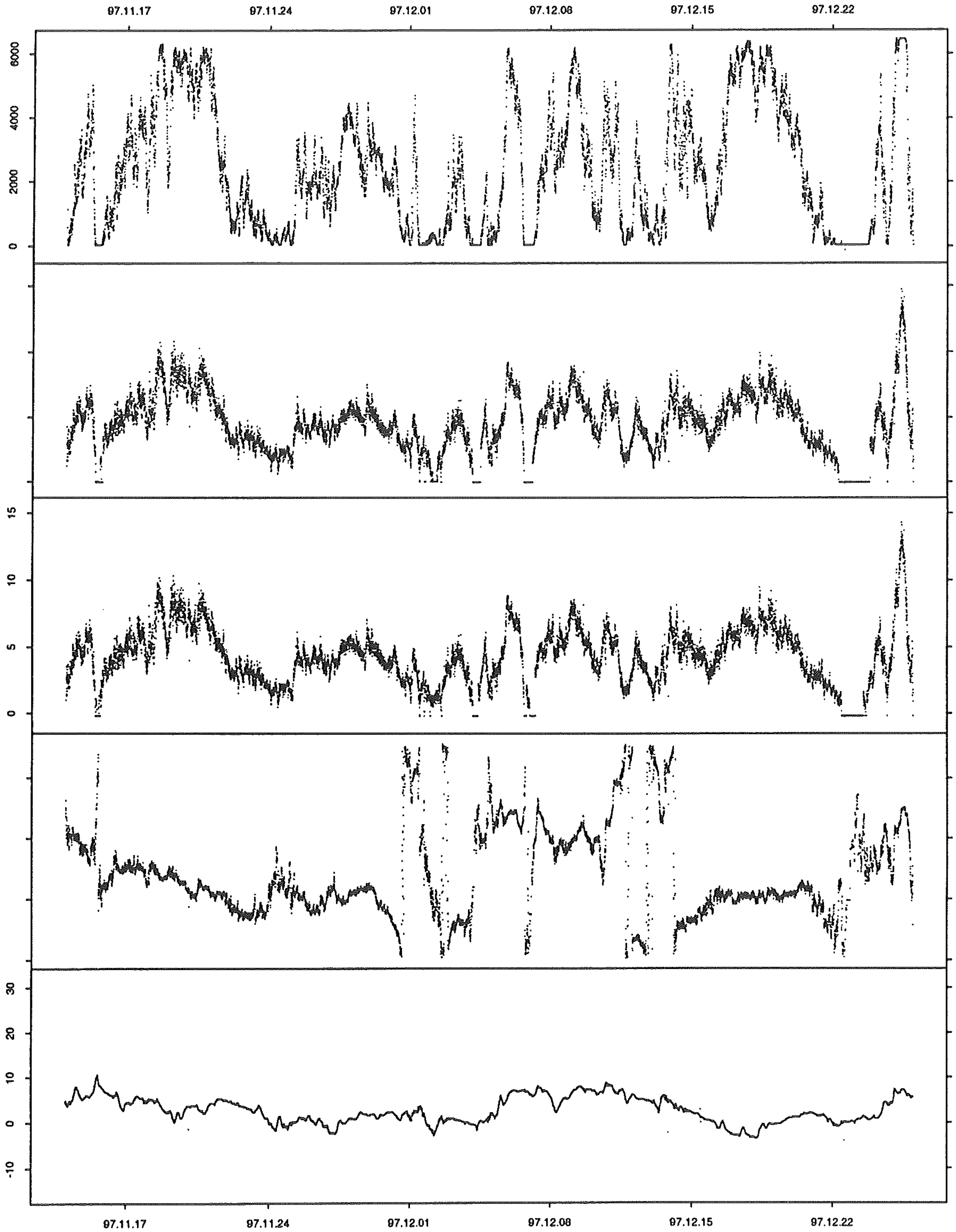

Figure B.40: *(Sydthy) The wind farm measurements in the period from 97.11.14 to 97.12.26 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

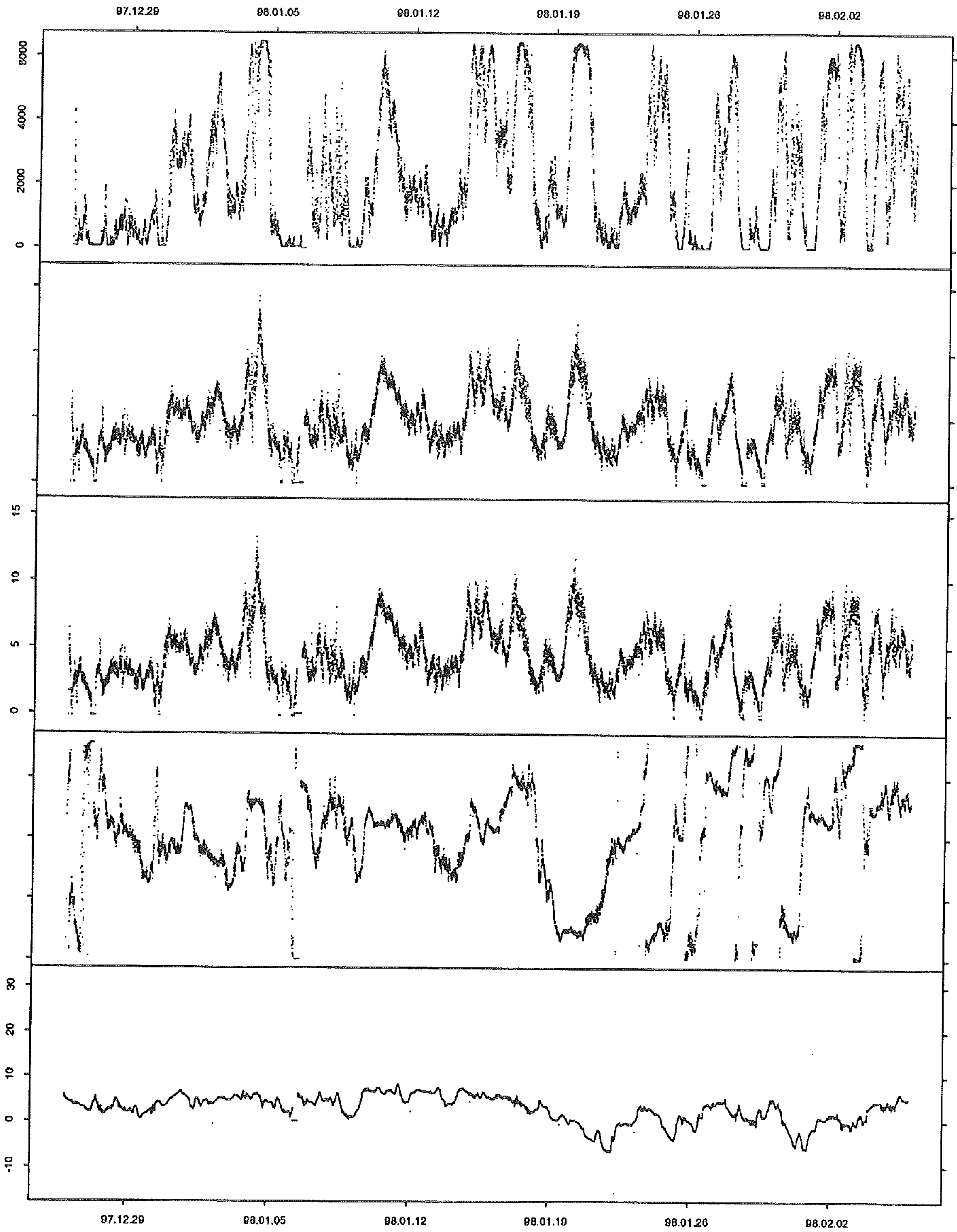

Figure B.41: *(Sydthy) The wind farm measurements in the period from 97.12.26 to 98.02.06 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

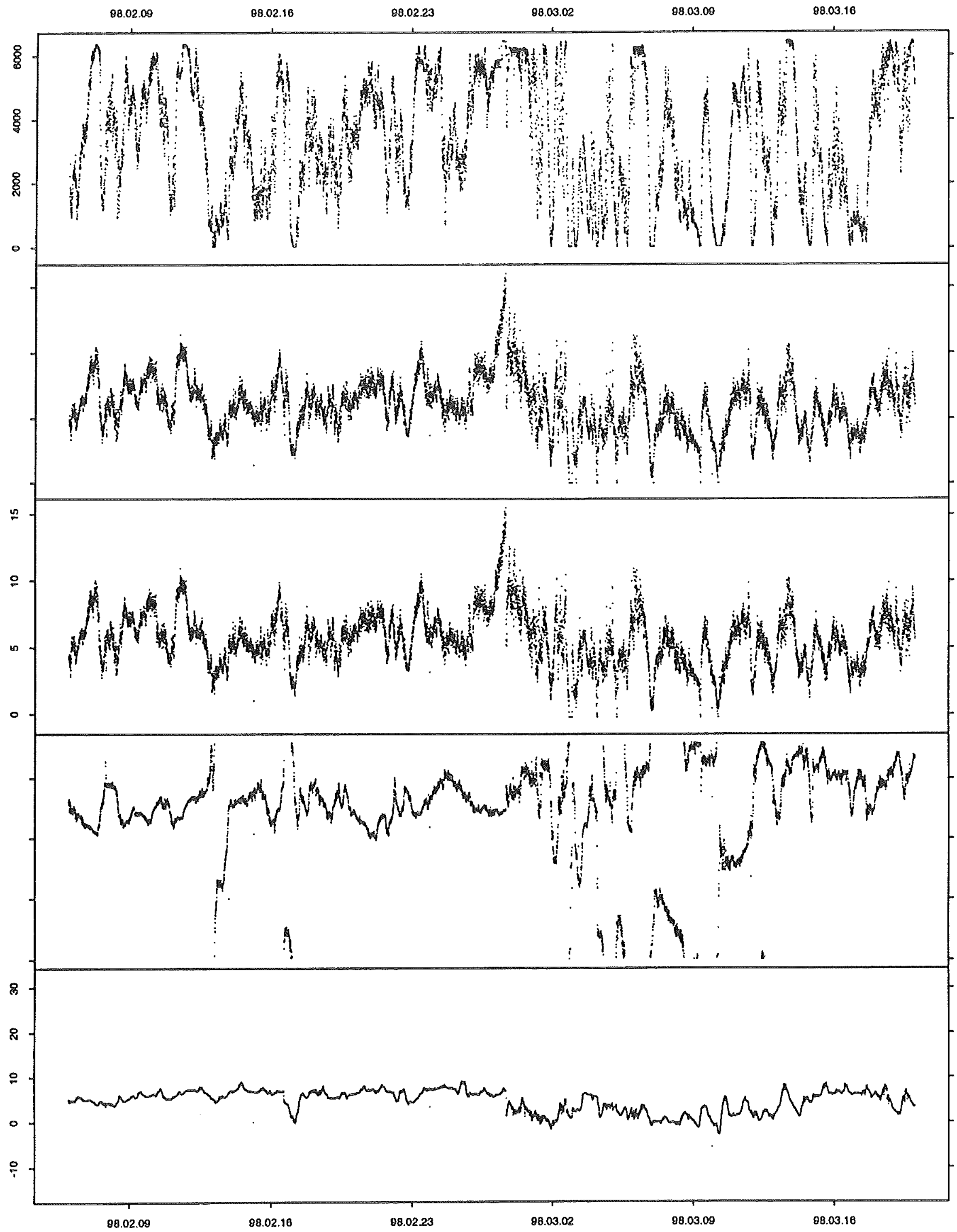

Figure B.42: *(Sydthy) The wind farm measurements in the period from 98.02.06 to 98.03.20 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

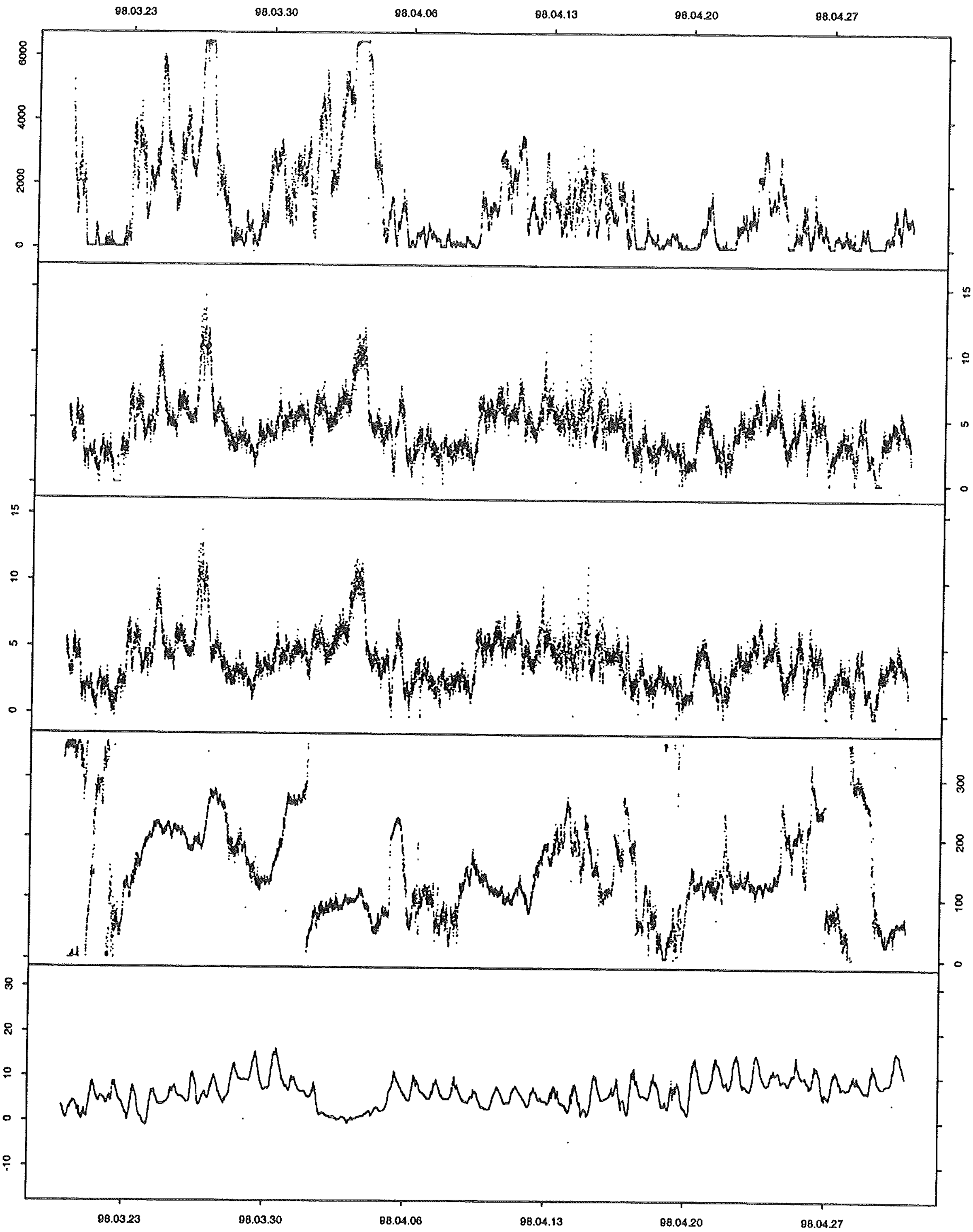

Figure B.43: *(Sydthy) The wind farm measurements in the period from 98.03.20 to 98.05.01 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

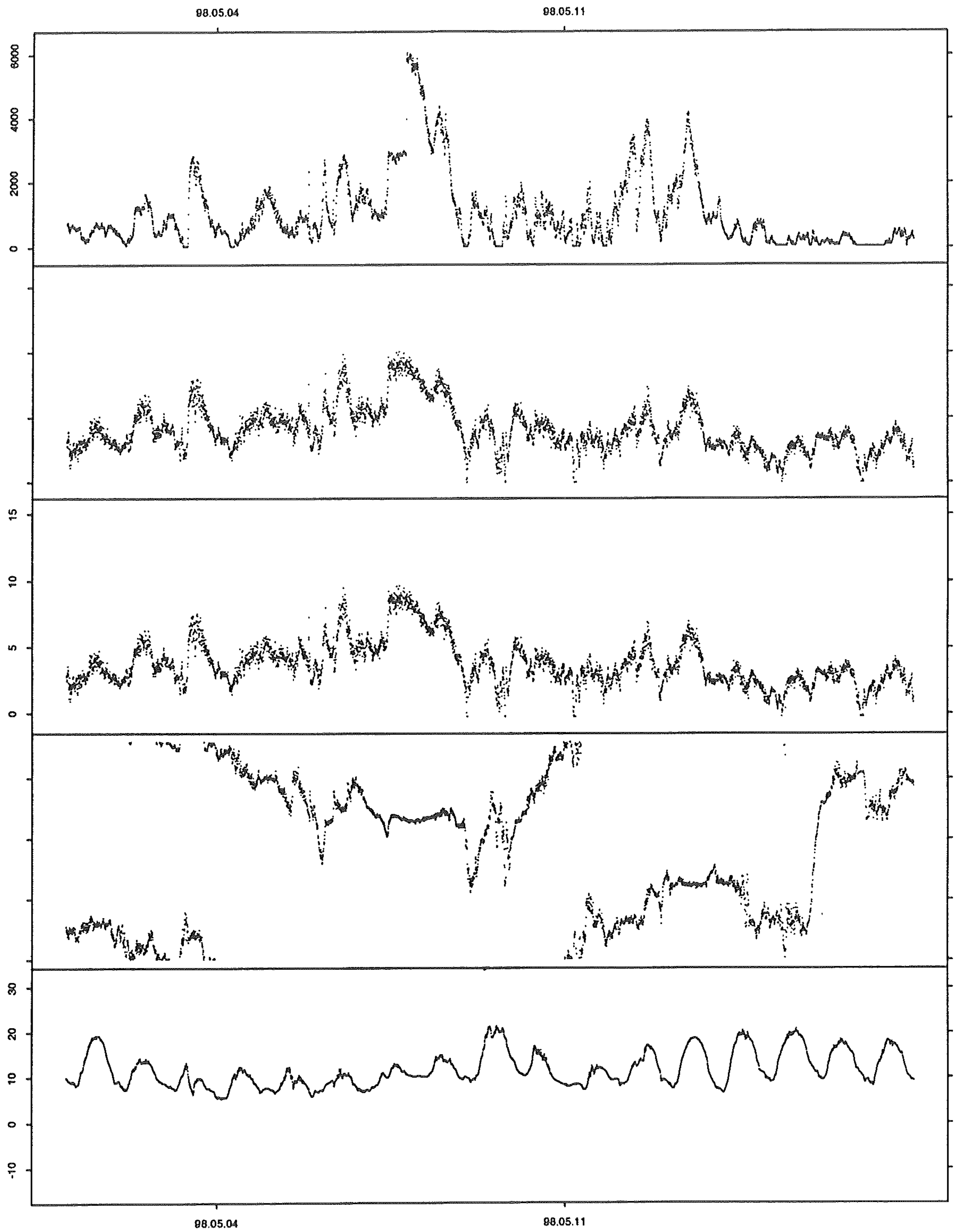

Figure B.44: *(Sydthy) The wind farm measurements in the period from 98.05.01 to 98.05.17 plotted as 5 minute average values. From top row to bottom row the plots show wind power [kW], wind speed 1 and 2 [m/s], wind direction [°] and ambient air temperature [°C].*

Appendix C

Meteorological data

C.1 Dræby

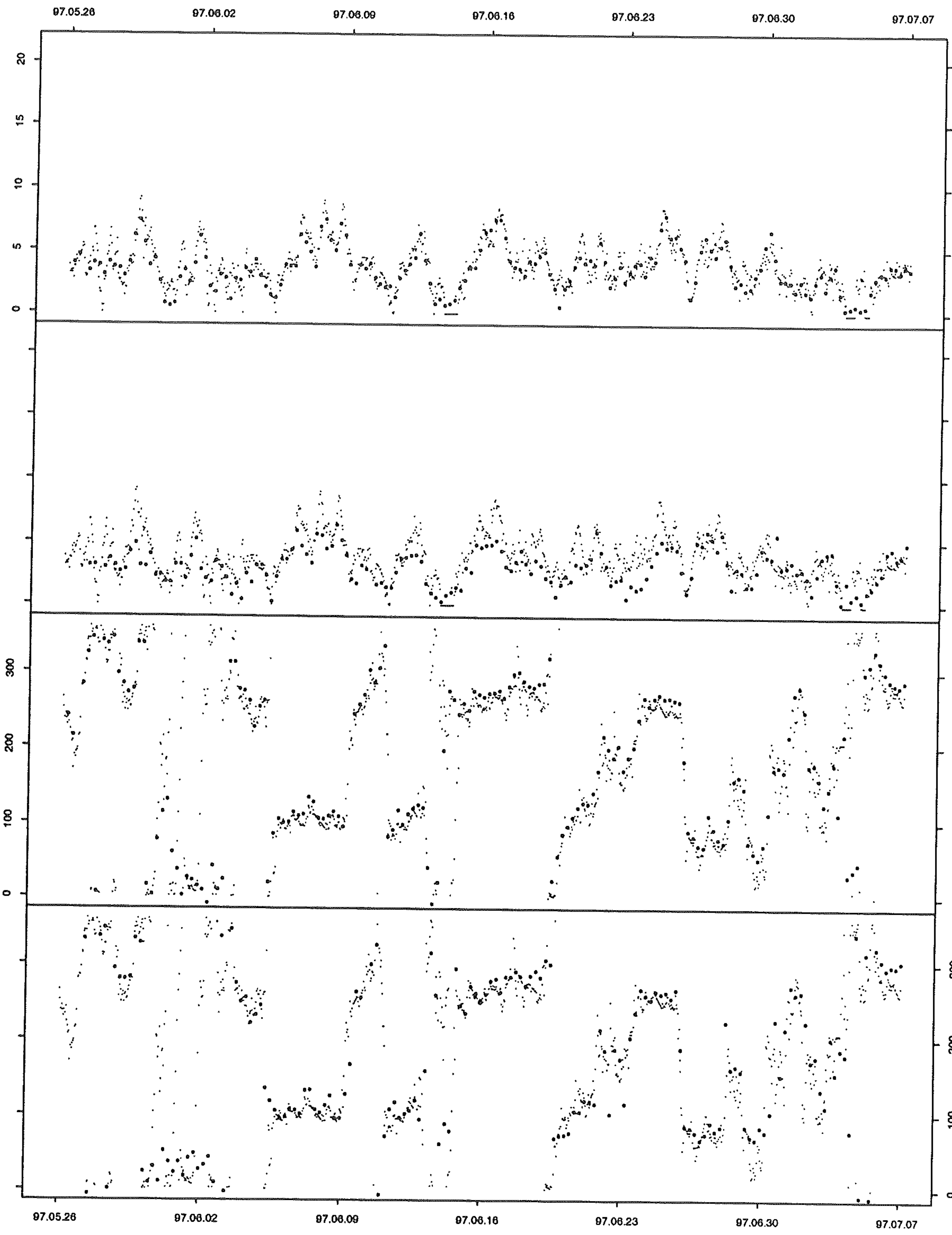

Figure C.1: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.05.26 to 97.07.07. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

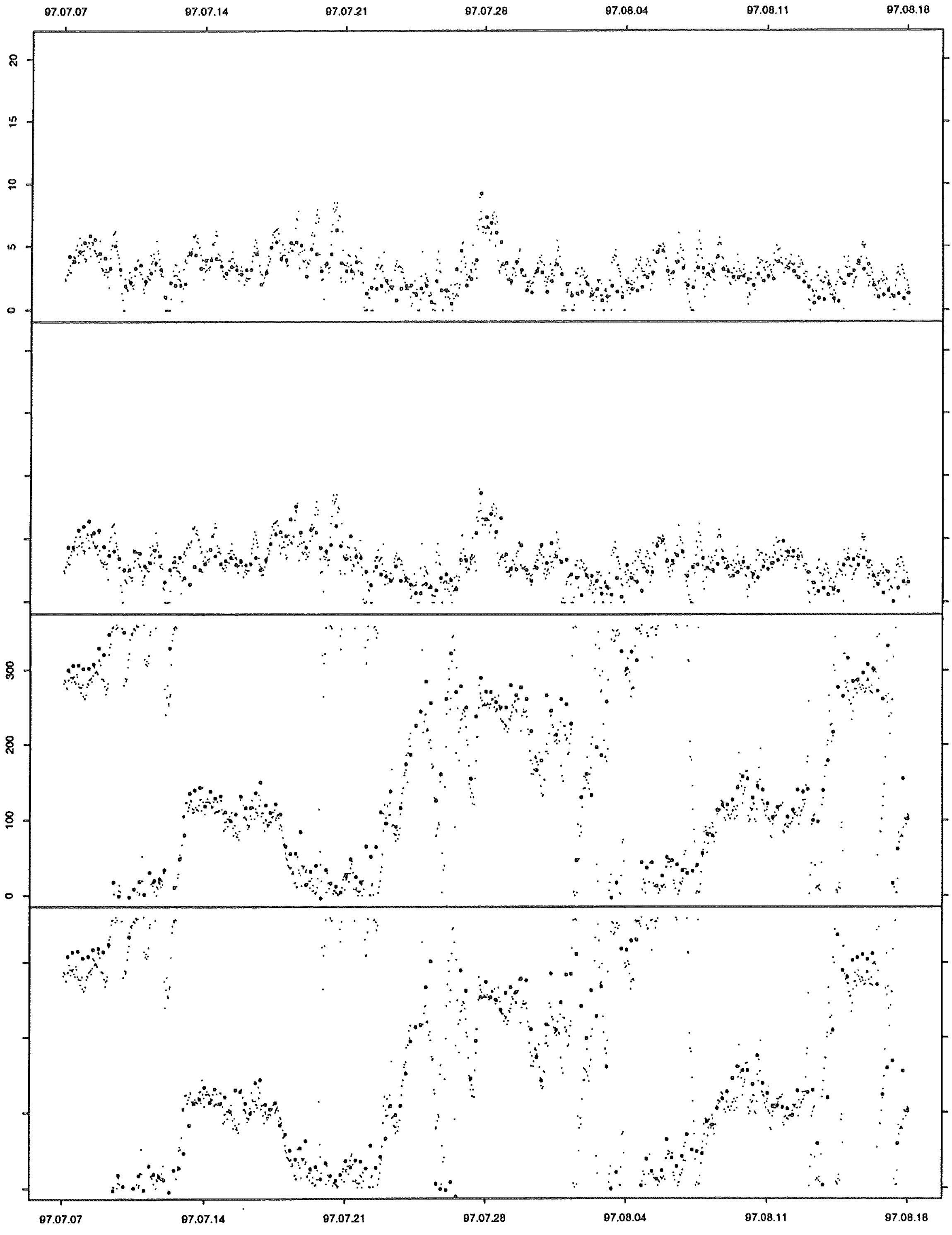

Figure C.2: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.07.07 to 97.08.18. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

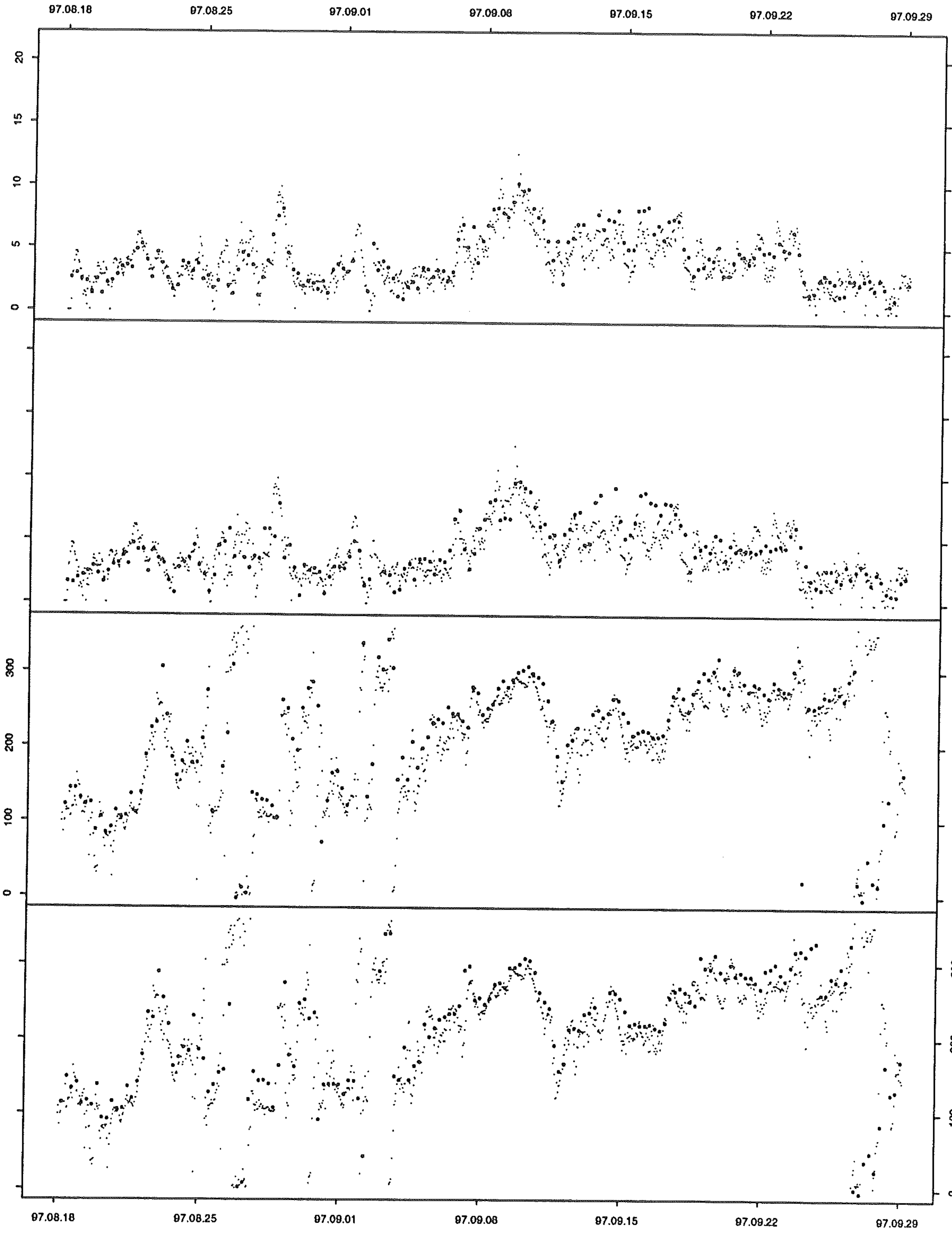

Figure C.3: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.08.18 to 97.09.29. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

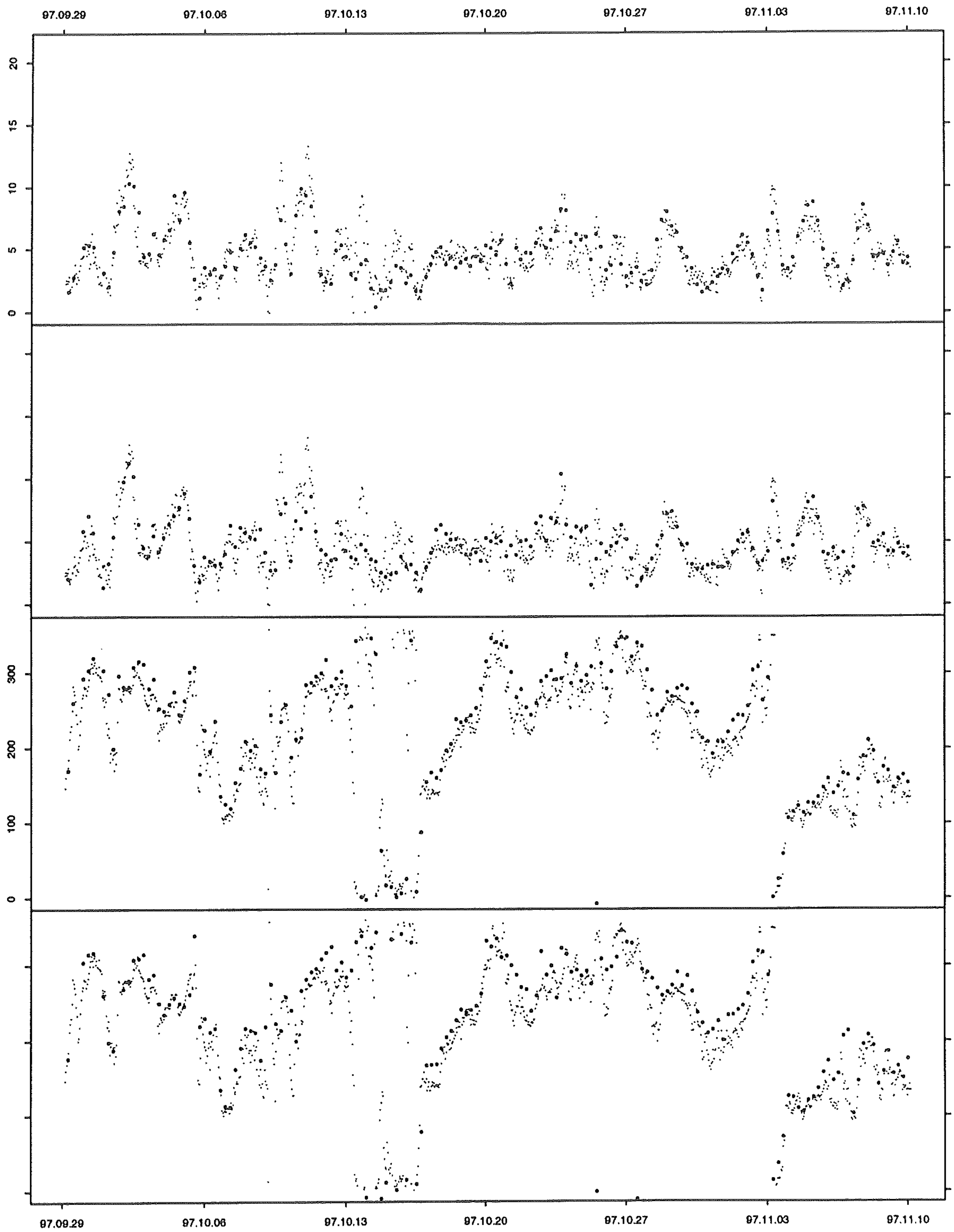

Figure C.4: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.09.29 to 97.11.10. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

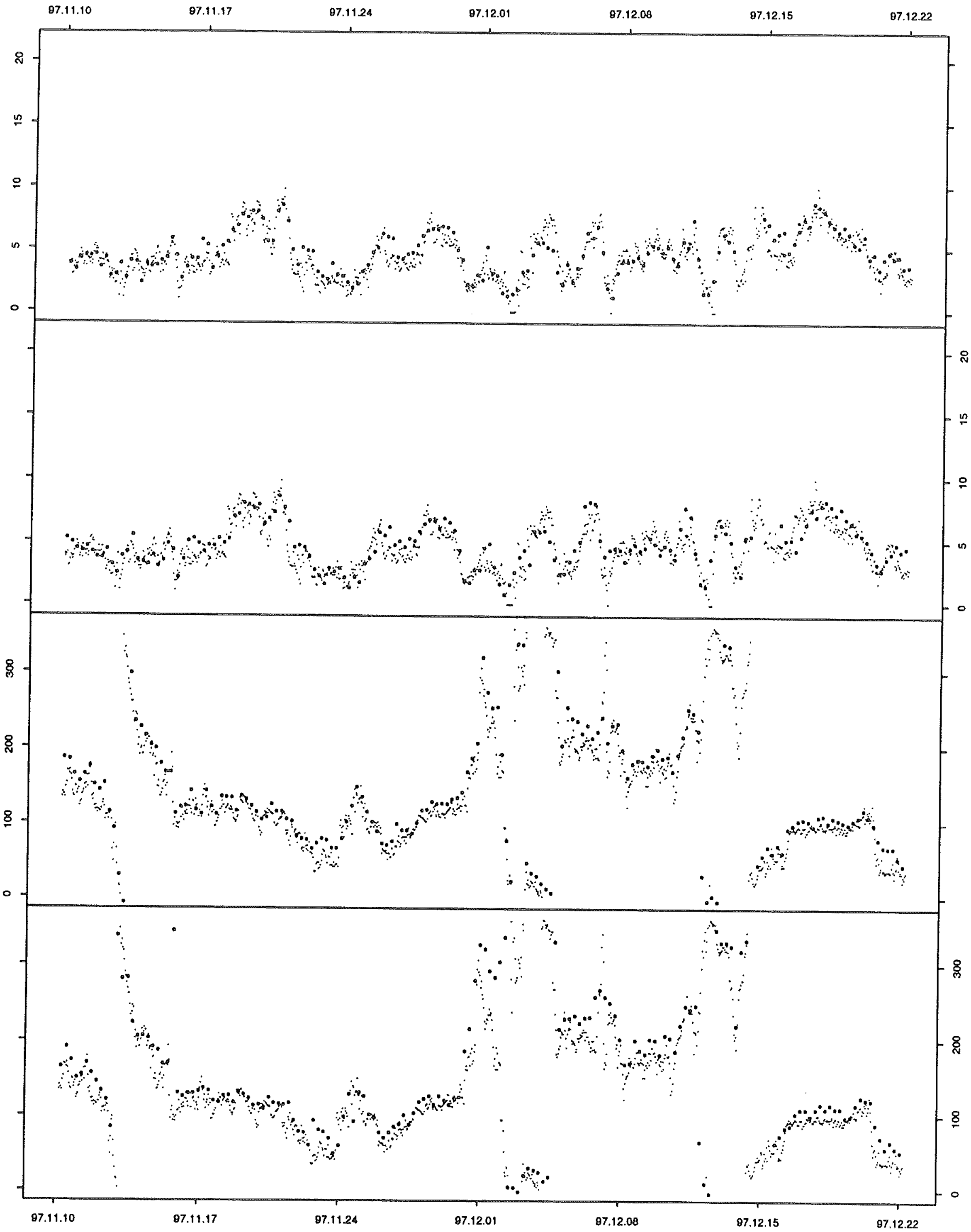

Figure C.5: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.11.10 to 97.12.22. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

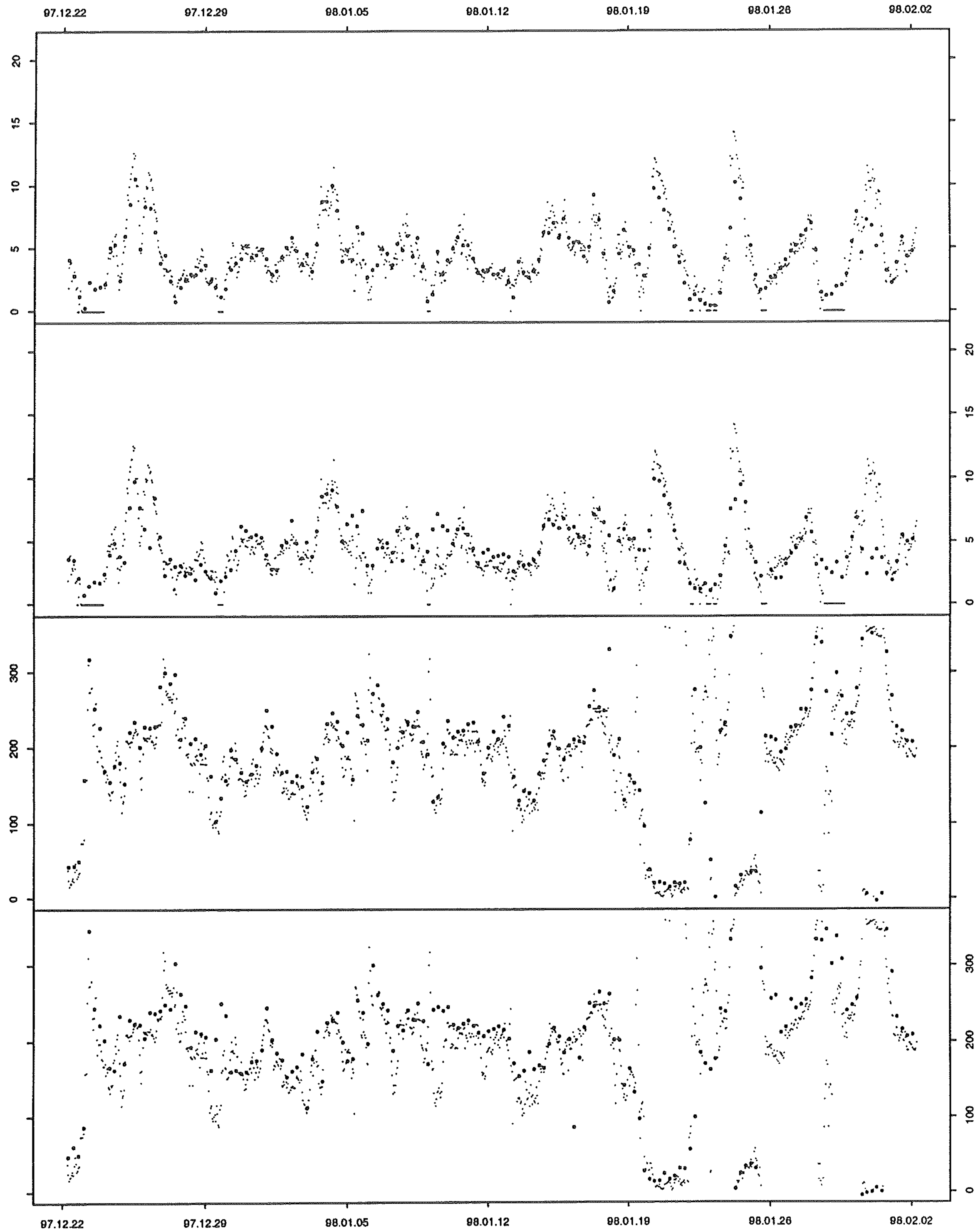

Figure C.6: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.12.22 to 98.02.02. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [*m/s*]*, observed wind speed and the 24 hour forecast* [*m/s*]*, observed wind direction and the analysis* [°]*, and observed wind direction and the 24 hour forecast* [°].

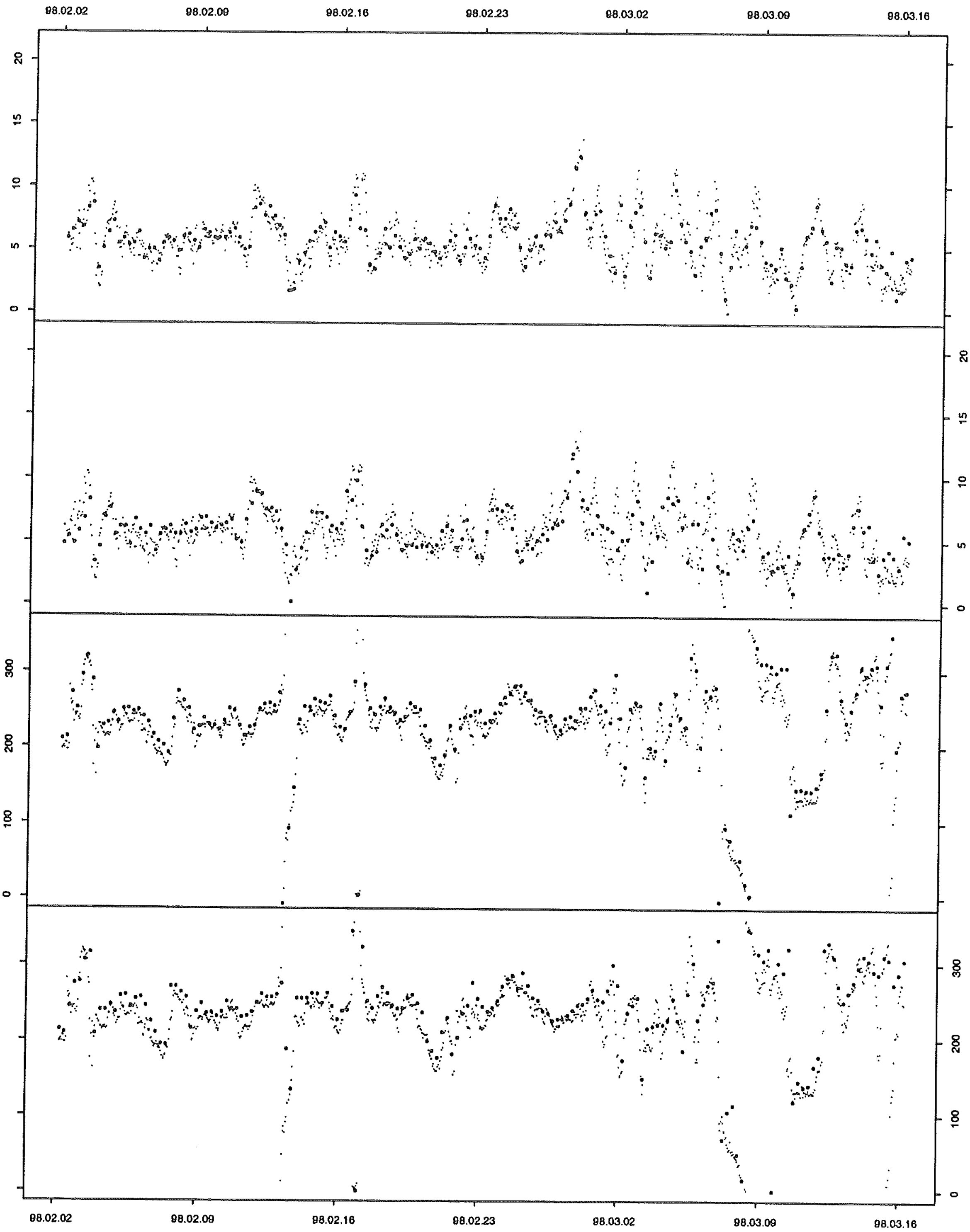

Figure C.7: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.02.02 to 98.03.16. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

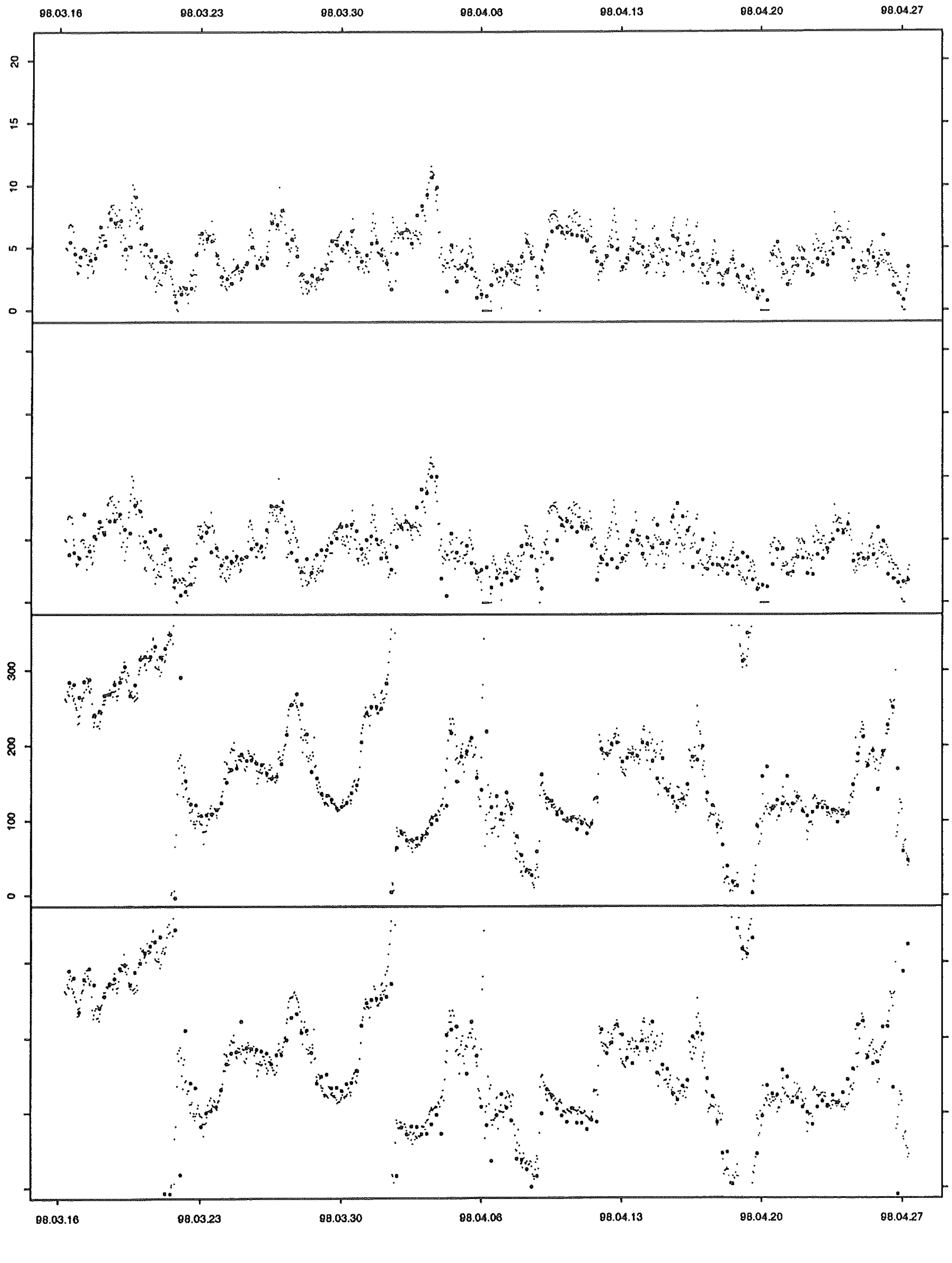

Figure C.8: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.03.16 to 98.04.27. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

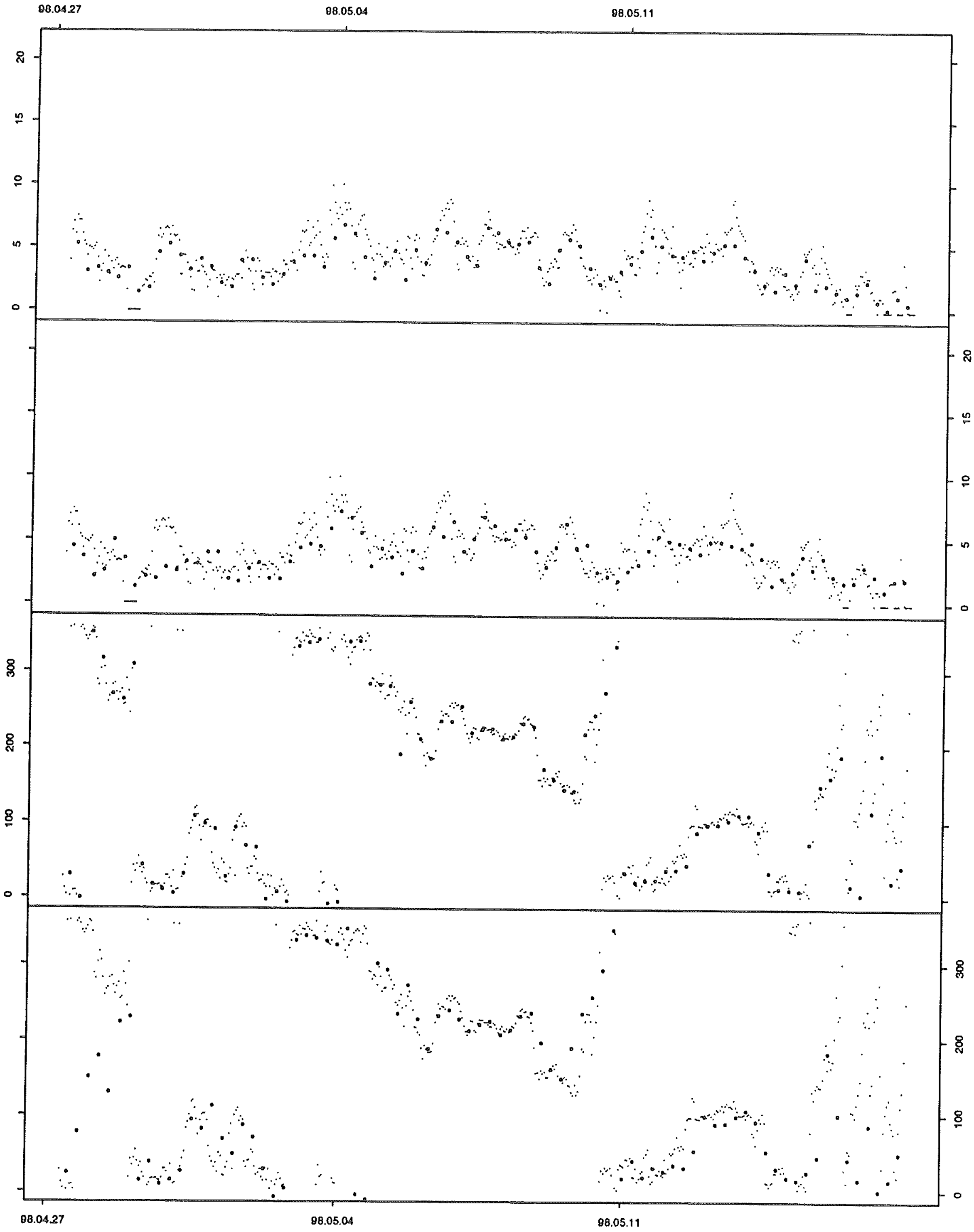

Figure C.9: *(Dræby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.04.27 to 98.05.17. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

C.2 Fjaldene

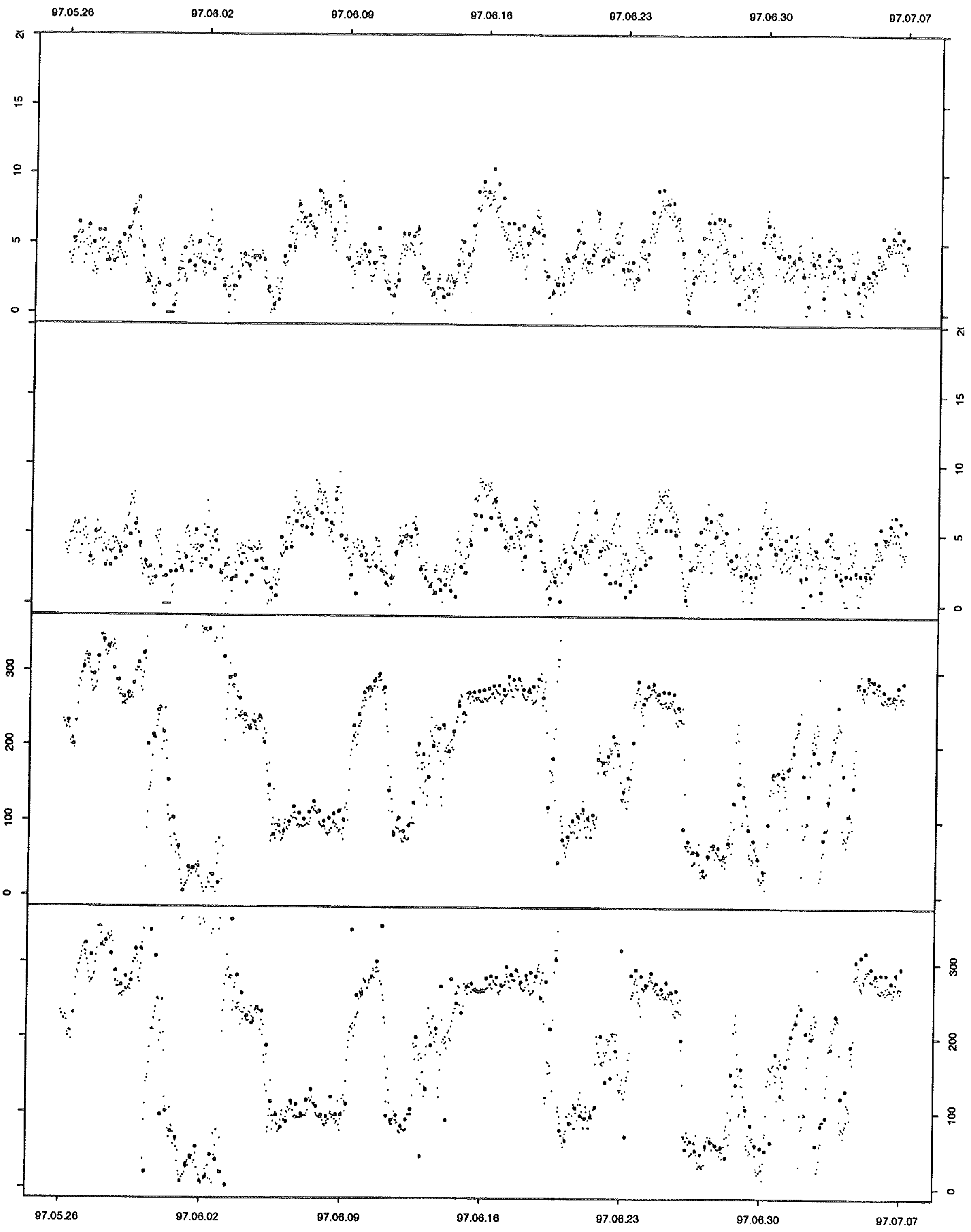

Figure C.10: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.05.26 to 97.07.07. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

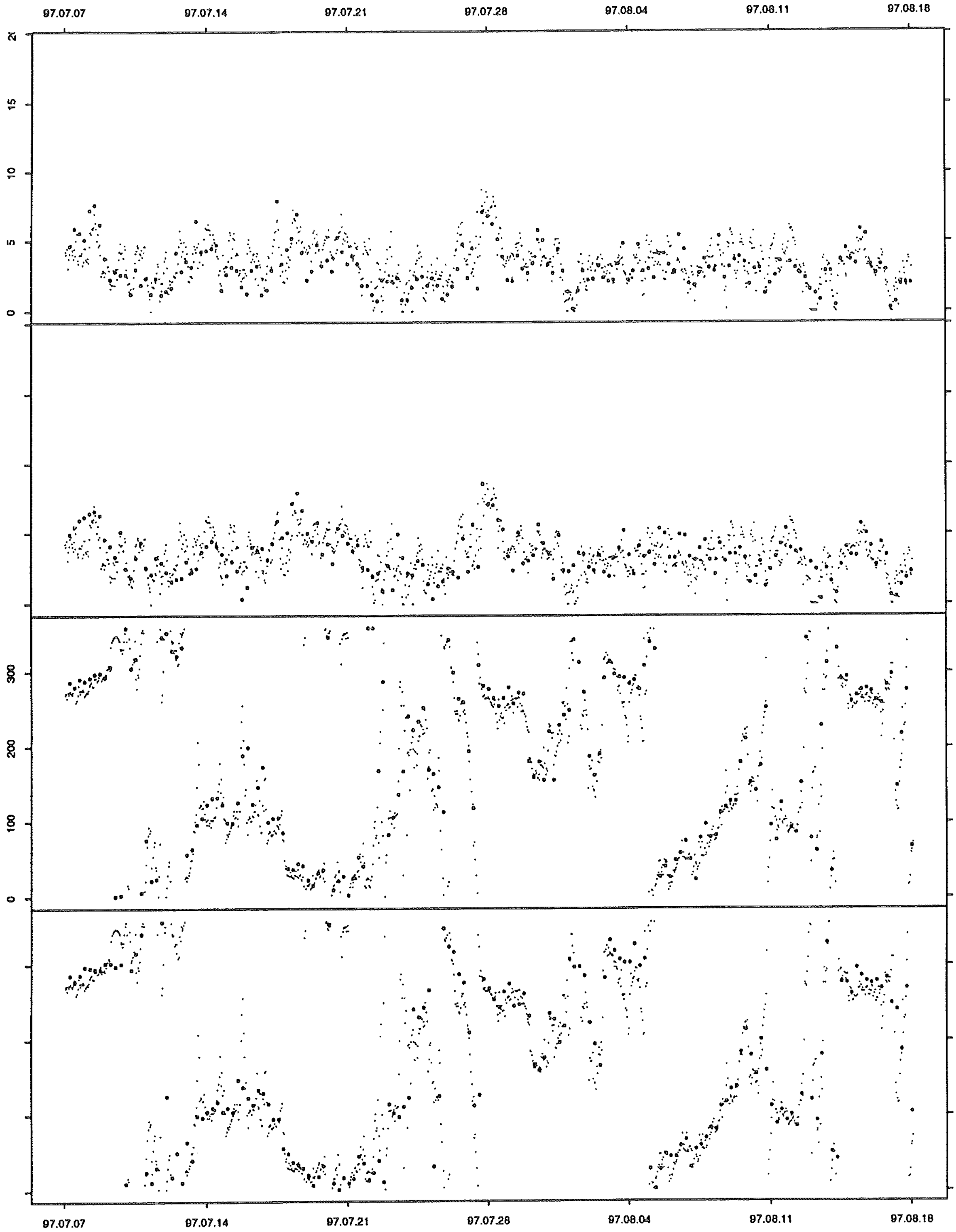

Figure C.11: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.07.07 to 97.08.18. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

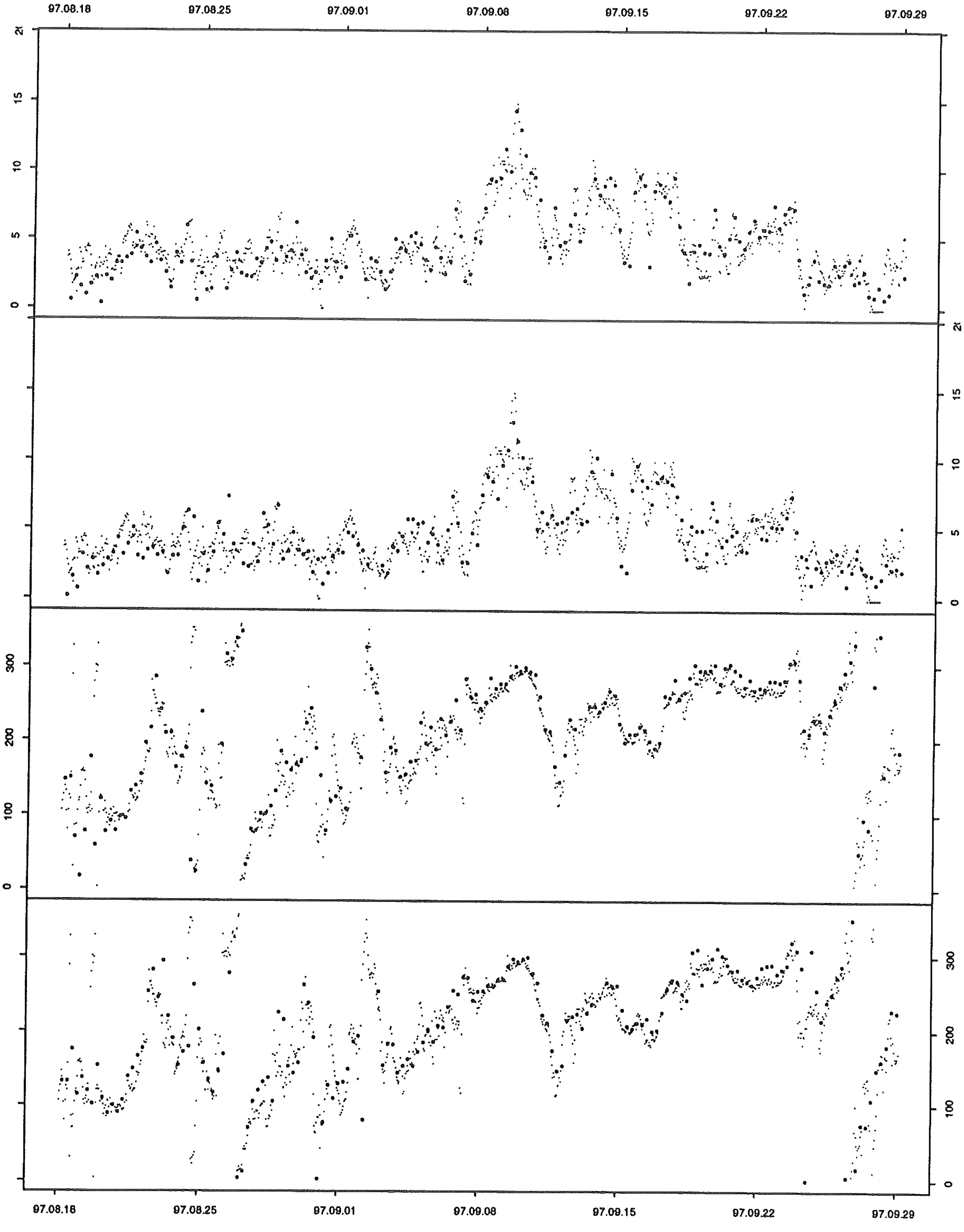

Figure C.12: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.08.18 to 97.09.29. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [m/s], *observed wind speed and the 24 hour forecast* [m/s], *observed wind direction and the analysis* [°], *and observed wind direction and the 24 hour forecast* [°].

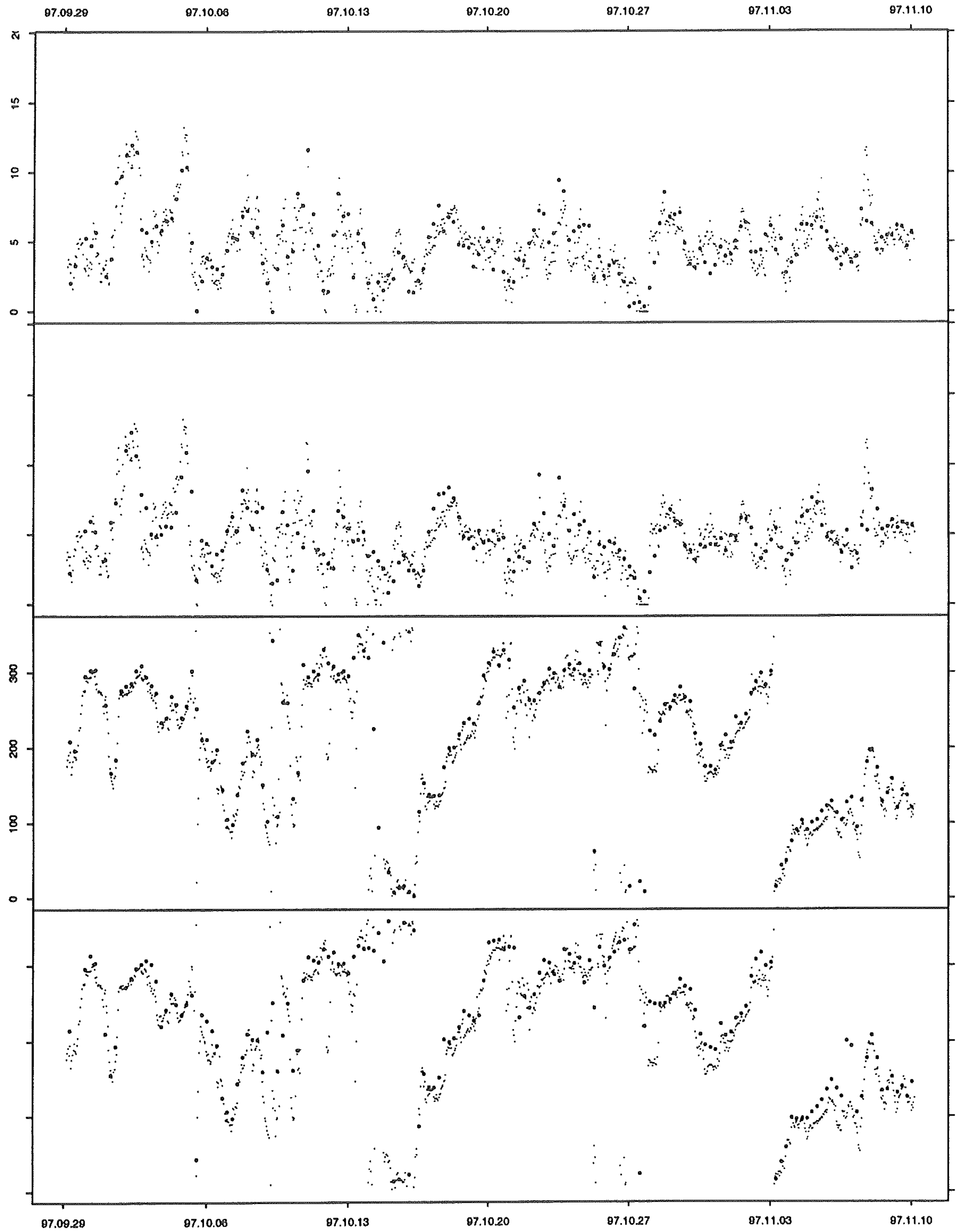

Figure C.13: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.09.29 to 97.11.10. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

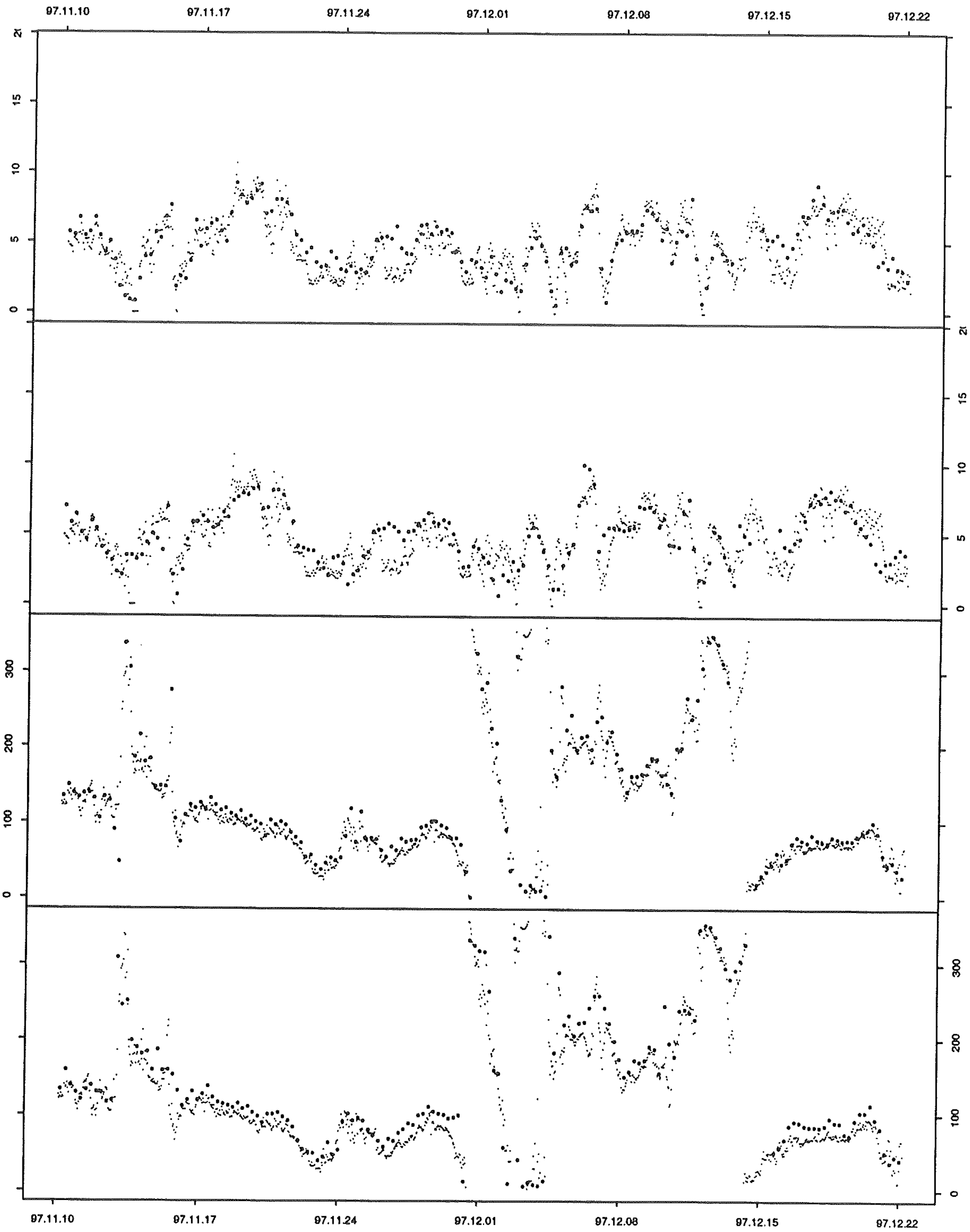

Figure C.14: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.11.10 to 97.12.22. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

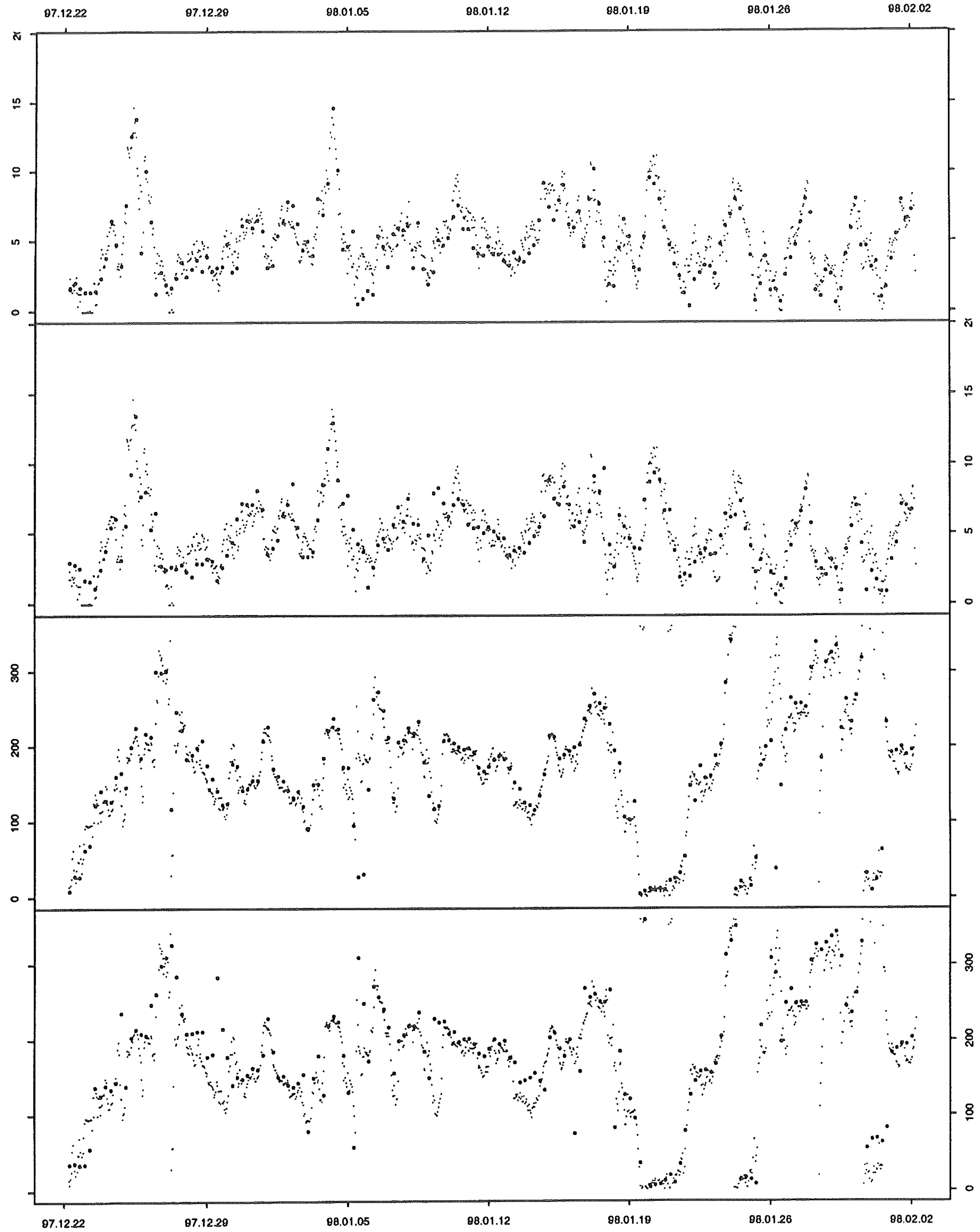

Figure C.15: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.12.22 to 98.02.02. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

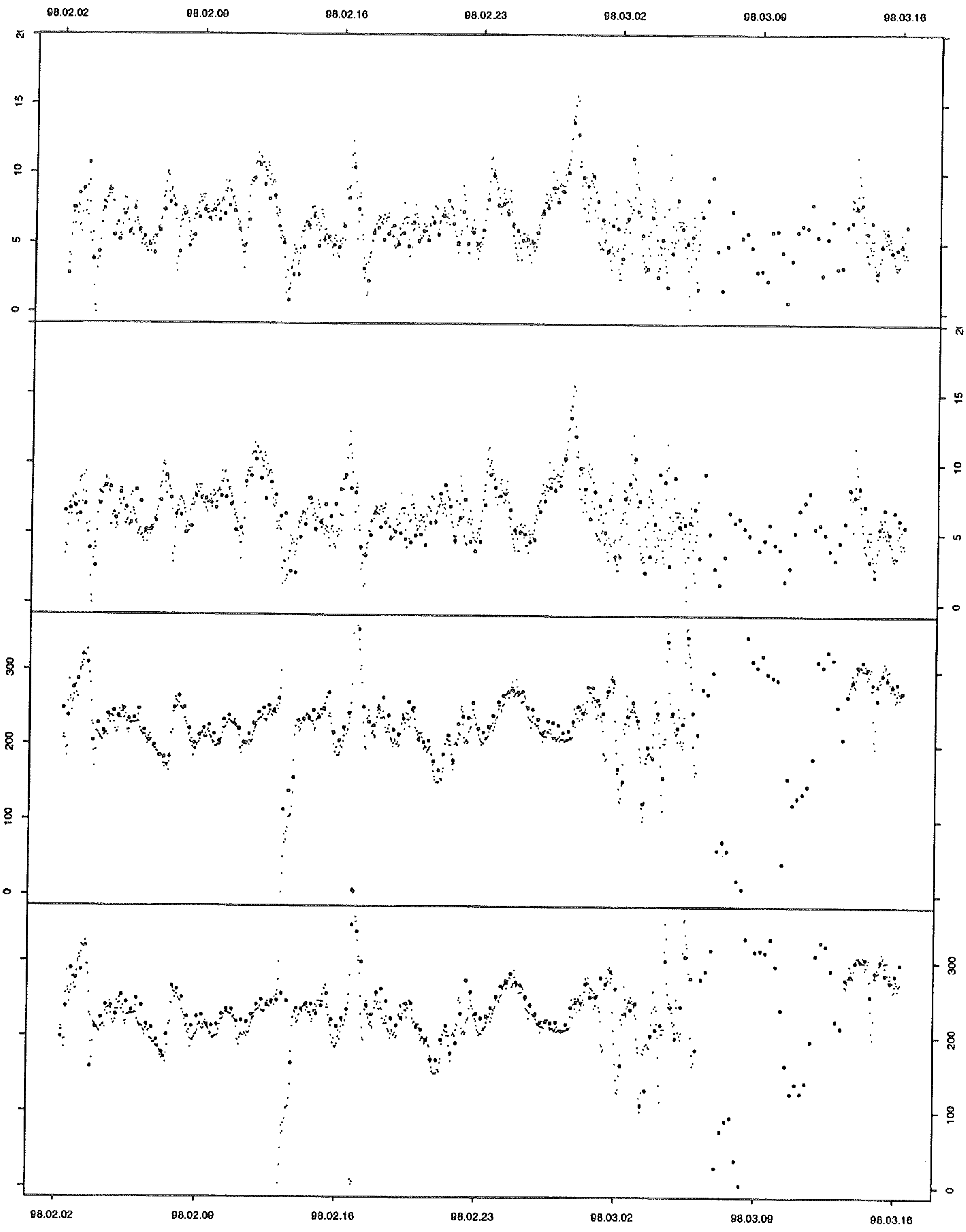

Figure C.16: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.02.02 to 98.03.16. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

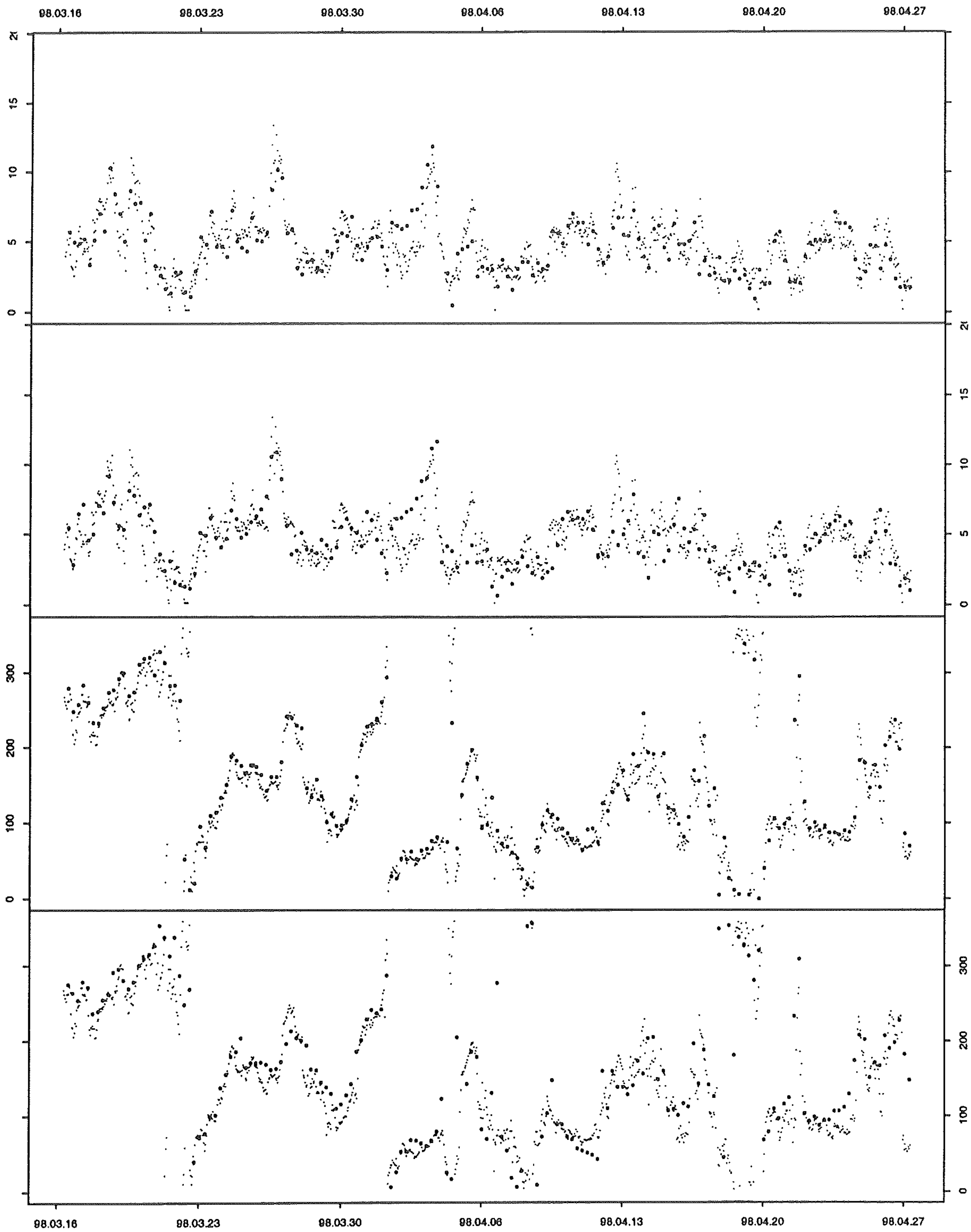

Figure C.17: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.03.16 to 98.04.27. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

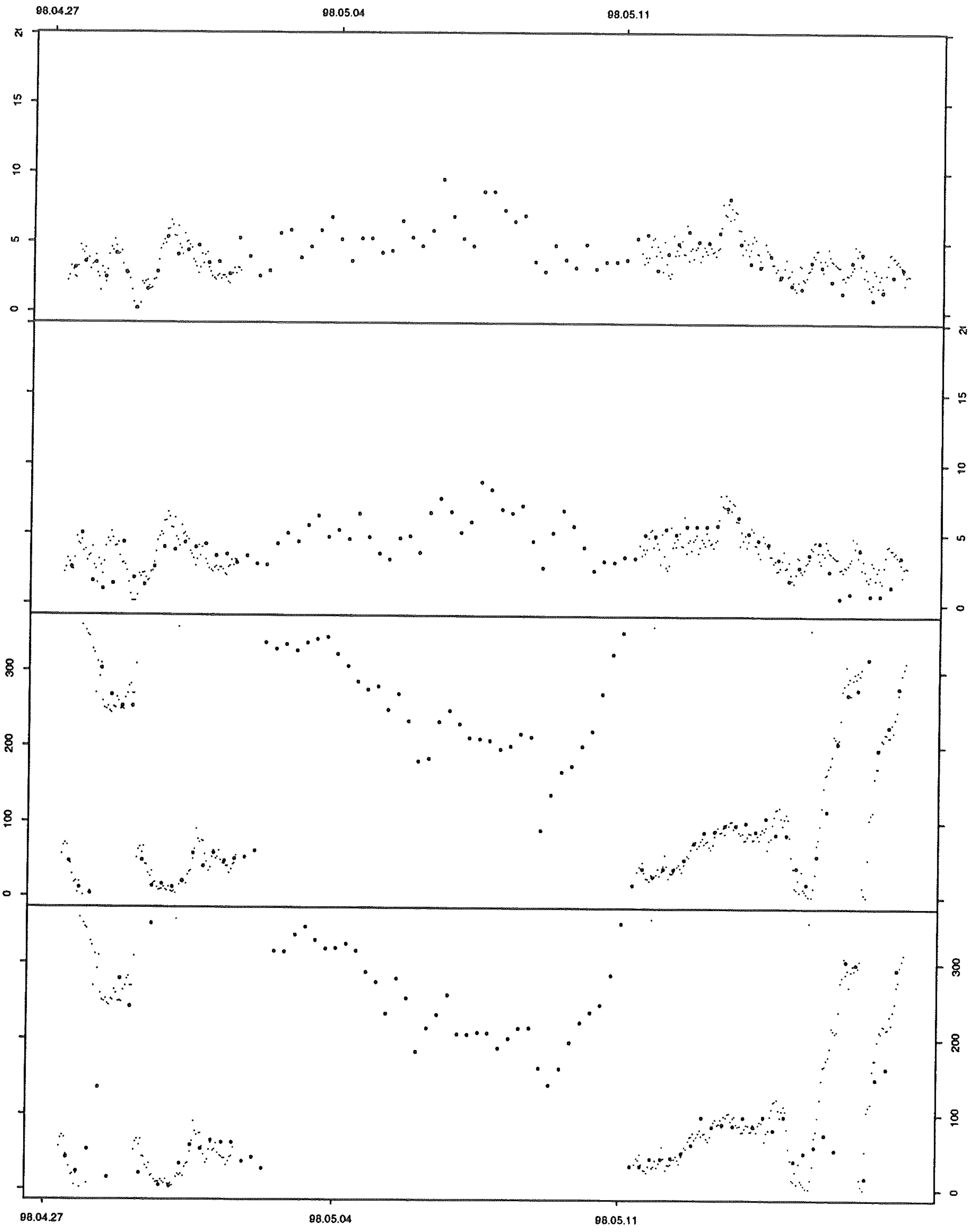

Figure C.18: *(Fjaldene) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.04.27 to 98.05.17. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

C.3 Hollandsbjerg

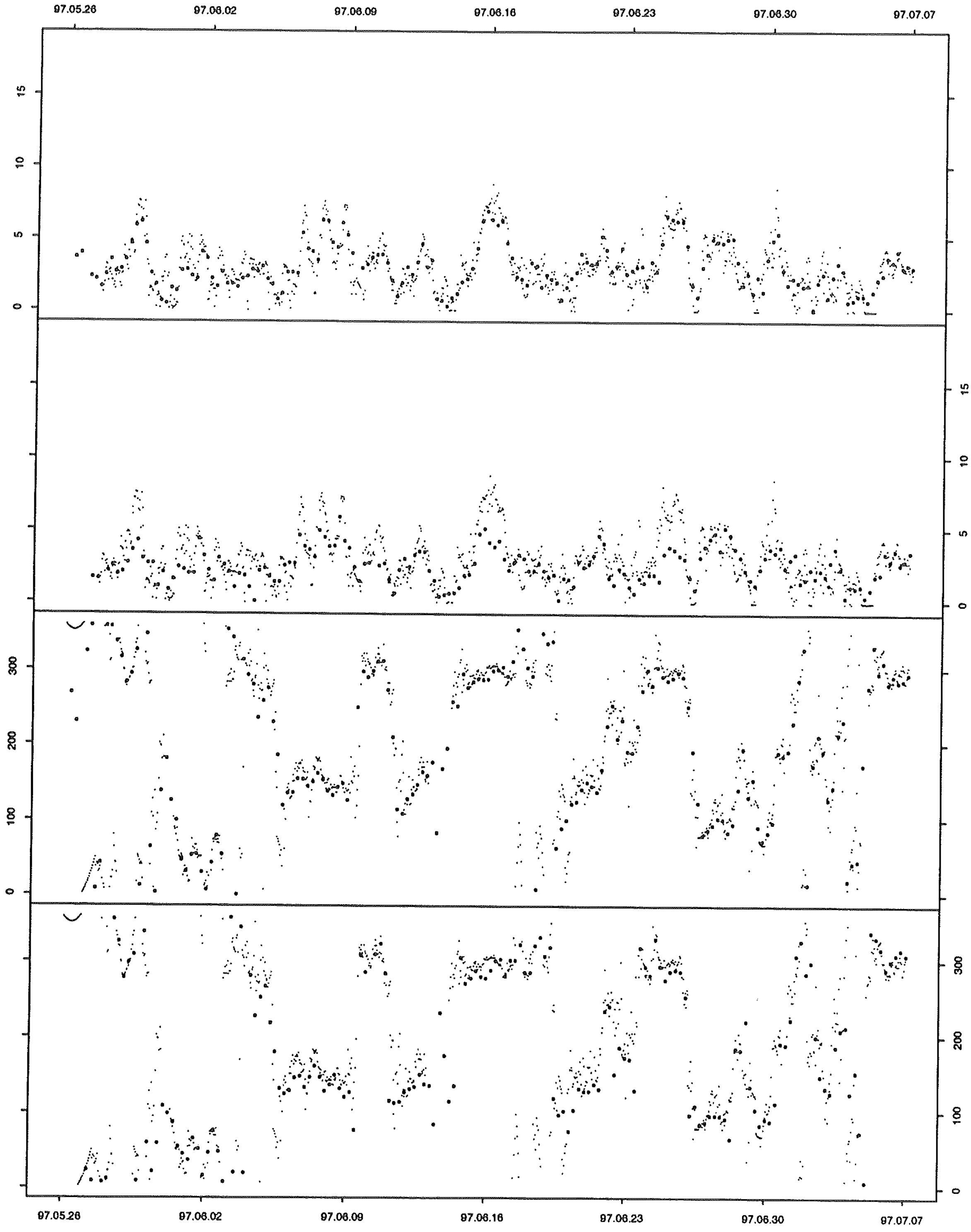

Figure C.19: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.05.26 to 97.07.07. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

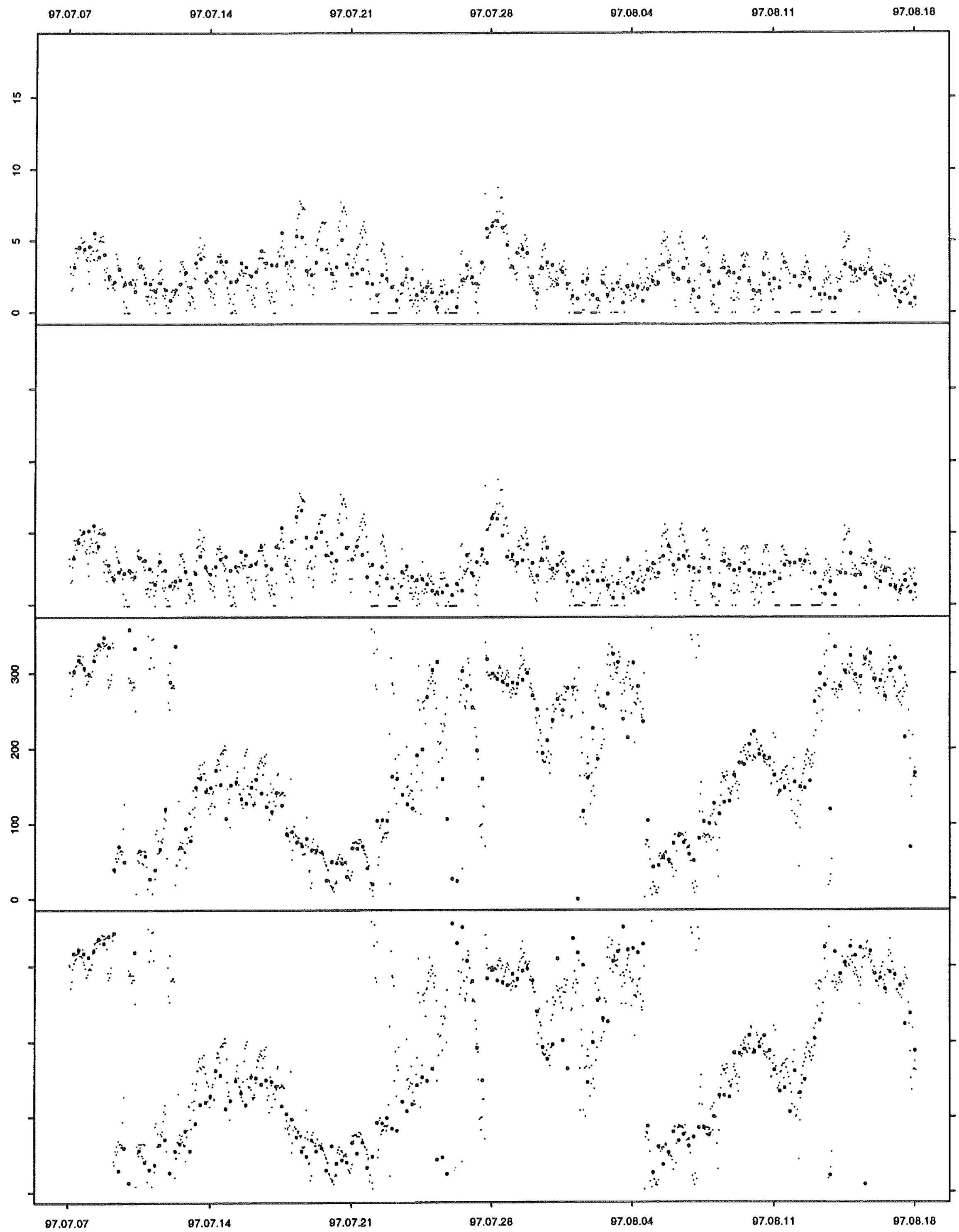

Figure C.20: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.07.07 to 97.08.18. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

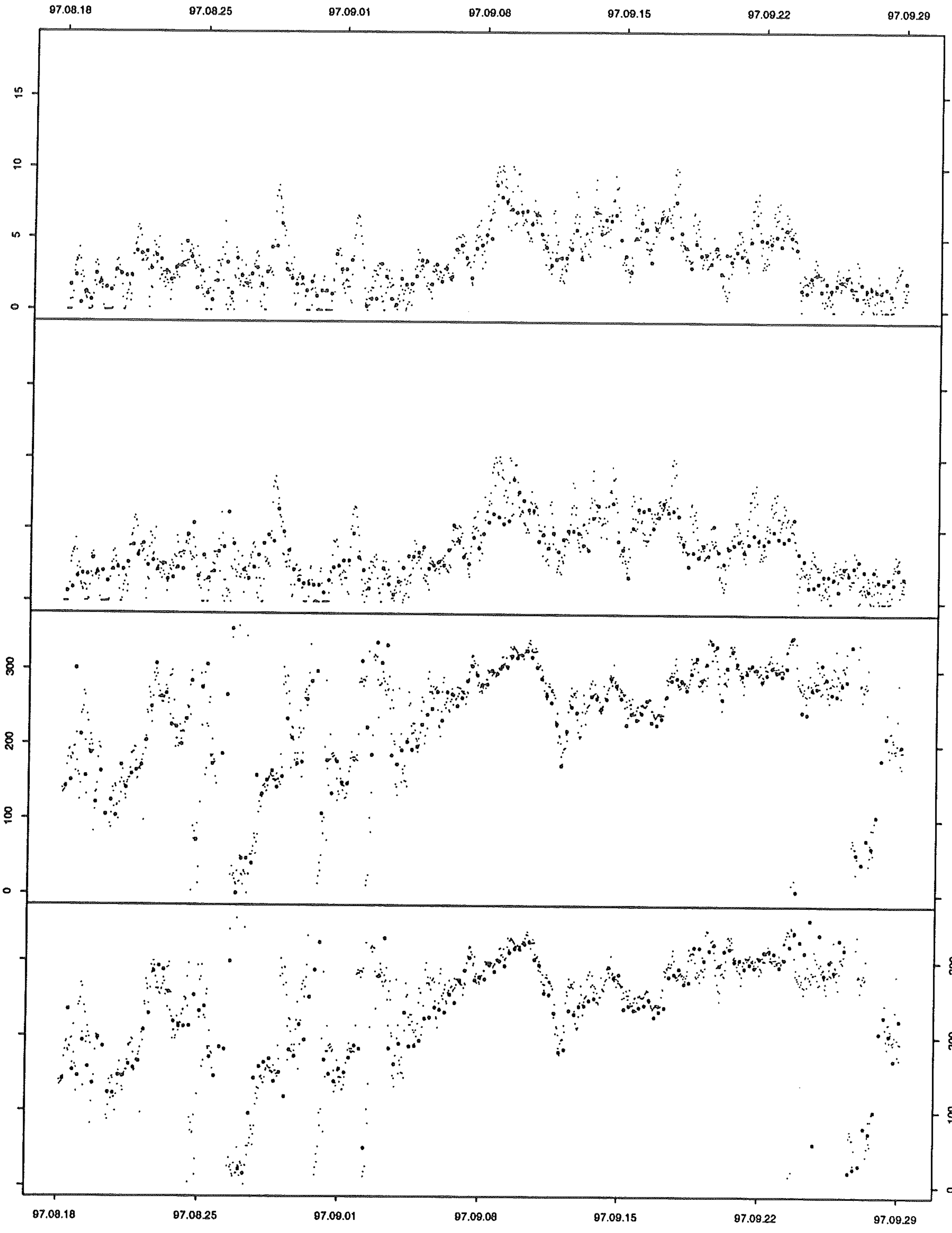

Figure C.21: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.08.18 to 97.09.29. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

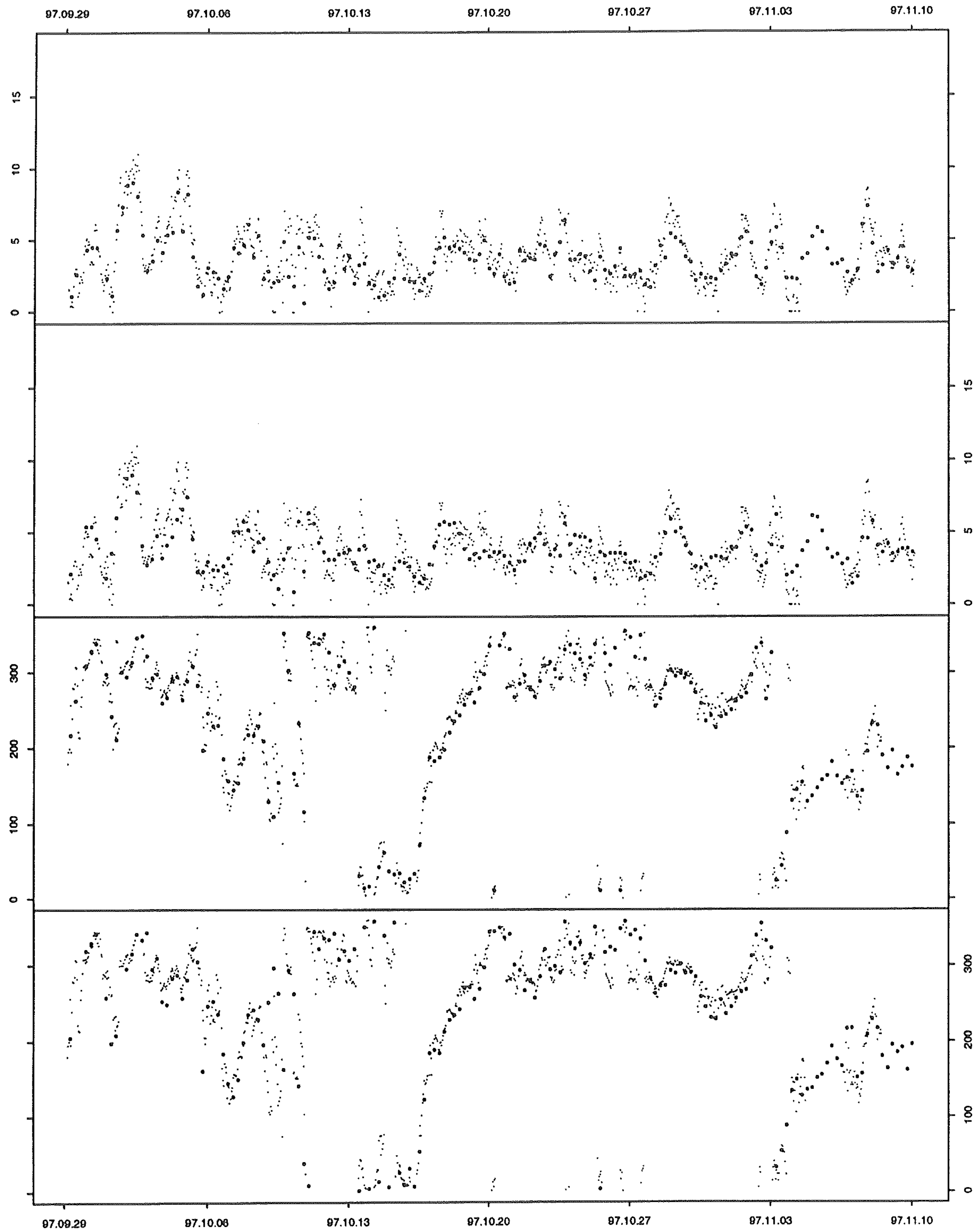

Figure C.22: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.09.29 to 97.11.10. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [m/s]*, observed wind speed and the 24 hour forecast* [m/s]*, observed wind direction and the analysis* [°]*, and observed wind direction and the 24 hour forecast* [°].

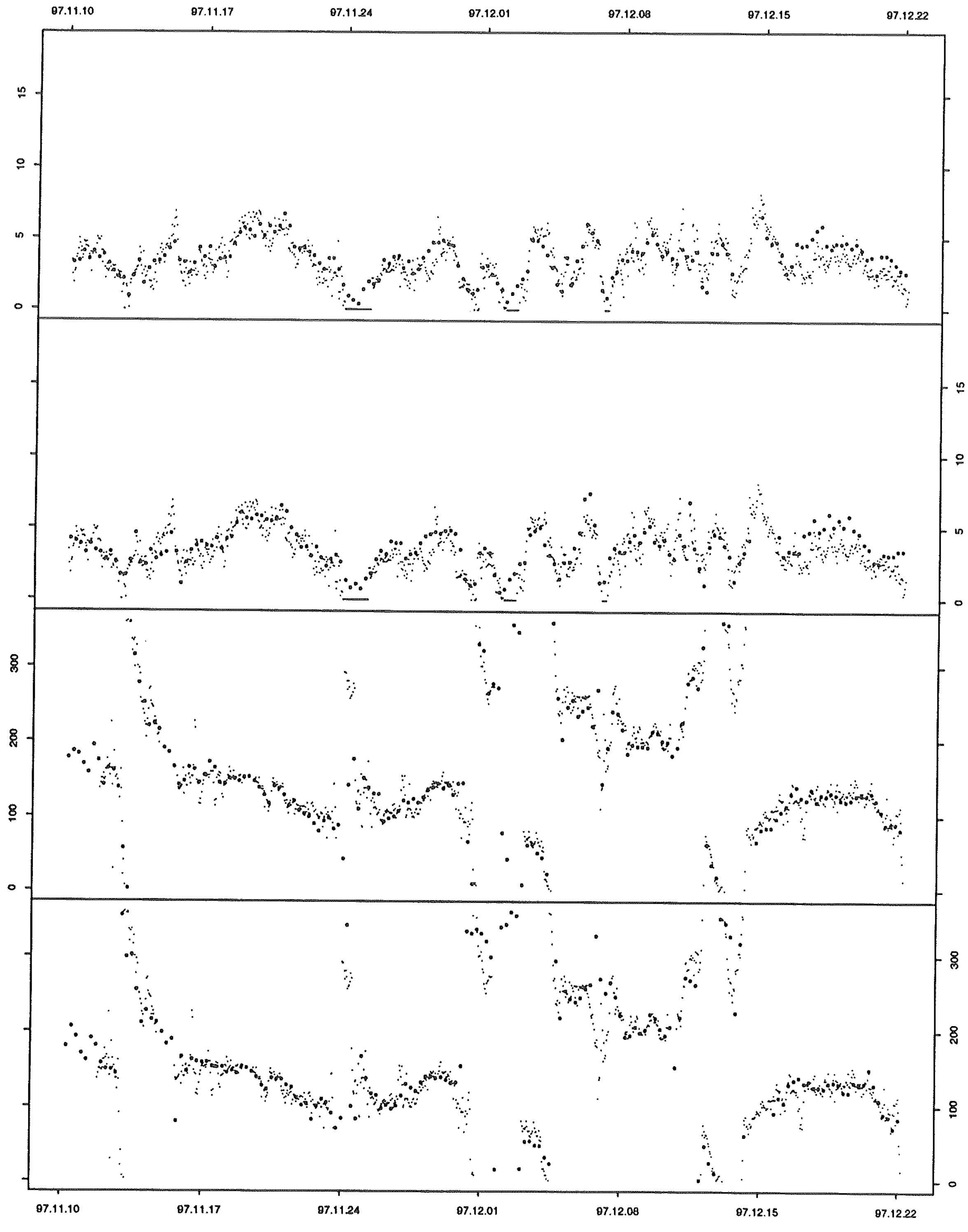

Figure C.23: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.11.10 to 97.12.22. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

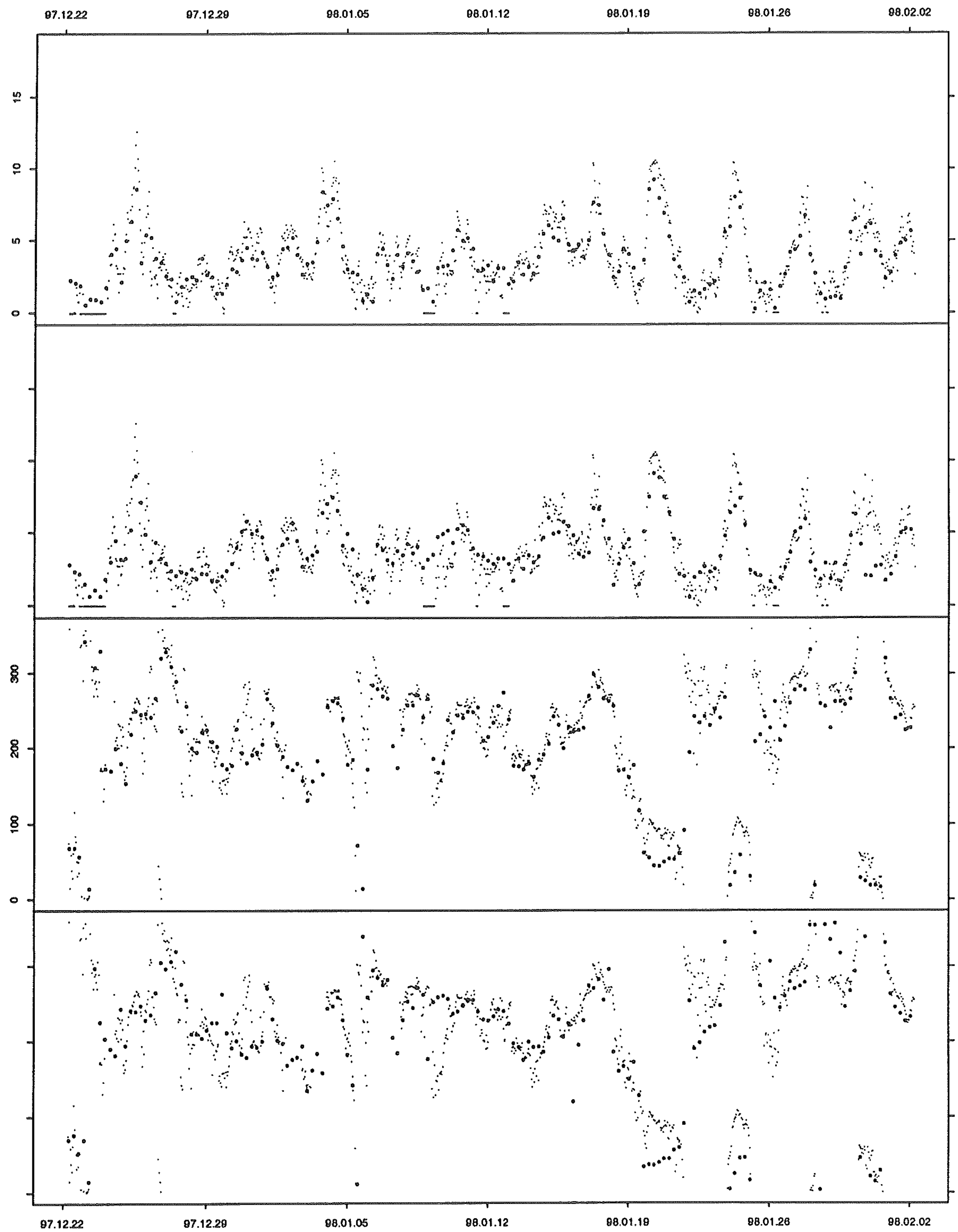

Figure C.24: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.12.22 to 98.02.02. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [m/s], *observed wind speed and the 24 hour forecast* [m/s], *observed wind direction and the analysis* [°], *and observed wind direction and the 24 hour forecast* [°].

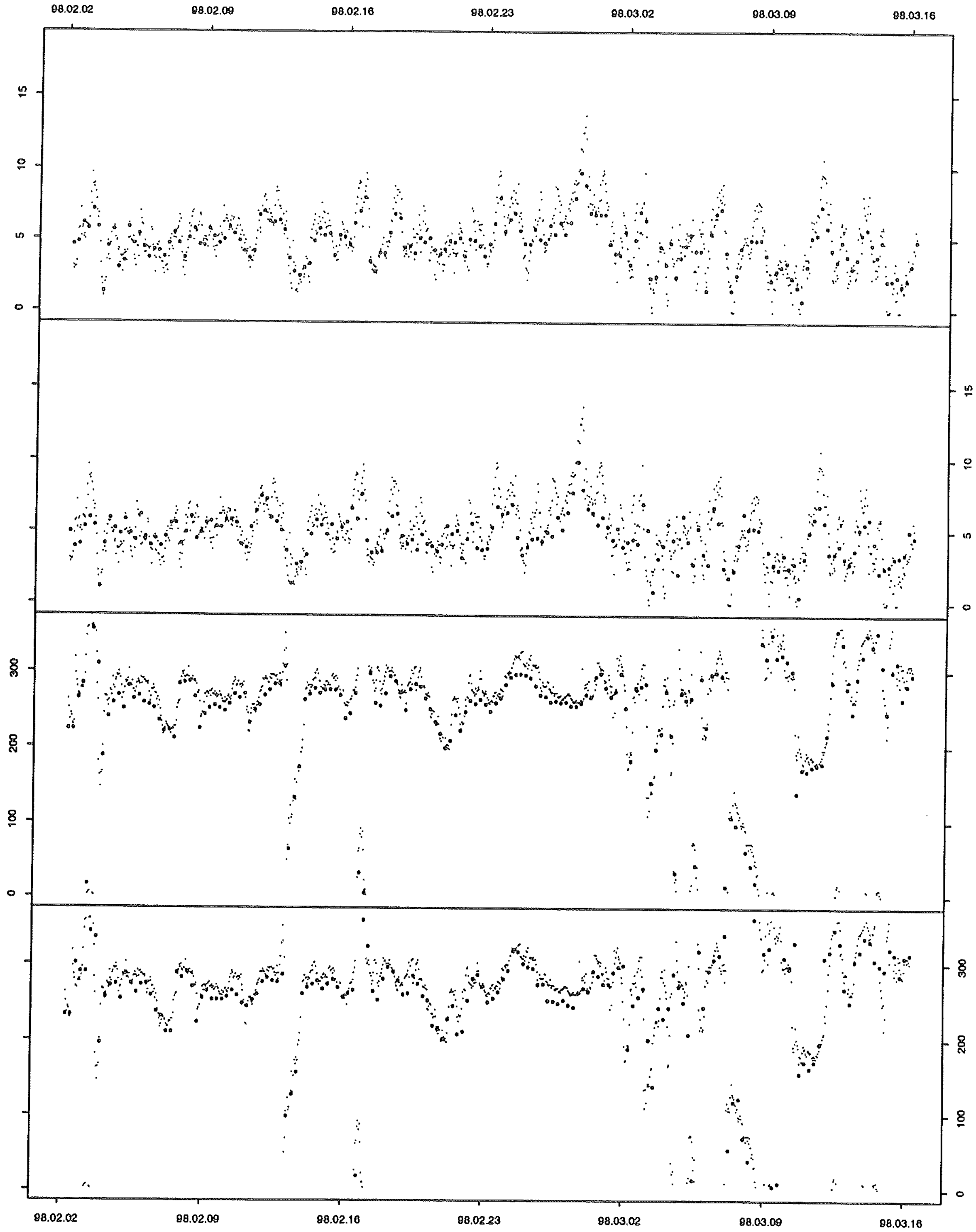

Figure C.25: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.02.02 to 98.03.16. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

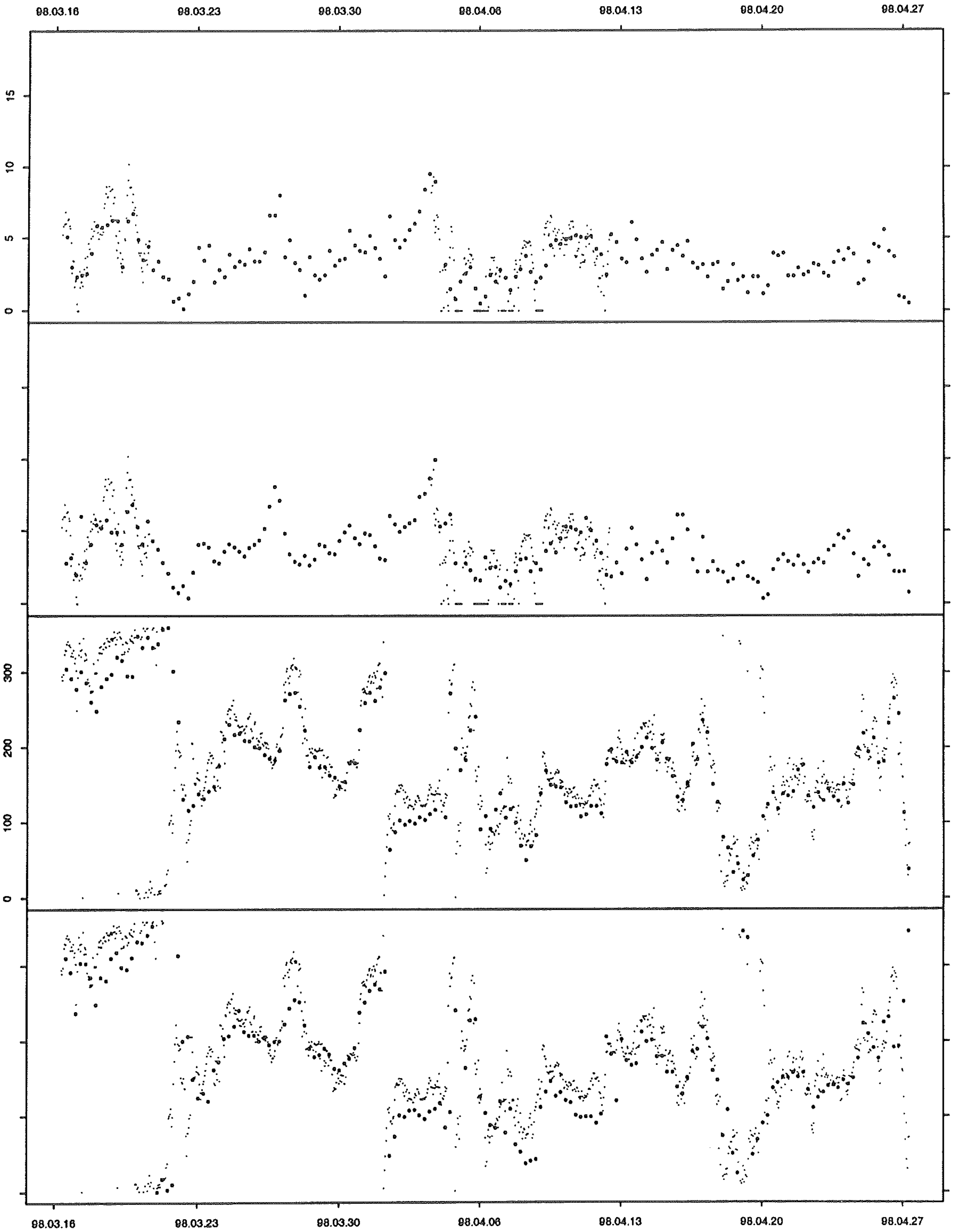

Figure C.26: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.03.16 to 98.04.27. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

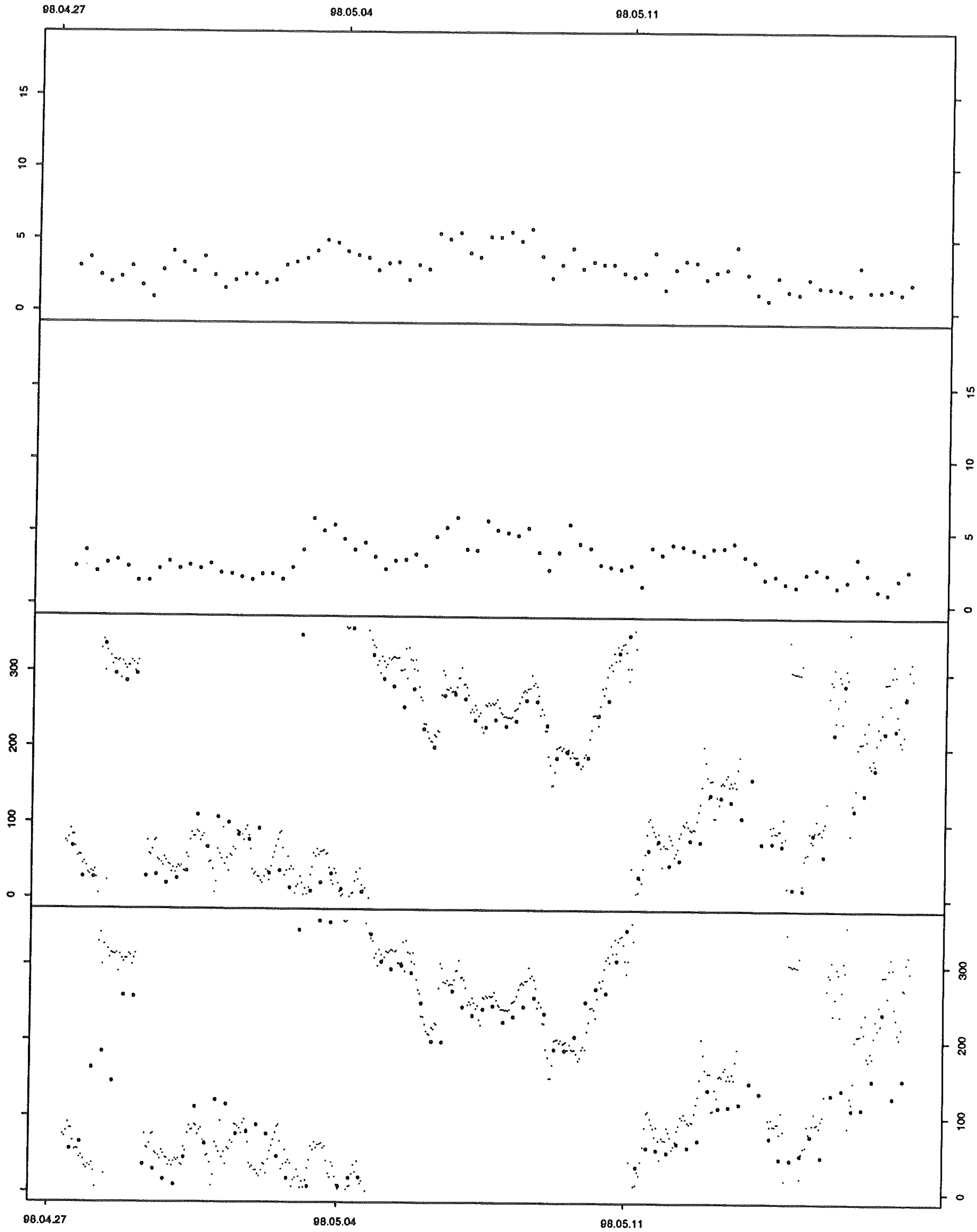

Figure C.27: *(Hollandsbjerg) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.04.27 to 98.05.17. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

C.4 Rejsby

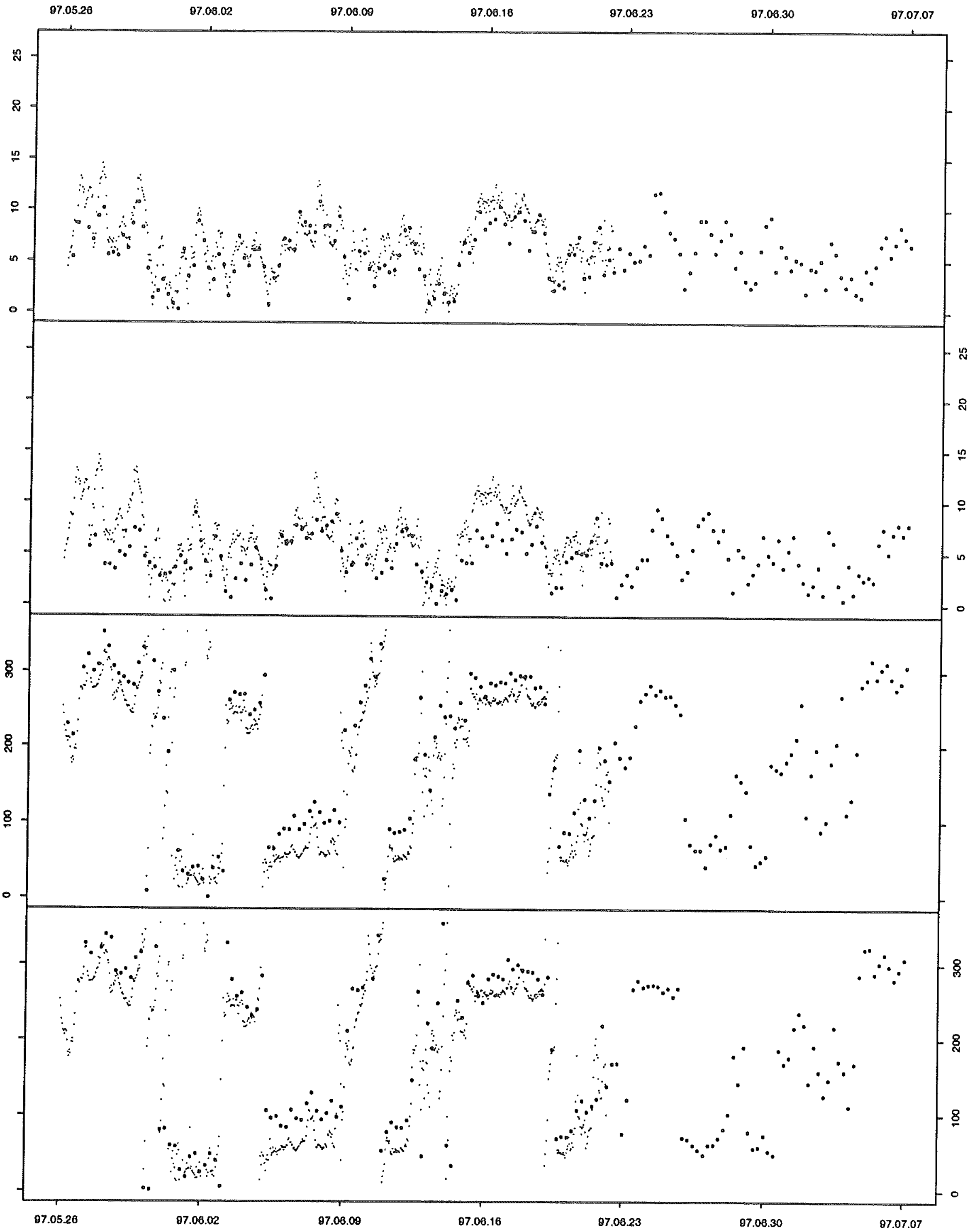

Figure C.28: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.05.26 to 97.07.07. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

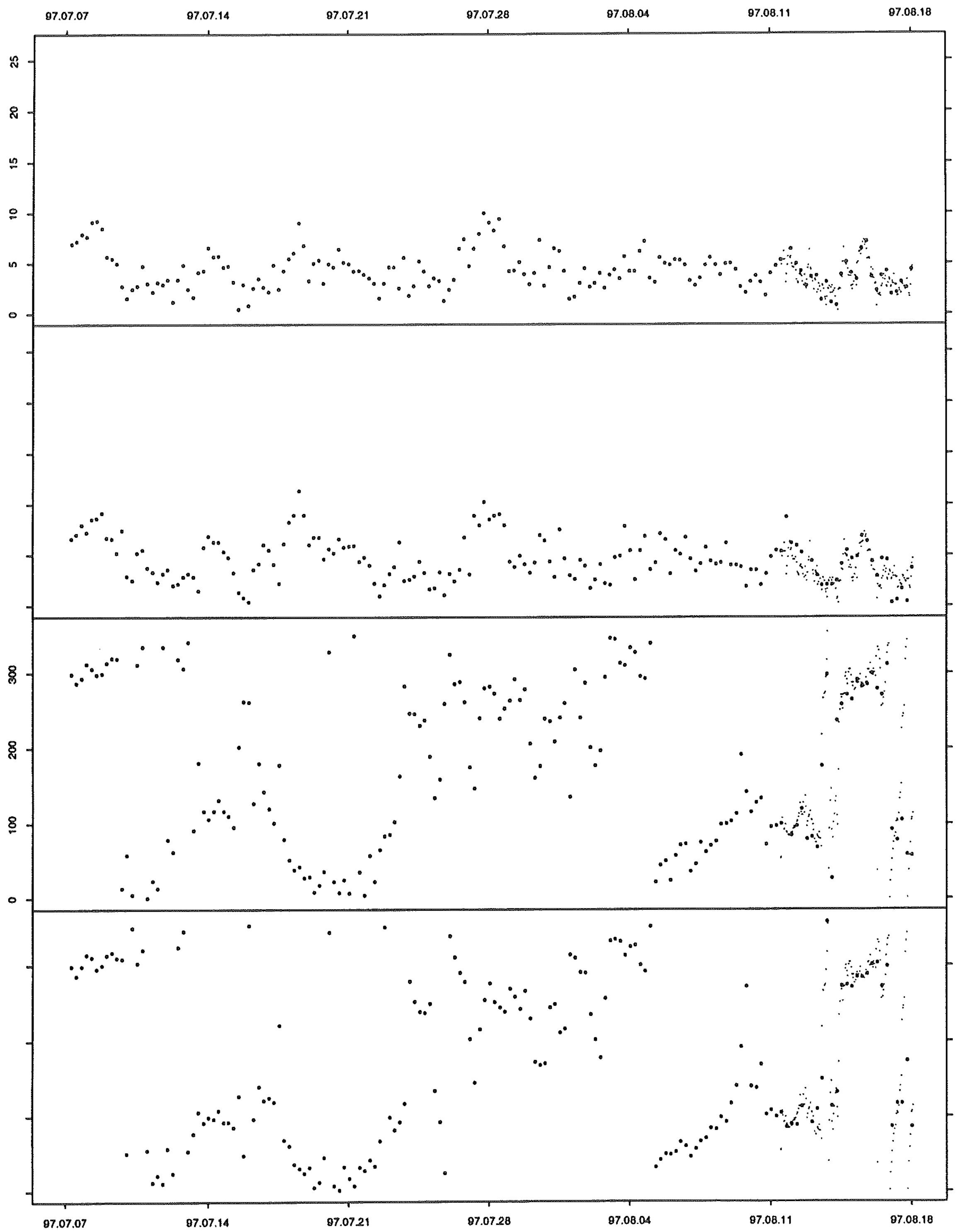

Figure C.29: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.07.07 to 97.08.18. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

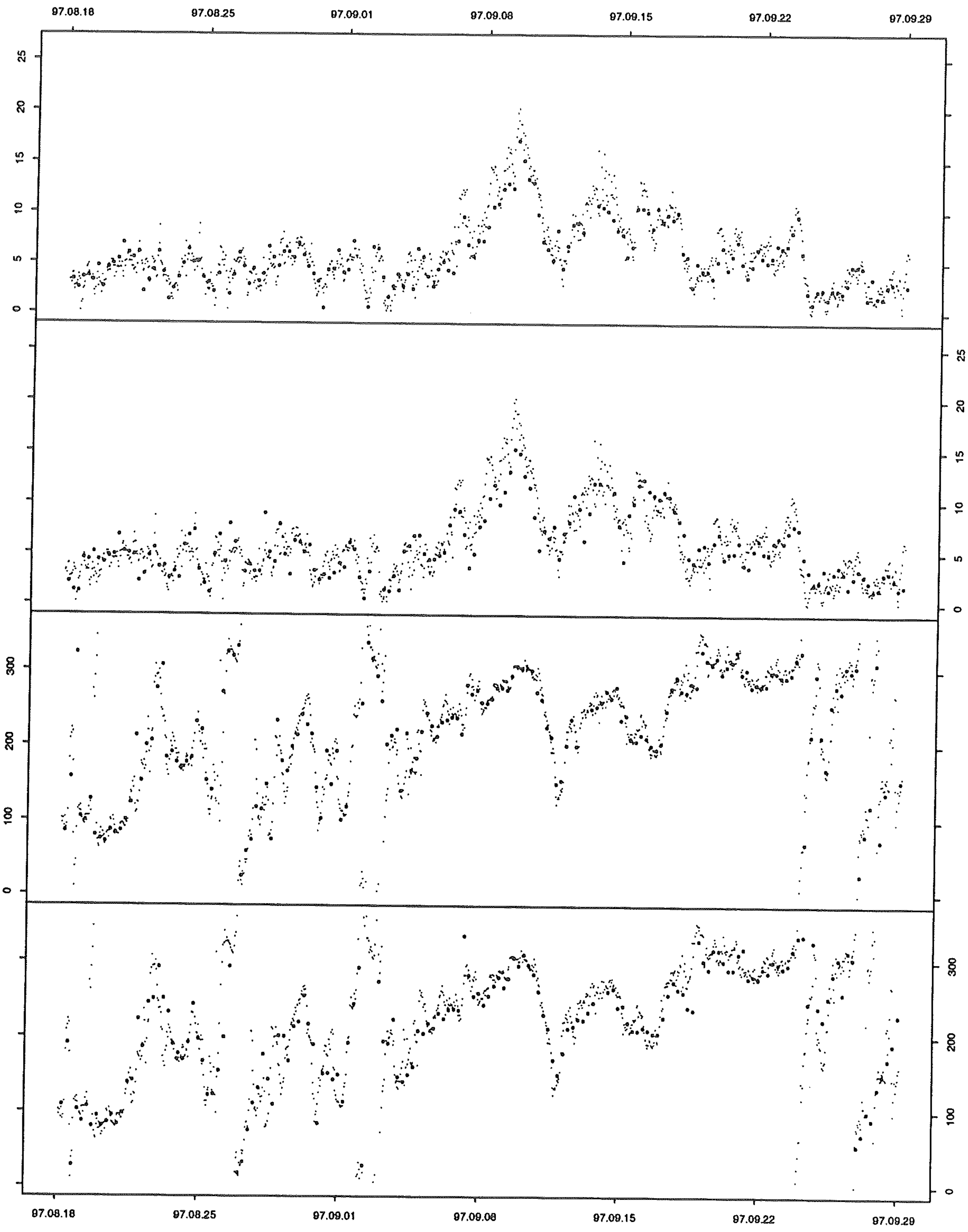

Figure C.30: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.08.18 to 97.09.29. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [m/s]*, observed wind speed and the 24 hour forecast* [m/s]*, observed wind direction and the analysis* [°]*, and observed wind direction and the 24 hour forecast* [°].

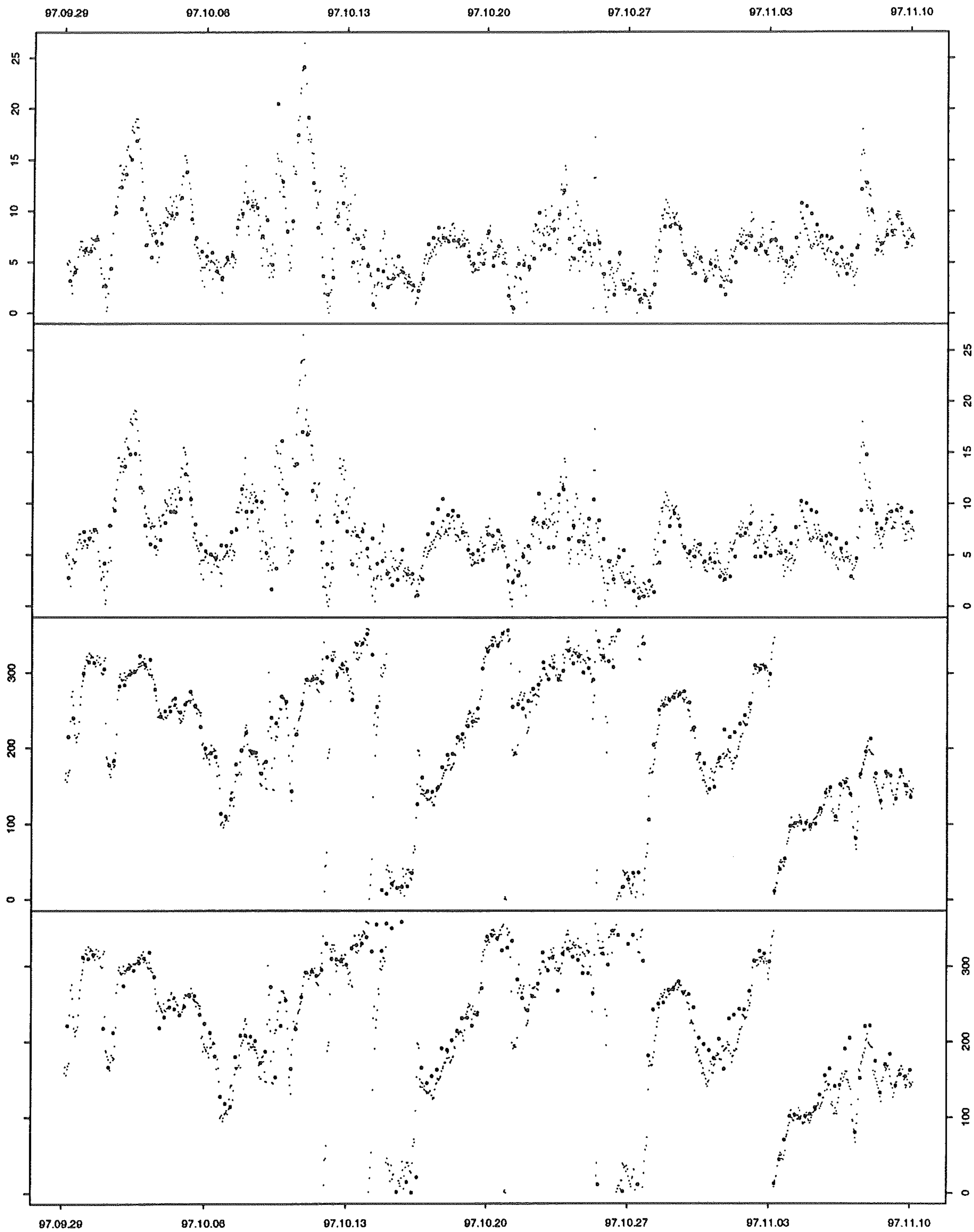

Figure C.31: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.09.29 to 97.11.10. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

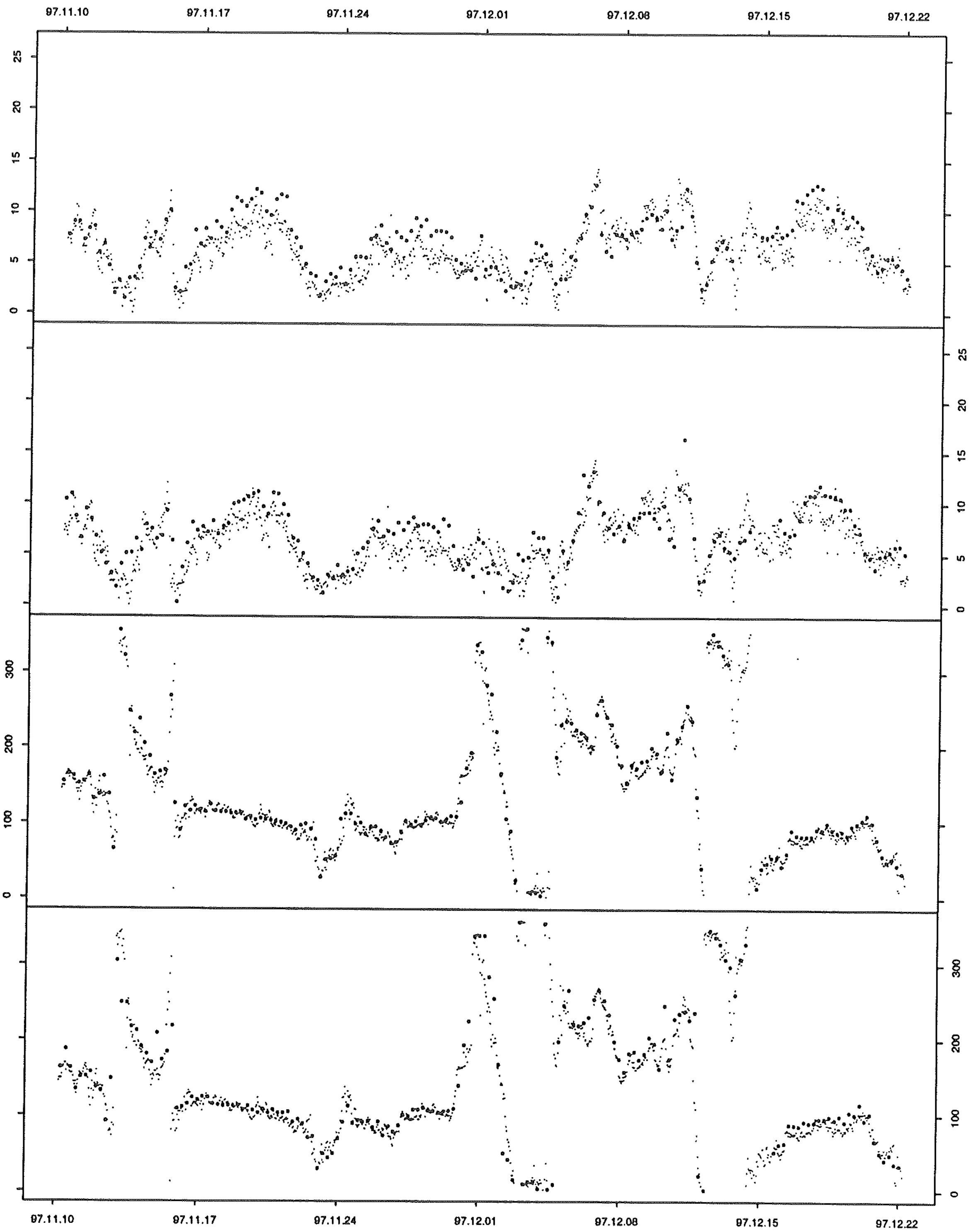

Figure C.32: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.11.10 to 97.12.22. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

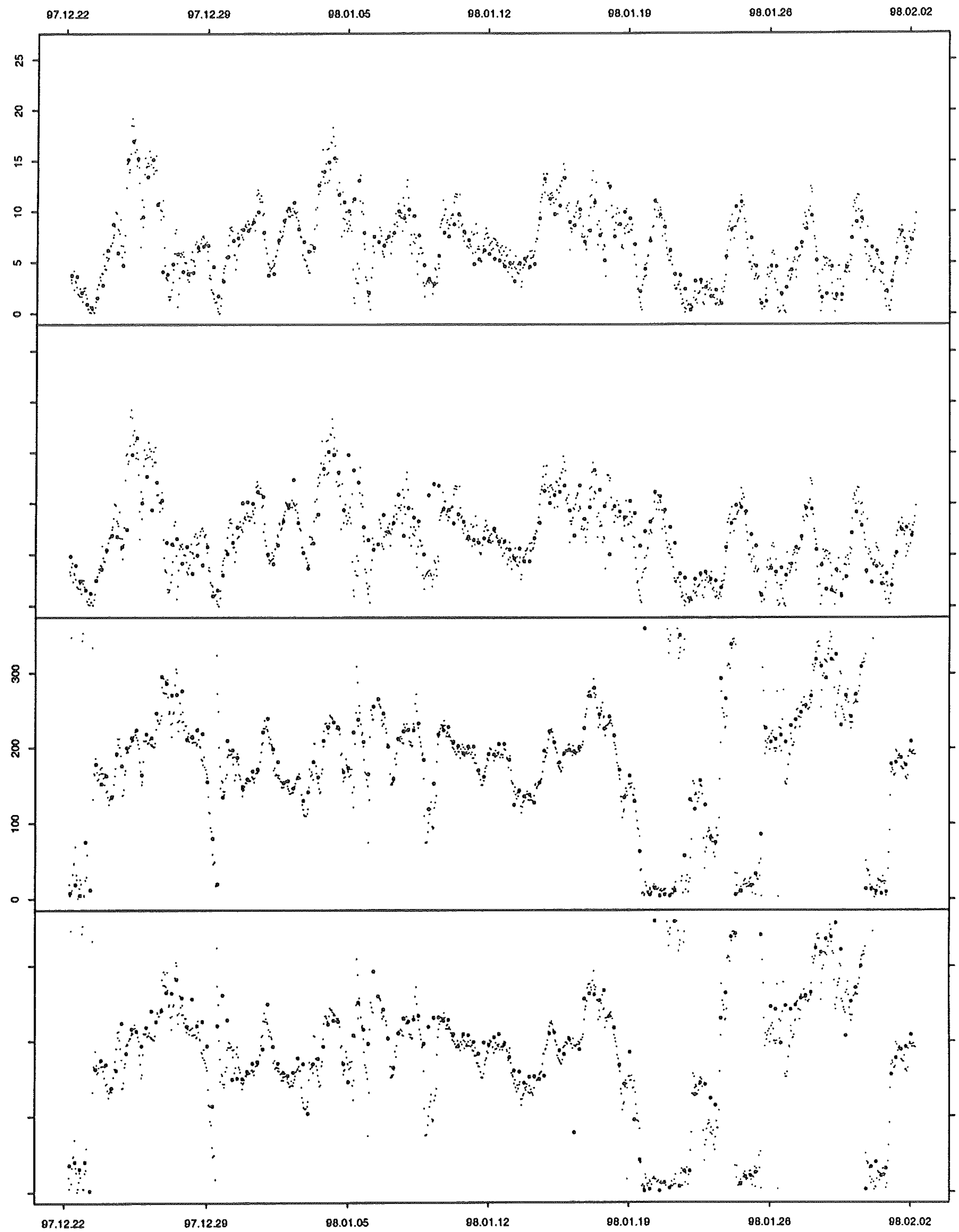

Figure C.33: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.12.22 to 98.02.02. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

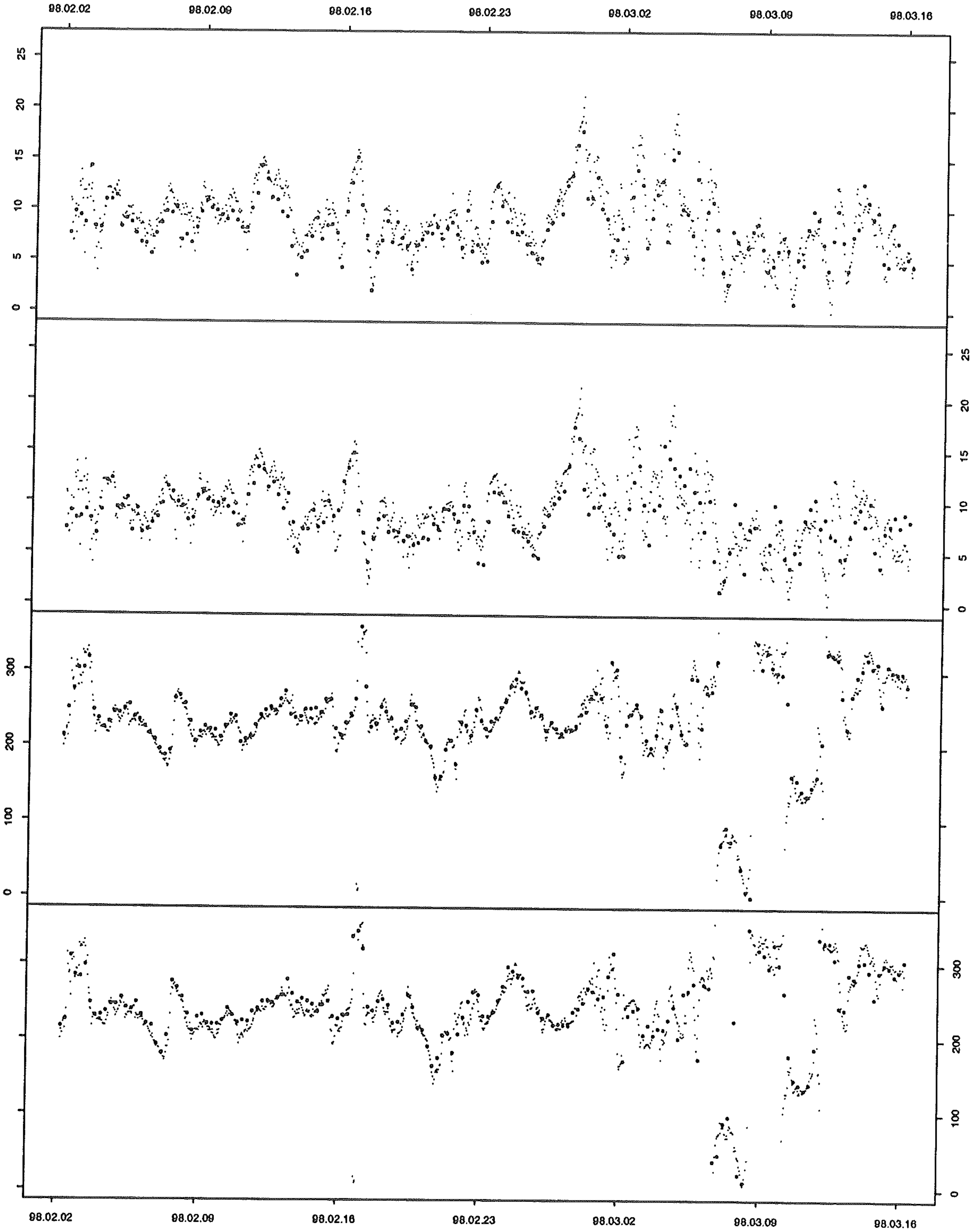

Figure C.34: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.02.02 to 98.03.16. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

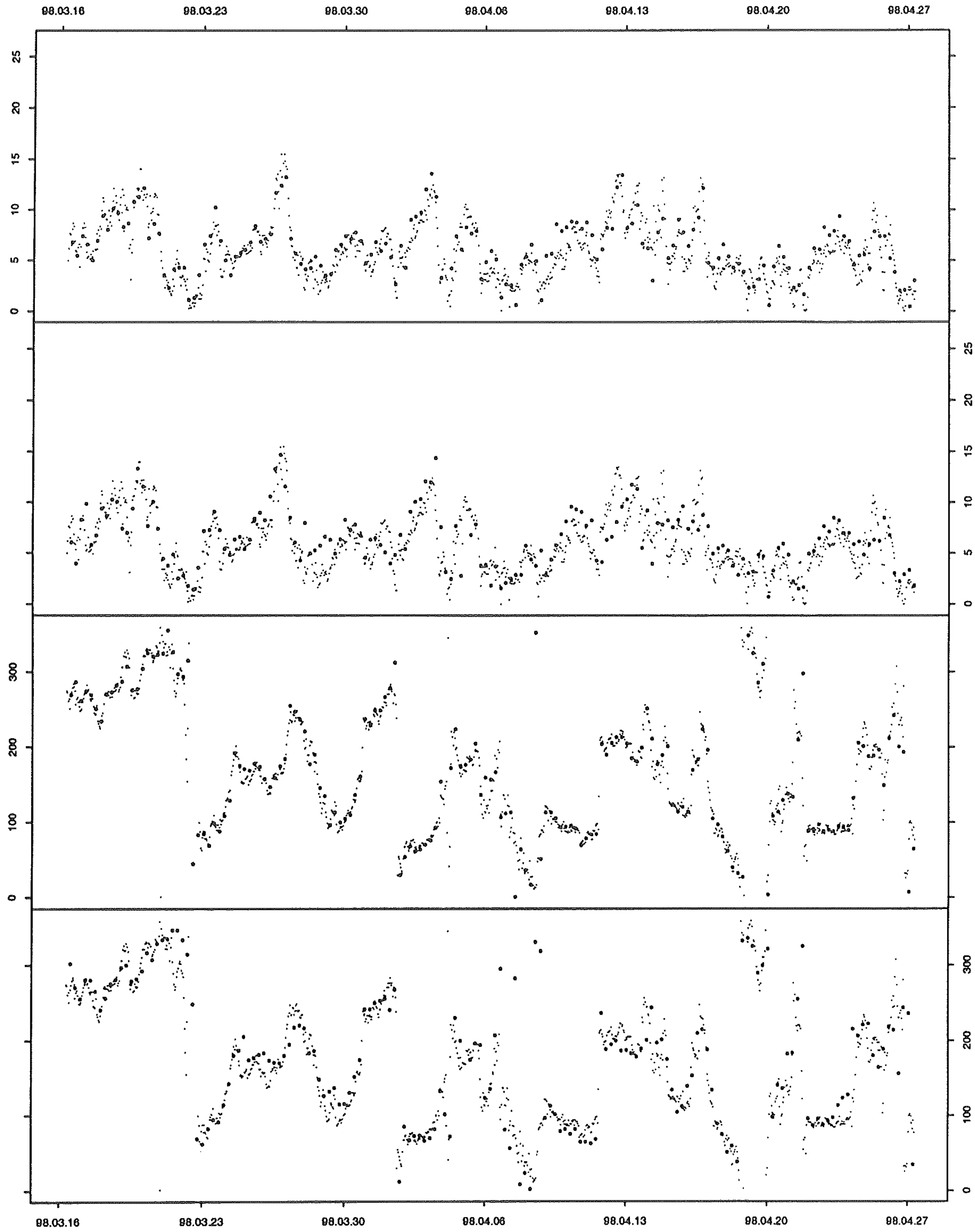

Figure C.35: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.03.16 to 98.04.27. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

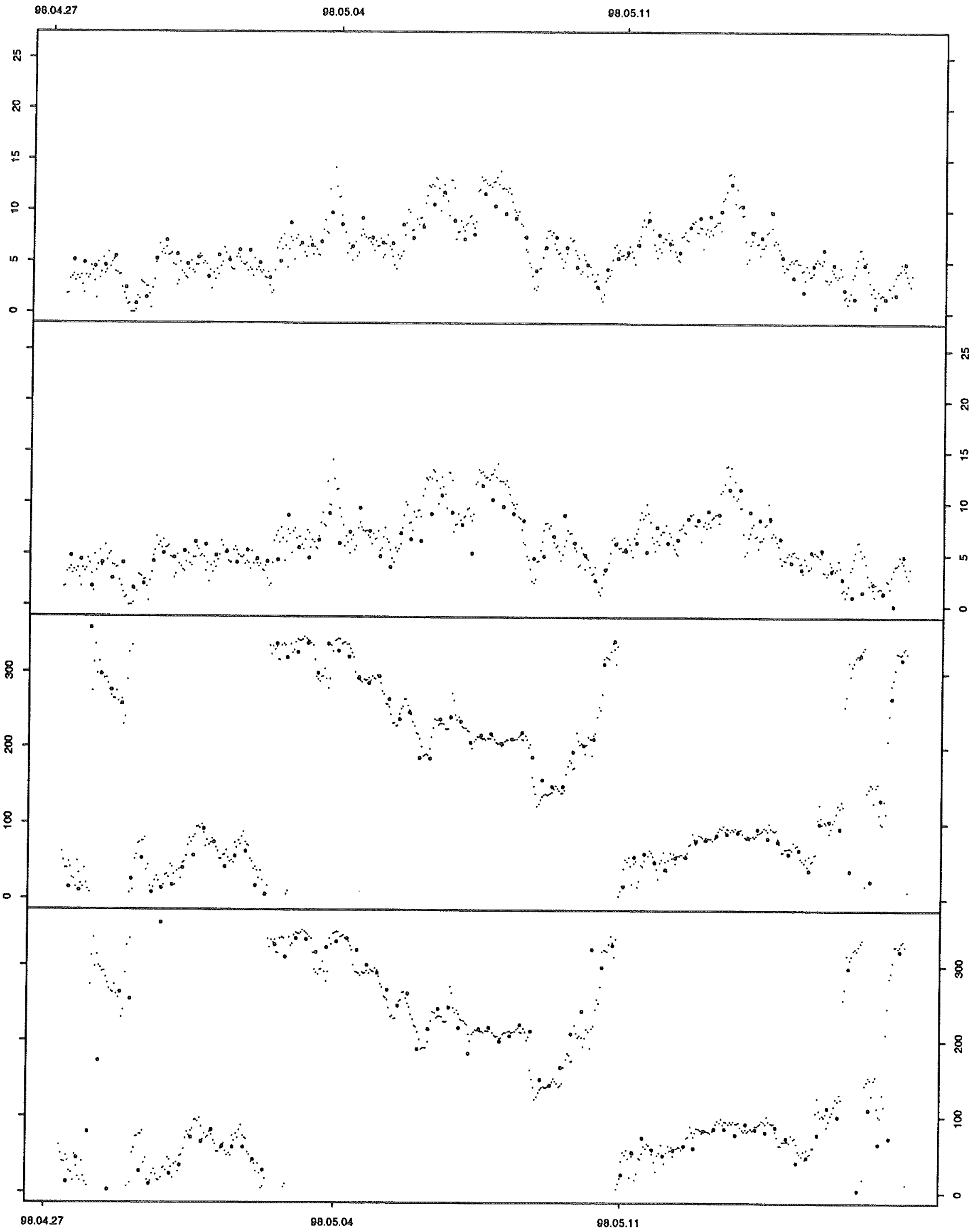

Figure C.36: *(Rejsby) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.04.27 to 98.05.17. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

C.5 Sydthy

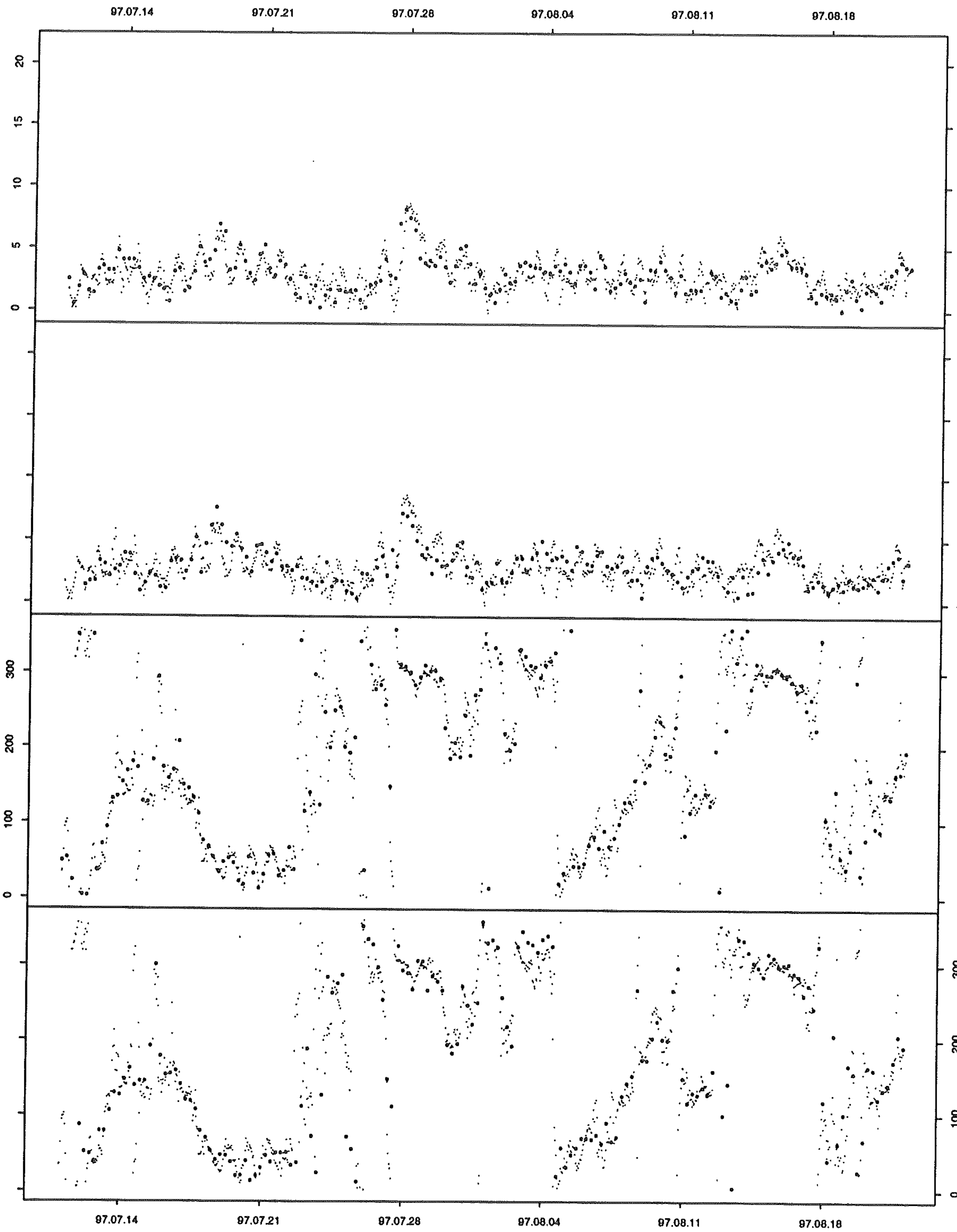

Figure C.37: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.07.11 to 97.08.22. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

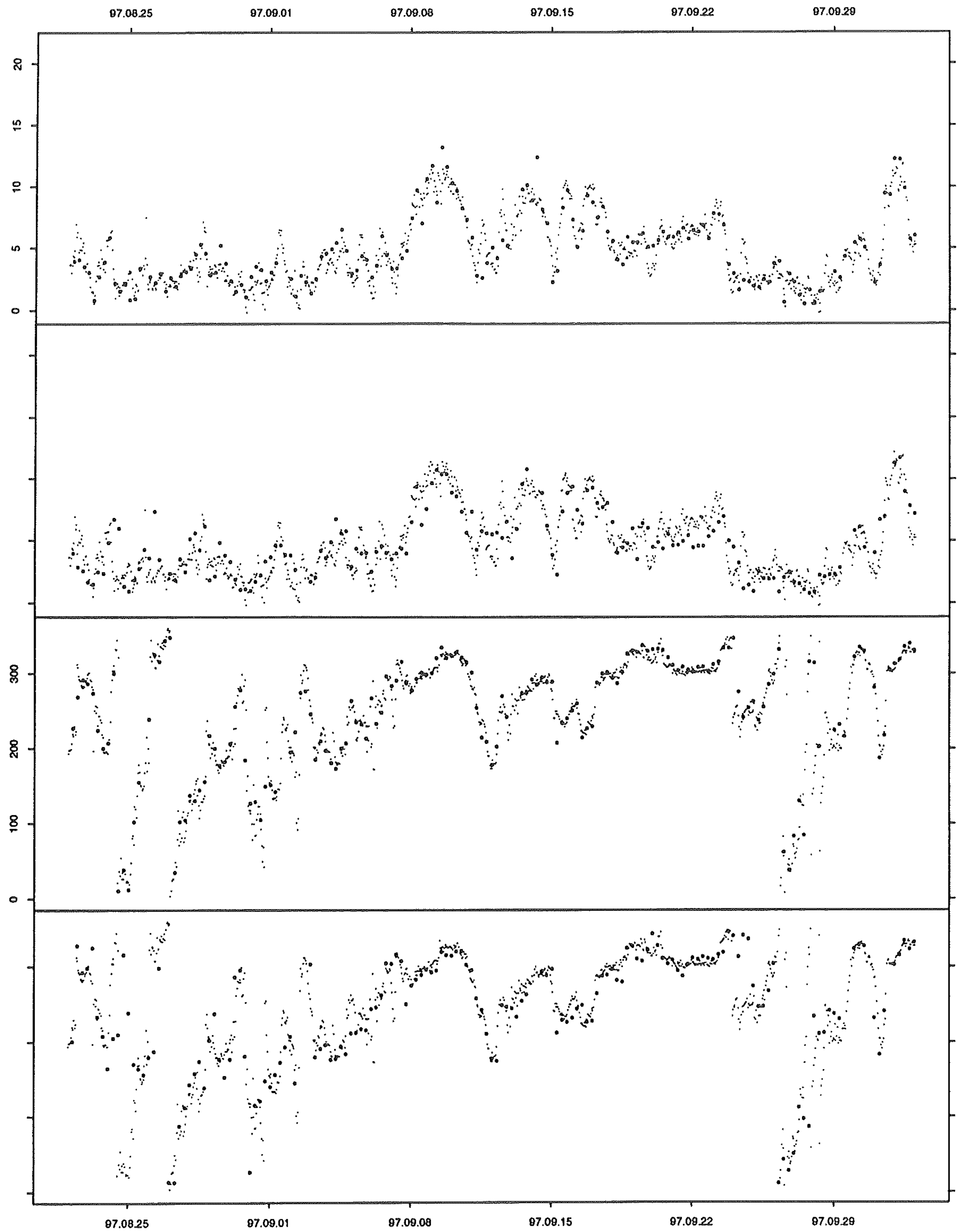

Figure C.38: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.08.22 to 97.10.03. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

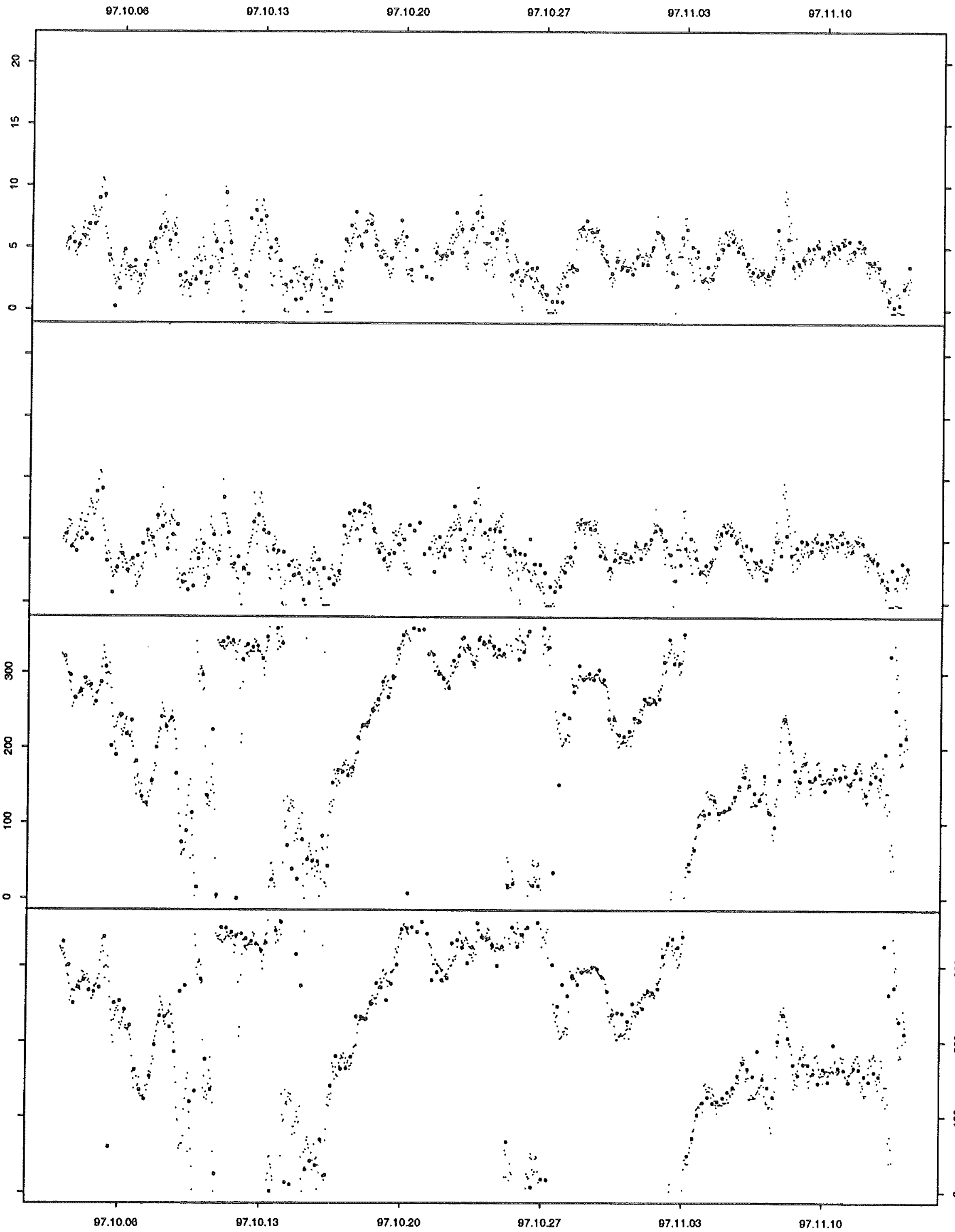

Figure C.39: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.10.03 to 97.11.14. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

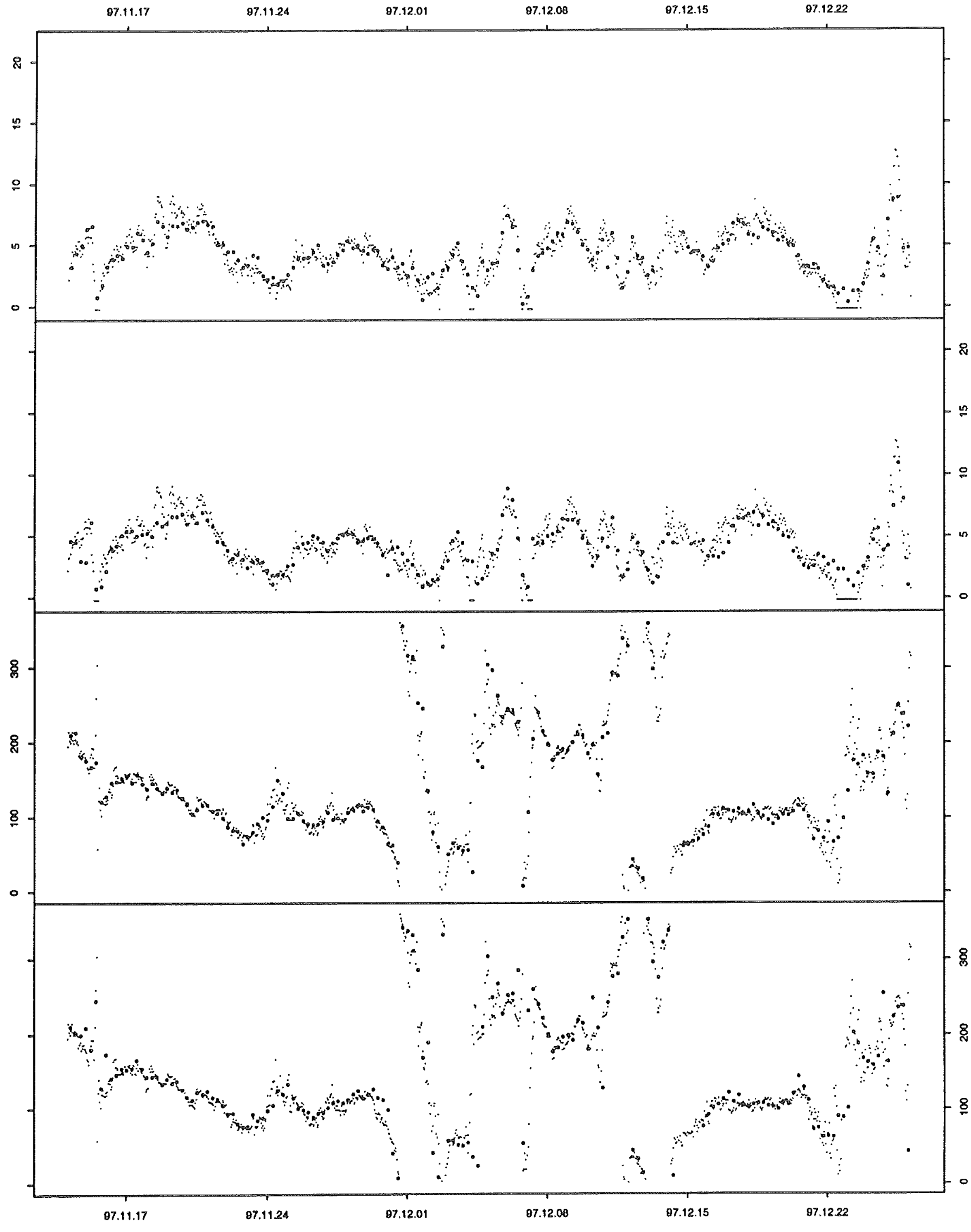

Figure C.40: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.11.14 to 97.12.26. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

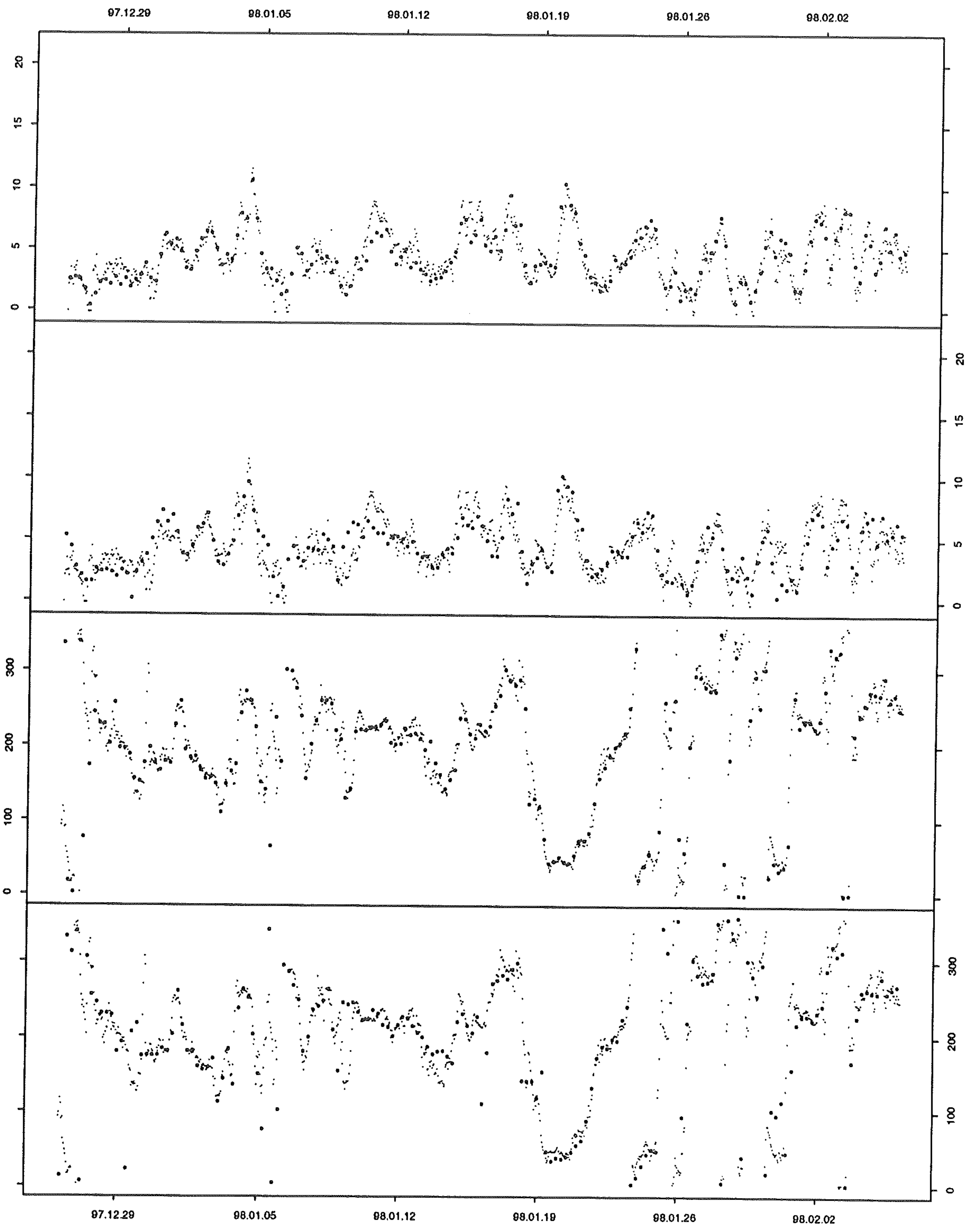

Figure C.41: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 97.12.26 to 98.02.06. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

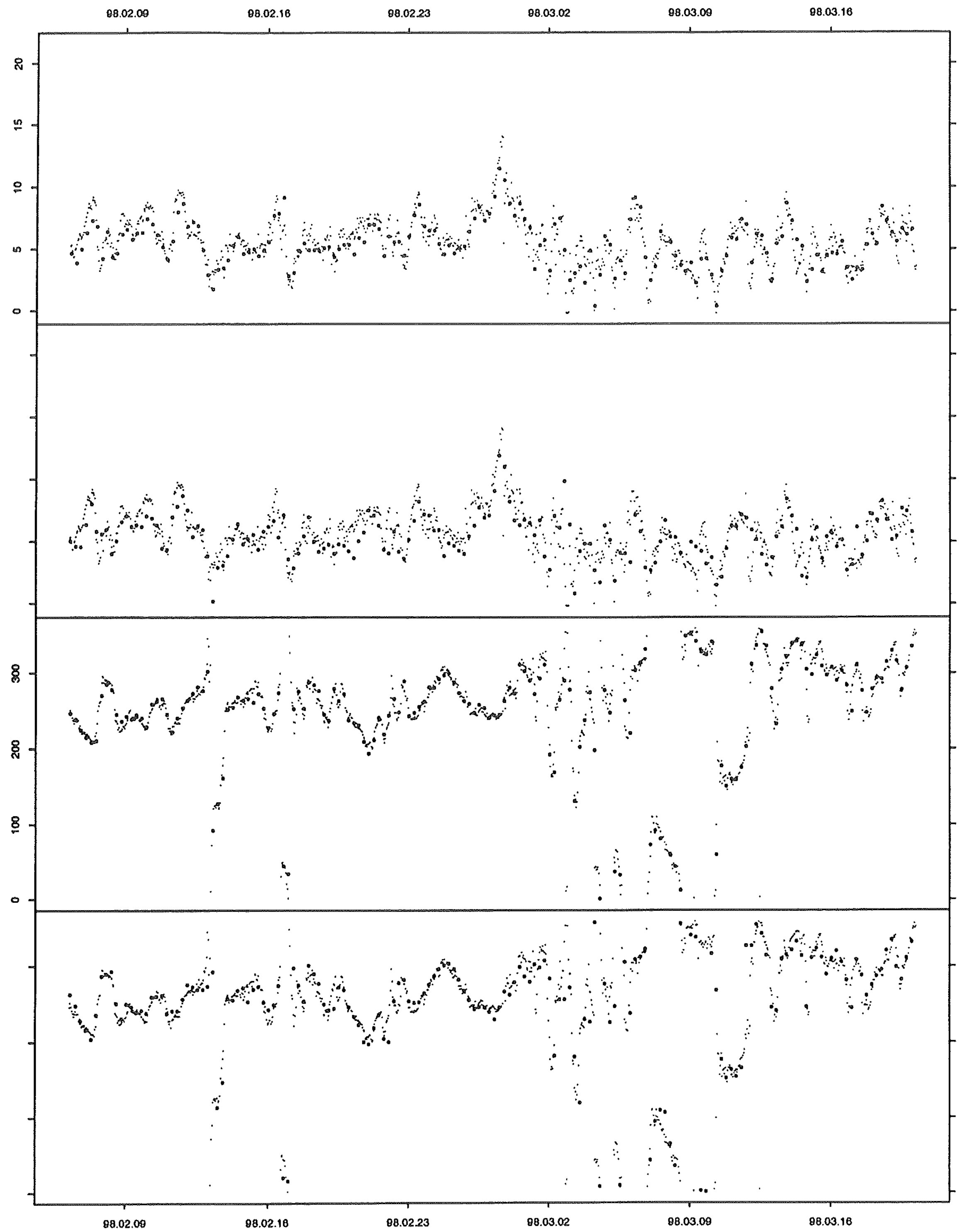

Figure C.42: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.02.06 to 98.03.20. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

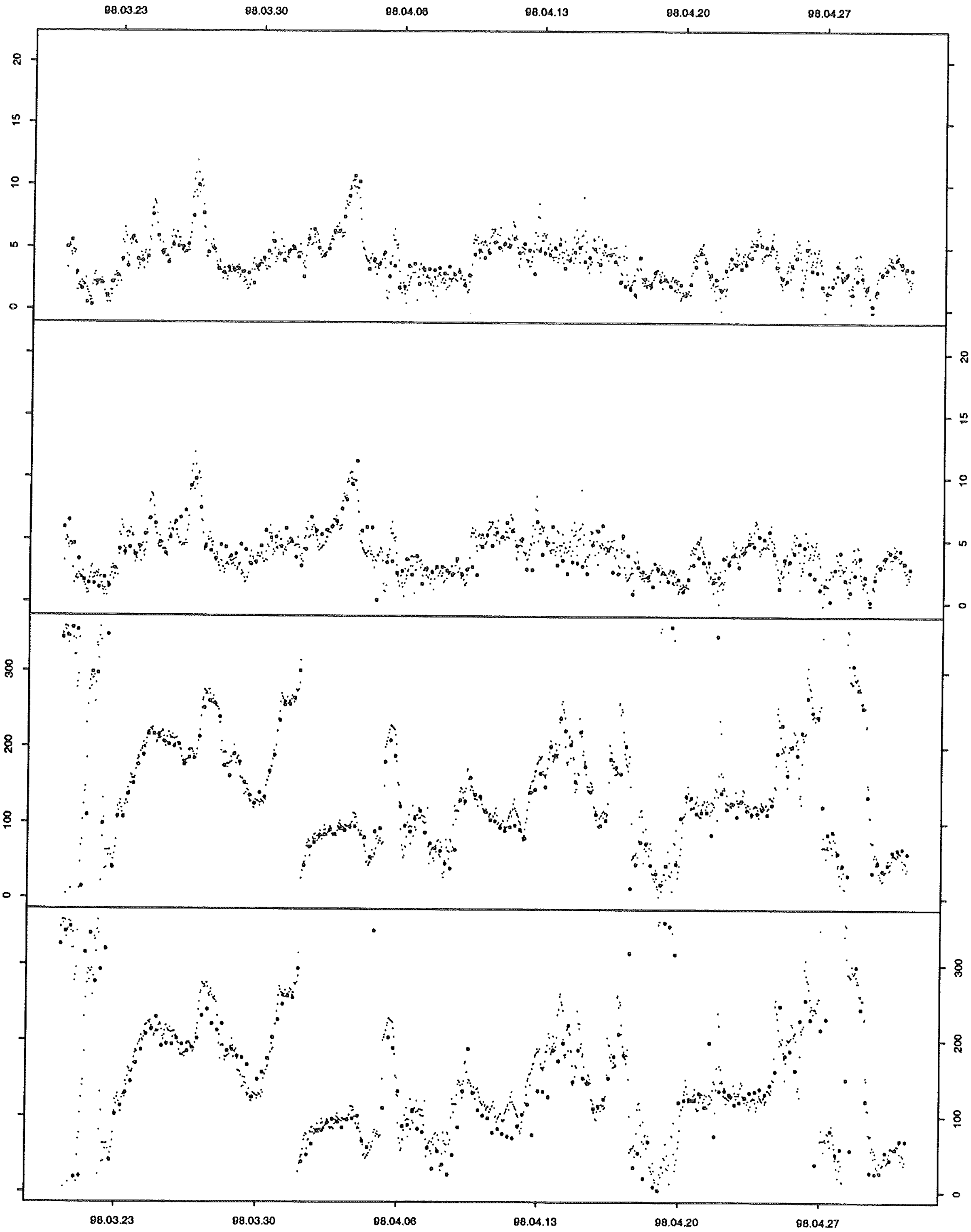

Figure C.43: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.03.20 to 98.05.01. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast [m/s], observed wind speed and the 24 hour forecast [m/s], observed wind direction and the analysis [°], and observed wind direction and the 24 hour forecast [°].*

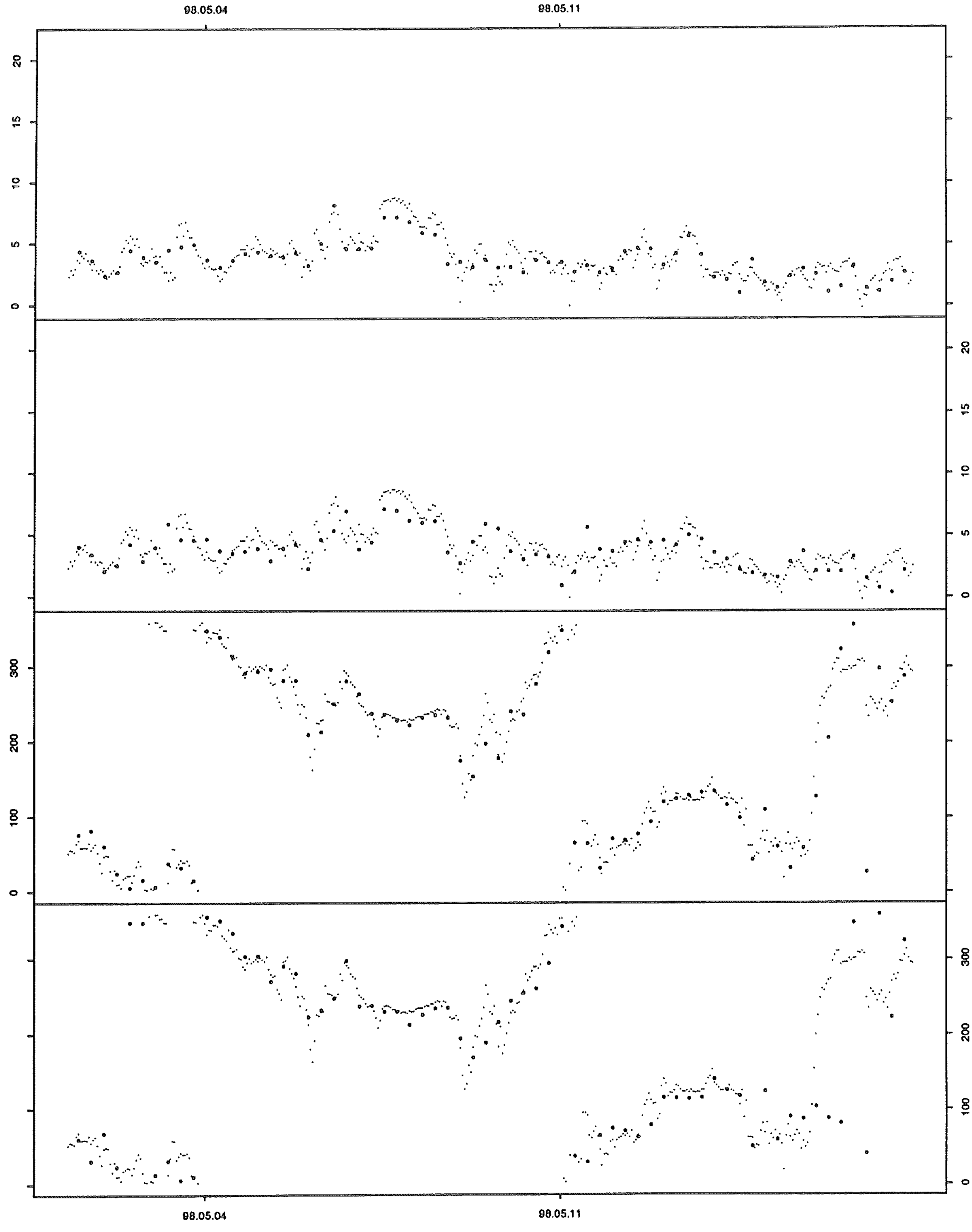

Figure C.44: *(Sydthy) Meteorological forecasts of wind speed and wind direction plotted together with the observed values in the period from 98.05.01 to 98.05.17. The observations are shown as corrected 30 minute average values (small dots) whereas the meteorological forecasts are the raw forecasts adjusted for scaling and bias errors (big dots). From top row to bottom row the plots show observed wind speed and the analysis or 0 hour forecast* [m/s], *observed wind speed and the 24 hour forecast* [m/s], *observed wind direction and the analysis* [°], *and observed wind direction and the 24 hour forecast* [°].

Appendix D

Meteorological Models

D.1 Forecasted wind speed statistics

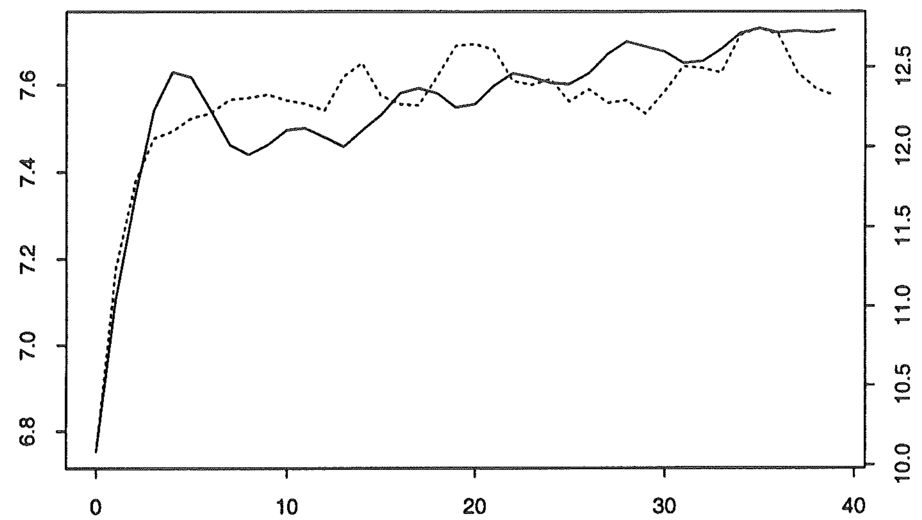

Figure D.1: *(Dræby) Estimated mean (full line, left hand axis [m/s]) and variance (dotted line, right hand axis [m^2/s^2]) versus prediction horizon (hours) for the forecasted wind speed at model level 31.*

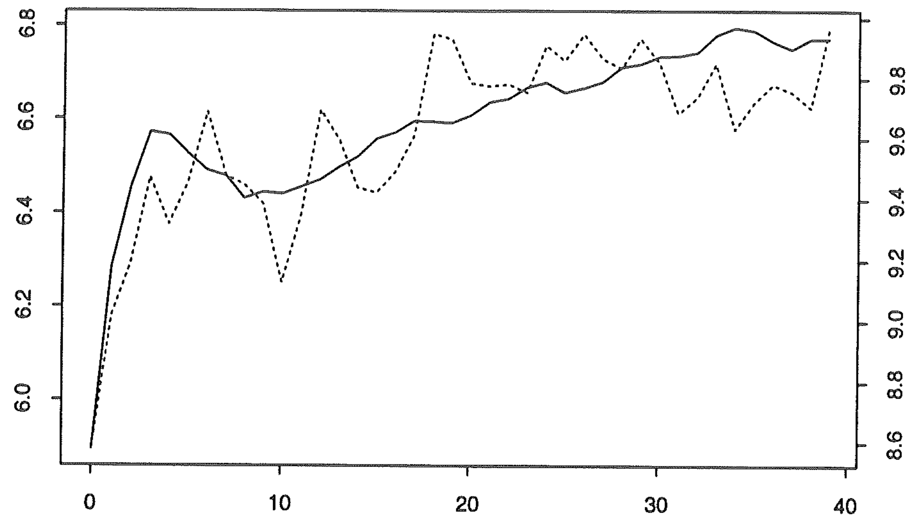

Figure D.2: *(Fjaldene) Estimated mean (full line, left hand axis [m/s]) and variance (dotted line, right hand axis [m^2/s^2]) versus prediction horizon (hours) for the forecasted wind speed at model level 31.*

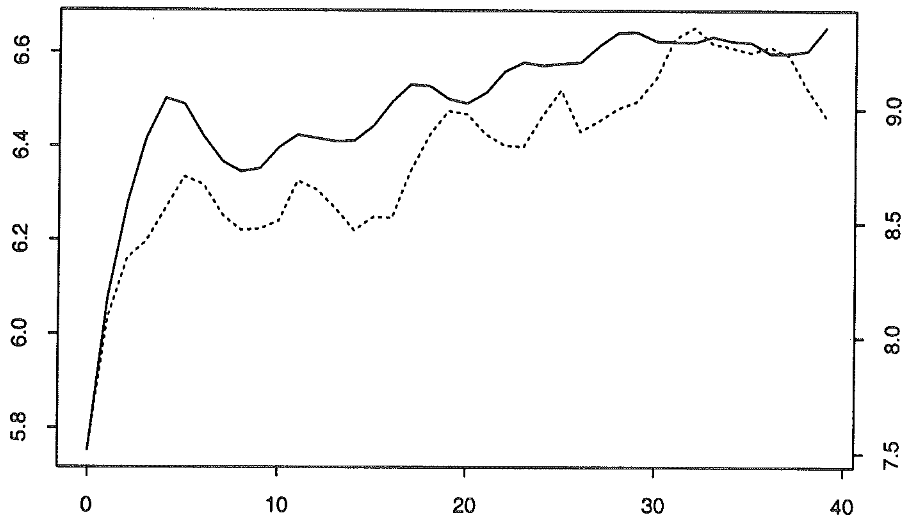

Figure D.3: *(Hollandsbjerg) Estimated mean (full line, left hand axis [m/s]) and variance (dotted line, right hand axis [m^2/s^2]) versus prediction horizon (hours) for the forecasted wind speed at model level 31.*

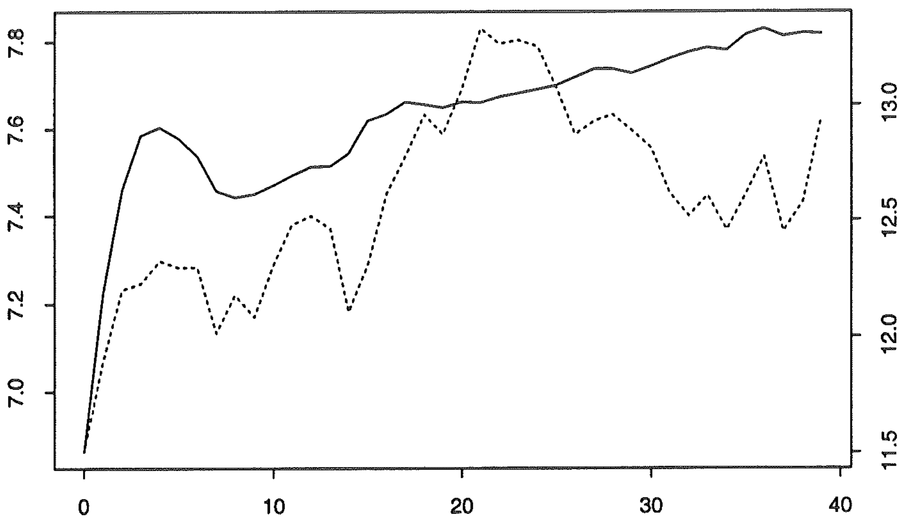

Figure D.4: *(Sydthy) Estimated mean (full line, left hand axis [m/s]) and variance (dotted line, right hand axis [m^2/s^2]) versus prediction horizon (hours) for the forecasted wind speed at model level 31.*

D.2 Relations between observed and forecasted wind speed

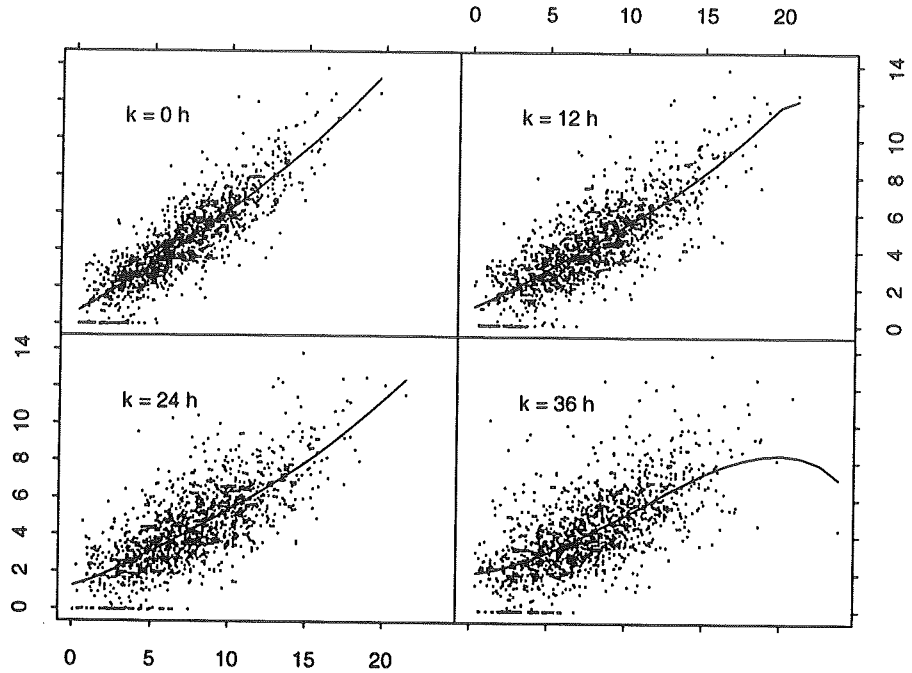

Figure D.5: *(Dræby) Observed wind speed [m/s] versus forecasted wind speed at level 31 [m/s] for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation.*

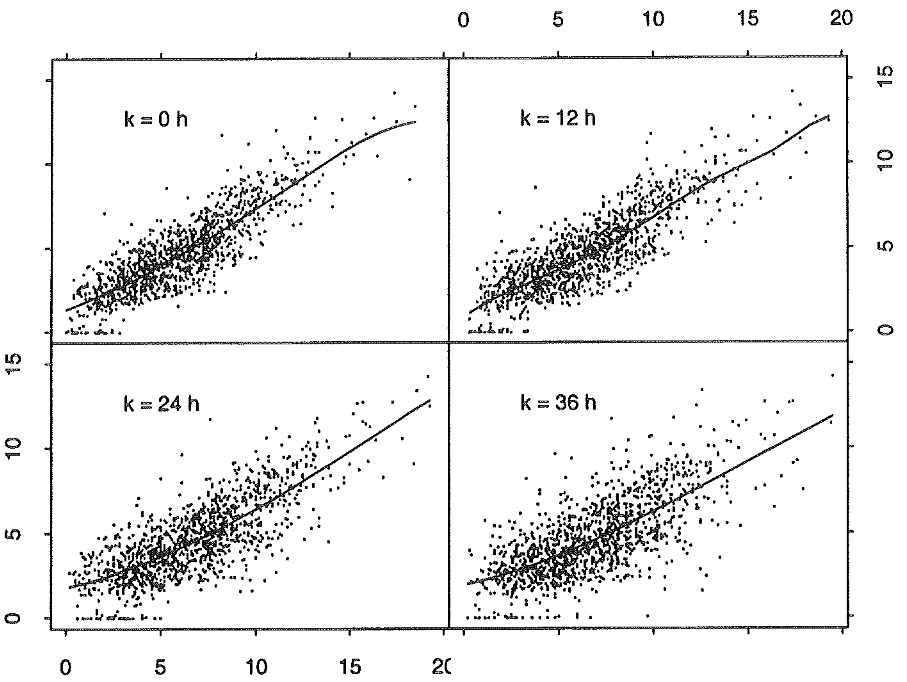

Figure D.6: *(Fjaldene) Observed wind speed [m/s] versus forecasted wind speed at level 31 [m/s] for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation.*

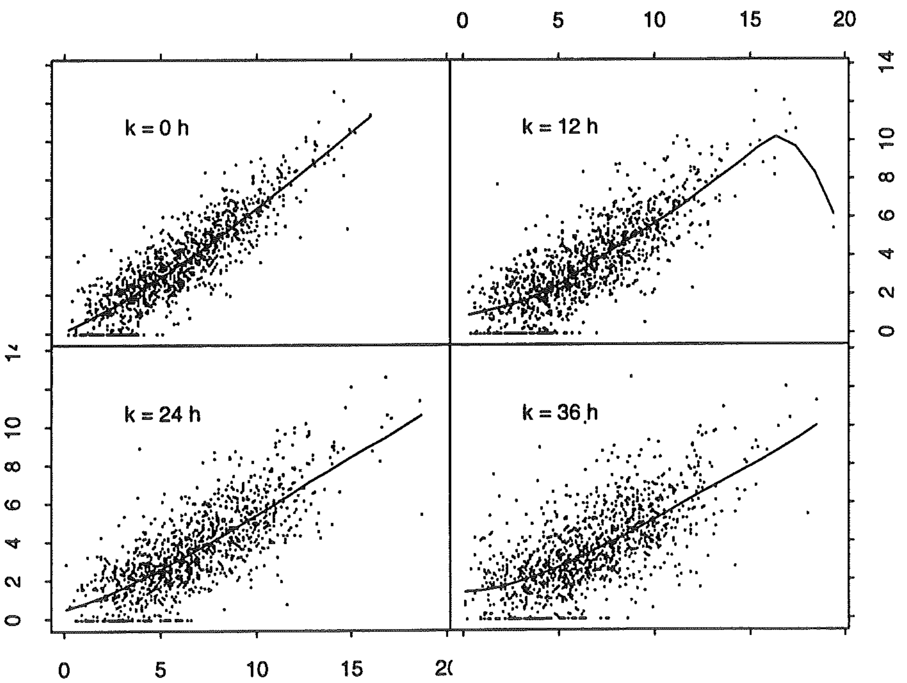

Figure D.7: *(Hollandsbjerg) Observed wind speed [m/s] versus forecasted wind speed at level 31 [m/s] for a prediction horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation.*

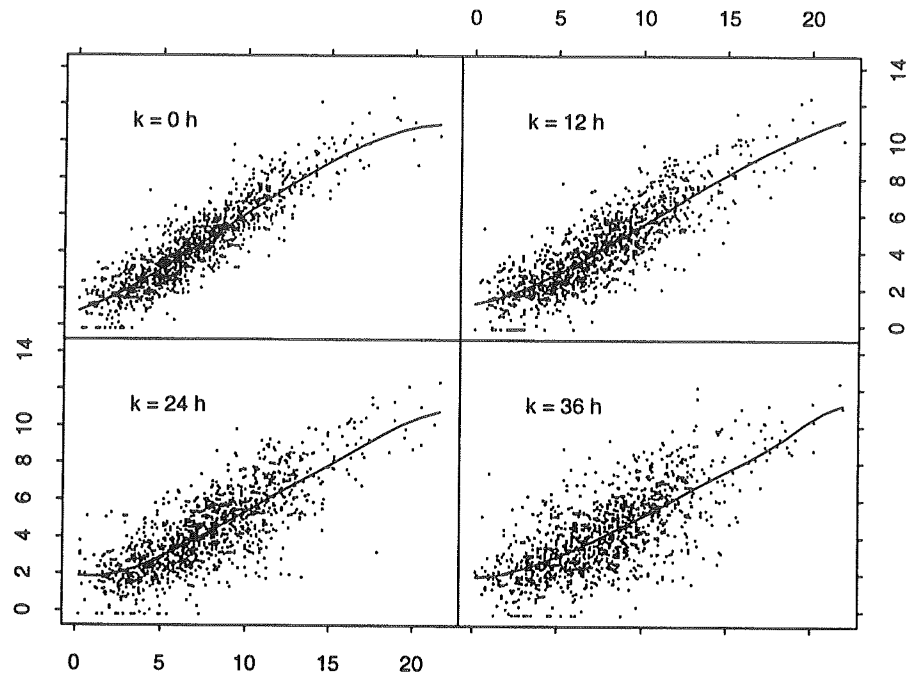

Figure D.8: *(Sydthy) Observed wind speed [m/s] versus forecasted wind speed at level 31 [m/s] for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation.*

	Prediction horizon [*hours*]								
Model	0	3	6	9	12	18	24	30	36
l30 m1	1.15	1.49	1.51	1.69	1.67	1.82	2.06	2.32	2.64
l30 m2	1.19	1.50	1.56	1.72	1.68	1.81	2.05	2.33	2.59
l30 m3	1.11	1.50	1.48	1.70	1.64	1.81	2.08	2.37	2.67
l31 m1	1.06	1.47	1.46	1.66	1.59	1.76	1.99	2.27	2.60
l31 m2	1.07	1.49	1.49	1.69	1.61	1.77	1.98	2.27	2.51
l31 m3	0.98	1.49	1.47	1.69	1.59	1.77	2.02	2.34	2.64
$s^2_{w^2}$	4.76	4.89	4.75	4.87	4.76	4.77	4.77	4.76	4.77

Table D.1: *(Dræby) Estimated variance for the model error of wind speed model (6.2), (6.3) and (6.4) (labelled "m1" to "m3") with forecasted wind speed from either model level 30 or model level 31 (labelled "l30" or "l31") as input and observed wind speed (w^2) as output. The results are shown for selected prediction horizons between 0 hours (the analysis) and 36 hours. The estimated variance for the observed wind speed is listed for the data set corresponding to the selected prediction horizons.*

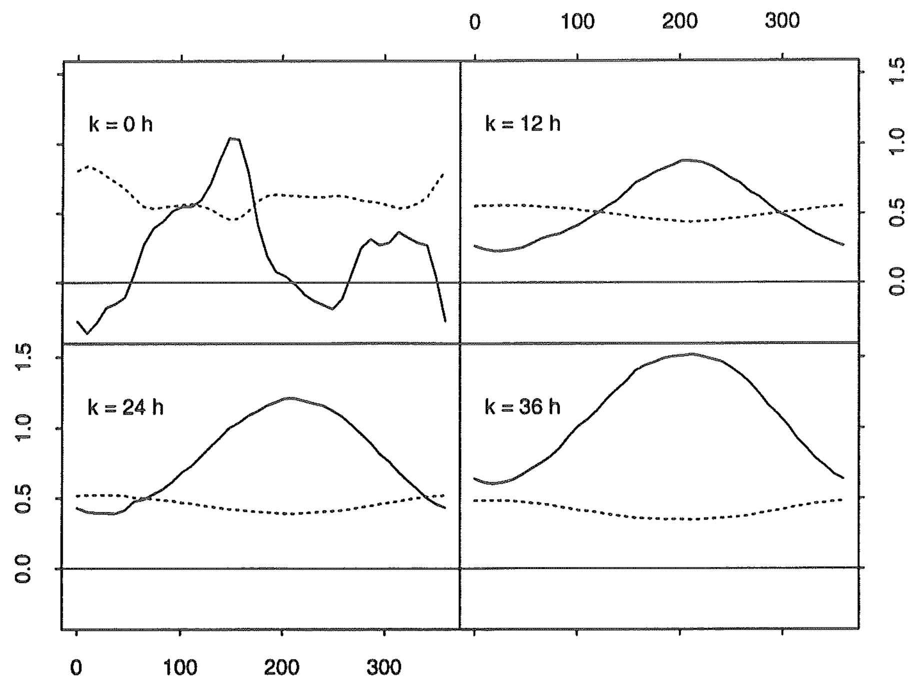

Figure D.9: *(Dræby) Estimated intecept, $b_0()$ (full line), and slope, $b_1()$ (dotted line), in (6.4) as a function of wind direction for a prediction horizon of 0 hours (top left), 12 hours (top right), 24 hours (buttom left) and 36 hours (buttom right). For the analysis the estimated coefficient functions indicate that disturbances is present in the wind field in the direction north east - south west. As this correspondes to the orientation of the bar on which the anomometers are placed this seems plausible. For the higher prediction horizons the wind direction dependancy is vigorously smoothed and only the trend remains.*

	Prediction horizon [*hours*]								
Model	0	3	6	9	12	18	24	30	36
130 m1	1.26	1.67	1.51	1.82	1.52	1.75	1.96	2.35	2.52
130 m2	1.22	1.60	1.47	1.76	1.48	1.72	1.90	2.29	2.47
130 m3	1.19	1.57	1.47	1.73	1.48	1.73	1.95	2.32	2.50
131 m1	1.25	1.57	1.47	1.72	1.47	1.70	1.88	2.29	2.45
131 m2	1.22	1.52	1.43	1.68	1.43	1.67	1.83	2.26	2.42
131 m3	1.15	1.48	1.43	1.65	1.44	1.68	1.87	2.25	2.44
$s^2_{w^2}$	5.33	5.50	5.28	5.49	5.28	5.32	5.33	5.29	5.30

Table D.2: *(Fjaldene) Estimated variance for the model error of wind speed model (6.2), (6.3) and (6.4) (labelled "m1" to "m3") with forecasted wind speed from either model level 30 or model level 31 (labelled "l30" or "l31") as input and observed wind speed (w^2) as output. The results are shown for selected prediction horizons between 0 hours (the analysis) and 36 hours. The estimated variance for the observed wind speed is listed for the data set corresponding to the selected prediction horizons.*

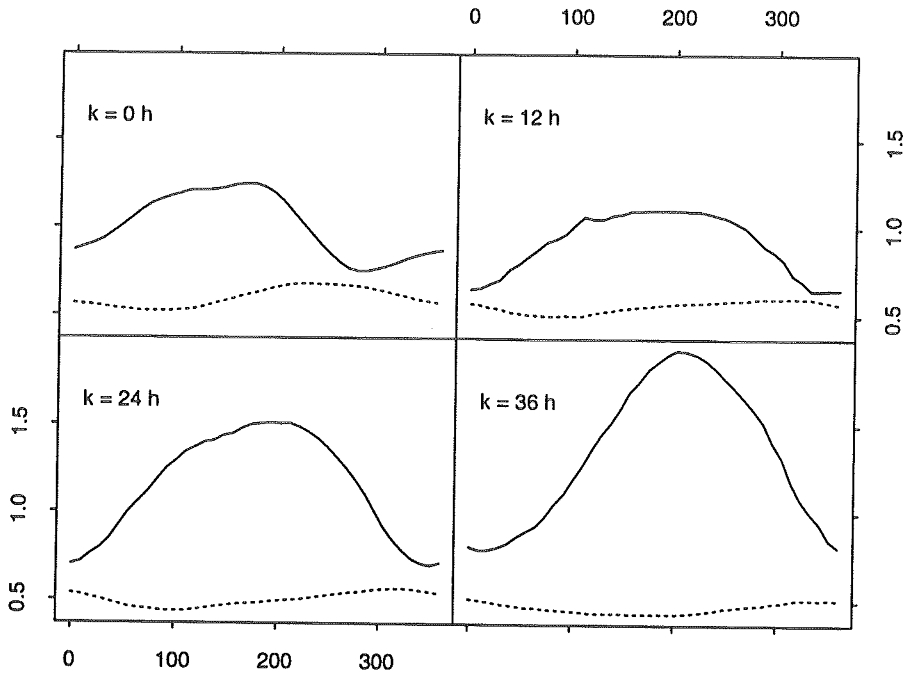

Figure D.10: *(Fjaldene) Estimated intecept, $b_0()$ (full line), and slope, $b_1()$ (dotted line), in (6.4) as a function of wind direction for a prediction horizon of 0 hours (top left), 12 hours (top right), 24 hours (buttom left) and 36 hours (buttom right). The estimated coefficient functions indicate that some shading is present for the northerly wind directions, which might be explained by the fact that meteorology tower is placed just south of the wind farm.*

	Prediction horizon [*hours*]								
Model	0	3	6	9	12	18	24	30	36
130 m1	1.37	1.72	1.77	1.73	1.95	2.03	2.22	2.51	2.77
130 m2	1.34	1.67	1.74	1.68	1.91	2.02	2.19	2.45	2.68
130 m3	1.30	1.55	1.70	1.67	1.90	1.97	2.18	2.56	2.84
131 m1	1.11	1.51	1.61	1.53	1.81	1.88	2.03	2.35	2.62
131 m2	1.09	1.48	1.57	1.50	1.76	1.85	2.02	2.32	2.56
131 m3	1.05	1.34	1.54	1.47	1.75	1.80	1.99	2.38	2.65
$s^2_{w^2}$	4.94	4.85	4.86	4.82	4.84	4.93	4.92	4.86	4.89

Table D.3: *(Hollandsbjerg) Estimated variance for the model error of wind speed model (6.2), (6.3) and (6.4) (labelled "m1" to "m3") with forecasted wind speed from either model level 30 or model level 31 (labelled "l30" or "l31") as input and observed wind speed (w^2) as output. The results are shown for selected prediction horizons between 0 hours (the analysis) and 36 hours. The estimated variance for the observed wind speed is listed for the data set corresponding to the selected prediction horizons.*

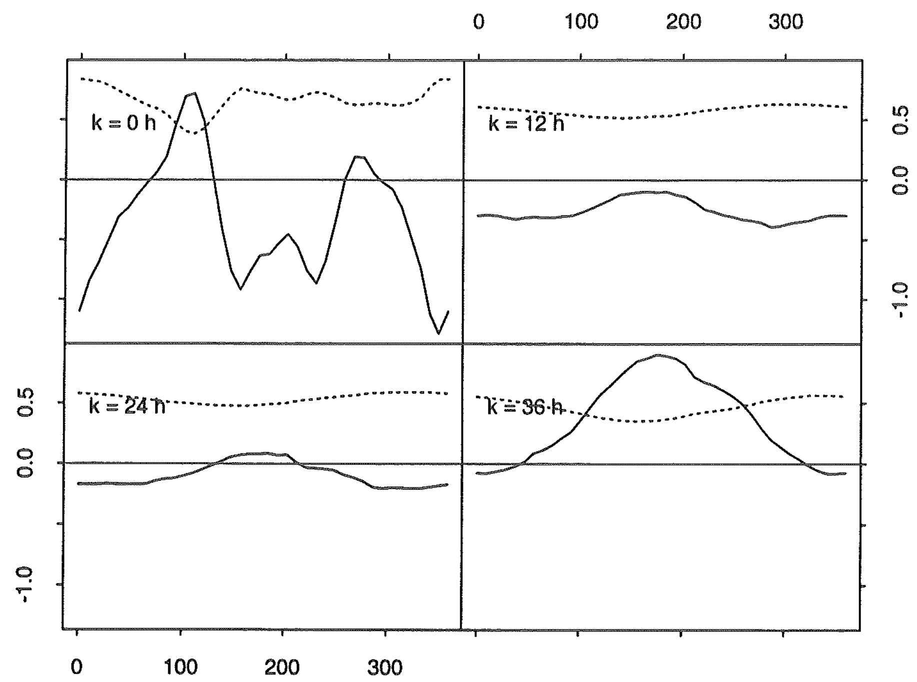

Figure D.11: *(Hollandsbjerg) Estimated intecept, $b_0()$ (full line), and slope, $b_1()$ (dotted line), in (6.4) as a function of wind direction for a prediction horizon of 0 hours (top left), 12 hours (top right), 24 hours (buttom left) and 36 hours (buttom right). Also here the estimated coefficient functions for the analysis show a disturbance im the wind field - this time is seems very plausible that the effect is caused by shading from a wind tubine placed just south south west of the meteorology mast. For the longer prediction horizons only a higly smoothed version of aformentioned pattern remains to be seen.*

	Prediction horizon [*hours*]								
Model	0	3	6	9	12	18	24	30	36
130 m1	2.68	3.19	3.51	3.42	3.90	4.35	4.71	5.32	5.93
130 m2	2.76	3.15	3.59	3.65	5.91	4.54	4.69	6.33	7.56
130 m3	2.01	2.68	3.02	2.89	3.37	3.92	4.28	4.91	5.51
131 m1	2.47	3.02	3.29	3.26	3.72	4.16	4.53	5.15	5.82
131 m2	2.56	2.97	3.36	3.43	6.28	4.34	4.52	5.86	7.10
131 m3	1.86	2.61	2.86	2.83	3.28	3.81	4.16	4.79	5.44
$s^2_{w^2}$	13.0	12.9	13.0	12.8	13.0	13.0	13.0	13.2	13.3

Table D.4: *(Rejsby) Estimated variance for the model error of wind speed model (6.2), (6.3) and (6.4) (labelled "m1" to "m3") with forecasted wind speed from either model level 30 or model level 31 (labelled "l30" or "l31") as input and observed wind speed (w^2) as output. The results are shown for selected prediction horizons between 0 hours (the analysis) and 36 hours. The estimated variance for the observed wind speed is listed for the data set corresponding to the selected prediction horizons.*

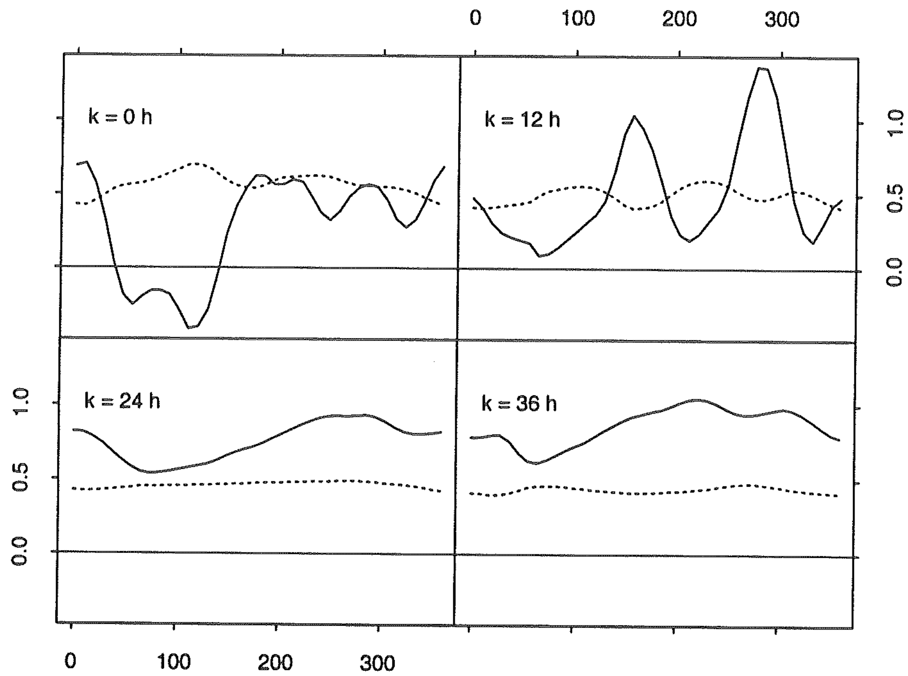

Figure D.12: *(Sydthy) Estimated intecept, $b_0()$ (full line), and slope, $b_1()$ (dotted line), in (6.4) as a function of wind direction for a prediction horizon of 0 hours (top left), 12 hours (top right), 24 hours (buttom left) and 36 hours (buttom right). The estimated coefficient functions indicate that the wind field is disturbed for easterly wind directions. This corresponds well with the east - west orientation of the sliding bar on which the anemometers are placed as well as the fact that the observed wind speed in (6.4) originate from anemometer 2 positioned on the western part of the sliding bar. The estimated coefficient functions for the 12 hour predictions horizons seems to exagerate a much weaker pattern also found for the remain prediction horizons - probably due to some statistical fluke in the data set.*

	Prediction horizon [*hours*]								
Model	0	3	6	9	12	18	24	30	36
l30 m1	0.960	1.26	1.33	1.47	1.40	1.49	1.74	2.16	2.55
l30 m2	0.935	1.22	1.30	1.43	1.37	1.48	1.73	2.13	2.51
l30 m3	0.886	1.14	1.24	1.33	1.31	1.45	1.71	2.13	2.51
l31 m1	0.917	1.23	1.31	1.41	1.35	1.46	1.69	2.10	2.47
l31 m2	0.887	1.20	1.26	1.38	1.32	1.43	1.68	2.07	2.44
l31 m3	0.815	1.07	1.18	1.22	1.23	1.40	1.65	2.06	2.41
$s^2_{w^2}$	4.78	4.97	4.73	4.95	4.68	4.65	4.67	4.68	4.73

Table D.5: *(Sydthy) Estimated variance for the model error of wind speed model (6.2), (6.3) and (6.4) (labelled "m1" to "m3") with forecasted wind speed from either model level 30 or model level 31 (labelled "l30" or "l31") as input and observed wind speed (w^2) as output. The results are shown for selected prediction horizons between 0 hours (the analysis) and 36 hours. The estimated variance for the observed wind speed is listed for the data set corresponding to the selected prediction horizons.*

D.3 Diurnal variations in observed and forecasted wind speed

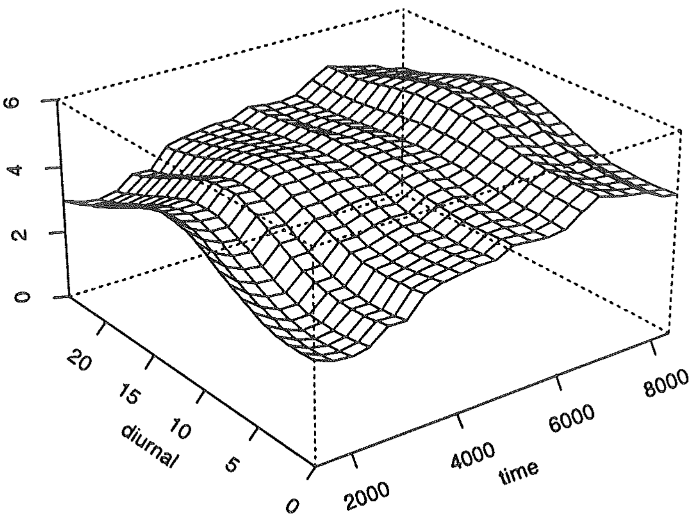

Figure D.13: *(Dræby) Annual variation in the estimated diurnal variation [m/s] versus time of day [hours] for the observed wind speed (w^2). Here the observation numbers 2000, 4000, 6000 and 8000 correspond to the dates 17.08.97, 08.11.97, 31.01.98 and 24.04.98, respectively. A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

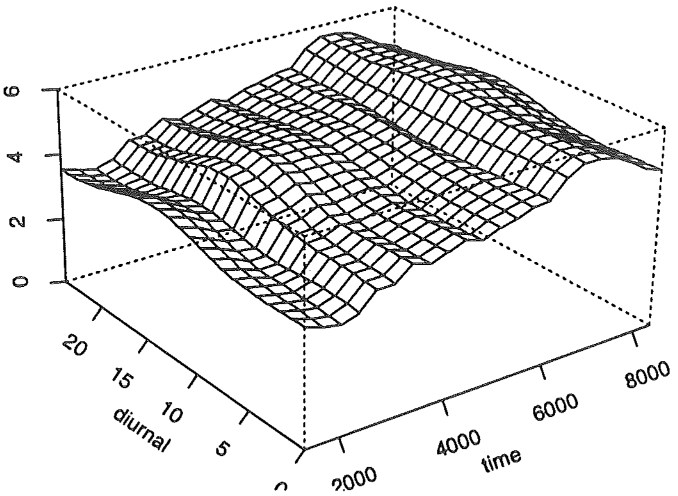

Figure D.14: *(Fjaldene) Annual variation in the estimated diurnal variation [m/s] versus time of day [hours] for the observed wind speed (w^2). Here the observation numbers 2000, 4000, 6000 and 8000 correspond to the dates 17.08.97, 08.11.97, 31.01.98 and 24.04.98, respectively. A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

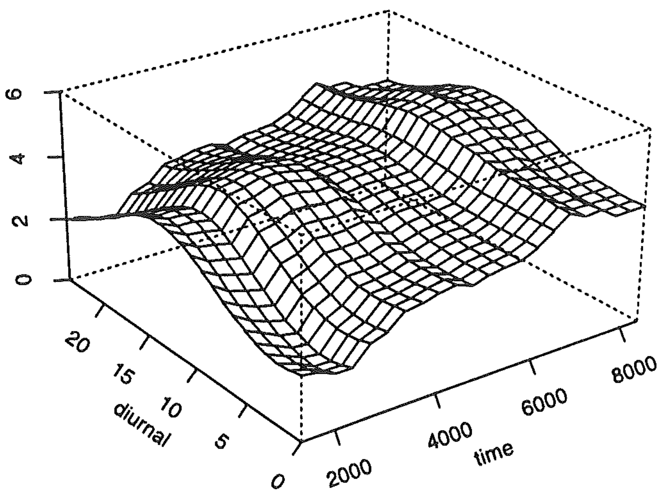

Figure D.15: *(Hollandsbjerg) Annual variation in the estimated diurnal variation [m/s] versus time of day [hours] for the observed wind speed (w^2). Here the observation numbers 2000, 4000, 6000 and 8000 correspond to the dates 17.08.97, 08.11.97, 31.01.98 and 24.04.98, respectively. A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

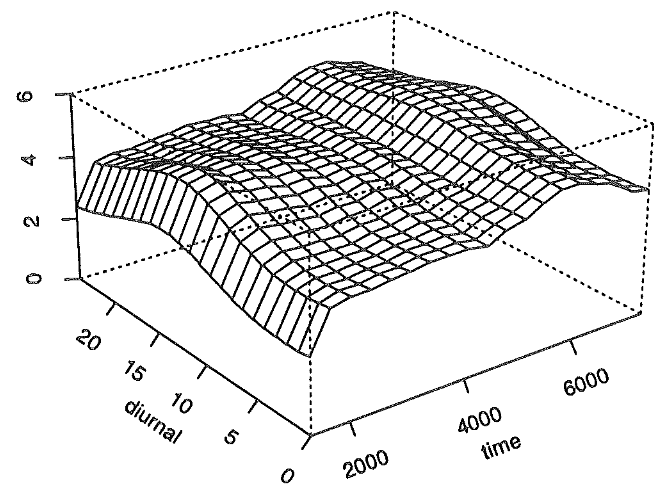

Figure D.16: *(Sydthy). Annual variation in the estimated diurnal variation [m/s] versus time of day [hours] for the observed wind speed (w^2). Here the observation numbers 2000, 4000 and 6000 correspond to the dates 02.10.97, 24.12.97 and 18.03.98, respectively. A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

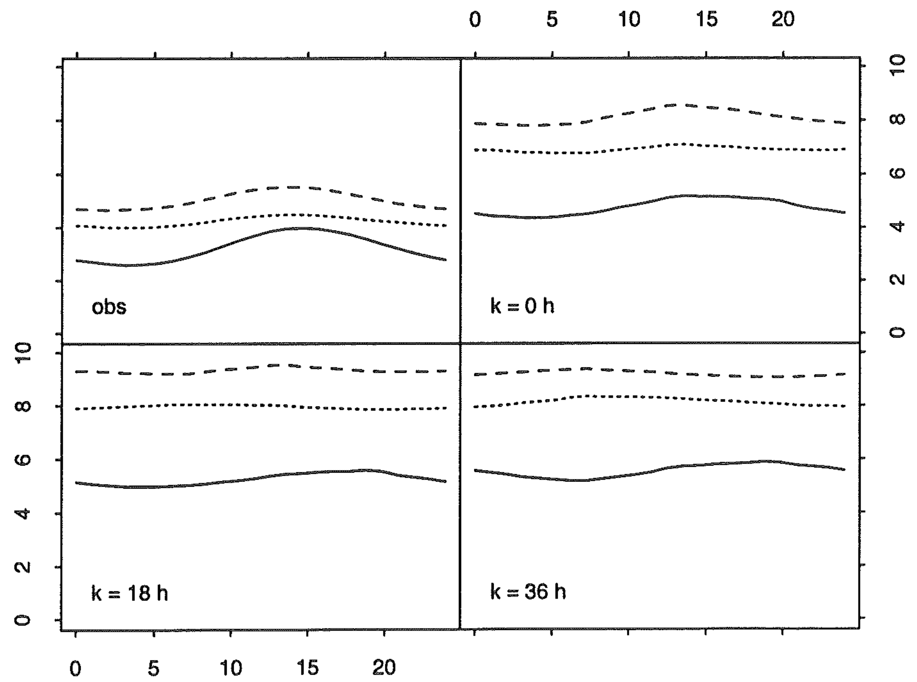

Figure D.17: *(Dræby) Estimated diurnal variation [m/s] versus time of day [hours] at 3th September 1997 (full line), 12th December 1997 (dotted line) and 22nd March 1998 (dashed line) for the observed wind speed (top left) as well as forecasted wind speed for a prediction horizon of 0 hours (top right), 18 hours (buttom left) and 36 hours (buttom right). A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

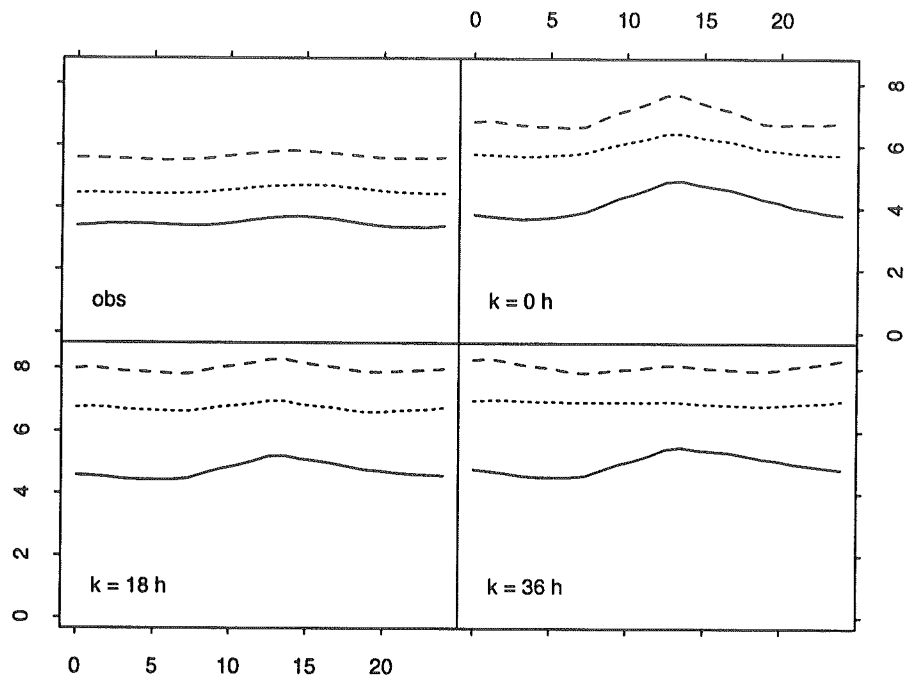

Figure D.18: *(Fjaldene) Estimated diurnal variation [m/s] versus time of day [hours]at 3th September 1997 (full line), 12th December 1997 (dotted line) and 22nd March 1998 (dashed line) for the observed wind speed (top left) as well as forecasted wind speed for a prediction horizon of 0 hours (top right), 18 hours (buttom left) and 36 hours (buttom right). A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

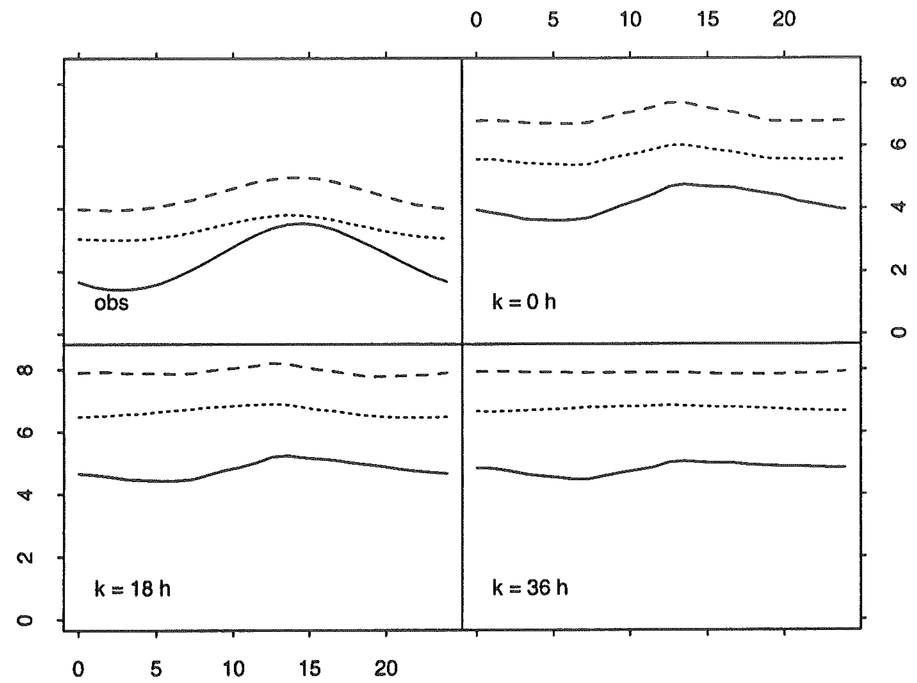

Figure D.19: *(Hollandsbjerg) Estimated diurnal variation [m/s] versus time of day [hours] at 3th September 1997 (full line), 12th December 1997 (dotted line) and 22nd March 1998 (dashed line) for the observed wind speed (top left) as well as forecasted wind speed for a prediction horizon of 0 hours (top right), 18 hours (buttom left) and 36 hours (buttom right). A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

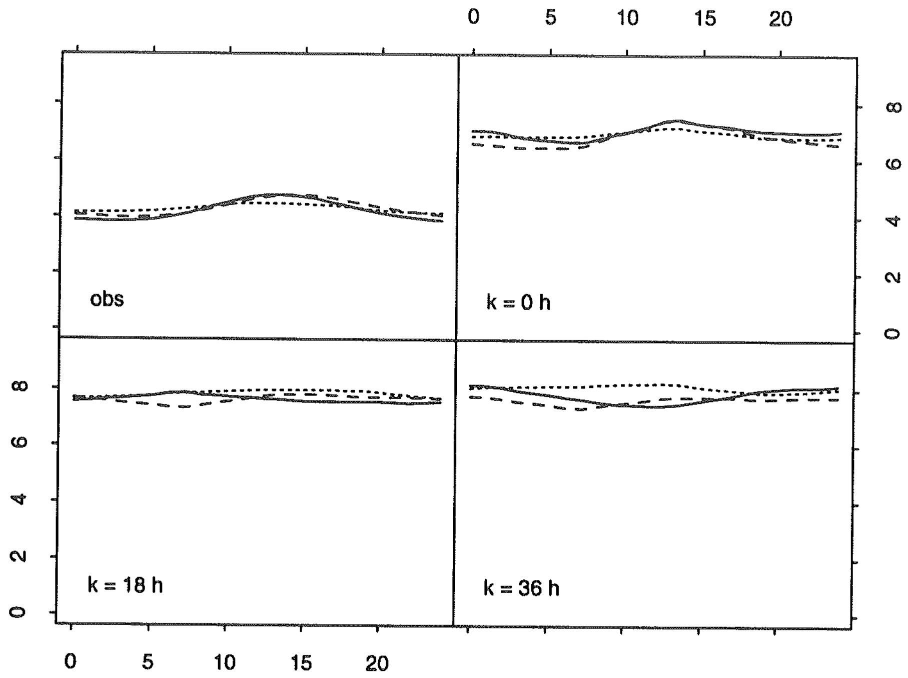

Figure D.20: *(Sydthy) Estimated diurnal variation [m/s] versus time of day [hours] at 19th October 1997 (full line), 27th January 1998 (dotted line) and 7th May 1998 (dashed line) for the observed wind speed (top left) as well as forecasted wind speed for a prediction horizon of 0 hours (top right), 18 hours (buttom left) and 36 hours (buttom right). A forgetting factor corresponding to a memory time constant of 4 weeks is used in the estimation.*

D.4 Forecasted wind direction statistics

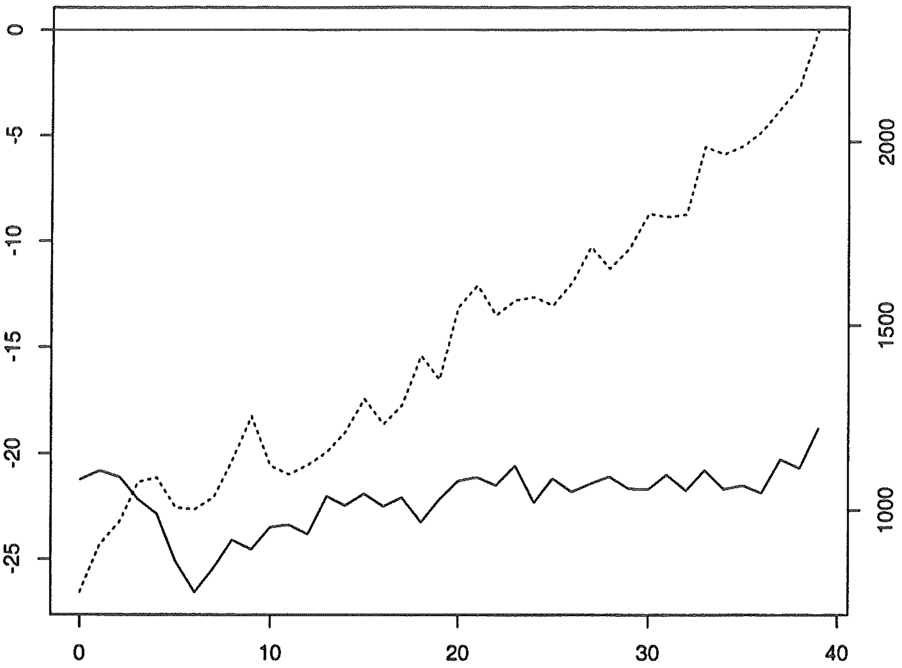

Figure D.21: *(Dræby) Estimated mean error (full line, left hand axis* [°]*) and error variance (dotted line, right hand axis* [(°)^2]*) versus prediction horizon (hours) for the forecasted wind direction at model level 31.*

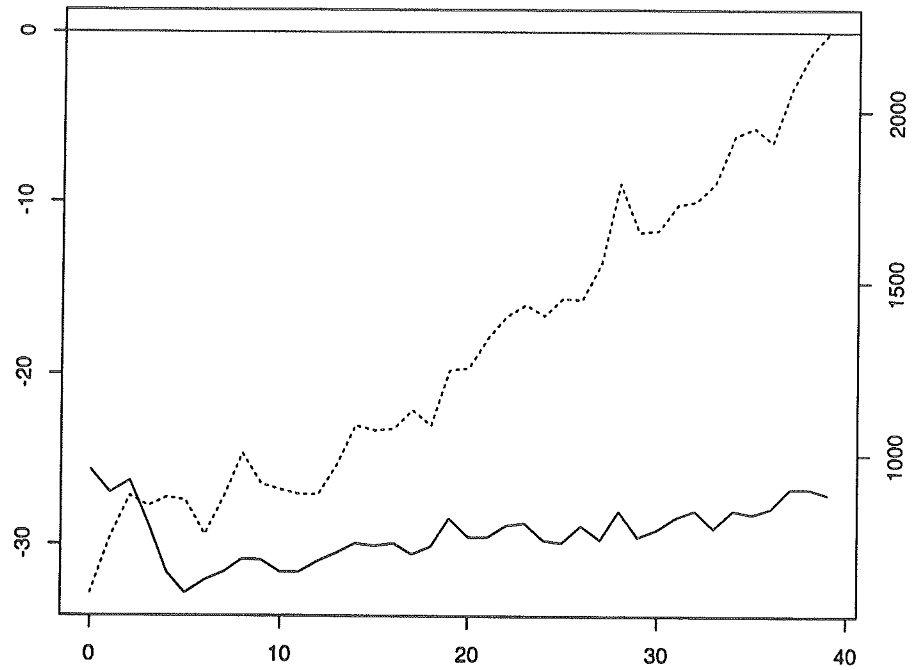

Figure D.22: *(Fjaldene) Estimated mean error (full line, left hand axis [°]) and error variance (dotted line, right hand axis [(°)^2]) versus prediction horizon (hours) for the forecasted wind direction at model level 31.*

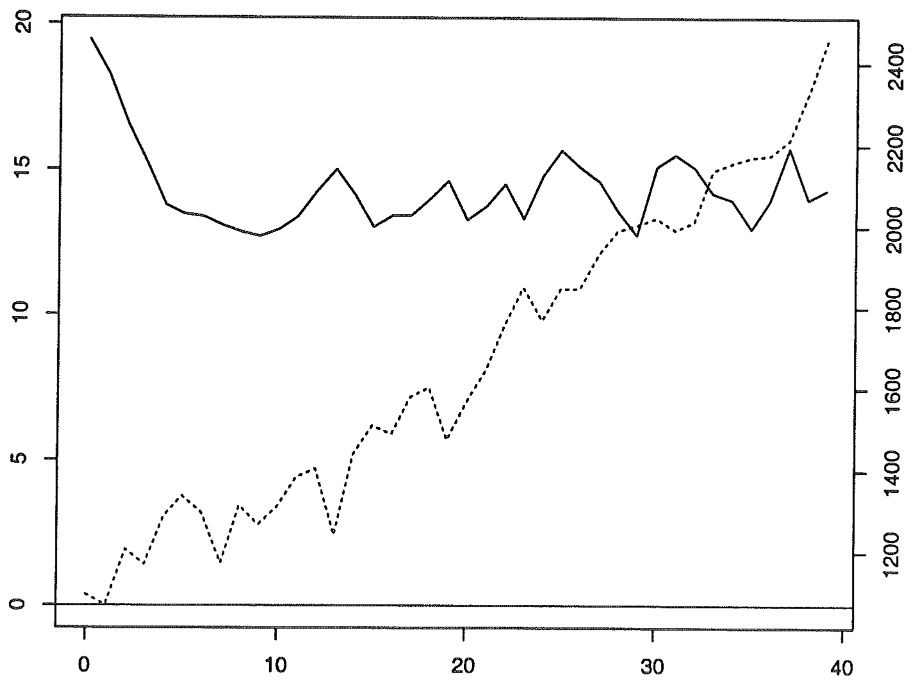

Figure D.23: *(Hollandsbjerg) Estimated mean error (full line, left hand axis [°]) and error variance (dotted line, right hand axis [(°)^2]) versus prediction horizon (hours) for the forecasted wind direction at model level 31.*

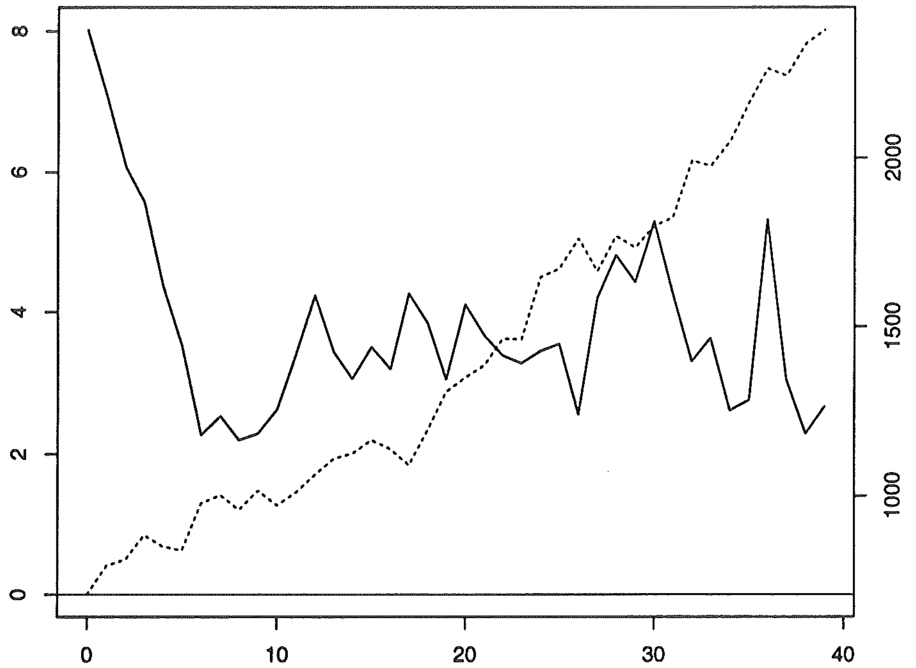

Figure D.24: *(Sydthy) Estimated mean error (full line, left hand axis [°]) and error variance (dotted line, right hand axis [(°)^2]) versus prediction horizon (hours) for the forecasted wind direction at model level 31.*

D.5 Relations between observed and forecasted wind direction

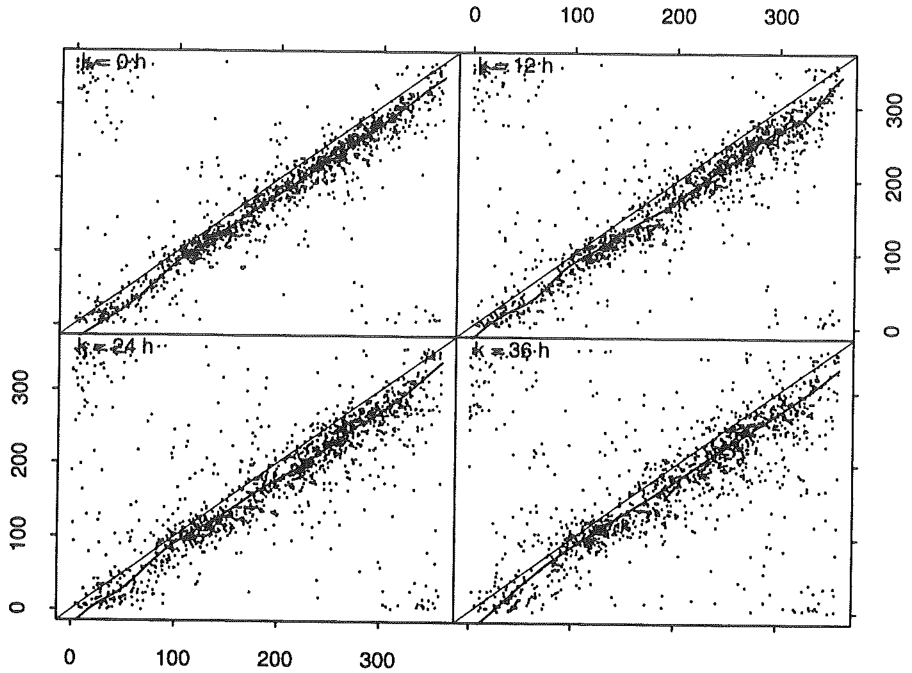

Figure D.25: *(Dræby) Observed wind direction [°] versus forecasted wind direction at level 31 [°] for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour. The line is the estimated relationship using local regression and 2. order polynomial approximation.*

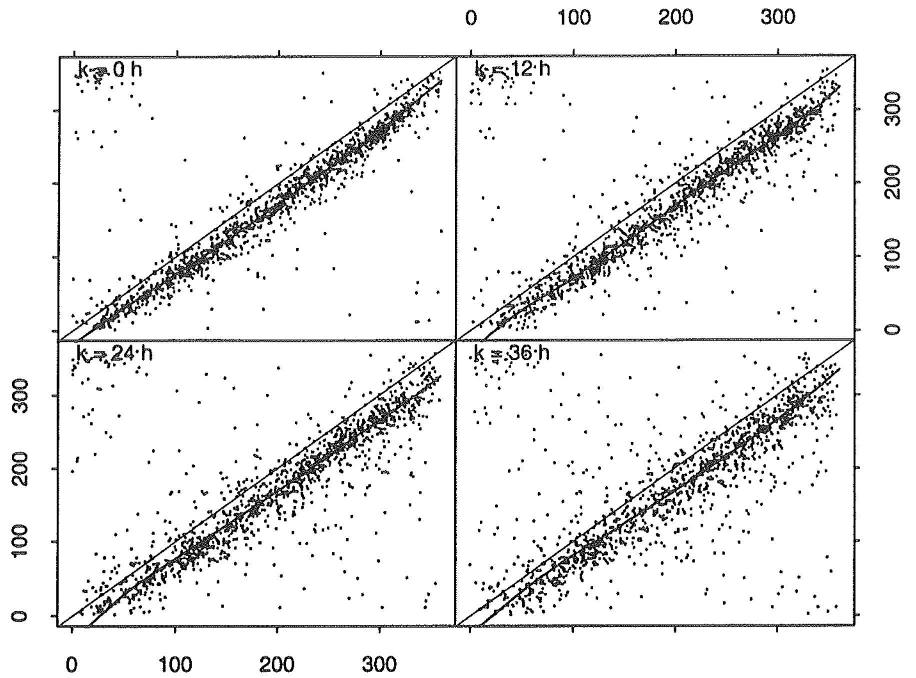

Figure D.26: *(Fjaldene) Observed wind direction* [°] *versus forecasted wind direction at level 31* [°] *for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour. The line is the estimated relationship using local regression and 2. order polynomial approximation.*

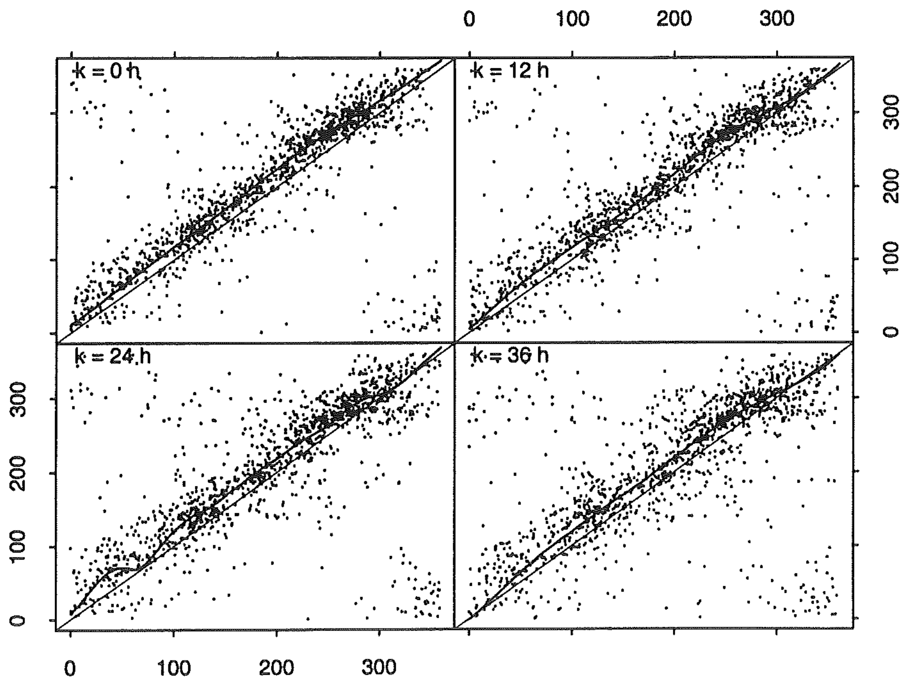

Figure D.27: *(Hollandsbjerg) Observed wind direction* [°] *versus forecasted wind direction at level 31* [°] *for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour. The line is the estimated relationship using local regression and 2. order polynomial approximation.*

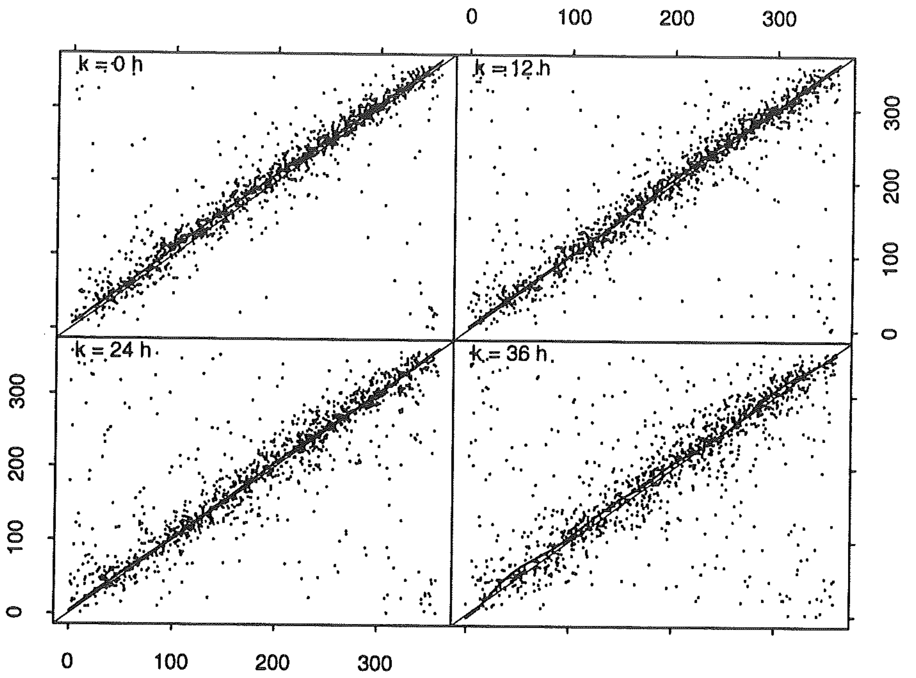

Figure D.28: *(Sydthy) Observed wind direction [°] versus forecasted wind direction at level 31 [°] for a forecast horizon of 0 hours (top left), 12 hour (top rigth), 24 hour (buttom left) and 36 hour. The line is the estimated relationship using local regression and 2. order polynomial approximation.*

Appendix E

Power curve

E.1 Area wind speed

Model	DR	FJ	HO	RB	SY
$m1_{ws^1}$	1.063	1.216	1.045	2.388	0.8476
$m1_{ws^2}$	1.047	1.250	1.136	2.049	0.8871
$m1_c$	1.086	1.262	1.049	2.100	0.8599
$m1_c^I$	0.949	0.990	0.904	1.796	0.7840
$m2_{ws^1}$	0.995	1.022	1.064	2.117	0.7855
$m2_{ws^2}$	0.971	0.981	1.082	1.827	0.7789
$m2_c$	0.979	0.986	0.985	1.829	0.7779
$m2_c^I$	0.976	0.975	0.987	1.828	0.7762
$s^2_{w^m_{t\|t}}$	3.441	3.464	3.416	9.337	3.579

Table E.1: *(All wind farms) Estimated error variance for the single wind speed model without intercept (6.11) or with intercept (6.14) using either wind speed 1 or 2 as regressors (labelled $m1_{w^i}$ and $m2_{w^i}$, where i is equal to either 1 or 2 for wind speed 1 or 2, respectively), for the combined models without intercept using estimated area wind speed from either (6.11) or (6.14) as regressors (labelled $m1_c$ and $m2_c$) and for the combined models with an intercept (labelled either $m1_c^I$ or $m2_c^I$).*

E.2 Identification and estimation of wind farm power curves

E.2.1 Dræby

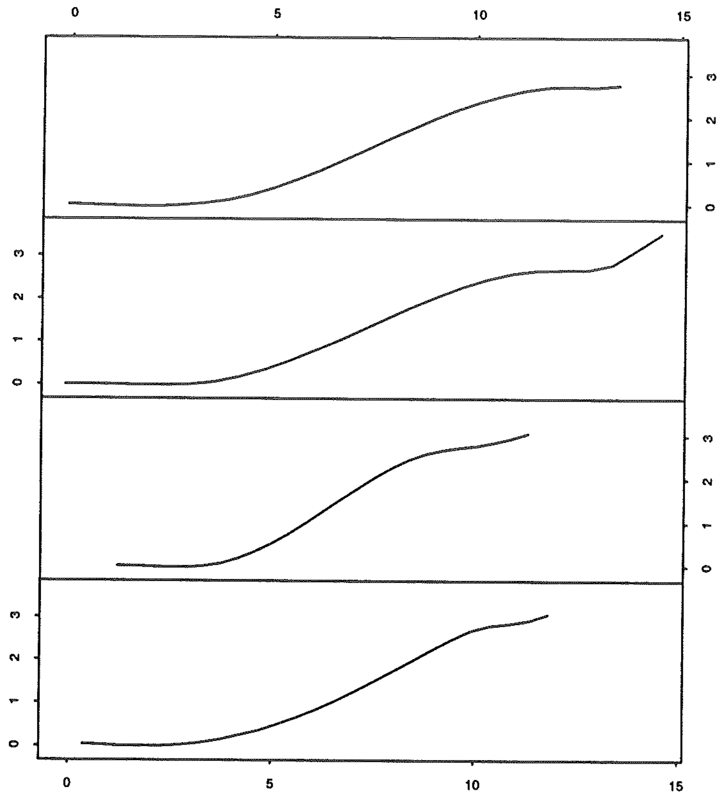

Figure E.1: *(Dræby) Estimated power curve as a function of from top to bottom wind speed 1 and 2, estimated area wind speed and the analysis.*

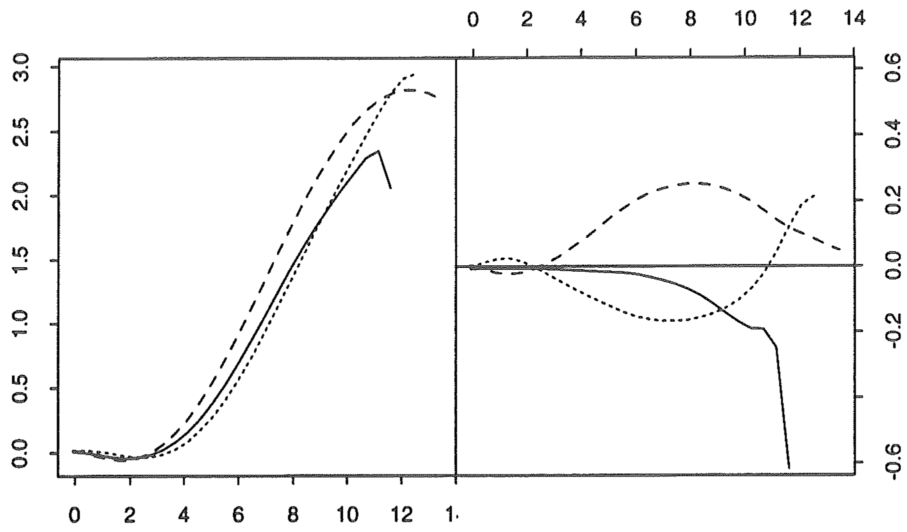

Figure E.2: *(Dræby) Power curve as a function of wind speed 1 and estimated locally around a wind direction of* 0° *(full line),* 110° *(dotted line) and* 220° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^1)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 11m/s]$ *and 0 otherwise.*

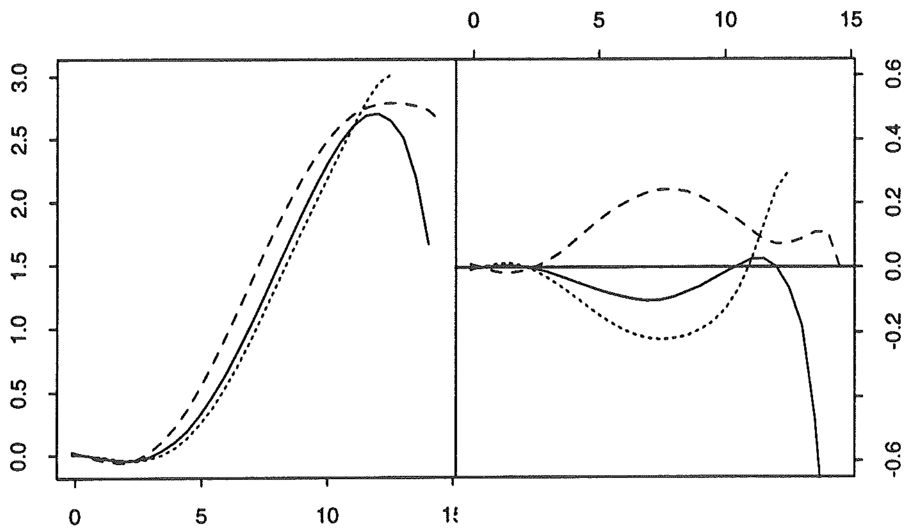

Figure E.3: *(Dræby) Power curve as a function of wind speed 2 and estimated locally around a wind direction of* 0° *(full line),* 110° *(dotted line) and* 220° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^2)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 12m/s]$ *and 0 otherwise.*

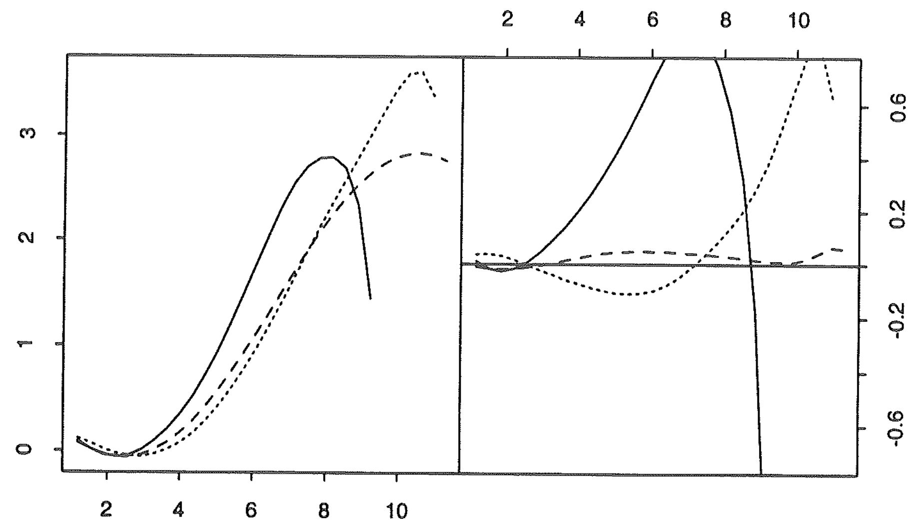

Figure E.4: *(Dræby) Power curve as a function of the area wind speed and estimated locally around a wind direction of* 0° *(full line),* 110° *(dotted line) and* 220° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^a)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 9m/s]$ *and 0 otherwise.*

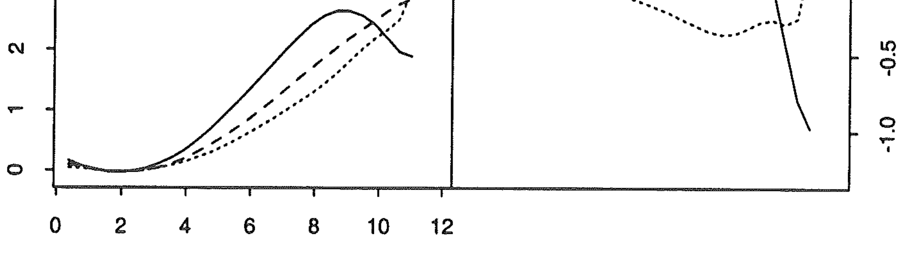

Figure E.5: *(Dræby) Power curve as a function of the analysis and estimated locally around a wind direction of* 0° *(full line),* 110° *(dotted line) and* 220° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_{t|t}^m)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 10m/s]$ *and 0 otherwise.*

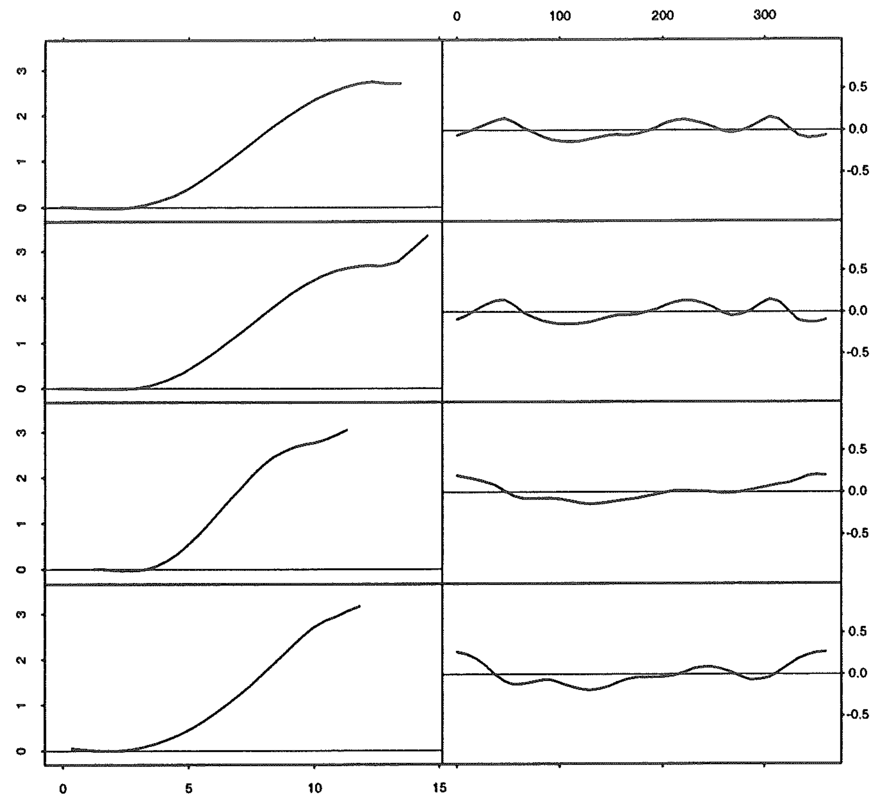

Figure E.6: *(Dræby) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a constant approximation of the wind direction dependency. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

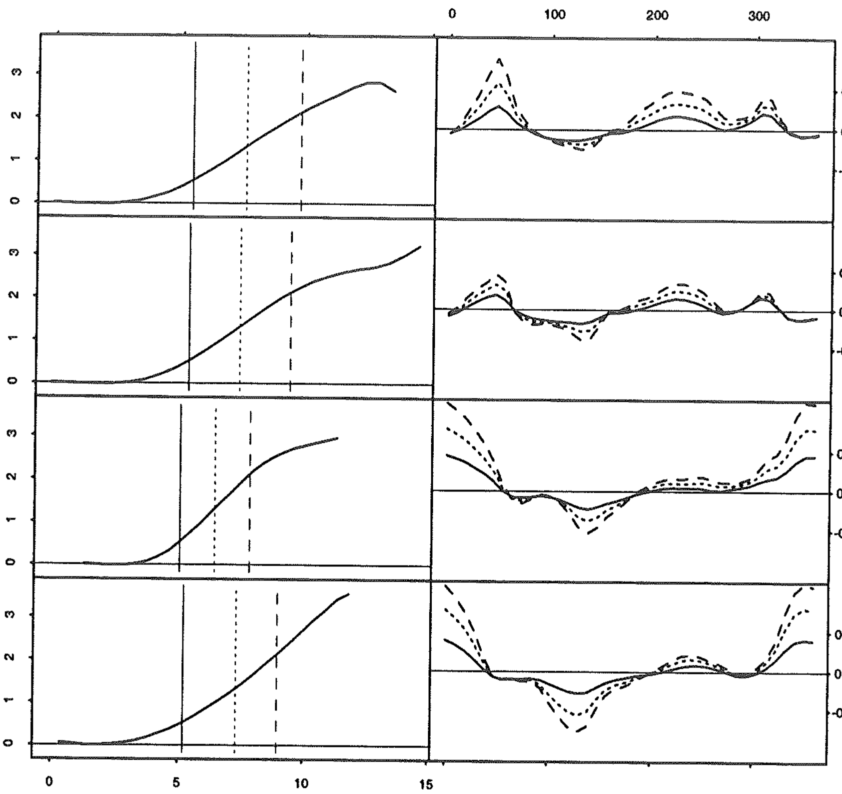

Figure E.7: *(Dræby) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a first order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

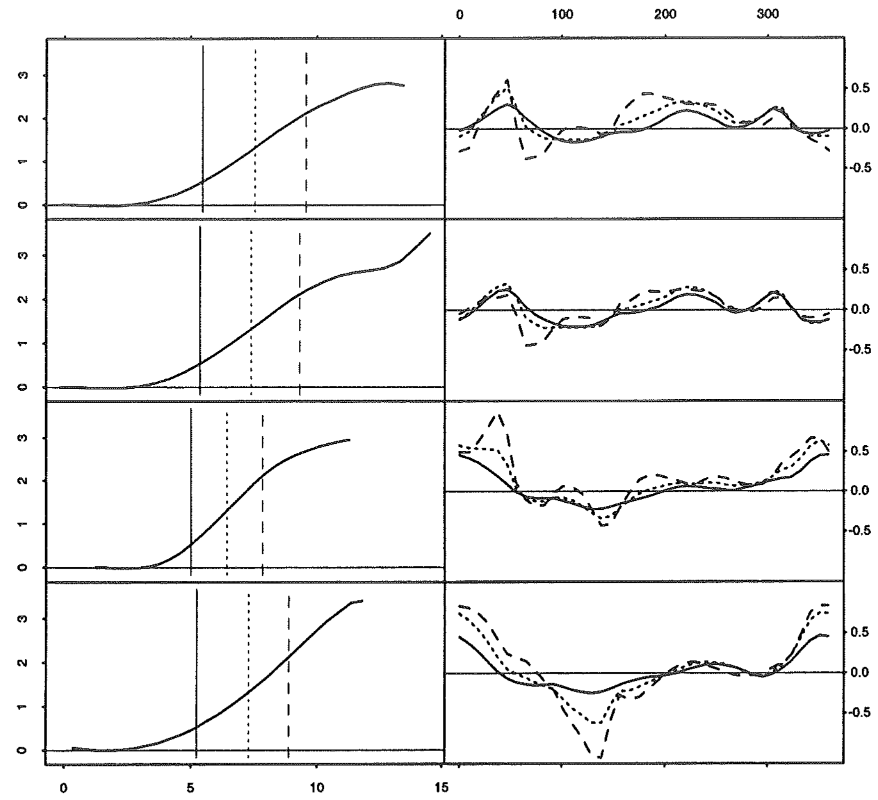

Figure E.8: *(Dræby) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a second order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

E.2.2 Fjaldene

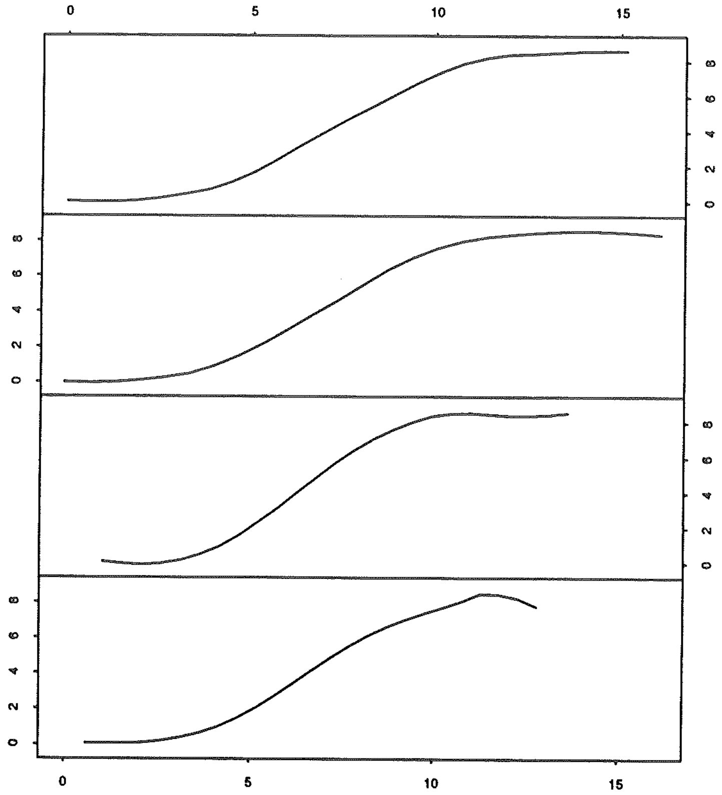

Figure E.9: *(Fjaldene) Estimated power curve as a function of from top to bottom wind speed 1 and 2, estimated area wind speed and the analysis.*

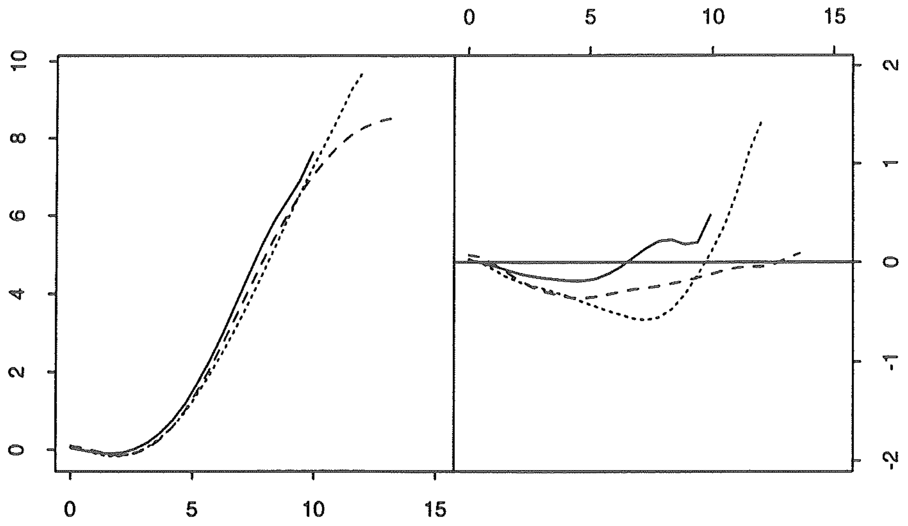

Figure E.10: *(Fjaldene) Power curve as a function of wind speed 1 and estimated locally around a wind direction of* 10° *(full line),* 100° *(dotted line) and* 240° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^1)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 10m/s]$ *and 0 otherwise.*

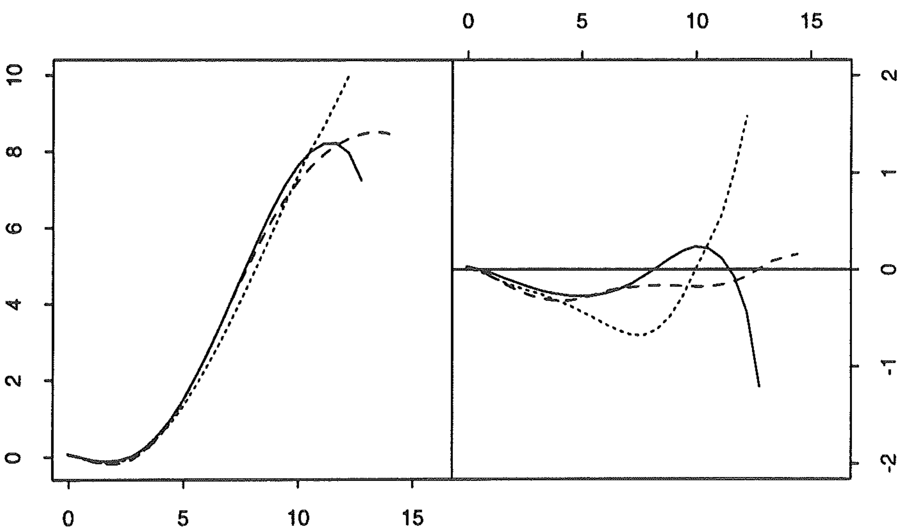

Figure E.11: *(Fjaldene) Power curve as a function of wind speed 2 and estimated locally around a wind direction of* 10° *(full line),* 100° *(dotted line) and* 240° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^2)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 11m/s]$ *and 0 otherwise.*

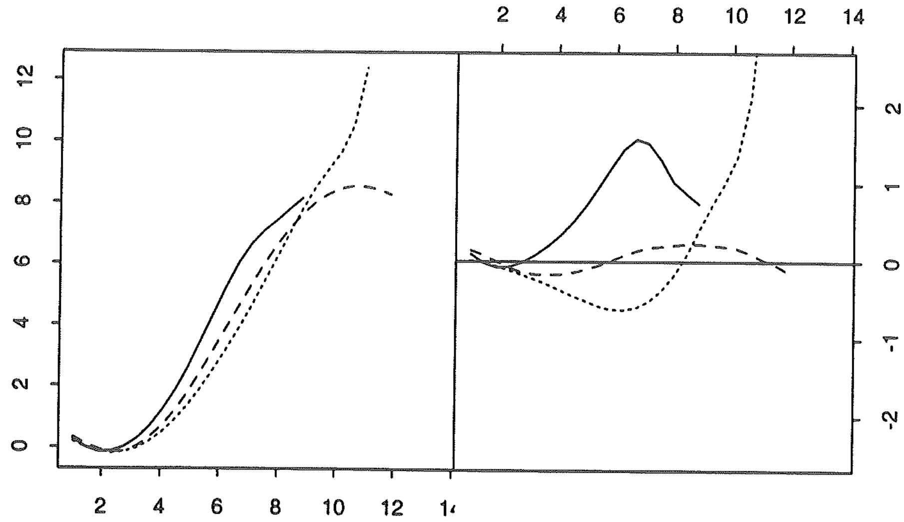

Figure E.12: *(Fjaldene) Power curve as a function of area wind speed and estimated locally around a wind direction of* 10° *(full line),* 100° *(dotted line) and* 200° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^a)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 9m/s]$ *and 0 otherwise.*

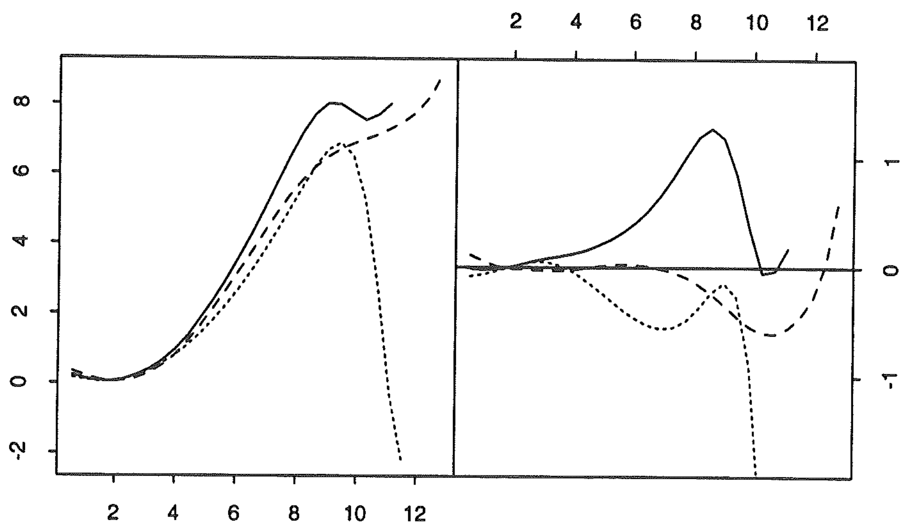

Figure E.13: *(Fjaldene) Power curve as a function of the analysis and estimated locally around a wind direction of* 10° *(full line),* 100° *(dotted line) and* 240° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_{t|t}^m)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 9m/s]$ *and 0 otherwise.*

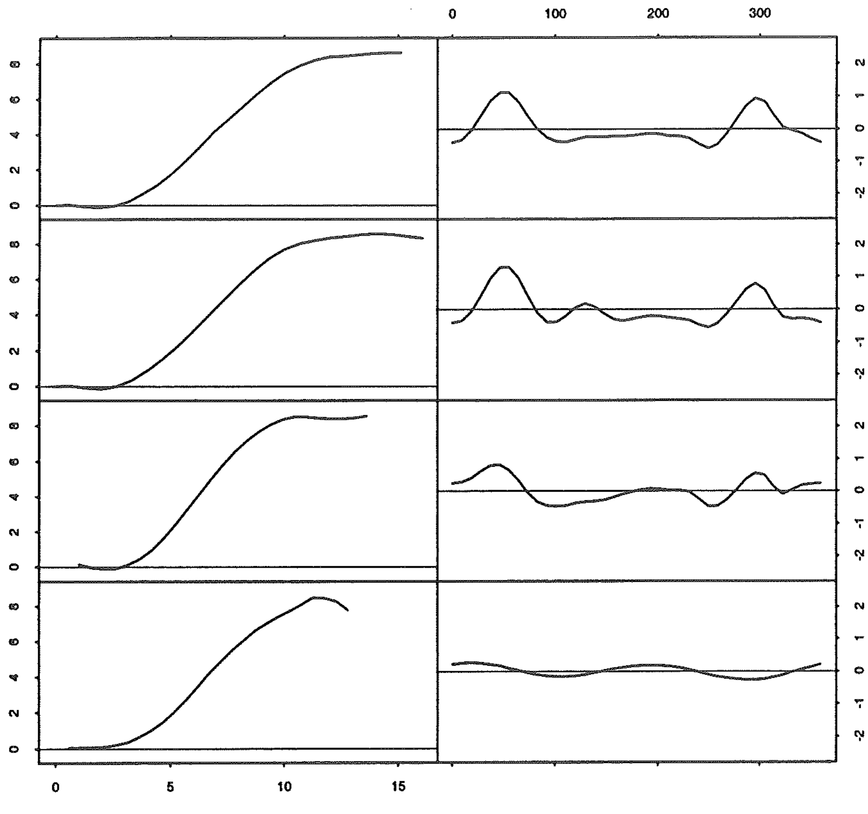

Figure E.14: *(Fjaldene) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a constant approximation of the wind direction dependency. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

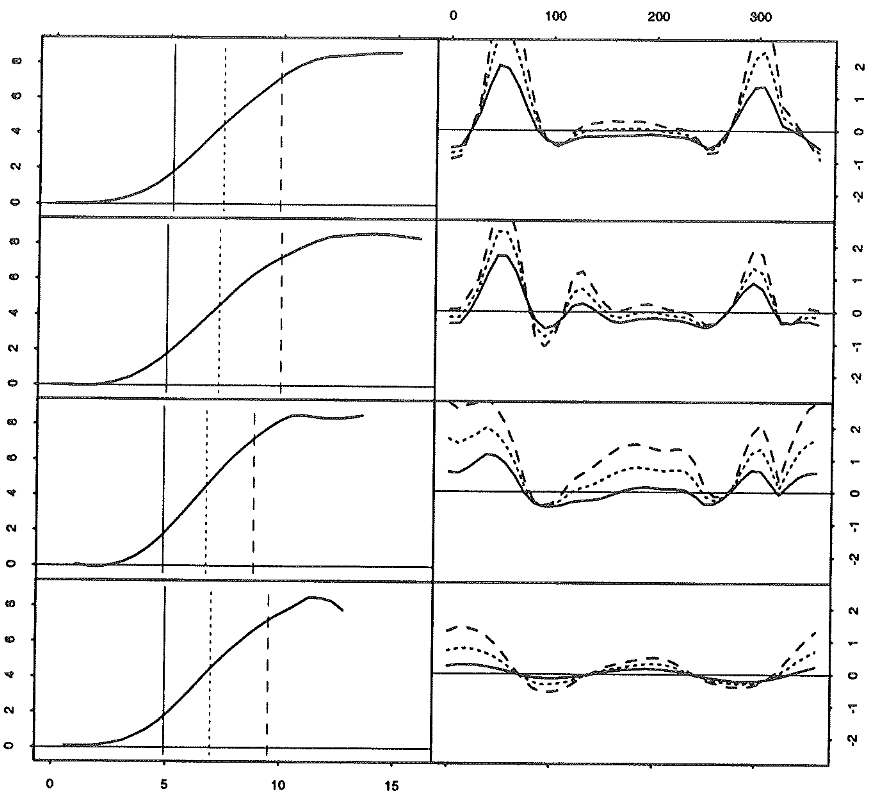

Figure E.15: *(Fjaldene) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a first order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

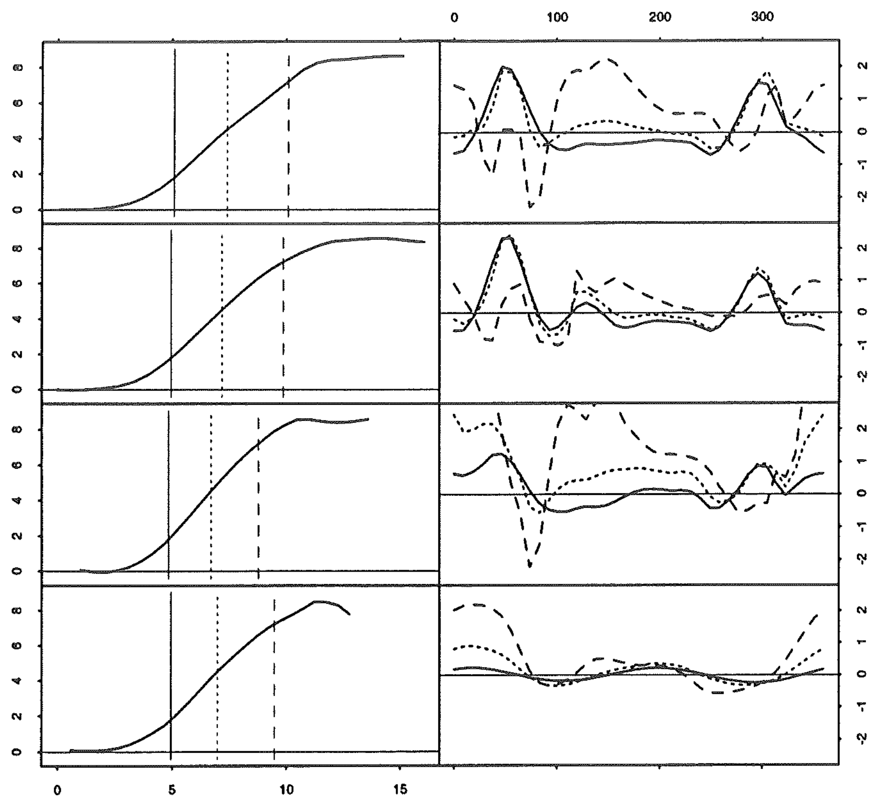

Figure E.16: *(Fjaldene) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a second order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

E.2.3 Hollandsbjerg

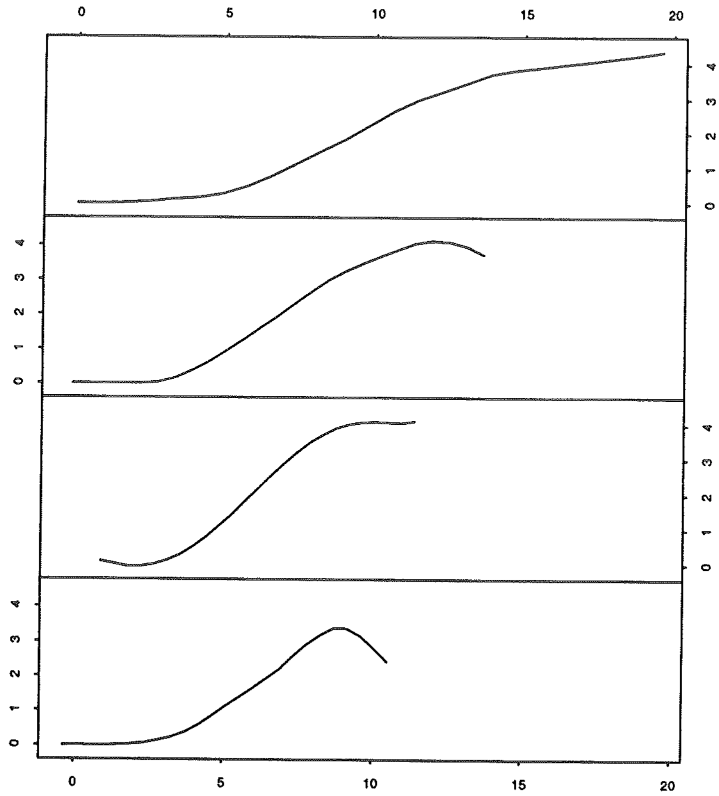

Figure E.17: *(Hollandsbjerg) Estimated power curve as a function of from top to bottom wind speed 1 and 2, estimated area wind speed and the analysis.*

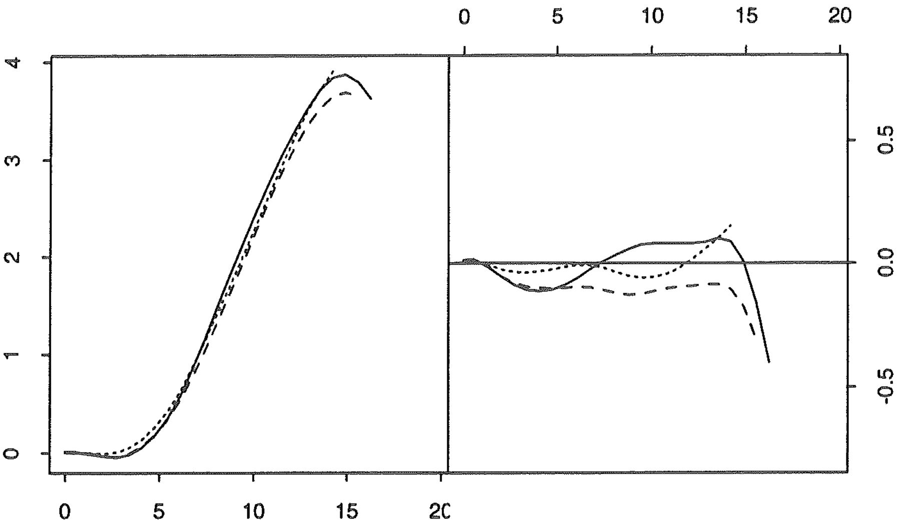

Figure E.18: *(Hollandsbjerg) Power curve as a function of wind speed 1 and estimated locally around a wind direction of* 90° *(full line),* 240° *(dotted line) and* 330° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^1)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 15m/s]$ *and 0 otherwise.*

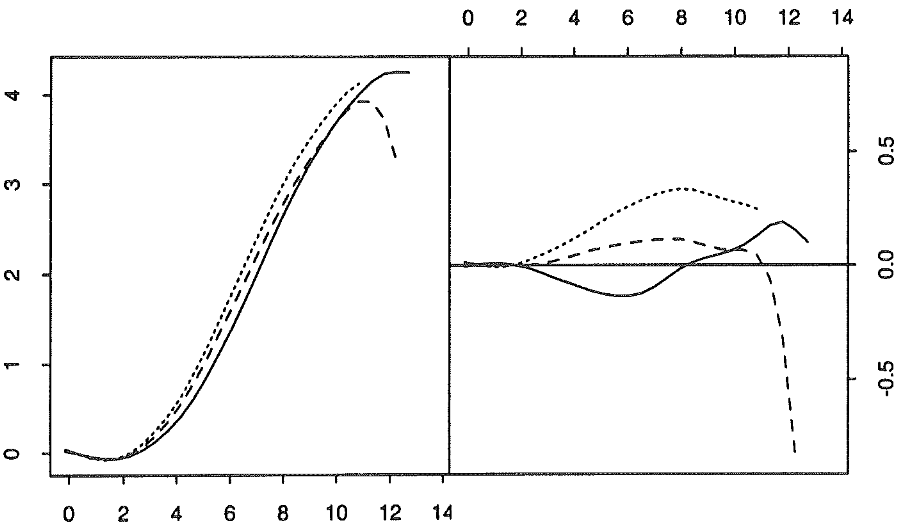

Figure E.19: *(Hollandsbjerg) Power curve as a function of wind speed 2 and estimated locally around a wind direction of* 90° *(full line),* 240° *(dotted line) and* 330° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^2)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 11m/s]$ *and 0 otherwise.*

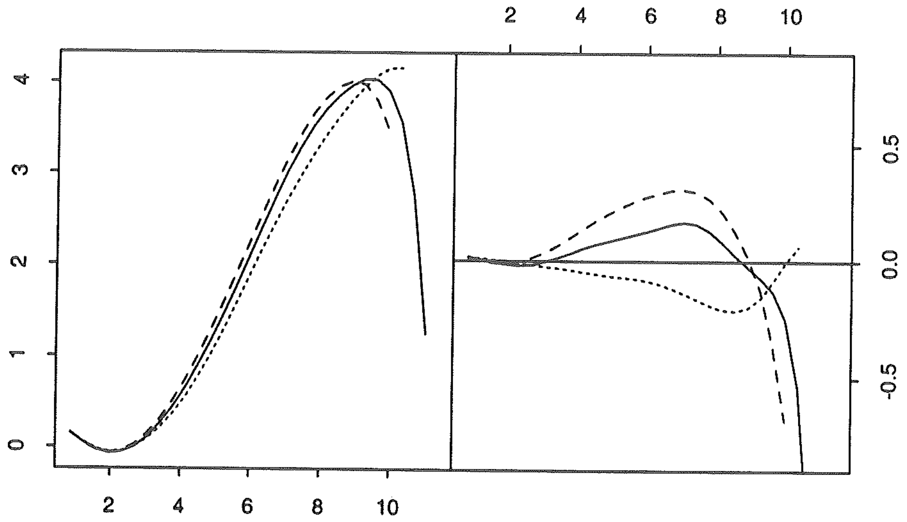

Figure E.20: *(Hollandsbjerg) Power curve as a function of the area wind speed and estimated locally around a wind direction of* 90° *(full line),* 240° *(dotted line) and* 330° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^a)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 9m/s]$ *and 0 otherwise.*

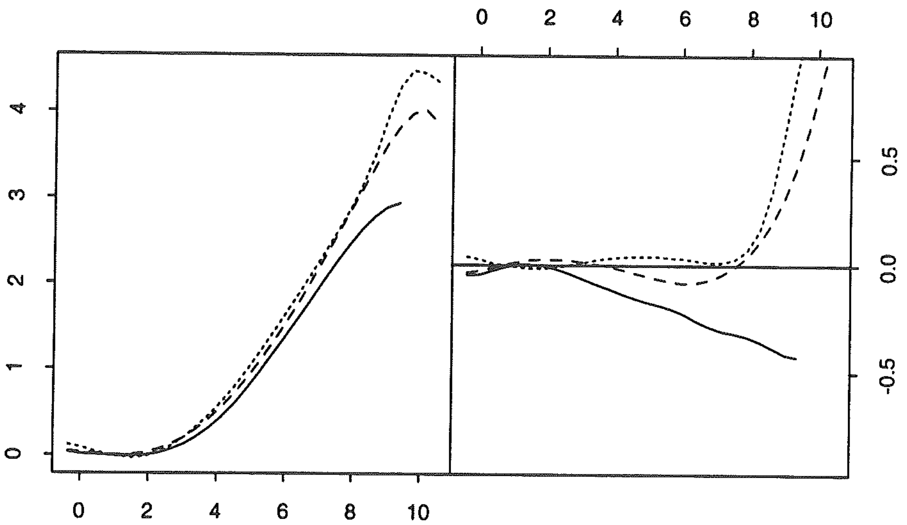

Figure E.21: *(Hollandsbjerg) Power curve as a function of the analysis and estimated locally around a wind direction of* 90° *(full line),* 240° *(dotted line) and* 330° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_{t|t}^m)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 9m/s]$ *and 0 otherwise.*

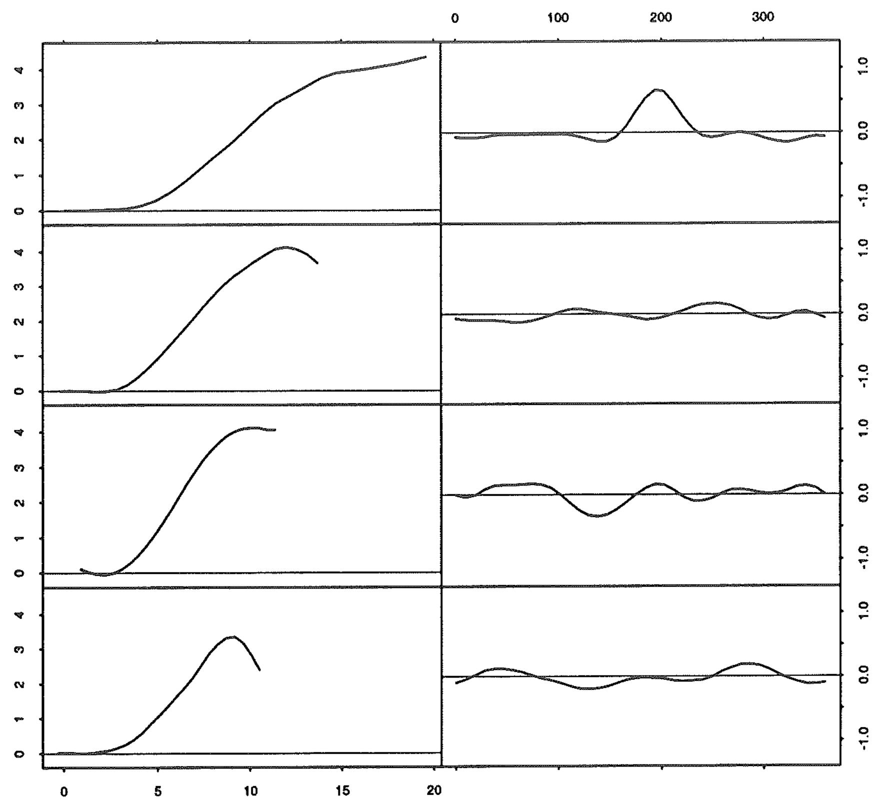

Figure E.22: *(Hollandsbjerg) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a constant approximation of the wind direction dependency. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

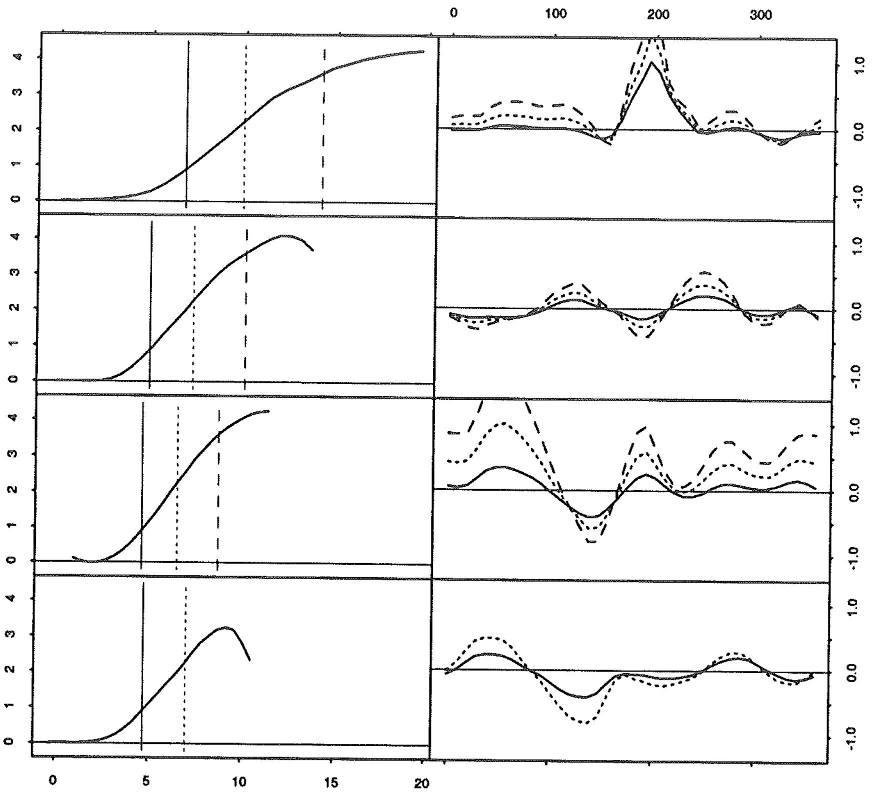

Figure E.23: *(Hollandsbjerg) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a first order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 45% (dotted line) and 70% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

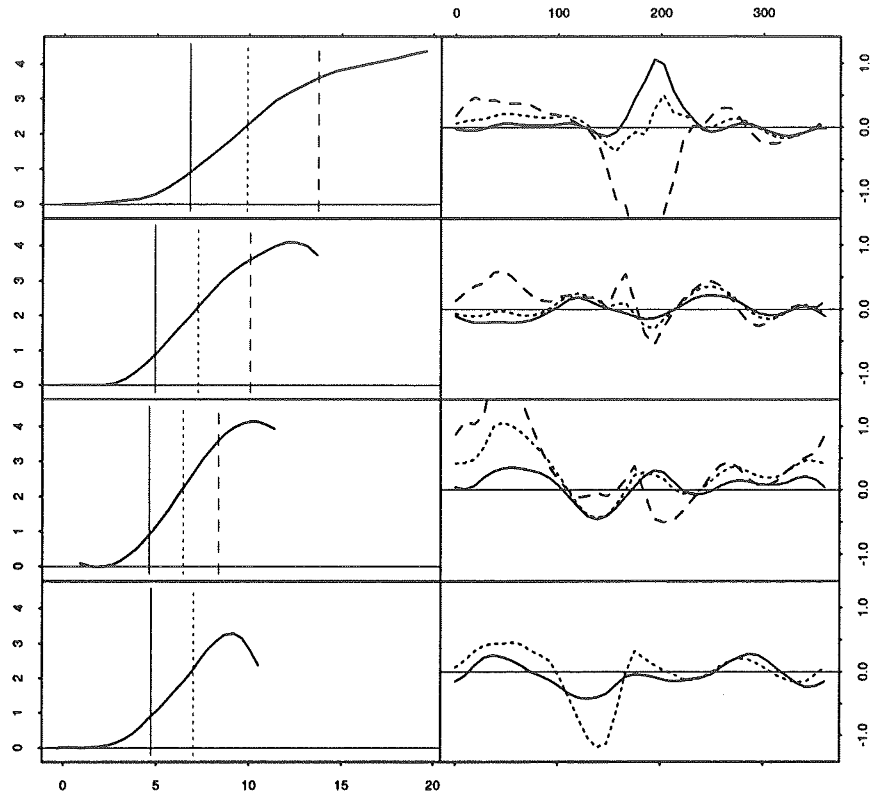

Figure E.24: *(Hollandsbjerg) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a second order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 45% (dotted line) and 70% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

E.2.4 Rejsby

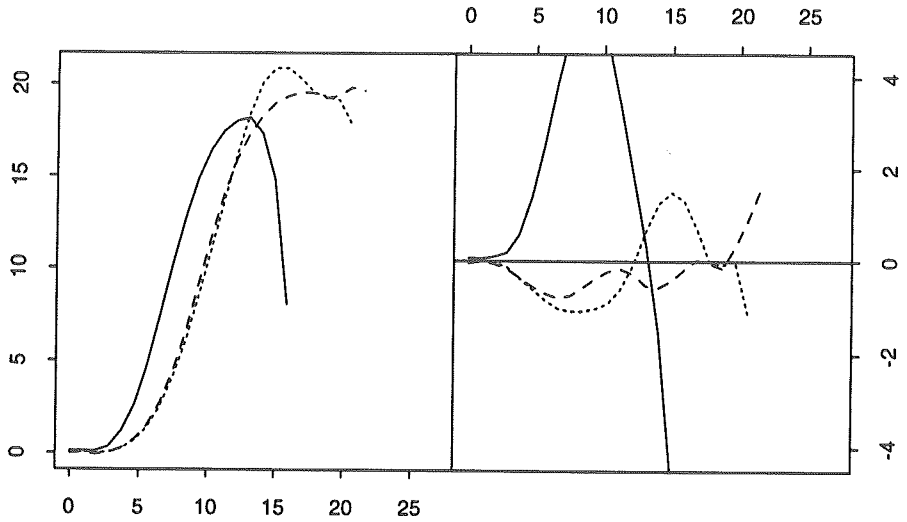

Figure E.25: *(Rejsby) Power curve as a function of wind speed 1 and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^1)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 12m/s]$ *and 0 otherwise.*

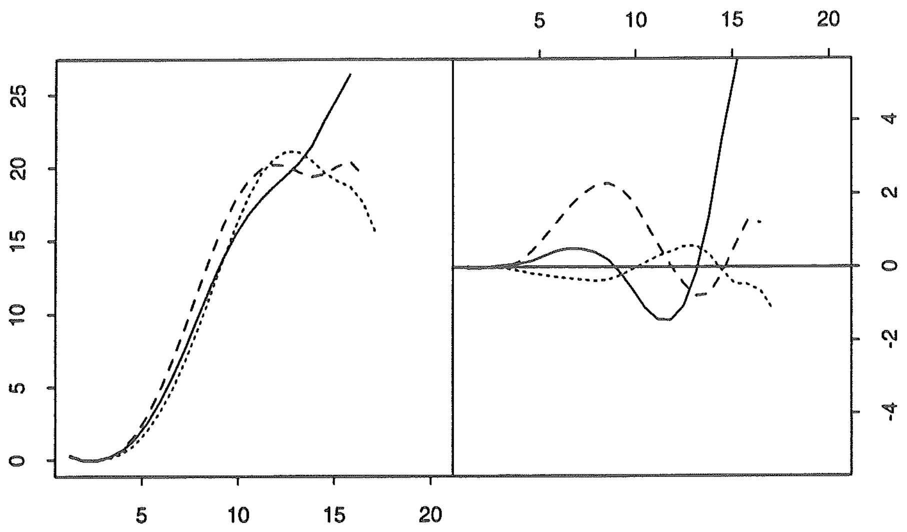

Figure E.26: *(Rejsby) Power curve as a function of the area wind speed and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^a)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 12m/s]$ *and 0 otherwise.*

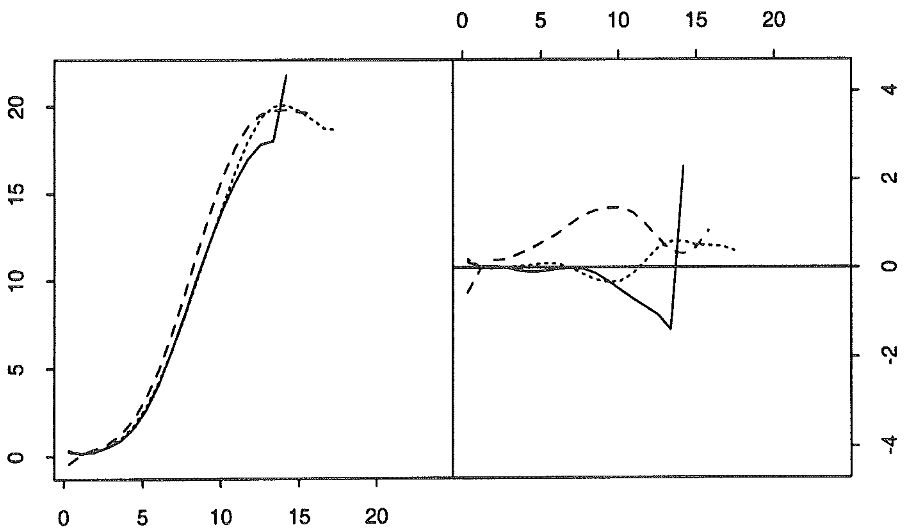

Figure E.27: *(Rejsby) Power curve as a function of the analysis and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^m)$ *used in (6.18) is set to 1 in the interval* $[3m/s; 13m/s]$ *and 0 otherwise.*

E.2.5 Sydthy

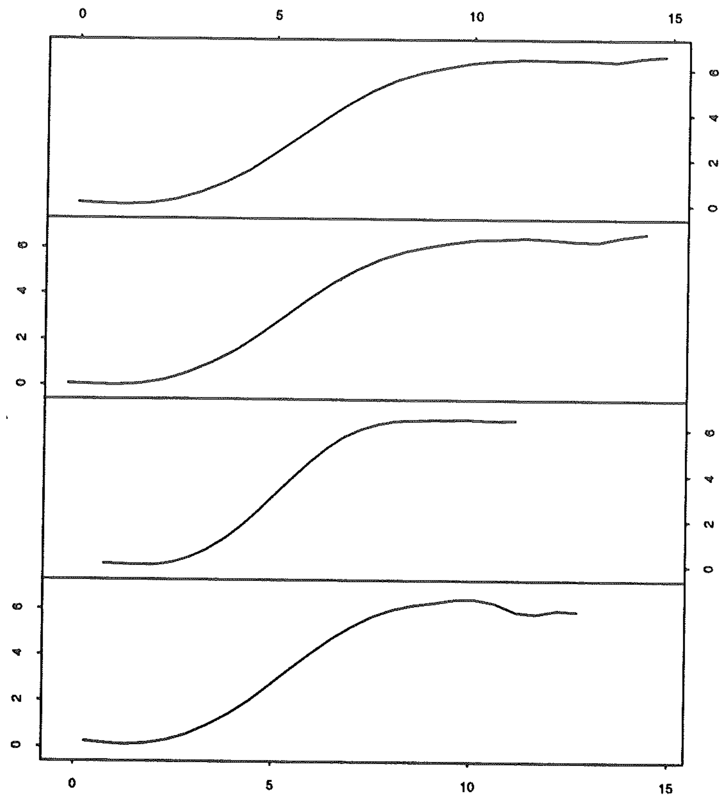

Figure E.28: *(Sydthy) Estimated power curve as a function of from top to bottom wind speed 1 and 2, estimated area wind speed and the analysis.*

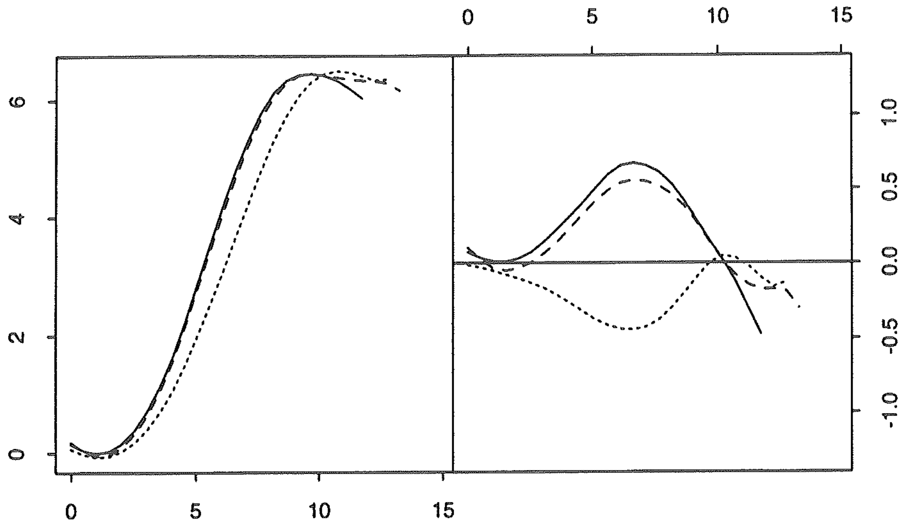

Figure E.29: *(Sydthy) Power curve as a function of wind speed 1 and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^1)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 10m/s]$ *and 0 otherwise.*

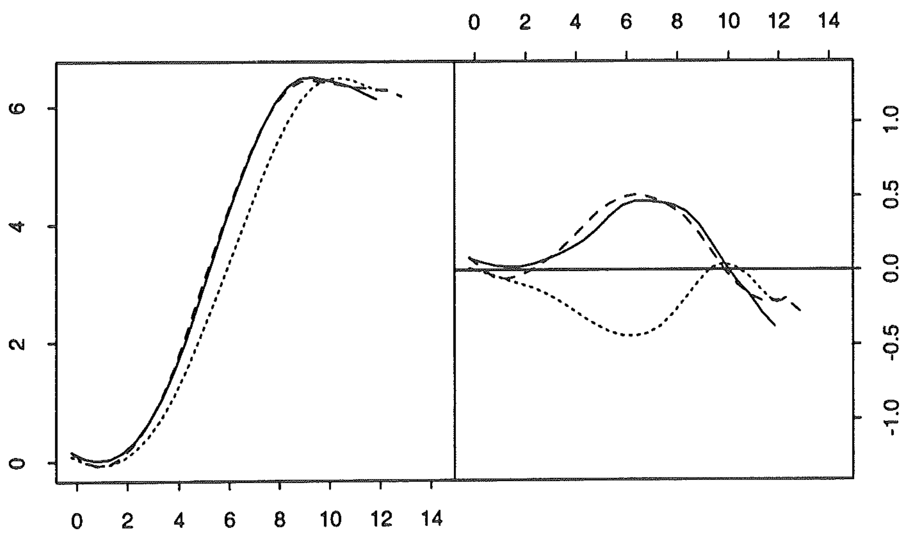

Figure E.30: *(Sydthy) Power curve as a function of wind speed 2 and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* 5m/s *for the wind speed. Based on the plot the indicator function* $I(w_t^2)$ *used in (6.18) is set to 1 in the interval* $[2m/s; 10m/s]$ *and 0 otherwise.*

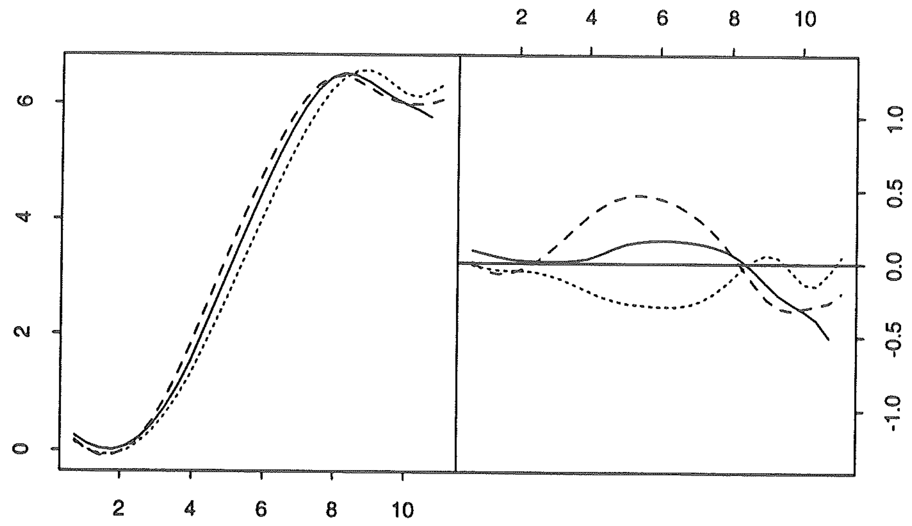

Figure E.31: *(Sydthy) Power curve as a function of the area wind speed and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_t^a)$ *used in (6.18) is set to 1 in the interval* $[2.5m/s; 8.5m/s]$ *and 0 otherwise.*

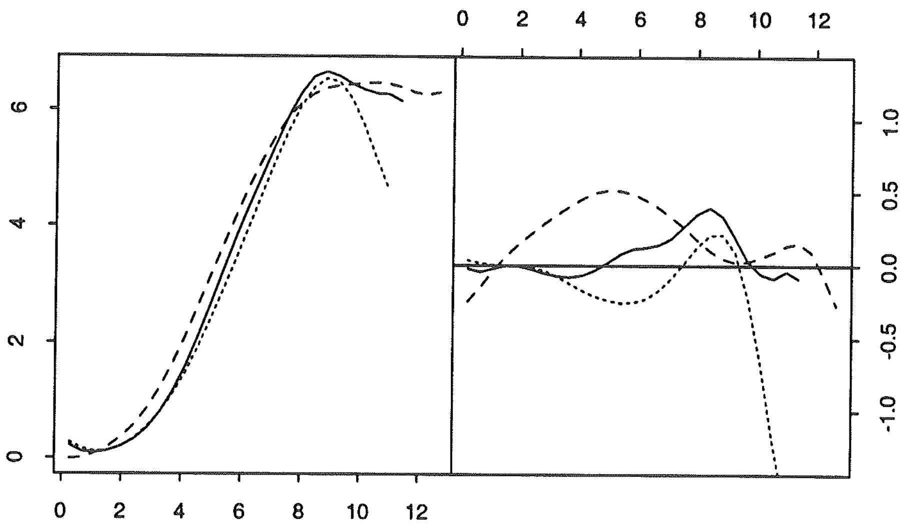

Figure E.32: *(Sydthy) Power curve as a function of the analysis and estimated locally around a wind direction of* 90° *(full line),* 200° *(dotted line) and* 300° *(dashed line). Each of the three curves is estimated using a fixed bandwidth of* 30° *for the wind direction and* $5m/s$ *for the wind speed. Based on the plot the indicator function* $I(w_{t|t}^m)$ *used in (6.18) is set to 1 in the interval* $[1m/s; 9m/s]$ *and 0 otherwise.*

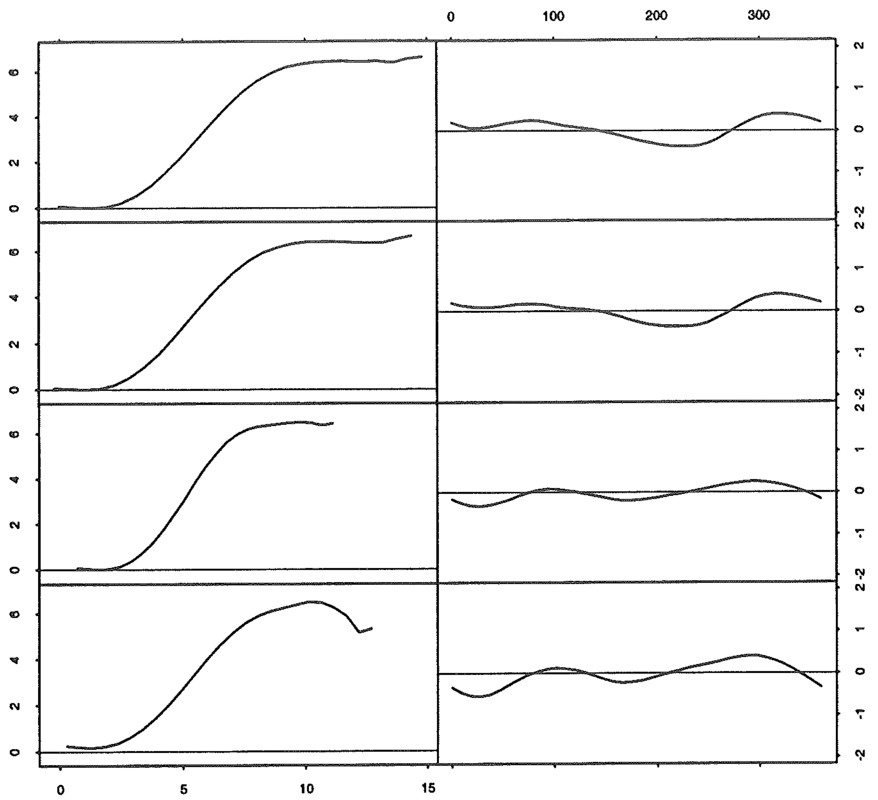

Figure E.33: *(Sydthy) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a constant approximation of the wind direction dependency. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

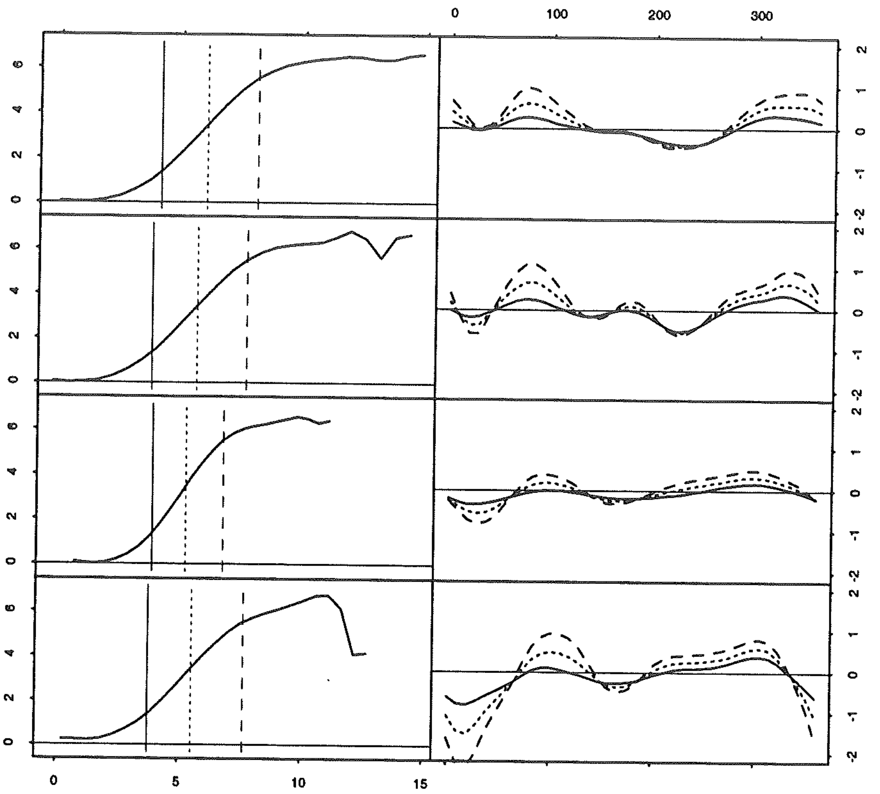

Figure E.34: *(Sydthy) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a first order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

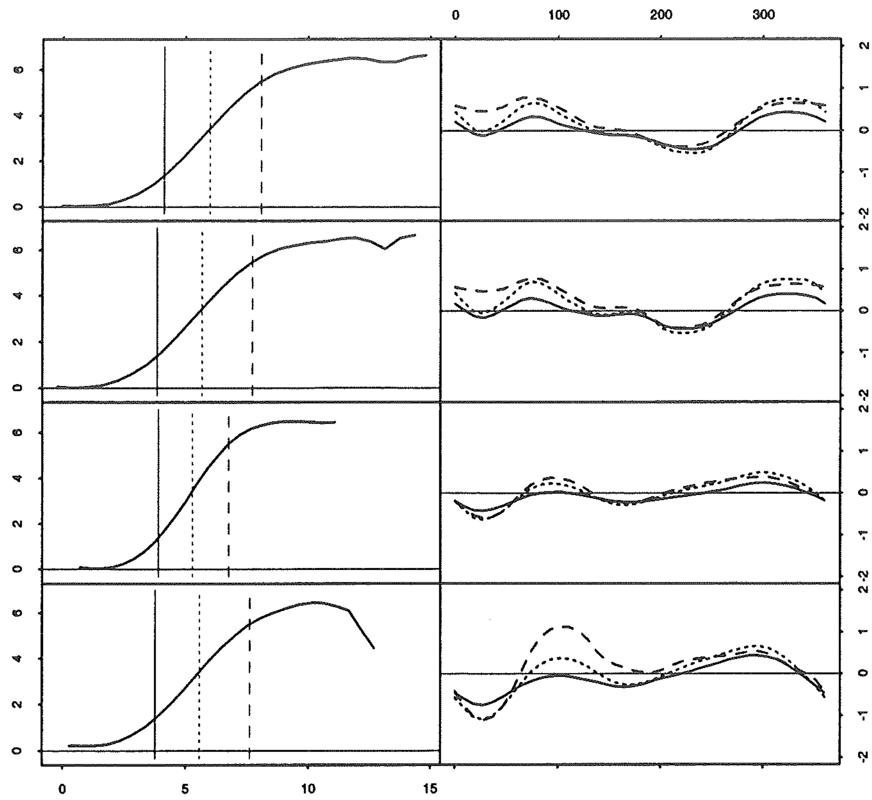

Figure E.35: *(Sydthy) Estimated dependency on wind speed (left column) and wind direction (right column) in power curve model (6.18) with a second order polynomial approximation of the wind direction dependency. The three curves on the right hand plot gives the wind direction dependency at a wind speed corresponding to 20% (full line), 50% (dotted line) and 80% (dashed line) of rated power on the left hand curve. From top row to bottom row the estimates are calculated on the basis of wind speed 1 and 2, the area wind speed and the analysis.*

E.3 Power curve model summary

	Wind farm				
Model	DR	FJ	HO	RB	SY
$m1\ w^1$	0.0168	0.585	0.0679	6.28	0.394
$m1\ w^2$	0.0184	0.607	0.0250	4.55	0.389
$m1\ w^a$	0.0209	0.431	0.0480	3.71	0.381
$m2\ w^1$	0.0103	0.344	0.0421	4.19	0.333
$m2\ w^2$	0.0104	0.347	0.0192	3.15	0.332
$m2\ w^a$	0.0131	0.294	0.0236	3.01	0.351
$m3\ w^1$	0.0095	0.299	0.0396	3.77	0.326
$m3\ w^2$	0.0092	0.296	0.0179	2.89	0.330
$m3\ w^a$	0.0091	0.271	0.0146	2.86	0.342
$m4\ w^1$	0.0097	0.294	0.0431	3.68	0.317
$m4\ w^2$	0.0094	0.263	0.0173	2.74	0.320
$m4\ w^a$	0.0094	0.297	0.0150	2.72	0.332
$s_p^2[MW^2]$	0.297	4.31	0.664	43.9	3.71

Table E.2: *(All wind farms) Estimated model error variance for the power curve model without wind direction dependency (6.17) or with wind direction dependency (6.18) using either wind speed 1 or 2, area wind speed or the analysis as regressors. Label "m1" corresponds to (6.17) and "m2", "m3" and "m4" to (6.18) with constant, first order and second order polynomial expansion of the wind direction dependency, respectively.*

E.4 Prediction via the power curve

	Prediction horizon [$\frac{1}{2}hours$]								
Model	0	6	12	18	24	36	48	60	72
$m1\ w^2$	0.106	0.117	0.123	0.129	0.137	0.152	0.172	0.197	0.223
$m1\ w^a$	0.159	0.167	0.168	0.173	0.178	0.187	0.200	0.215	0.240
$m1\ w^m$	0.107	0.118	0.124	0.130	0.137	0.150	0.170	0.195	0.220
$m2\ w^2$	0.111	0.123	0.130	0.136	0.142	0.158	0.176	0.199	0.224
$m2\ w^a$	0.154	0.162	0.163	0.168	0.173	0.180	0.195	0.215	0.241
$m2\ w^m$	0.102	0.113	0.118	0.124	0.131	0.145	0.167	0.198	0.224
$m3\ w^2$	0.109	0.121	0.128	0.135	0.141	0.156	0.175	0.198	0.224
$m3\ w^a$	0.154	0.161	0.163	0.167	0.170	0.179	0.198	0.219	0.243
$m3\ w^m$	0.100	0.111	0.116	0.122	0.129	0.146	0.172	0.199	0.225
$m4\ w^2$	0.116	0.128	0.136	0.142	0.147	0.160	0.179	0.204	0.227
$m4\ w^a$	0.164	0.171	0.172	0.176	0.180	0.186	0.204	0.223	0.244
$m4\ w^m$	0.104	0.115	0.120	0.126	0.134	0.150	0.176	0.204	0.228
$s_p^2[MW^2]$	0.363	0.362	0.361	0.361	0.362	0.363	0.363	0.364	0.365

Table E.3: *(Dræby) Estimated prediction error variance for model 1 to model 4 ("m1" to "m4") from Section 6.4.2 when meteorological forecasts of wind speed and wind direction are used as input in order to calculate predictions of power production for Dræby. The models have been estimated using either wind speed 2 ("w^2"), area wind speed ("w^a") or the analysis ("w^m") as input.*

Model	Prediction horizon [$\frac{1}{2}hours$]								
	0	6	12	18	24	36	48	60	72
$m1\ w^2$	1.14	1.23	1.27	1.28	1.34	1.57	1.85	2.25	2.51
$m1\ w^a$	1.18	1.27	1.30	1.31	1.39	1.58	1.87	2.29	2.52
$m1\ w^m$	1.09	1.17	1.21	1.22	1.29	1.50	1.79	2.20	2.46
$m2\ w^2$	1.28	1.39	1.43	1.42	1.48	1.72	2.03	2.45	2.73
$m2\ w^a$	1.26	1.37	1.41	1.40	1.48	1.69	1.98	2.41	2.65
$m2\ w^m$	1.06	1.16	1.21	1.22	1.29	1.51	1.80	2.22	2.46
$m3\ w^2$	1.31	1.43	1.48	1.46	1.52	1.78	2.08	2.51	2.78
$m3\ w^a$	1.47	1.60	1.65	1.65	1.73	1.94	2.23	2.66	2.86
$m3\ w^m$	1.06	1.16	1.21	1.22	1.29	1.52	1.81	2.22	2.46
$m4\ w^2$	1.35	1.48	1.52	1.50	1.56	1.83	2.15	2.56	2.84
$m4\ w^a$	1.57	1.70	1.74	1.74	1.84	2.04	2.31	2.75	2.89
$m4\ w^m$	1.06	1.16	1.21	1.22	1.29	1.52	1.80	2.21	2.45
$s_p^2[MW^2]$	4.92	4.91	4.90	4.90	4.91	4.93	4.93	4.95	4.96

Table E.4: *(Fjaldene) Estimated prediction error variance for model 1 to model 4 ("m1" to "m4") from Section 6.4.2 when meteorological forecasts of wind speed and wind direction are used as input in order to calculate predictions of power production for Fjaldene. The models have been estimated using either wind speed 2 ("w^2"), area wind speed ("w^a") or the analysis ("w^m") as input.*

Model	Prediction horizon [$\frac{1}{2}hours$]								
	0	6	12	18	24	36	48	60	72
$m1\ w^2$	0.191	0.211	0.218	0.232	0.247	0.270	0.295	0.332	0.368
$m1\ w^a$	0.228	0.244	0.246	0.255	0.269	0.289	0.314	0.346	0.380
$m1\ w^m$	0.185	0.204	0.210	0.222	0.237	0.258	0.284	0.320	0.353
$m2\ w^2$	0.201	0.221	0.227	0.240	0.254	0.275	0.299	0.333	0.369
$m2\ w^a$	0.214	0.231	0.240	0.251	0.264	0.287	0.315	0.354	0.388
$m2\ w^m$	0.173	0.189	0.196	0.210	0.223	0.247	0.276	0.313	0.347
$m3\ w^2$	0.208	0.228	0.233	0.245	0.258	0.278	0.301	0.334	0.369
$m3\ w^a$	0.248	0.263	0.274	0.285	0.300	0.323	0.356	0.396	0.436
$m3\ w^m$	0.168	0.183	0.192	0.205	0.220	0.243	0.271	0.311	0.347
$m4\ w^2$	0.212	0.231	0.235	0.247	0.260	0.278	0.301	0.335	0.370
$m4\ w^a$	0.320	0.335	0.340	0.349	0.359	0.374	0.410	0.450	0.473
$m4\ w^m$	0.175	0.188	0.196	0.208	0.221	0.246	0.274	0.315	0.350
$s_p^2[MW^2]$	0.656	0.654	0.652	0.652	0.655	0.658	0.654	0.651	0.658

Table E.5: *(Hollandsbjerg) Estimated prediction error variance for model 1 to model 4 ("m1" to "m4") from Section 6.4.2 when meteorological forecasts of wind speed and wind direction are used as input in order to calculate predictions of power production for Hollandsbjerg. The models have been estimated using either wind speed 2 ("w^2"), area wind speed ("w^a") or the analysis ("w^m") as input.*

	Prediction horizon [$\frac{1}{2}hours$]								
Model	0	6	12	18	24	36	48	60	72
$m1\ w^2$	9.42	10.5	11.3	12.0	12.7	14.6	16.4	19.2	22.0
$m1\ w^a$	10.40	11.5	12.3	12.9	13.6	15.7	17.9	20.5	23.4
$m1\ w^m$	9.36	10.5	11.2	11.8	12.5	14.4	16.2	18.8	21.6
$m2\ w^2$	10.50	11.5	12.2	13.0	13.9	15.6	17.2	20.1	22.9
$m2\ w^a$	10.30	11.3	12.0	12.5	13.2	15.4	17.6	20.4	23.4
$m2\ w^m$	9.14	10.2	10.8	11.5	12.1	14.2	16.1	18.7	21.6
$m3\ w^2$	12.40	13.3	13.8	14.6	15.5	17.0	18.3	21.1	23.8
$m3\ w^a$	10.20	11.1	11.6	12.3	12.9	15.4	17.6	20.5	23.6
$m3\ w^m$	9.22	10.2	10.9	11.5	12.2	14.3	16.1	18.8	21.6
$m4\ w^2$	12.10	13.0	13.6	14.4	15.4	17.0	18.4	21.2	24.0
$m4\ w^a$	9.96	10.9	11.5	12.1	12.8	15.4	17.6	20.5	23.5
$m4\ w^m$	9.57	10.5	11.1	11.7	12.4	14.4	16.2	18.8	21.5
$s_p^2[MW^2]$	41.30	41.3	41.2	41.2	41.2	41.3	41.3	41.6	41.8

Table E.6: *(Rejsby) Estimated prediction error variance for model 1 to model 4 ("m1" to "m4") from Section 6.4.2 when meteorological forecasts of wind speed and wind direction are used as input in order to calculate predictions of power production for Rejsby. The models have been estimated using either wind speed 2 ("w^2"), area wind speed ("w^a") or the analysis ("w^m") as input.*

	Prediction horizon [$\frac{1}{2}hours$]								
Model	0	6	12	18	24	36	48	60	72
$m1\ w^2$	0.732	0.817	0.862	0.884	0.937	1.14	1.35	1.66	2.03
$m1\ w^a$	0.845	0.954	1.010	1.020	1.080	1.32	1.51	1.85	2.26
$m1\ w^m$	0.733	0.824	0.871	0.894	0.946	1.16	1.36	1.68	2.05
$m2\ w^2$	0.771	0.845	0.877	0.892	0.946	1.17	1.39	1.69	2.05
$m2\ w^a$	0.811	0.902	0.946	0.970	1.030	1.29	1.48	1.81	2.20
$m2\ w^m$	0.696	0.766	0.806	0.835	0.896	1.12	1.33	1.63	1.98
$m3\ w^2$	0.823	0.893	0.917	0.938	0.990	1.22	1.45	1.75	2.11
$m3\ w^a$	0.837	0.925	0.965	0.994	1.050	1.32	1.52	1.84	2.22
$m3\ w^m$	0.706	0.773	0.812	0.851	0.916	1.15	1.36	1.65	1.99
$m4\ w^2$	0.832	0.906	0.933	0.949	0.999	1.23	1.46	1.75	2.12
$m4\ w^a$	0.874	0.964	1.000	1.030	1.080	1.34	1.53	1.86	2.26
$m4\ w^m$	0.688	0.756	0.794	0.826	0.888	1.12	1.33	1.63	1.98
$s_p^2[MW^2]$	3.680	3.670	3.660	3.660	3.650	3.64	3.65	3.66	3.66

Table E.7: *(Sydthy) Estimated prediction error variance for model 1 to model 4 ("m1" to "m4") from Section 6.4.2 when meteorological forecasts of wind speed and wind direction are used as input in order to calculate predictions of power production for Sydthy. The models have been estimated using either wind speed 2 ("w^2"), area wind speed ("w^a") or the analysis ("w^m") as input.*

Appendix F

Models for predicting wind power

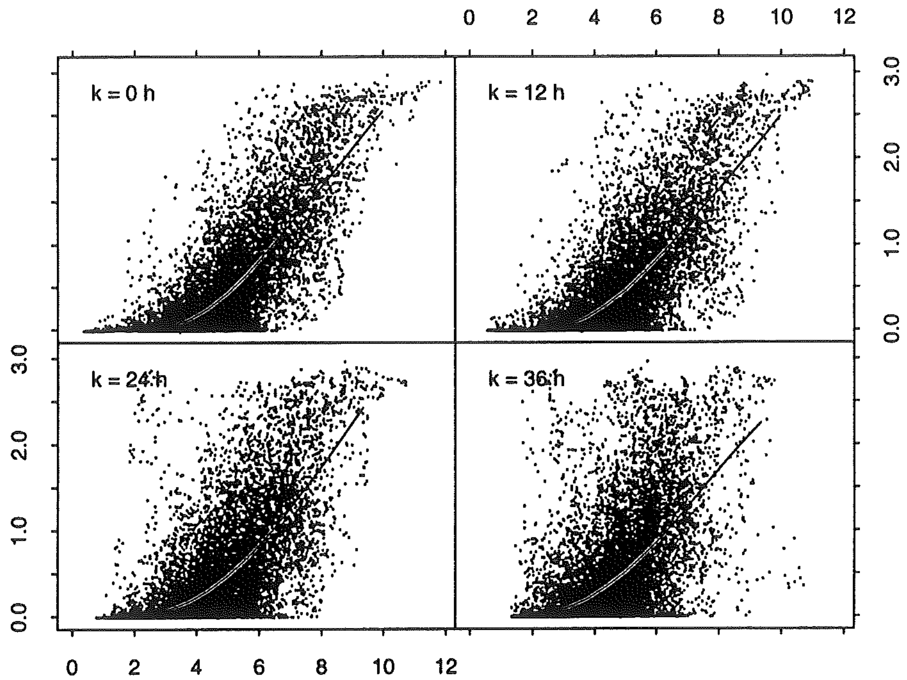

Figure F.1: *(Dræby) Observed power production [MW] versus forecasted wind speed [m/s] for a forecast horizon of 0 hours (top left), 12 hours (top right), 24 hours (bottom left) and 36 hours (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation with a bandwidth of 3.2, 4.1, 4.1 and 6.0 [m/s] for the 0, 12, 24 and 36 hours forecasts, respectively.*

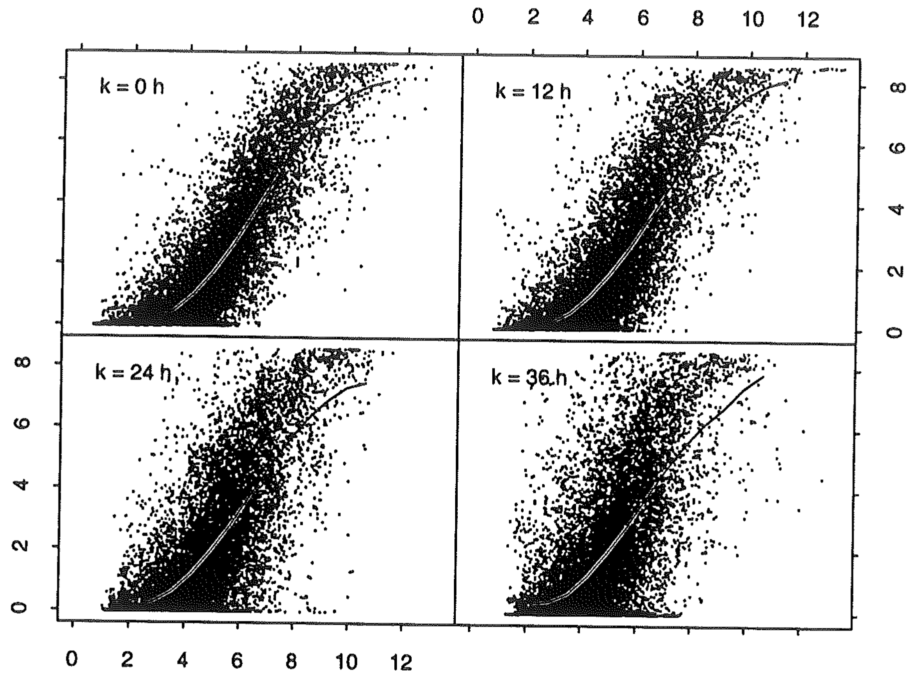

Figure F.2: *(Fjaldene) Observed power production [MW] versus forecasted wind speed [m/s] for a forecast horizon of 0 hours (top left), 12 hours (top right), 24 hours (bottom left) and 36 hours (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation with a bandwidth of 5.3, 5.6, 4.1 and 4.4 [m/s] for the 0, 12, 24 and 36 hours forecasts, respectively.*

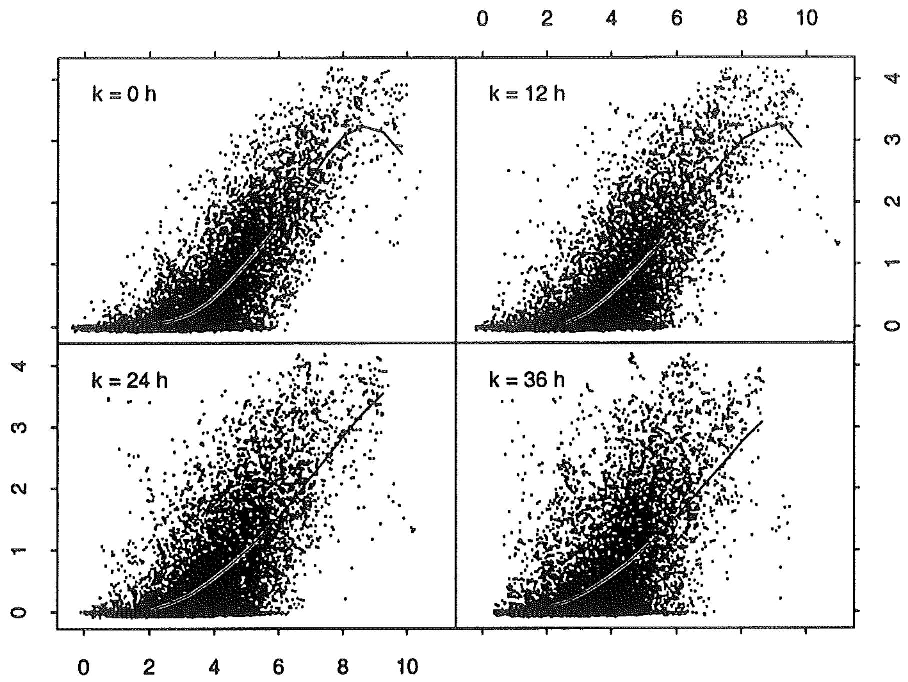

Figure F.3: *(Hollandsbjerg) Observed power production [MW] versus forecasted wind speed [m/s] for a forecast horizon of 0 hours (top left), 12 hours (top right), 24 hours (bottom left) and 36 hours (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation with a bandwidth of 2.2, 2.2, 8.6 and 8.4 [m/s] for the 0, 12, 24 and 36 hours forecasts, respectively.*

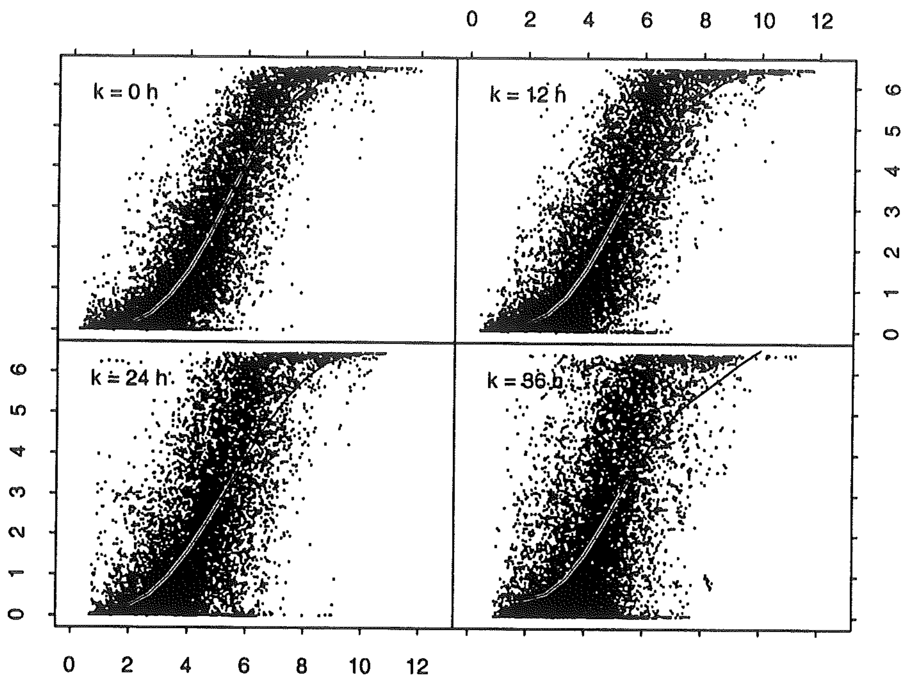

Figure F.4: *(Sydthy) Observed power production [MW] versus forecasted wind speed [m/s] for a forecast horizon of 0 hours (top left), 12 hours (top right), 24 hours (bottom left) and 36 hours (bottom right). The line is the estimated relationship using local regression and 2. order polynomial approximation with a bandwidth of 2.5, 3.2, 4.8 and 3.2 [m/s] for the 0, 12, 24 and 36 hours forecasts, respectively.*

F.1 Selection of model 1

Abbreviation	Term in (6.24)
$\sqrt{p_1}$	$a_1\sqrt{p_t}$
$\sqrt{p_2}$	$a_1\sqrt{p_{t-1}}$
$\sqrt{w}$	$b_1^o\sqrt{w_t}$
w	$b_2^o w_t$
$\sqrt{m}$	$b_1^m\sqrt{w_{t+k\|t}^m}$
m	$b_2^m w_{t+k\|t}^m$
d_1	$c_1^c \cos\frac{2\pi h_{t+k}^{24}}{24} + c_1^s \sin\frac{2\pi h_{t+k}^{24}}{24}$
d_2	$c_2^c \cos\frac{4\pi h_{t+k}^{24}}{24} + c_2^s \sin\frac{4\pi h_{t+k}^{24}}{24}$
d_3	$c_3^c \cos\frac{6\pi h_{t+k}^{24}}{24} + c_3^s \sin\frac{6\pi h_{t+k}^{24}}{24}$
1	m

Table F.1: *Translation list between the subsequent tables and model (6.24), where k is the prediction horizon.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+w+m+d_1+d_2$ 0.03741	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+d_1+d_2$ 0.4694	$1+\sqrt{p_1}+\sqrt{p_2}+m+d_1$ 0.07641	$1+\sqrt{p_1}+\sqrt{m}$ 5.040	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}$ 0.2739
$1+\sqrt{p_1}+\sqrt{p_2}+m+d_1+d_2$ 0.03743	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+d_1$ 0.4699	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+m+d_1$ 0.07654	$1+\sqrt{p_1}+\sqrt{m}+m$ 5.045	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 0.2741
$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+m+d_1+d_2$ 0.03745	$1+\sqrt{p_1}+\sqrt{m}+d_1+d_2$ 0.4700	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+m+d_1$ 0.07663	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}$ 5.050	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}$ 0.2746
$1+\sqrt{p_1}+m+d_1+d_2$ 0.03748	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+d_2$ 0.4704	$1+\sqrt{p_1}+\sqrt{p_2}+w+m+d_1$ 0.07674	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 5.051	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m$ 0.2749
$1+\sqrt{p_1}+\sqrt{p_2}+w+m+d_1+d_2$ 0.03749	$1+\sqrt{p_1}+\sqrt{m}+d_1$ 0.4709	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+d_1$ 0.07702	$1+\sqrt{p_1}+\sqrt{w}+\sqrt{m}$ 5.051	$1+\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}$ 0.2753

Table F.2: *(Model 1, k = 2) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error* MW^2. *A forgetting factor,* $\lambda = 0.9963$, *is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m+d_1+d_2$ 0.07924	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+d_1$ 0.9369	$1+\sqrt{p_1}+\sqrt{w}+m+d_1$ 0.1514	$1+\sqrt{p_1}+\sqrt{m}+m$ 9.076	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 0.6459
$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2$ 0.07927	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+d_1+d_2$ 0.9385	$1+\sqrt{p_1}+\sqrt{w}+w+m+d_1$ 0.1516	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 9.083	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m$ 0.6481
$1+\sqrt{p_1}+\sqrt{p_2}+m+d_1+d_2$ 0.07928	$1+\sqrt{p_1}+\sqrt{m}+d_1$ 0.9393	$1+\sqrt{p_1}+m+d_1$ 0.1517	$1+\sqrt{p_1}+\sqrt{w}+\sqrt{m}+m$ 9.102	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+w+\sqrt{m}+m$ 0.6489
$1+\sqrt{p_1}+m+d_1+d_2$ 0.07928	$1+\sqrt{p_1}+\sqrt{m}+d_1+d_2$ 0.9397	$1+\sqrt{p_1}+w+m+d_1$ 0.1520	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m$ 9.115	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 0.6490
$1+\sqrt{p_1}+\sqrt{w}+m+d_1+d_2$ 0.07936	$1+\sqrt{p_1}+\sqrt{p_2}+m+d_1+d_2$ 0.9402	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+m+d_1$ 0.1520	$1+\sqrt{p_1}+w+\sqrt{m}+m$ 9.135	$1+\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}+m$ 0.6491

Table F.3: *(Model 1, k = 6) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error* MW^2. *A forgetting factor,* $\lambda = 0.9969$, *is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{p_1}$+$\sqrt{p_2}$+$\sqrt{m}$+ m+d_1+d_2+d_3 0.1008	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+d_1+d_2 1.111	$\sqrt{p_1}$+$\sqrt{m}$+m+d_1 0.1869	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m 11.45	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+$\sqrt{m}$+m 0.8979
$\sqrt{p_1}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.1008	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_1+d_2 1.112	$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_1 0.1872	1+$\sqrt{p_1}$+$\sqrt{m}$+m 11.45	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ w+$\sqrt{m}$+m 0.8988
$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_1+d_2 0.1009	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2 1.113	$\sqrt{p_1}$+$\sqrt{m}$+m+ d_1+d_3 0.1875	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_3 11.48	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m 0.8990
$\sqrt{p_1}$+$\sqrt{p_2}$+$\sqrt{w}$+ $\sqrt{m}$+m+ d_1+d_2+d_3 0.1009	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+ d_1+d_2+d_3 1.113	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_1 0.1876	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_3 11.48	1+$\sqrt{p_1}$+w+ $\sqrt{m}$+m 0.8996
$\sqrt{p_1}$+$\sqrt{w}$+$\sqrt{m}$+ m+d_1+d_2+d_3 0.1010	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_1+d_2 1.115	$\sqrt{p_1}$+$\sqrt{m}$+m+ d_1+d_2 0.1876	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_2 11.49	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+$\sqrt{m}$+m+d_3 0.8998

Table F.4: *(Model 1, $k = 12$) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9983$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}+m+d_1+d_2$ 0.1102	$1+\sqrt{p_1}+\sqrt{m}+m+d_1+d_2$ 1.157	$\sqrt{p_1}+\sqrt{w}+w+\sqrt{m}+m+d_1$ 0.2045	$1+\sqrt{p_1}+w+\sqrt{m}$ 12.78	$1+\sqrt{p_1}+\sqrt{w}+\sqrt{m}+m$ 0.9882
$\sqrt{p_1}+w+\sqrt{m}+m+d_1+d_2$ 0.1103	$1+\sqrt{p_1}+\sqrt{w}+\sqrt{m}+m+d_1+d_2$ 1.159	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+w+\sqrt{m}+m+d_1$ 0.2046	$1+\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}$ 12.78	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m$ 0.9890
$\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}+m+d_1+d_2+d_3$ 0.1104	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m+d_1+d_2$ 1.159	$\sqrt{p_1}+\sqrt{w}+w+\sqrt{m}+m+d_1+d_2$ 0.2048	$1+\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}+m$ 12.78	$1+\sqrt{p_1}+w+\sqrt{m}+m$ 0.9898
$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m+d_1+d_2$ 0.1104	$1+\sqrt{p_2}+\sqrt{m}+m+d_1+d_2$ 1.160	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+w+\sqrt{m}+m+d_1+d_2$ 0.2049	$1+\sqrt{p_1}+w+\sqrt{m}+m$ 12.78	$1+\sqrt{p_1}+\sqrt{w}+\sqrt{m}+m+d_2$ 0.9898
$\sqrt{p_1}+w+\sqrt{m}+m+d_1+d_2+d_3$ 0.1104	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+\sqrt{m}+m+d_1+d_2$ 1.161	$\sqrt{p_1}+\sqrt{w}+w+\sqrt{m}+m+d_1+d_3$ 0.2050	$1+\sqrt{p_1}+w+\sqrt{m}+d_3$ 12.79	$1+\sqrt{p_1}+\sqrt{p_2}+w+\sqrt{m}+m$ 0.9905

Table F.5: *(Model 1, $k = 18$) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9988$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{p_1}$+$\sqrt{w}$+w+ $\sqrt{m}$+m+ d_1+d_2+d_3 0.1180	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+d_1 1.274	$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_3 0.2223	1+$\sqrt{p_1}$+$\sqrt{m}$+m 13.98	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m 1.071
$\sqrt{p_1}$+$\sqrt{w}$+w+ $\sqrt{m}$+m+d_1+d_2 0.1180	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+d_1+d_2 1.275	$\sqrt{w}$+$\sqrt{m}$+m+d_1 0.2224	1+$\sqrt{p_1}$+w+$\sqrt{m}$ 13.99	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+$\sqrt{m}$+m 1.072
$\sqrt{p_1}$+$\sqrt{p_2}$+$\sqrt{w}$+ w+$\sqrt{m}$+m+ d_1+d_2+d_3 0.1181	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+$\sqrt{m}$+m+d_1 1.276	$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.2227	1+$\sqrt{p_1}$+w+ $\sqrt{m}$+m 13.99	1+$\sqrt{p_1}$+w+ $\sqrt{m}$+m 1.072
$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+w+ $\sqrt{m}$+m+d_1+d_2 0.1181	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+d_1+d_3 1.276	$\sqrt{p_1}$+$\sqrt{m}$+m+ d_1+d_3 0.2228	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m 13.99	1+$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m+d_2 1.072
$\sqrt{p_1}$+w+ $\sqrt{m}$+m+ d_1+d_2+d_3 0.1182	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_1 1.276	$\sqrt{p_1}$+ $\sqrt{m}$+m+d_1 0.2228	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_3 13.99	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ w+$\sqrt{m}$+m 1.073

Table F.6: *(Model 1, $k = 24$) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9991$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{m}$+m+d_1+d_2 0.1361	1+$\sqrt{m}$+m+ d_1+d_2 1.545	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ m+d_1+d_2 0.2560	1+$\sqrt{p_1}$+ $\sqrt{m}$+m 16.32	1+$\sqrt{p_1}$+ $\sqrt{w}$+m 1.334
$\sqrt{m}$+m+ d_1+d_2+d_3 0.1363	1+m+d_1+d_2 1.546	1+$\sqrt{p_1}$+m+ d_1+d_2 0.2561	1+w+$\sqrt{m}$ 16.33	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{w}$+m 1.334
$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2 0.1369	1+$\sqrt{p_2}$+m+ d_1+d_2 1.547	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ m+d_1 0.2562	1+$\sqrt{p_2}$+$\sqrt{m}$+m 16.33	1+$\sqrt{p_1}$+w+m 1.335
$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.1371	1+$\sqrt{p_1}$+m+ d_1+d_2 1.547	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ m+d_1+d_2+d_3 0.2562	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m 16.33	$\sqrt{p_1}$+$\sqrt{w}$+ $\sqrt{m}$+m 1.335
1+$\sqrt{m}$+m+ d_1+d_2 0.1371	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ m+d_1+d_2 1.548	1+$\sqrt{p_1}$+m+d_1 0.2563	1+$\sqrt{p_1}$+ $\sqrt{m}$+m+d_3 16.34	1+$\sqrt{p_1}$+$\sqrt{w}$+$\sqrt{m}$ 1.335

Table F.7: *(Model 1, k = 36) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9992$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{m}$+m+d_1+d_2 0.1620	1+$\sqrt{m}$+m+ d_1+d_2 1.865	$\sqrt{p_2}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.2837	1+w+$\sqrt{m}$ 18.25	1+$\sqrt{p_1}$+$\sqrt{m}$+d_2 1.587
$\sqrt{m}$+m+ d_1+d_2+d_3 0.1620	1+$\sqrt{m}$+m+ d_1+d_2+d_3 1.866	$\sqrt{p_1}$+$\sqrt{p_2}$+$\sqrt{m}$+ m+d_1+d_2+d_3 0.2838	1+$\sqrt{w}$+$\sqrt{m}$ 18.25	1+$\sqrt{p_2}$+$\sqrt{m}$+d_2 1.587
$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2 0.1624	1+$\sqrt{m}$+m+d_2 1.868	$\sqrt{p_1}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.2839	1+w+$\sqrt{m}$+d_3 18.26	1+$\sqrt{p_1}$+$\sqrt{m}$+ d_2+d_3 1.588
1+$\sqrt{m}$+m+ d_1+d_2 0.1624	1+$\sqrt{m}$+m+ d_2+d_3 1.870	$\sqrt{p_2}$+$\sqrt{m}$+m+ d_1+d_3 0.2840	1+$\sqrt{p_1}$+$\sqrt{m}$+m 18.27	1+$\sqrt{p_2}$+$\sqrt{m}$+ d_2+d_3 1.588
$\sqrt{w}$+$\sqrt{m}$+m+ d_1+d_2+d_3 0.1625	1+$\sqrt{p_2}$+w+ m+d_1+d_2 1.877	$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m+d_1+d_3 0.2840	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+m 18.27	1+$\sqrt{p_1}$+$\sqrt{p_2}$+ $\sqrt{m}$+d_2 1.588

Table F.8: *(Model 1, k = 48) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9993$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{m}+m+d_1+d_2+d_3$ 0.1932	$1+\sqrt{m}+m+d_2$ 2.137	$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2+d_3$ 0.3221	$1+\sqrt{p_1}+\sqrt{m}+m$ 21.07	$1+\sqrt{p_1}+m$ 1.876
$\sqrt{m}+m+d_1+d_2$ 0.1932	$1+\sqrt{m}+m+d_2+d_3$ 2.138	$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2$ 0.3222	$1+\sqrt{p_2}+\sqrt{m}+m$ 21.07	$1+\sqrt{p_1}+m+d_1$ 1.876
$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2+d_3$ 0.1932	$1+\sqrt{m}+m+d_1+d_2$ 2.138	$\sqrt{p_2}+\sqrt{m}+m+d_1+d_2+d_3$ 0.3222	$1+\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m$ 21.07	$1+\sqrt{p_1}+m+d_3$ 1.876
$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2$ 0.1932	$1+\sqrt{m}+m+d_1+d_2+d_3$ 2.139	$\sqrt{p_2}+\sqrt{m}+m+d_1+d_2$ 0.3223	$1+\sqrt{p_1}+\sqrt{m}+m+d_2$ 21.08	$1+\sqrt{p_1}+\sqrt{m}+m$ 1.876
$\sqrt{p_2}+\sqrt{m}+m+d_1+d_2+d_3$ 0.1933	$1+\sqrt{w}+\sqrt{m}+m+d_1+d_2$ 2.141	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m+d_1+d_2+d_3$ 0.3223	$1+\sqrt{p_1}+\sqrt{m}+m+d_3$ 21.08	$1+\sqrt{p_1}+m+d_1+d_3$ 1.877

Table F.9: *(Model 1, $k = 60$) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9993$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

Wind farm				
DR	FJ	HO	RB	SY
$\sqrt{m}+m+d_1+d_2$ 0.2147	$1+\sqrt{p_2}+\sqrt{m}+m+d_1$ 2.346	$\sqrt{p_1}+\sqrt{m}+m+d_1+d_3$ 0.3606	$1+\sqrt{w}+\sqrt{m}+m$ 23.01	$\sqrt{p_1}+\sqrt{w}+m$ 2.119
$\sqrt{m}+m+d_1+d_2+d_3$ 0.2148	$1+\sqrt{w}+\sqrt{m}+m+d_1$ 2.346	$\sqrt{p_1}+\sqrt{m}+m+d_1$ 0.3607	$1+\sqrt{w}+\sqrt{m}+m+d_3$ 23.02	$\sqrt{p_1}+\sqrt{w}+m+d_1$ 2.121
$1+m+d_1+d_2$ 0.2149	$1+\sqrt{w}+\sqrt{m}+m$ 2.346	$\sqrt{p_1}+\sqrt{m}+m+d_1+d_2+d_3$ 0.3607	$1+\sqrt{p_1}+\sqrt{m}+m$ 23.03	$\sqrt{p_1}+\sqrt{w}+m+d_3$ 2.121
$1+m+d_1+d_2+d_3$ 0.2149	$1+\sqrt{p_2}+\sqrt{m}+m$ 2.346	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{m}+m+d_1+d_3$ 0.3608	$1+w+\sqrt{m}+m$ 23.03	$\sqrt{p_1}+\sqrt{p_2}+\sqrt{w}+m$ 2.122
$1+\sqrt{p_1}+\sqrt{w}+m+d_1+d_2$ 0.2150	$1+\sqrt{w}+\sqrt{m}+m+d_2$ 2.346	$\sqrt{p_2}+\sqrt{m}+m+d_1+d_3$ 0.3608	$1+\sqrt{m}+m$ 23.03	$\sqrt{p_1}+\sqrt{w}+m+d_2$ 2.122

Table F.10: *(Model 1, $k = 72$) The best five sub models of model (6.24) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9992$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.24) is found in Table F.1.*

F.2 Selection of model 2

Abbreviation	Term in (6.25)
p_1	$a_1 p_t$
p_2	$a_1 p_{t-1}$
w	$b_1^o w_t$
ww	$b_2^o w_t w_t$
m	$b_1^m w_{t+k\|t}^m$
mm	$b_2^m w_{t+k\|t}^m w_{t+k\|t}^m$
d_1	$c_1^c \cos \frac{2\pi h_{t+k}^{24}}{24} + c_1^s \sin \frac{2\pi h_{t+k}^{24}}{24}$
d_2	$c_2^c \cos \frac{4\pi h_{t+k}^{24}}{24} + c_2^s \sin \frac{4\pi h_{t+k}^{24}}{24}$
d_3	$c_3^c \cos \frac{6\pi h_{t+k}^{24}}{24} + c_3^s \sin \frac{6\pi h_{t+k}^{24}}{24}$
1	m

Table F.11: *Translation list between the subsequent tables and model (6.25), where k is the prediction horizon.*

Wind farm				
DR	FJ	HO	RB	SY
p_1+w^m+ $w^m w^m$+d_1+d_2 0.03790	1+p_1+ $w^m w^m$+d_1+d_2 0.4710	1+p_1+p_2+ $w^m w^m$+d_1 0.07633	1+p_1+ w^m+$w^m w^m$ 5.042	1+p_1+p_2+ w^m+$w^m w^m$ 0.2732
1+p_1+ $w^m w^m$+d_1+d_2 0.03793	1+p_1+p_2+ $w^m w^m$+d_1+d_2 0.4717	p_1+p_2+ w^m+$w^m w^m$+d_1 0.07667	1+p_1+p_2+ w^m+$w^m w^m$ 5.058	1+p_1+p_2+w^m 0.2736
p_1+p_2+ w^m+$w^m w^m$+d_1 0.03793	1+p_1+w^m+ d_1+d_2 0.4720	1+p_1+p_2+ $w^m w^m$+d_1+d_2 0.07681	1+p_1+ w^m+$w^m w^m$+d_1 5.059	1+p_1+p_2+ w+w^m+$w^m w^m$ 0.2742
p_1+p_2+w^m+ $w^m w^m$+d_1+d_2 0.03793	1+p_1+$w^m w^m$+ d_1 0.4720	1+p_1+$w^m w^m$+ d_1 0.07690	1+p_1+w^m 5.061	1+p_1+p_2+ ww+w^m 0.2743
1+p_1+w+ $w^m w^m$+d_1+d_2 0.03794	1+p_1+w^m+ $w^m w^m$+d_1+d_2 0.4720	1+p_1+p_2+ w^m+$w^m w^m$+d_1 0.07694	1+p_1+ w^m+$w^m w^m$+d_2 5.066	p_1+p_2+ w^m+$w^m w^m$ 0.2744

Table F.12: *(Model 2, $k = 2$) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9945$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
p_1+w^m+ $w^m w^m$+d_1+d_2 0.07828	1+p_1+p_2+ w^m+$w^m w^m$+ d_1+d_2 0.9279	p_1+w^m+ $w^m w^m$+d_1 0.1474	1+p_1+ w^m+$w^m w^m$ 9.006	1+p_1+p_2+ w^m+$w^m w^m$ 0.6449
1+p_1+w^m+ $w^m w^m$+d_1+d_2 0.07832	1+p_1+w^m+ $w^m w^m$+d_1+d_2 0.9281	p_1+p_2+w^m+ $w^m w^m$+d_1 0.1475	1+p_1+w^m+ $w^m w^m$+d_2 9.018	1+p_1+p_2+ w+w^m+$w^m w^m$ 0.6468
p_1+ww+w^m+ $w^m w^m$+d_1+d_2 0.07837	1+p_1+p_2+w+ w^m+$w^m w^m$+ d_1+d_2 0.9292	1+p_1+w^m+ $w^m w^m$+d_1 0.1476	1+p_1+p_2+ w^m+$w^m w^m$ 9.019	1+p_1+p_2+ ww+w^m+$w^m w^m$ 0.6488
1+p_1+w+ww+ $w^m w^m$+d_1+d_2 0.07838	1+p_1+w+w^m+ $w^m w^m$+d_1+d_2 0.9295	1+p_1+ $w^m w^m$+d_1 0.1477	1+p_1+p_2+ w^m+$w^m w^m$+d_2 9.031	1+p_1+p_2+w+ ww+w^m+$w^m w^m$ 0.6494
p_1+p_2+w^m+ $w^m w^m$+d_1+d_2 0.07838	1+p_1+p_2+ $w^m w^m$+d_1+d_2 0.9311	1+p_1+p_2+ w^m+$w^m w^m$+d_1 0.1477	1+p_1+w^m+ $w^m w^m$+d_1 9.040	1+p_1+p_2+ w^m+$w^m w^m$+d_1 0.6499

Table F.13: *(Model 2, $k = 6$) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9977$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
p_1+w^m+$w^m w^m$+ d_1+d_2+d_3 0.1005	1+p_1+w^m+ $w^m w^m$+d_1+d_2 1.124	1+p_1+w^m+ $w^m w^m$+d_1 0.1801	1+p_1+ w^m+$w^m w^m$ 11.37	1+p_1+p_2+ ww+w^m+$w^m w^m$ 0.9049
1+p_1+ w^m+$w^m w^m$+ d_1+d_2+d_3 0.1005	1+p_1+w+w^m+ $w^m w^m$+d_1+d_2 1.125	1+p_1+p_2+ w^m+$w^m w^m$+d_1 0.1802	1+p_1+w^m+ $w^m w^m$+d_2 11.37	1+p_1+p_2+ww+ w^m+$w^m w^m$+d_3 0.9058
p_1+w^m+ $w^m w^m$+d_1+d_2 0.1006	1+p_1+w+ w^m+$w^m w^m$+ d_1+d_2+d_3 1.126	1+p_1+p_2+ w^m+$w^m w^m$+ d_1+d_2+d_3 0.1802	1+p_1+p_2+ w^m+$w^m w^m$ 11.37	1+p_1+p_2+ w+w^m+$w^m w^m$ 0.9060
1+p_1+w^m+ $w^m w^m$+d_1+d_2 0.1006	1+p_1+p_2+w^m+ $w^m w^m$+d_1+d_2 1.126	1+p_1+p_2+w^m+ $w^m w^m$+d_1+d_3 0.1802	1+p_1+p_2+w^m+ $w^m w^m$+d_2 11.38	1+p_1+ww+ w^m+$w^m w^m$ 0.9065
p_1+p_2+ w^m+$w^m w^m$+ d_1+d_2+d_3 0.1007	1+p_1+ w^m+$w^m w^m$+ d_1+d_2+d_3 1.127	1+p_1+w^m+ $w^m w^m$+d_1+d_3 0.1802	1+p_1+w^m+ $w^m w^m$+d_3 11.39	1+p_1+p_2+w+ w^m+$w^m w^m$+d_3 0.9069

Table F.14: *(Model 2, $k = 12$) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9984$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
ww+w^m+ w^mw^m+d_1+d_2 0.1098	1+p_1+w+w^m+ w^mw^m+d_1+d_2 1.162	1+w+w^m+ w^mw^m+d_1+d_2 0.1977	1+p_1+ w^m+w^mw^m 12.71	1+p_1+w+ w^m+w^mw^m 1.005
p_1+w^m+ w^mw^m+d_1+d_2 0.1099	1+p_1+w^m+ w^mw^m+d_1+d_2 1.163	1+w+ w^m+w^mw^m+ d_1+d_2+d_3 0.1978	1+p_1+p_2+ w^m+w^mw^m 12.71	1+p_1+w+ w^m+w^mw^m+d_3 1.006
p_1+w+w^m+ w^mw^m+d_1+d_2 0.1099	1+p_1+p_2+ w+w^m+w^mw^m+ d_1+d_2 1.164	1+w+w^m+ w^mw^m+d_1 0.1981	1+p_1+w^m+ w^mw^m+d_2 12.72	1+p_1+w+ w^m+w^mw^m+d_2 1.006
p_1+p_2+w^m+ w^mw^m+d_1+d_2 0.1099	1+p_1+w+ w^m+w^mw^m+ d_1+d_2+d_3 1.165	1+w+w^m+ w^mw^m+d_1+d_3 0.1983	1+p_1+p_2+ w^m+w^mw^m+d_2 12.73	1+p_1+ww+ w^m+w^mw^m 1.007
1+p_1+w+w^m+ w^mw^m+d_1+d_2 0.1100	1+p_1+p_2+w^m+ w^mw^m+d_1+d_2 1.165	1+w+ w^mw^m+d_1+d_2 0.1986	1+p_1+ w^m+w^mw^m+d_3 12.73	1+p_1+p_2+ w+w^m+w^mw^m 1.007

Table F.15: *(Model 2, k = 18) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9986$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
ww+w^m+ $w^m w^m$+d_1+d_2 0.1174	1+w^m+ $w^m w^m$+d_1+d_2 1.266	1+w+ww+ $w^m w^m$+d_1 0.2140	1+p_1+ w^m+$w^m w^m$ 13.84	1+p_1+w+ w^m+$w^m w^m$ 1.088
ww+ w^m+$w^m w^m$+ d_1+d_2+d_3 0.1176	1+w^m+$w^m w^m$+ d_1+d_2+d_3 1.269	1+w+ww+ $w^m w^m$+d_1+d_2 0.2140	1+w^m+$w^m w^m$ 13.85	1+p_1+w+ w^m+$w^m w^m$+d_2 1.089
w^m+$w^m w^m$+ d_1+d_2 0.1176	1+w^m+ $w^m w^m$+d_1 1.270	1+w+ww+ $w^m w^m$+d_1+d_3 0.2142	1+p_1+ww+ w^m+$w^m w^m$ 13.86	1+p_1+w+ w^m+$w^m w^m$+d_3 1.089
1+w+ww+ $w^m w^m$+d_1+d_2 0.1176	1+w^m+ $w^m w^m$+d_2 1.271	1+w+ww+ $w^m w^m$+ d_1+d_2+d_3 0.2142	1+p_1+w^m+ $w^m w^m$+d_2 13.86	1+p_1+p_2+ w+w^m+$w^m w^m$ 1.090
w+w^m+$w^m w^m$+ d_1+d_2 0.1177	1+p_1+w^m+ $w^m w^m$+d_1+d_2 1.272	1+$w^m w^m$+ d_1+d_2 0.2148	1+p_1+p_2+ w^m+$w^m w^m$ 13.86	1+p_1+w+w^m+ $w^m w^m$+d_2+d_3 1.091

Table F.16: *(Model 2, k = 24) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9987$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
w^m+w^mw^m+ d_1+d_2 0.1335	1+w^m+w^mw^m+ d_1+d_2 1.513	1+p_1+w^mw^m+ d_1+d_2 0.2467	1+w^m+w^mw^m 16.04	1+p_1+w+w^m 1.340
w^m+w^mw^m+ d_1+d_2+d_3 0.1337	1+w^m+w^mw^m+ d_1+d_2+d_3 1.517	1+p_1+p_2+ w^mw^m+d_1+d_2 0.2468	1+w^m+ w^mw^m+d_2 16.06	1+p_1+ ww+w^m 1.340
1+w^mw^m+ d_1+d_2 0.1339	1+w^m+w^mw^m+ d_1 1.519	1+w^mw^m+ d_1+d_2 0.2468	1+w^m+w^mw^m+ d_3 16.07	1+p_1+w+ w^m+d_3 1.341
w^m+w^mw^m+d_1 0.1342	1+w^m+ w^mw^m+d_2 1.520	1+p_2+w^mw^m+ d_1+d_2 0.2469	1+w^m+w^mw^m+ d_2+d_3 16.09	1+p_1+p_2+ w+w^m 1.341
1+w^mw^m+ d_1+d_2+d_3 0.1342	1+w^m+w^mw^m+ d_1+d_3 1.522	1+w^mw^m+d_1 0.2470	1+p_1+ w^m+w^mw^m 16.12	1+p_1+ww+ w^m+d_3 1.341

Table F.17: *(Model 2, k = 36) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, λ = 0.9990, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
w^m+w^mw^m+ d_1+d_2 0.1603	1+w^m+w^mw^m+ d_1+d_2 1.827	1+p_2+w^mw^m+ d_1+d_2+d_3 0.2764	1+w^m+w^mw^m 18.03	p_2+w^mw^m 1.598
w^m+w^mw^m+ d_1+d_2+d_3 0.1604	1+w^m+w^mw^m+ d_1+d_2+d_3 1.829	1+p_2+w^mw^m+ d_1+d_2 0.2764	1+w^m+w^mw^m+ d_2 18.05	p_1+w^mw^m 1.598
1+w^m+w^mw^m+ d_1+d_2 0.1611	1+w^m+w^mw^m+ d_2 1.833	1+p_1+p_2+ w^mw^m+d_1+d_2 0.2765	1+w^m+w^mw^m+ d_3 18.05	1+p_1+w^m 1.599
1+w^m+w^mw^m+ d_1+d_2+d_3 0.1612	1+w^mw^m+ d_1+d_2 1.834	1+p_1+p_2+ w^mw^m+ d_1+d_2+d_3 0.2765	1+w^m+w^mw^m+ d_2+d_3 18.06	p_2+w^mw^m+ d_3 1.599
w^m+w^mw^m+d_1 0.1614	1+w^m+w^mw^m+ d_2+d_3 1.835	1+p_1+w^mw^m+ d_1+d_2 0.2765	1+p_1+ w^m+w^mw^m 18.14	1+p_2+w^m 1.599

Table F.18: *(Model 2, k = 48) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, λ = 0.9992, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
$w^m+w^mw^m+d_1+d_2$ 0.1912	$1+w^m+w^mw^m+d_1+d_2$ 2.097	$1+w^mw^m+d_1+d_2$ 0.3151	$1+w^m+w^mw^m$ 20.66	$p_1+w^mw^m$ 1.868
$w^m+w^mw^m+d_1+d_2+d_3$ 0.1912	$1+w^m+w^mw^m+d_1+d_2+d_3$ 2.098	$w^m+w^mw^m+d_1+d_2$ 0.3152	$1+w^m+w^mw^m+d_2$ 20.67	$p_1+w^mw^m+d_3$ 1.869
$1+w^mw^m+d_1+d_2$ 0.1916	$1+w^m+w^mw^m+d_2$ 2.099	$1+w^mw^m+d_1+d_2+d_3$ 0.3153	$1+w^m+w^mw^m+d_3$ 20.68	$p_2+w^mw^m$ 1.869
$1+w^mw^m+d_1+d_2+d_3$ 0.1916	$1+w^m+w^mw^m+d_2+d_3$ 2.100	$1+w^mw^m+d_1$ 0.3153	$1+w^m+w^mw^m+d_2+d_3$ 20.68	$p_2+w^mw^m+d_3$ 1.870
$w+w^m+w^mw^m+d_1+d_2$ 0.1918	$1+w^m+w^mw^m+d_1$ 2.105	$w^m+w^mw^m+d_1$ 0.3154	$1+p_1+w^m+w^mw^m+d_2$ 20.77	$p_1+p_2+w^mw^m$ 1.870

Table F.19: *(Model 2, $k = 60$) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9993$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

Wind farm				
DR	FJ	HO	RB	SY
$1+w^mw^m+d_1+d_2$ 0.2122	$1+w^m+w^mw^m+d_2$ 2.301	$w^m+w^mw^m+d_1+d_2$ 0.3505	$1+w^m+w^mw^m$ 22.68	$1+w^m$ 2.108
$w^m+w^mw^m+d_1+d_2$ 0.2123	$1+w^m+w^mw^m+d_2+d_3$ 2.304	$w^m+w^mw^m+d_1+d_2+d_3$ 0.3506	$1+w^m+w^mw^m+d_2$ 22.69	w^mw^m 2.108
$1+w^mw^m+d_1+d_2+d_3$ 0.2124	$1+w^m+w^mw^m+d_1+d_2$ 2.305	$w^m+w^mw^m+d_1$ 0.3509	$1+w^m+w^mw^m+d_3$ 22.70	$1+w^m+d_3$ 2.109
$w^m+w^mw^m+d_1+d_2+d_3$ 0.2124	$1+w^m+w^mw^m+d_1+d_2+d_3$ 2.307	$w^m+w^mw^m+d_1+d_3$ 0.3510	$1+w^m+w^mw^m+d_2+d_3$ 22.72	$w^mw^m+d_3$ 2.111
$w+ww+w^mw^m+d_1+d_2$ 0.2125	$1+w^m+w^mw^m$ 2.308	$p_1+w^m+w^mw^m+d_1+d_2$ 0.3516	$1+w^m+w^mw^m+d_1$ 22.82	$1+w^m+d_2$ 2.111

Table F.20: *(Model 2, $k = 72$) The best five sub models of model (6.25) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9991$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.25) is found in Table F.11.*

F.3 Selection of model 3

Abbreviation	Term in (6.26)
p_1	$a_1 p_t$
p_2	$a_1 p_{t-1}$
p^w	$b_1^o P_{pc}(w_t)$
p^m	$b_1^m P_{pc}(w_{t+k\|t}^m)$
p^{24}	$b_1^{24} P_{di}(h_{t+k}^{24}, t)$
d_1	$c_1^c \cos \frac{2\pi h_{t+k}^{24}}{24} + c_1^s \sin \frac{2\pi h_{t+k}^{24}}{24}$
d_2	$c_2^c \cos \frac{4\pi h_{t+k}^{24}}{24} + c_2^s \sin \frac{4\pi h_{t+k}^{24}}{24}$
d_3	$c_3^c \cos \frac{6\pi h_{t+k}^{24}}{24} + c_3^s \sin \frac{6\pi h_{t+k}^{24}}{24}$
1	m

Table F.21: *Translation list between the subsequent tables and model (6.26), where k is the prediction horizon.*

Wind farm				
DR	FJ	HO	RB	SY
p_1+p_2+p^m+ d_1+d_2 0.03744	p_1+p^m+p^{24}+ d_1+d_2 0.4626	p_1+p_2+p^m+d_1 0.07593	p_1+p^m+p^{24} 4.937	1+p_1+p_2+p^m 0.2696
p_1+p_2+p^m+ p^{24}+d_1+d_2 0.03744	1+p_1+p^m+ p^{24}+d_1+d_2 0.4629	p_1+p_2+p^m+ p^{24}+d_1+d_2 0.07595	p_1+p^m+d_1 4.938	p_1+p_2+p^m 0.2697
p_1+p_2+p^w+ p^m+d_1+d_2 0.03746	p_1+p_2+p^m+ p^{24}+d_1+d_2 0.4630	p_1+p_2+p^m+ d_1+d_2 0.07596	p_1+p^w+p^m+p^{24} 4.939	1+p_1+p_2+ p^m+d_1 0.2698
p_1+p_2+p^w+ p^m+p^{24}+d_1+d_2 0.03746	p_1+p^m+d_1+d_2 0.4630	1+p_1+p_2+p^m+d_1 0.07599	p_1+p^m 4.939	p_1+p_2+p^m+d_1 0.2699
1+p_1+p_2+ p^m+d_1+d_2 0.03748	p_1+p^w+p^m+ p^{24}+d_1+d_2 0.4632	p_1+p_2+p^m+ p^{24}+d_1 0.07600	p_1+p_2+p^w+ p^m+p^{24} 4.940	p_1+p_2+p^w+p^m 0.2700

Table F.22: *(Model 3, $k = 2$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9979$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
1+p_1+p^m+ d_1+d_2 0.07771	1+p_1+p_2+ p^m+d_1+d_2 0.9031	p_1+p^m+p^{24}+ d_1+d_2 0.1469	1+p_1+p^m+p^{24} 8.711	p_1+p_2+p^w+ p^m+d_1 0.6342
1+p_1+p_2+ p^m+d_1+d_2 0.07775	1+p_1+p_2+ p^m+p^{24}+d_1+d_2 0.9032	1+p_1+p^m+ p^{24}+d_1+d_2 0.1470	1+p_1+p^m+ p^{24}+d_1 8.713	p_1+p_2+p^w+p^m 0.6345
p_1+p^m+d_1+d_2 0.07777	1+p_1+p_2+p^w+ p^m+d_1+d_2 0.9039	p_1+p^m+d_1+d_2 0.1470	1+p_1+p^m+d_1 8.715	1+p_1+p_2+p^w+ p^m+d_1 0.6346
1+p_1+p^w+ p^m+d_1+d_2 0.07778	1+p_1+p_2+p^w+ p^m+p^{24}+d_1+d_2 0.9039	p_1+p_2+p^m+ p^{24}+d_1+d_2 0.1471	1+p_1+p^m+ d_1+d_2 8.717	1+p_1+p_2+p^w+p^m 0.6350
p_1+p^w+p^m+ d_1+d_2 0.07780	1+p_1+p^m+ d_1+d_2 0.9041	1+p_1+p^m+ d_1+d_2 0.1471	1+p_1+p_2+ p^m+p^{24} 8.717	1+p_1+p_2+p^m 0.6357

Table F.23: *(Model 3, $k = 6$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9988$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
$1+p_1+p^m+p^{24}+d_3$ 0.1000	$1+p_1+p^m+p^{24}$ 1.086	$p_1+p_2+p^m+d_1+d_2+d_3$ 0.1787	$p_1+p^m+p^{24}+d_1+d_2$ 10.78	$p_1+p_2+p^w+p^m$ 0.8841
$1+p_1+p^m+d_1+d_2+d_3$ 0.1000	$1+p_1+p_2+p^m+p^{24}$ 1.087	$p_1+p^m+d_1+d_2+d_3$ 0.1787	$p_1+p_2+p^m+p^{24}+d_1+d_2$ 10.79	$p_1+p_2+p^w+p^m+d_3$ 0.8846
$1+p_1+p^w+p^m+p^{24}+d_3$ 0.1001	$1+p_1+p^m+p^{24}+d_3$ 1.087	$p_1+p_2+p^m+d_1+d_2$ 0.1789	$p_1+p^m+p^{24}+d_1+d_2+d_3$ 10.79	$p_1+p^w+p^m$ 0.8847
$1+p_1+p^m+d_1+d_2$ 0.1001	$1+p_1+p^w+p^m+p^{24}$ 1.089	$p_1+p^m+d_1+d_2$ 0.1789	$p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 10.79	$1+p_1+p_2+p^w+p^m$ 0.8847
$1+p_1+p^w+p^m+d_1+d_2+d_3$ 0.1001	$1+p_1+p_2+p^m+p^{24}+d_3$ 1.089	$1+p_1+p_2+p^m+d_1+d_2+d_3$ 0.1789	$1+p_1+p^m+p^{24}+d_1+d_2$ 10.80	$1+p_1+p_2+p^w+p^m+d_3$ 0.8852

Table F.24: *(Model 3, $k = 12$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9990$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
$p_1+p^w+p^m+d_1+d_2$ 0.1093	$1+p_1+p^m+p^{24}$ 1.115	$p_1+p^m+d_1+d_2$ 0.1951	$p_1+p^m+p^{24}+d_1+d_2$ 11.92	$p_1+p^w+p^m$ 0.9713
$p_1+p_2+p^w+p^m+d_1+d_2$ 0.1093	$1+p_1+p_2+p^m+p^{24}$ 1.117	$p_1+p^m+d_1+d_2+d_3$ 0.1951	$p_1+p_2+p^m+p^{24}+d_1+d_2$ 11.92	$p_1+p^w+p^m+d_3$ 0.9722
$p_1+p^w+p^m+p^{24}$ 0.1094	$1+p_1+p^m+p^{24}+d_3$ 1.118	$1+p_1+p^m+d_1+d_2$ 0.1952	$p_1+p^m+p^{24}+d_1+d_2+d_3$ 11.93	$p_1+p^w+p^m+d_2$ 0.9728
$1+p_1+p^w+p^m+d_1+d_2$ 0.1094	$1+p_1+p^m+p^{24}+d_2$ 1.118	$1+p_1+p^m+d_1+d_2+d_3$ 0.1952	$p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 11.93	$1+p_1+p^w+p^m$ 0.9728
$p_1+p^w+p^m+d_1+d_2+d_3$ 0.1094	$1+p_2+p^m+p^{24}$ 1.118	$p_1+p_2+p^m+d_1+d_2+d_3$ 0.1953	$1+p_1+p^m+p^{24}+d_1+d_2$ 11.95	$p_1+p_2+p^w+p^m$ 0.9728

Table F.25: *(Model 3, $k = 18$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9992$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
p_1+p^w+p^m+ d_1+d_2 0.1170	p^m+p^{24}+d_1+d_2 1.211	1+p_1+p^m+ d_1+d_2+d_3 0.2105	1+p^m+p^{24}+ d_1+d_2+d_3 12.99	p_1+p^w+p^m 1.051
p_1+p_2+p^w+ p^m+d_1+d_2 0.1170	p^m+p^{24}+ d_1+d_2+d_3 1.213	1+p_1+p^m+ d_1+d_2 0.2105	1+p^m+ p^{24}+d_1+d_2 13.01	p_1+p^w+p^m+d_2 1.051
p_1+p^w+p^m+ d_1+d_2+d_3 0.1171	p^m+d_1+d_2 1.213	1+p_1+p^m+ d_1+d_3 0.2106	p^m+p^{24}+ d_1+d_2+d_3 13.01	p_1+p^w+p^m+d_3 1.052
p_1+p_2+p^w+ p^m+d_1+d_2+d_3 0.1171	p^m+d_1+d_2+d_3 1.214	1+p_1+p^m+d_1 0.2106	p_1+p^m+p^{24}+ d_1+d_2+d_3 13.02	p_1+p^w+p^m+ d_2+d_3 1.052
p^w+p^m+d_1+d_2 0.1172	p^m+p^{24} 1.215	p_1+p^m+ d_1+d_2+d_3 0.2107	p_1+p^m+ p^{24}+d_1+d_2 13.02	p_1+p_2+p^w+p^m 1.052

Table F.26: *(Model 3, $k = 24$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9993$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
p^m+d_1+d_2 0.1335	p^m+p^{24}+d_1+d_2 1.471	1+p_1+p^m+d_1+d_2 0.2424	1+p^m+p^{24}+ d_1+d_2+d_3 15.22	p_1+p^w+p^m+ p^{24}+d_1 1.298
1+p^m+d_1+d_2 0.1337	p^m+d_1+d_2 1.473	1+p_1+p_2+ p^m+d_1+d_2 0.2425	1+p^m+ p^{24}+d_1+d_2 15.24	p_1+p^w+p^m+ p^{24}+d_1+d_2 1.298
p^m+d_1+d_2+d_3 0.1337	p^m+p^{24}+ d_1+d_2+d_3 1.473	p_1+p^m+d_1+d_2 0.2425	1+p_1+p^m+ p^{24}+d_1+d_2+d_3 15.31	p_1+p^w+p^m+ p^{24}+d_1+d_2+d_3 1.298
p^m+p^{24}+d_1+d_2 0.1337	p^m+d_1+d_2+d_3 1.475	1+p_2+p^m+ d_1+d_2 0.2426	p^m+p^{24}+ d_1+d_2+d_3 15.31	p_1+p^w+p^m+ p^{24}+d_1+d_3 1.298
1+p^m+ p^{24}+d_1+d_2 0.1339	1+p^m+ p^{24}+d_1+d_2 1.475	p_1+p_2+p^m+ d_1+d_2 0.2427	1+p_2+p^m+ p^{24}+d_1+d_2+d_3 15.32	p_1+p_2+p^w+p^m+ p^{24}+d_1+d_2+d_3 1.299

Table F.27: *(Model 3, $k = 36$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9994$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
$1+p^m+d_1+d_2$ 0.1606	$p^m+p^{24}+d_1+d_2$ 1.804	$1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 0.2737	$1+p^m+p^{24}+d_1+d_2+d_3$ 17.14	$1+p^m+p^{24}+d_1+d_2+d_3$ 1.564
$1+p^m+d_1+d_2+d_3$ 0.1607	$p^m+p^{24}+d_1+d_2+d_3$ 1.805	$1+p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 0.2738	$1+p^m+p^{24}+d_1+d_2$ 17.17	$p_2+p^m+p^{24}+d_1+d_2$ 1.565
$p^m+d_1+d_2$ 0.1608	$1+p^m+p^{24}+d_1+d_2$ 1.806	$1+p_1+p^m+p^{24}+d_1+d_2+d_3$ 0.2738	$1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 17.23	$1+p_1+p^m+p^{24}+d_1+d_2$ 1.565
$1+p^m+p^{24}+d_1+d_2$ 0.1609	$p^m+d_1+d_2$ 1.806	$1+p_2+p^m+p^{24}+d_1+d_2$ 0.2739	$1+p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 17.23	$p_1+p^m+p^{24}+d_1+d_2$ 1.565
$p^m+d_1+d_2+d_3$ 0.1609	$1+p^m+p^{24}+d_1+d_2+d_3$ 1.807	$1+p_1+p_2+p^m+p^{24}+d_1+d_2$ 0.2740	$1+p_1+p^m+p^{24}+d_1+d_2+d_3$ 17.24	$1+p_2+p^m+p^{24}+d_1+d_2$ 1.565

Table F.28: *(Model 3, k = 48) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9995$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
$1+p^m+p^{24}+d_1+d_2$ 0.1881	$p^m+p^{24}+d_1+d_2$ 2.086	$1+p_1+p^m+p^{24}+d_1+d_2+d_3$ 0.3113	$1+p^m+p^{24}+d_1+d_2+d_3$ 19.64	$1+p^m+p^{24}+d_1+d_2+d_3$ 1.798
$1+p^m+p^{24}+d_1+d_2+d_3$ 0.1881	$p^m+p^{24}+d_1+d_2+d_3$ 2.087	$1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 0.3113	$1+p^m+p^{24}+d_1+d_2$ 19.69	$1+p^m+p^{24}+d_1+d_2$ 1.801
$1+p^m+d_1+d_2$ 0.1887	$1+p^m+p^{24}+d_1+d_2$ 2.094	$1+p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 0.3114	$1+p_1+p^m+p^{24}+d_1+d_2+d_3$ 19.76	$1+p^w+p^m+p^{24}+d_1+d_2+d_3$ 1.811
$1+p^m+d_1+d_2+d_3$ 0.1887	$1+p^m+p^{24}+d_1+d_2+d_3$ 2.095	$1+p^m+p^{24}+d_1+d_2+d_3$ 0.3115	$1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 19.76	$1+p^w+p^m+p^{24}+d_1+d_2$ 1.813
$1+p^w+p^m+p^{24}+d_1+d_2+d_3$ 0.1888	$p^m+d_1+d_2$ 2.096	$1+p_1+p^m+p^{24}+d_1+d_2$ 0.3115	$1+p_1+p_2+p^m+p^{24}+d_1+d_2+d_3$ 19.77	$1+p^m+p^{24}+d_1+d_3$ 1.815

Table F.29: *(Model 3, k = 60) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9994$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

Wind farm				
DR	FJ	HO	RB	SY
1+p^m+ p^{24}+d_1+d_2 0.2070	p^m+p^{24}+d_1+d_2 2.290	1+p^m+ p^{24}+d_1+d_2+d_3 0.3459	1+p^m+ p^{24}+d_1+d_2+d_3 21.63	1+p^m+ p^{24}+d_1+d_2+d_3 1.989
1+p^m+ p^{24}+d_1+d_2+d_3 0.2070	p^m+ p^{24}+d_1+d_2+d_3 2.291	1+p^m+ p^{24}+d_1+d_2 0.3461	1+p^m+ p^{24}+d_1+d_2 21.70	1+p^m+ p^{24}+d_1+d_2 1.994
1+p^w+p^m+ p^{24}+d_1+d_2+d_3 0.2074	1+p^m+ p^{24}+d_1+d_2 2.299	1+p_1+p^m+ p^{24}+d_1+d_2+d_3 0.3465	1+p_2+p^m+ p^{24}+d_1+d_2+d_3 21.75	1+p^w+p^m+ p^{24}+d_1+d_2+d_3 2.005
1+p^w+p^m+ p^{24}+d_1+d_2 0.2074	1+p^m+ p^{24}+d_1+d_2+d_3 2.300	1+p_1+p_2+p^m+ p^{24}+d_1+d_2+d_3 0.3467	1+p_1+p^m+ p^{24}+d_1+d_2+d_3 21.75	1+p_2+p^m+ p^{24}+d_1+d_2+d_3 2.008
1+p_1+p^m+ p^{24}+d_1+d_2 0.2076	p^m+d_2 2.311	1+p_2+p^m+ p^{24}+d_1+d_2+d_3 0.3467	1+p_1+p_2+p^m+ p^{24}+d_1+d_2+d_3 21.76	1+p_1+p^m+ p^{24}+d_1+d_2+d_3 2.009

Table F.30: *(Model 3, $k = 72$) The best five sub models of model (6.26) when mean square error is used as a measure together with the corresponding mean square error MW^2. A forgetting factor, $\lambda = 0.9993$, is applied in the RLS estimation. The translation list between the abbreviated models in the table and model (6.26) is found in Table F.21.*

F.4 Results for the predictions models

		Prediction horizon $[\frac{1}{2}hours]$								
WF	Model	2	6	12	18	24	36	48	60	72
DR	$NAIVE$	0.0435	0.128	0.249	0.349	0.427	0.520	0.550	0.604	0.638
DR	$WPPT1$	0.0419	0.111	0.193	0.246	0.280	0.315	0.326	0.333	0.331
DR	$WPPT2$	0.0383	0.0805	0.104	0.113	0.121	0.140	0.166	0.198	0.221
DR	$m1$	0.0378	0.0799	0.103	0.112	0.121	0.139	0.164	0.196	0.221
DR	$m2$	0.0375	0.0785	0.100	0.110	0.118	0.134	0.161	0.193	0.214
DR	$m3_a$	0.0375	0.0778	0.100	0.110	0.117	0.133	0.161	0.188	0.205
DR	$m3_b$	0.0372	0.0744	0.0934	0.103	0.110	0.126	0.154	0.184	0.205
FJ	$NAIVE$	0.531	1.510	2.92	4.00	4.89	6.17	6.73	7.31	7.55
FJ	$WPPT1$	0.528	1.400	2.43	3.11	3.55	4.03	4.17	4.32	4.33
FJ	$WPPT2$	0.478	0.940	1.12	1.17	1.28	1.58	1.91	2.18	2.36
FJ	$m1$	0.471	0.934	1.12	1.16	1.28	1.55	1.88	2.13	2.34
FJ	$m2$	0.468	0.929	1.12	1.16	1.28	1.51	1.82	2.09	2.30
FJ	$m3_a$	0.464	0.903	1.09	1.13	1.22	1.47	1.80	2.08	2.27
FJ	$m3_b$	0.458	0.875	1.05	1.08	1.18	1.45	1.79	2.07	2.27
HO	$NAIVE$	0.0915	0.263	0.503	0.706	0.866	1.02	1.11	1.23	1.27
HO	$WPPT1$	0.0874	0.226	0.378	0.476	0.537	0.586	0.610	0.630	0.638
HO	$WPPT2$	0.0778	0.152	0.189	0.207	0.227	0.269	0.298	0.335	0.368
HO	$m1$	0.0767	0.151	0.187	0.206	0.226	0.264	0.291	0.328	0.363
HO	$m2$	0.0759	0.147	0.180	0.199	0.215	0.251	0.280	0.316	0.351
HO	$m3_a$	0.0757	0.147	0.179	0.195	0.211	0.247	0.277	0.312	0.345
HO	$m3_b$	0.0744	0.137	0.164	0.179	0.192	0.232	0.266	0.304	0.343
RB	$NAIVE$	5.80	14.60	26.9	36.6	44.0	53.4	58.6	62.7	64.9
RB	$WPPT1$	5.55	13.20	22.3	28.3	32.2	36.8	39.5	41.3	41.8
RB	$WPPT2$	5.05	9.16	11.6	12.9	14.0	16.6	18.7	21.6	23.4
RB	$m1$	5.05	9.12	11.5	12.9	14.1	16.5	18.4	21.2	23.0
RB	$m2$	5.02	9.05	11.4	12.9	14.0	16.2	18.1	20.7	22.7
RB	$m3_a$	4.96	8.73	10.9	12.1	13.2	15.3	17.1	19.6	21.3
RB	$m3_b$	4.96	8.65	10.6	11.8	12.8	15.1	16.8	19.3	21.2
SY	$NAIVE$	0.303	0.996	2.05	2.89	3.58	4.65	5.14	5.46	5.72
SY	$WPPT1$	0.299	0.940	1.79	2.37	2.77	3.22	3.40	3.55	3.68
SY	$WPPT2$	0.281	0.659	0.911	1.00	1.08	1.34	1.61	1.89	2.15
SY	$m1$	0.275	0.652	0.919	1.01	1.08	1.35	1.62	1.89	2.13
SY	$m2$	0.273	0.650	0.927	1.02	1.13	1.38	1.65	1.91	2.14
SY	$m3_a$	0.270	0.640	0.898	0.984	1.06	1.28	1.51	1.74	1.90
SY	$m3_b$	0.266	0.605	0.815	0.885	0.956	1.19	1.44	1.67	1.83

Table F.31: *(All wind farms) Mean square error for model 1 ("m1"), model 2 ("m2") and model 3 ("$m3_a$" or "$m3_b$") stated in Table 6.8, 6.9 and 6.10, respectively. In model 3 the power curve models identified in Section 6.4.2 are used to transform wind speed to power production. Here model 3_a uses power curves without wind direction dependency whereas model 3_b employs power curves with first order polynomial approximation of the wind direction dependency. The results for the naive predictor, WPPT1 and WPPT2 given by (6.23), (6.21) and (6.22), respectively, are listed for reference.*

		Prediction horizon [$\frac{1}{2}hours$]								
WF	Model	2	6	12	18	24	36	48	60	72
DR	$WPPT1$	0.96	0.87	0.78	0.71	0.66	0.61	0.59	0.55	0.52
DR	$WPPT2$	0.88	0.63	0.42	0.32	0.28	0.27	0.30	0.33	0.35
DR	$m1$	0.87	0.63	0.41	0.32	0.28	0.27	0.30	0.33	0.35
DR	$m2$	0.86	0.62	0.40	0.31	0.28	0.26	0.29	0.32	0.33
DR	$m3_a$	0.86	0.61	0.40	0.31	0.27	0.26	0.29	0.31	0.32
DR	$m3_b$	0.85	0.58	0.38	0.29	0.26	0.24	0.28	0.31	0.32
DR	$s_p^2[MW^2]$	0.358	0.357	0.356	0.355	0.356	0.357	0.357	0.358	0.358
FJ	$WPPT1$	0.99	0.92	0.83	0.78	0.73	0.65	0.62	0.59	0.57
FJ	$WPPT2$	0.90	0.62	0.38	0.29	0.26	0.26	0.28	0.30	0.31
FJ	$m1$	0.89	0.62	0.38	0.29	0.26	0.25	0.28	0.29	0.31
FJ	$m2$	0.88	0.61	0.38	0.29	0.26	0.24	0.27	0.29	0.30
FJ	$m3_a$	0.87	0.60	0.37	0.28	0.25	0.24	0.27	0.28	0.30
FJ	$m3_b$	0.86	0.58	0.36	0.27	0.24	0.23	0.27	0.28	0.30
FJ	$s_p^2[MW^2]$	4.67	4.66	4.65	4.64	4.65	4.64	4.63	4.64	4.64
HO	$WPPT1$	0.95	0.86	0.75	0.67	0.62	0.57	0.55	0.51	0.50
HO	$WPPT2$	0.85	0.58	0.37	0.29	0.26	0.26	0.27	0.27	0.29
HO	$m1$	0.84	0.58	0.37	0.29	0.26	0.26	0.26	0.27	0.29
HO	$m2$	0.83	0.56	0.36	0.28	0.25	0.25	0.25	0.26	0.28
HO	$m3_a$	0.83	0.56	0.36	0.28	0.24	0.24	0.25	0.25	0.27
HO	$m3_b$	0.81	0.52	0.33	0.25	0.22	0.23	0.24	0.25	0.27
HO	$s_p^2[MW^2]$	0.689	0.688	0.687	0.686	0.688	0.685	0.684	0.681	0.684
RB	$WPPT1$	0.96	0.90	0.83	0.77	0.73	0.69	0.67	0.66	0.64
RB	$WPPT2$	0.87	0.63	0.43	0.35	0.32	0.31	0.32	0.34	0.36
RB	$m1$	0.87	0.63	0.43	0.35	0.32	0.31	0.31	0.34	0.35
RB	$m2$	0.87	0.62	0.42	0.35	0.32	0.30	0.31	0.33	0.35
RB	$m3_a$	0.86	0.60	0.40	0.33	0.30	0.29	0.29	0.31	0.33
RB	$m3_b$	0.86	0.59	0.40	0.32	0.29	0.28	0.29	0.31	0.33
RB	$s_p^2[MW^2]$	41.7	41.7	41.7	41.7	41.7	41.7	41.6	41.8	41.7
SY	$WPPT1$	0.99	0.94	0.87	0.82	0.77	0.69	0.66	0.65	0.64
SY	$WPPT2$	0.93	0.66	0.44	0.35	0.30	0.29	0.31	0.35	0.38
SY	$m1$	0.91	0.65	0.45	0.35	0.30	0.29	0.32	0.35	0.37
SY	$m2$	0.90	0.65	0.45	0.35	0.32	0.30	0.32	0.35	0.37
SY	$m3_a$	0.89	0.64	0.44	0.34	0.30	0.27	0.29	0.32	0.33
SY	$m3_b$	0.88	0.61	0.40	0.31	0.27	0.26	0.28	0.31	0.32
SY	$s_p^2[MW^2]$	3.94	3.92	3.91	3.90	3.92	3.93	3.94	3.94	3.95

Table F.32: *(All wind farms) Relative mean square error for model 1 ("m1"), model 2 ("m2") and model 3 ("$m3_a$" or "$m3_b$") stated in Table 6.8, 6.9 and 6.10, respectively. In model 3 the power curve models identified in Section 6.4.2 are used to transform wind speed to power production. Here model 3_a uses power curves without wind direction dependency whereas model 3_b employs power curves with first order polynomial approximation of the wind direction dependency. The results for $WPPT1$ and $WPPT2$ given by (6.21) and (6.22), respectively, are listed for reference.*

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