Harvard Forest Data Archive HF206-02

Data File:

Name = hf206-02-HK-micro-2014-present.csv
Description = Hemlock microclimate, 2014-present
Rows = 181417 Columns = 85
MD5 checksum = d4288a5bb32bb5a906adec15cc0d0045

Variables:

datetime = date and time (EST)
year = year
dec_date = day of year with hour of day converted to fraction of day
   (nominalDay)
par = photosynthetically active radiation measured above the canopy
   at 24 m height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
net_rad = net radiation measured above
 the canopy at 30m
   (wattPerMeterSquared)
tair_ac = air temperature with
 aspirated radiation shield measured
   above the
 canopy at 33m height by a Campbell Scientific
 CS215 sensor
   (celsius)
rh = relative humidity with
 aspirated radiation shield measured
   above the
 canopy at 33m height by a Campbell Scientific
 CS215 sensor
   (dimensionless)
tair_ac_toc = air temperature measured
 above the canopy at 24m by a
   shaded
 thermocouple (celsius)
wvp = water vapor
 pressure (kilopascal)
wvp_act = actual water vapor
 pressure (kilopascal)
vpd = vapor pressure
 deficit (kilopascal)
tair_us_1m = air temperature measured
 below the canopy at 1m
   (celsius)
tsoil1 = soil temperature 1 measured
 at 10 cm depth (celsius)
tsoil2 = soil temperature 2 measured
 at 10 cm depth (celsius)
tsoil3 = soil temperature 3 measured
 at 10 cm depth (celsius)
tsoil4 = soil temperature 4 measured
 at 10 cm depth (celsius)
tsoil5 = soil temperature 5 measured
 at 10 cm depth (celsius)

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tsoil6 = soil temperature 6 measured
 at 10 cm depth (celsius)
tsoil_ave = average of soil temperature
 1−6 measured at 10 cm depth
   (celsius)
par_ac_down = photosynthetically active radiation measured above the
   canopy at 30 m height by a Licor 190S quantum sensor
   (micromolePerMeterSquaredPerSecond)
par_mid = photosynthetically active
 radiation measured above the
   canopy at 20 m height
 by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
par_low = photosynthetically active
 radiation measured above the
   canopy at 10 m height
 by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
albedo = Albedo as measured by NR01 at
 30m (wattPerMeterSquared)
rs_down = SWin (downwelling) solar radiation from upfacing
   pyranometer on NR01 (wattPerMeterSquared)
rs_up = SWout (upwelling) solar radiation from downfacing
   pyranometer on NR01 (wattPerMeterSquared)
rl_down = LWin (downwelling) Far infrared radiation from up facing
   pygeometer on NR01 (wattPerMeterSquared)
rl_up = LWout (upwelling) Far infrared radiation from down facing
   pygeometer on NR01 (wattPerMeterSquared)
tnr01 = temperature of NR01
 sensor (kelvin)
tair_mid = air temperature with
 aspirated radiation shield measured
   mid canopy at
 20m height by a Campbell Scientific CS215
 sensor
   (celsius)
rh_mid = relative humidity with
 aspirated radiation shield measured
   mid canopy at
 20m height by a Campbell Scientific CS215
 sensor
   (dimensionless)
tair_low = air temperature with
 aspirated radiation shield measured
   lower canopy
 at 10m height by a Campbell Scientific CS215
 sensor
   (celsius)
rh_low = relative humidity with
 aspirated radiation shield measured
   lower canopy
 at 10m height by a Campbell Scientific CS215
 sensor
   (dimensionless)
ws = wind
 speed (metersPerSecond)
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wsres = average horizontal resultant
 vector wind speed. Vector
   average of daily
 averages (metersPerSecond)
winddir = wind
 direction (degree)
winddir_sd1 = wind direction standard
 deviation (degree)
par_max = maximum photosynthetically
 active radiation measured
   above the canopy at 24 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
net_rad_max = maximum net radiation
 measured above the canopy at

   30m (wattPerMeterSquared)
tair_ac_max = maximum air temperature with
 aspirated radiation
   shield measured above the
 canopy at 33m height by a Campbell
   Scientific
 CS215 sensor (celsius)
rh_max = maximum relative humidity
 with aspirated radiation shield
   measured above the
 canopy at 33m height by a Campbell Scientific
 CS215
   sensor (dimensionless)
tair_ac_toc_max = maximum air temperature
 measured above the canopy
   at 24m by a shaded
 thermocouple (celsius)
tair_us_1m_max = maximum air temperature
 measured below the canopy
   at
 1m (celsius)
tsoil1_max = maximum soil temperature 1
 measured at 10 cm depth
   (celsius)
tsoil2_max = maximum soil temperature 2
 measured at 10 cm depth
   (celsius)
tsoil3_max = maximum soil temperature 3
 measured at 10 cm depth
   (celsius)
tsoil4_max = maximum soil temperature 4
 measured at 10 cm depth
   (celsius)
tsoil5_max = maximum soil temperature 5
 measured at 10 cm depth
   (celsius)
tsoil6_max = maximum soil temperature 6
 measured at 10 cm depth
   (celsius)
par_ac_down_max = photosynthetically active radiation measured above
   the canopy at 30 m height by a Licor 190S quantum sensor
   (micromolePerMeterSquaredPerSecond)
par_mid_max = maximum photosynthetically
 active radiation measured
   mid canopy at 20 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
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par_low_max = maximum photosynthetically
 active radiation measured
   lower canopy at 10 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
albedo_max = maximum Albedo as measured by
 NR01 at 30m
   (wattPerMeterSquared)
rs_down_max = maximum SWin (downwelling)
 solar radiation from
   upfacing pyranometer on
 NR01 (wattPerMeterSquared)
rs_up_max = maximum SWout (upwelling)
 solar radiation from
   downfacing pyranometer on
 NR01 (wattPerMeterSquared)
rl_down_max = maximum LWin (downwelling)
 Far infrared radiation
   from up facing pygeometer
 on NR01 (wattPerMeterSquared)
rl_up_max = maximum LWout (upwelling) Far
 infrared radiation from
   down facing pygeometer on
 NR01 (wattPerMeterSquared)
tair_mid_max = maximum air temperature with
 aspirated radiation
   shield measured mid canopy at
 20m height by a Campbell Scientific
   CS215
 sensor (celsius)
rh_mid_max = maximum relative humidity
 with aspirated radiation
   shield measured mid
 canopy at 20m height by a Campbell Scientific

   CS215 sensor (dimensionless)
tair_low_max = maximum air temperature with
 aspirated radiation
   shield measured lower canopy
 at 10m height by a Campbell Scientific
   CS215
 sensor (celsius)
rh_low_max = maximum relative humidity
 with aspirated radiation
   shield measured lower
 canopy at 10m height by a Campbell Scientific

   CS215 sensor (dimensionless)
par_min = minimum photosynthetically
 active radiation measured
   above the canopy at 24 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
net_rad_min = minimum net radiation
 measured above the canopy at

   30m (wattPerMeterSquared)
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tair_ac_min = minimum air temperature with
 aspirated radiation
   shield measured above the
 canopy at 33m height by a Campbell
   Scientific
 CS215 sensor (celsius)
rh_min = minimum relative humidity
 with aspirated radiation shield
   measured above the
 canopy at 33m height by a Campbell Scientific
 CS215
   sensor (dimensionless)
tair_ac_toc_min = minimum air temperature
 measured above the canopy
   at 24m by a shaded
 thermocouple (celsius)
tair_us_1m_min = minimum air temperature
 measured below the canopy
   at
 1m (celsius)
tsoil1_min = minimum soil temperature 1
 measured at 10 cm depth
   (celsius)
tsoil2_min = minimum soil temperature 2
 measured at 10 cm depth
   (celsius)
tsoil3_min = minimum soil temperature 3
 measured at 10 cm depth
   (celsius)
tsoil4_min = minimum soil temperature 4
 measured at 10 cm depth
   (celsius)
tsoil5_min = minimum soil temperature 5
 measured at 10 cm depth
   (celsius)
tsoil6_min = minimum soil temperature 6
 measured at 10 cm depth
   (celsius)
par_ac_down_min = photosynthetically active radiation measured above
   the canopy at 30 m height by a Licor 190S quantum sensor
   (micromolePerMeterSquaredPerSecond)
par_mid_min = minimum photosynthetically
 active radiation measured
   mid canopy at 20 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
par_low_min = minimum photosynthetically
 active radiation measured
   lower canopy at 10 m
 height by a Licor 190S quantum
 sensor
   (micromolePerMeterSquaredPerSecond)
albedo_min = minimum Albedo as measured by
 NR01 at 30m
   (wattPerMeterSquared)
rs_down_min = minimum SWin (downwelling)
 solar radiation from
   upfacing pyranometer on
 NR01 (wattPerMeterSquared)
rs_up_min = minimum SWout (upwelling)
 solar radiation from
   downfacing pyranometer on
 NR01 (wattPerMeterSquared)
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rl_down_min = minimum LWin (downwelling)
 Far infrared radiation
   from up facing pygeometer
 on NR01 (wattPerMeterSquared)
rl_up_min = minimum LWout (upwelling) Far
 infrared radiation from
   down facing pygeometer on
 NR01 (wattPerMeterSquared)
tair_mid_min = minimum air temperature with
 aspirated radiation
   shield measured mid canopy at
 20m height by a Campbell Scientific
   CS215
 sensor (celsius)
rh_mid_min = minimum relative humidity with aspirated radiation
   shield measured mid
 canopy at 20m height by a Campbell Scientific

   CS215 sensor (dimensionless)
tair_low_min = minimum air temperature with
 aspirated radiation
   shield measured lower canopy
 at 10m height by a Campbell Scientific
   CS215
 sensor (celsius)
rh_low_min = minimum relative humidity
 with aspirated radiation
   shield measured lower
 canopy at 10m height by a Campbell Scientific

   CS215 sensor (dimensionless)
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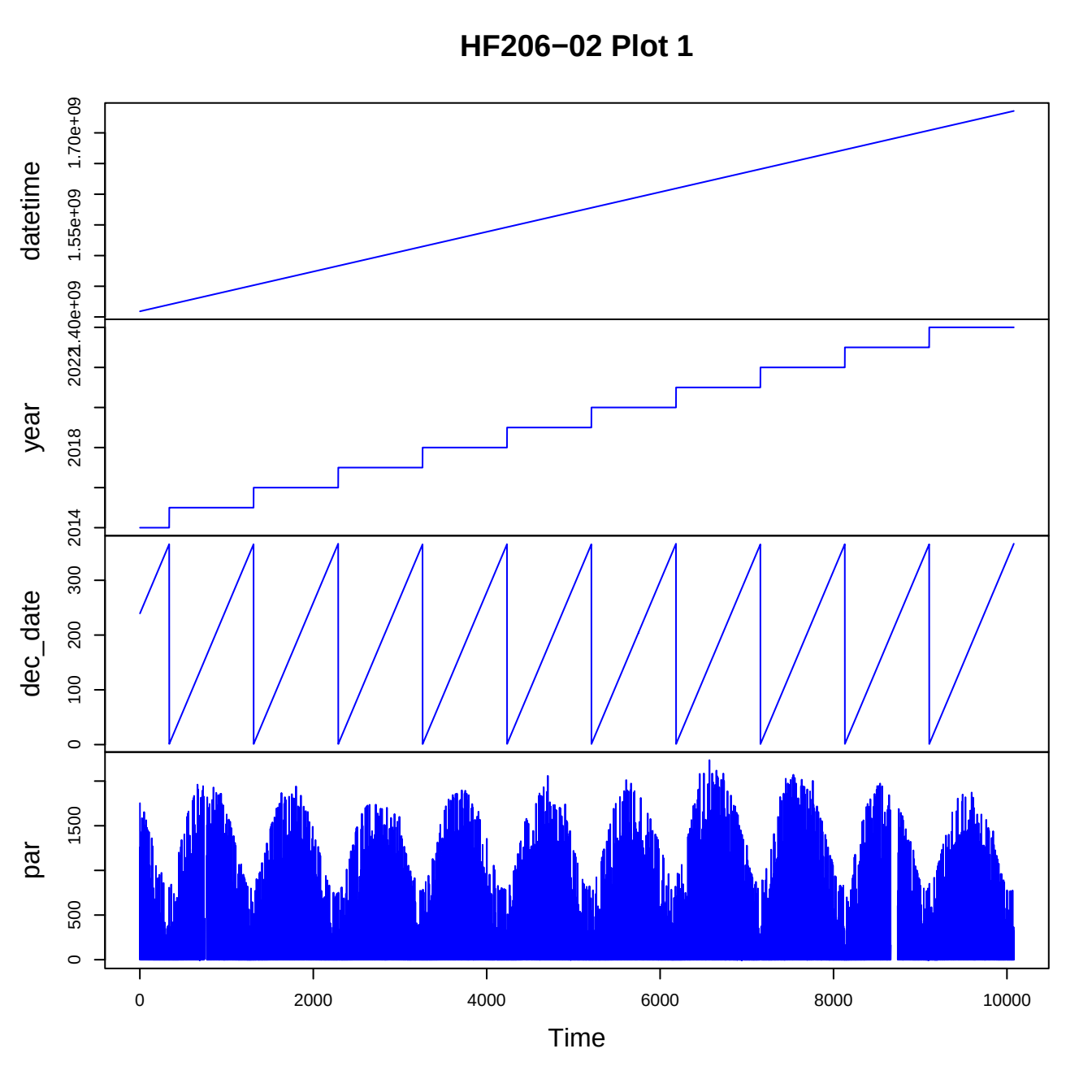
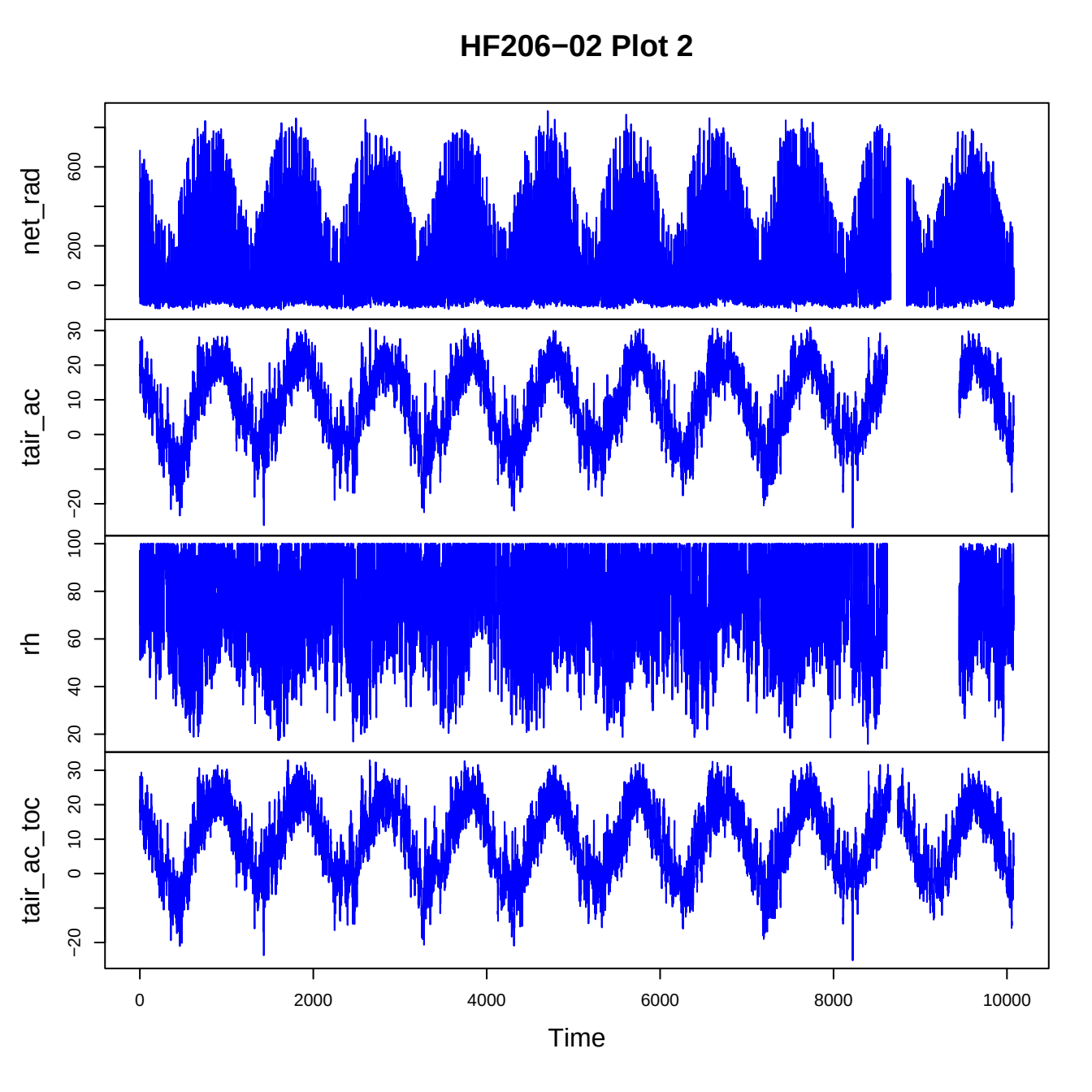
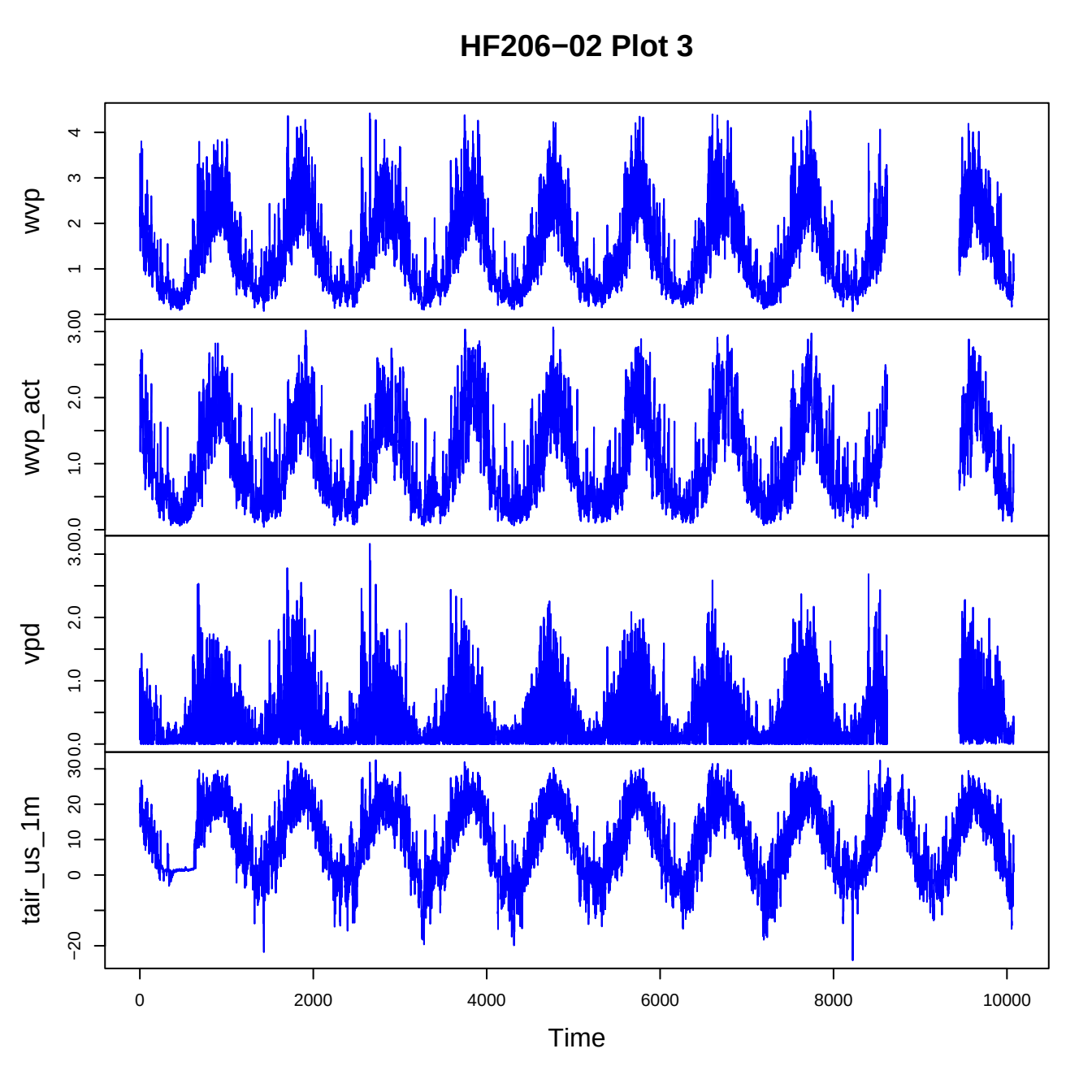
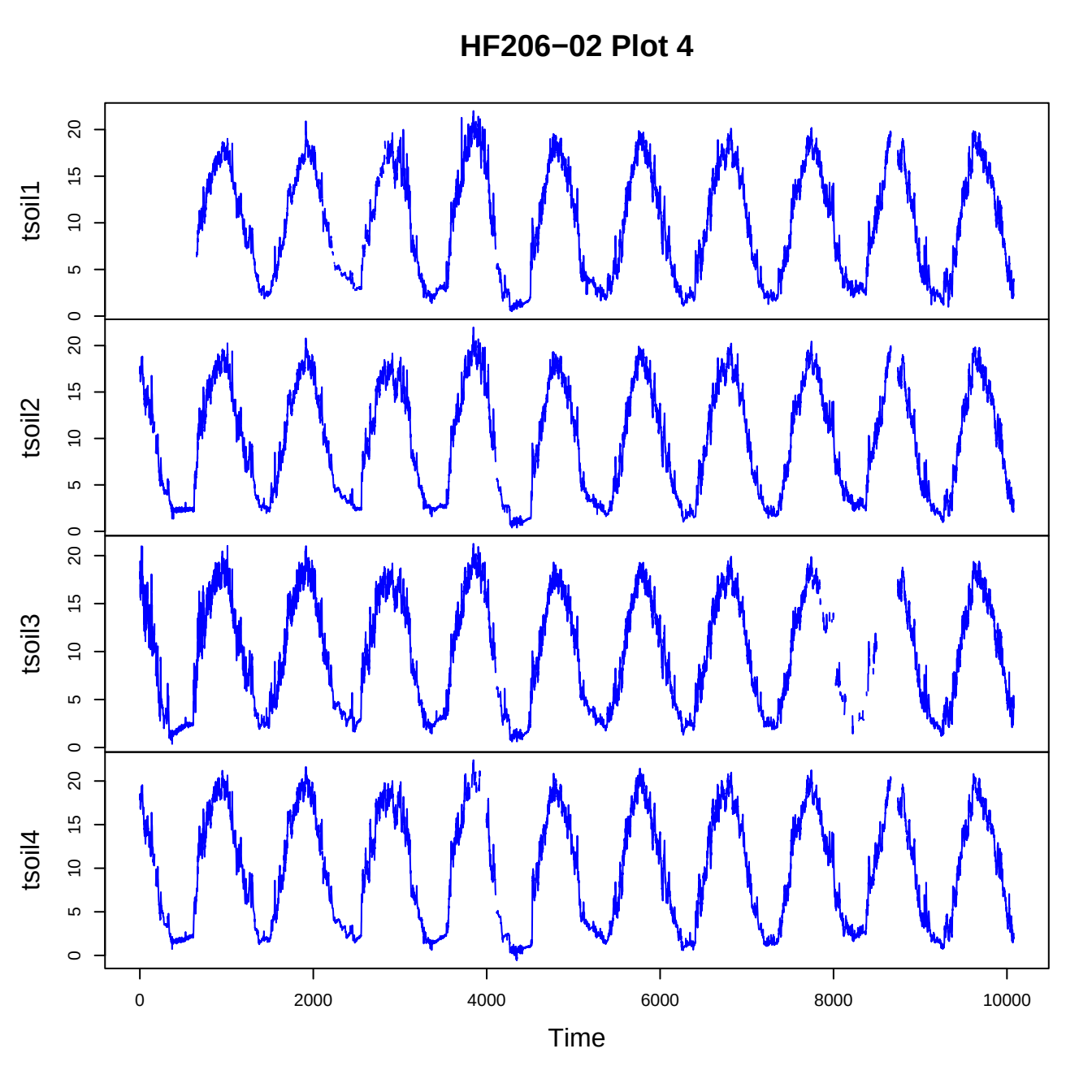
Variable	Min	Median	Mean	Max	NAs
datetime	2014-08-27T12:00			2025-01-01T00:00	0
year	2014.000	2019.000	2019.316	2025.000	0
dec_date	1.000	189.958	187.625	366.979	0
par	-9.850	9.475	303.474	2235.000	2237
net_rad	-137.500	-1.147	84.194	965.000	4657
tair_ac	-28.460	9.180	8.644	32.320	15529
rh	12.160	77.290	75.337	100.000	15352
tair_ac_toc	-27.220	9.630	9.460	34.590	2404
wvp	0.059	1.161	1.365	4.841	15529
wvp_act	0.027	0.847	1.017	3.113	15666
vpd	0.000	0.186	0.348	3.350	15666
tair_us_1m	-25.850	9.420	9.504	32.940	1877
tsoil1	0.128	9.810	9.829	22.180	16430
tsoil2	0.195	9.330	9.571	22.090	2036
tsoil3	-0.410	9.410	9.684	21.360	13103
tsoil4	-1.104	9.300	9.644	22.460	4565
tsoil5	0.104	9.390	9.694	21.810	2031
tsoil6	-0.304	9.020	9.509	22.410	2915
tsoil_ave	0.182	9.337	9.630	21.920	2029
par_ac_down	-7.462	0.210	11.201	235.096	10169
par_mid	-5.525	4.053	148.455	1965.387	5988
par_low	-9.968	1.037	35.668	1292.893	12633
albedo	0.000	0.089	0.067	0.999	23488
rs_down	-13.478	2.901	157.985	1164.775	3636
rs_up	-4.415	1.966	17.613	140.179	3635
rl_down	109.906	310.824	305.432	460.226	4592
rl_up	205.249	356.945	359.146	499.853	4592
tnr01	244.570	281.959	281.869	309.083	3634
tair_mid	-28.172	8.950	8.544	32.700	5769
rh_mid	11.506	80.187	76.947	100.000	5486
tair_low	-28.266	8.418	8.140	31.949	2160
rh_low	13.014	83.137	79.163	99.998	1939
ws	0.000	2.307	2.479	14.300	1784
wsres	0.000	2.142	2.294	13.600	1784
winddir	0.000	242.200	215.413	360.000	2312
winddir_sd1	0.000	20.480	20.435	78.590	2312
par_max	-7.865	22.980	406.385	6097.000	2237
net_rad_max	-134.700	0.555	134.328	1386.000	4657
tair_ac_max	-28.410	9.480	8.947	32.780	15529
rh_max	12.680	79.230	76.937	100.000	15352
tair_ac_toc_	-27.100	9.950	9.800	35.820	2404
tair_us_1m_m	-25.450	9.730	9.803	33.640	1877
tsoil1_max	0.347	9.850	9.893	27.390	16430
tsoil2_max	0.359	9.370	9.641	28.540	2036
tsoil3_max	-0.284	9.460	9.750	27.990	13103
tsoil4_max	-0.904	9.330	9.705	28.590	4565
tsoil5_max	0.178	9.430	9.750	28.790	2031
tsoil6_max	-0.227	9.070	9.577	30.270	2915
par_ac_down_	-4.143	1.831	15.420	724.047	10170

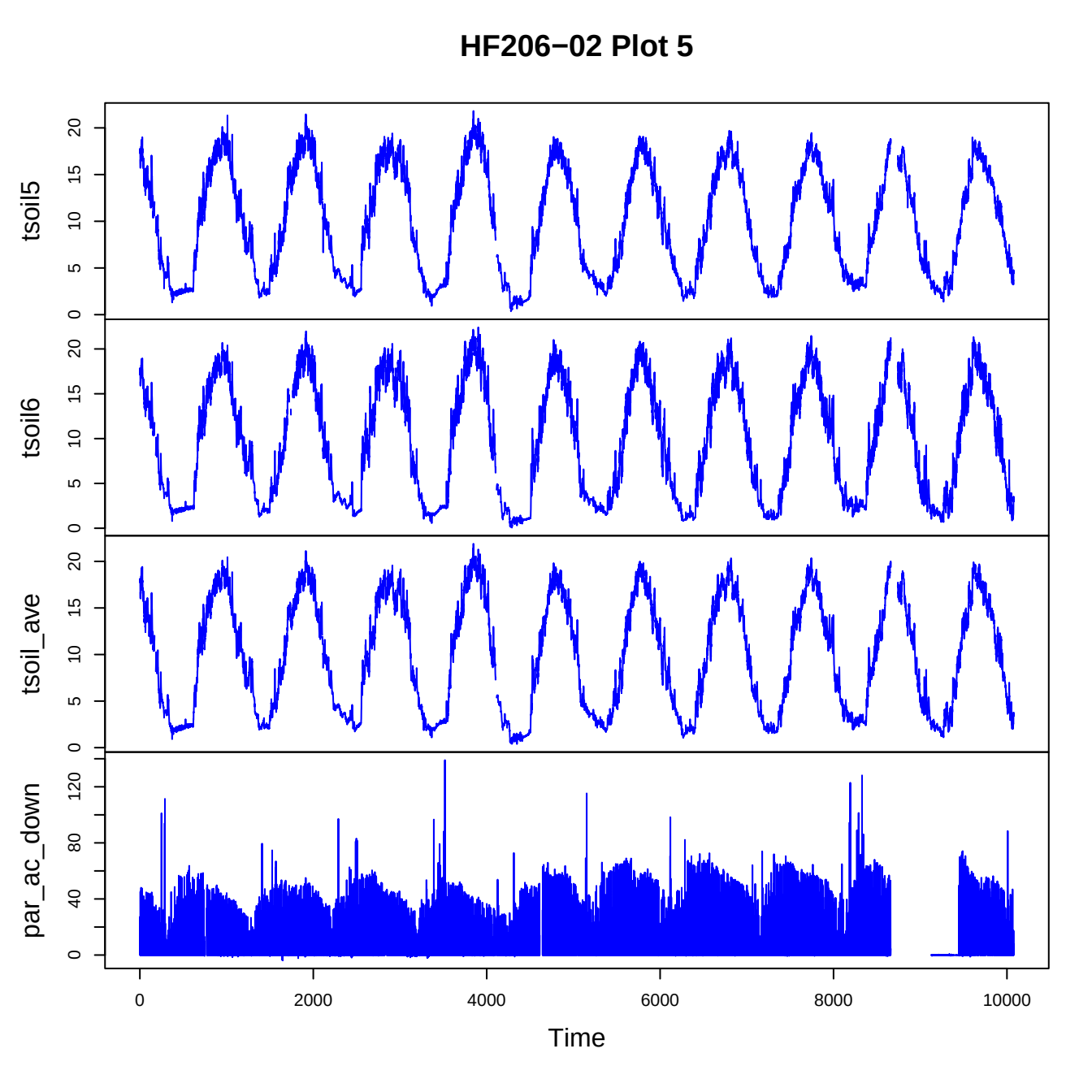
Variable	Min	Median	Mean	Max	NAs
par_mid_max	−5.012	9.853	244.634	2818.660	5989
par_low_max	−9.495	3.059	90.167	1819.548	12634
albedo_max	0.000	0.117	0.144	0.999	86358
rs_down_max	−9.096	10.358	215.166	1629.021	3636
rs_up_max	−2.114	3.128	24.419	245.351	3635
rl_down_max	110.478	315.303	310.968	502.863	4592
rl_up_max	205.718	359.065	361.538	902.827	4592
tair_mid_max	−28.077	9.253	8.854	33.257	5769
rh_mid_max	12.823	82.348	78.779	100.000	5486
tair_low_max	−28.138	8.690	8.404	32.308	2160
rh_low_max	14.122	85.242	81.005	99.998	1939
par_min	−1127.000	1.204	201.252	2107.000	2237
net_rad_min	−670.600	−5.067	35.332	839.000	4657
tair_ac_min	−28.530	8.910	8.358	32.050	15529
rh_min	11.680	75.360	73.755	100.000	15352
tair_ac_toc_	−27.320	9.310	9.132	34.110	2404
tair_us_1m_m	−26.340	9.120	9.216	32.590	1877
tsoil1_min	−6.460	9.770	9.769	21.650	16430
tsoil2_min	−5.731	9.280	9.505	21.310	2036
tsoil3_min	−6.300	9.370	9.621	21.090	13103
tsoil4_min	−7.875	9.270	9.587	22.120	4565
tsoil5_min	0.050	9.360	9.641	21.430	2031
tsoil6_min	−0.347	8.980	9.447	22.320	2915
par_ac_down_	−1725.066	−0.136	7.149	149.038	10170
par_mid_min	−110.532	0.448	80.055	1856.417	5989
par_low_min	−136.793	0.000	15.982	451.298	12634
albedo_min	0.000	0.097	0.100	0.979	95877
rs_down_min	−98.531	−0.231	103.305	1041.743	3645
rs_up_min	−94.847	1.180	11.034	118.138	3636
rl_down_min	−44.656	305.974	299.965	449.645	4592
rl_up_min	204.825	354.854	356.901	496.231	4592
tair_mid_min	−28.240	8.630	8.237	32.267	5769
rh_mid_min	10.464	78.080	75.276	100.000	5486
tair_low_min	−28.384	8.136	7.878	31.678	2160
rh_low_min	11.834	81.161	77.544	99.998	1939

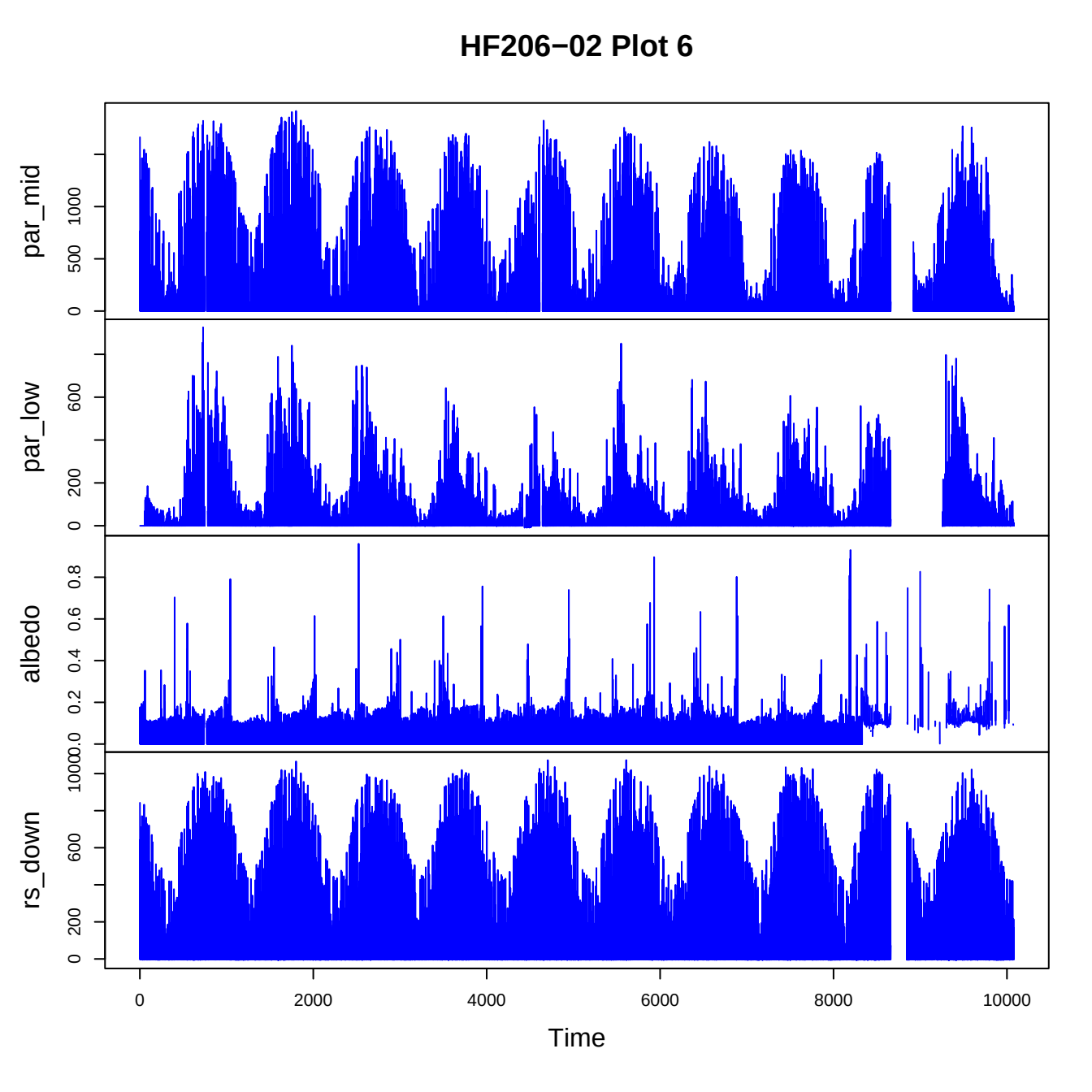

HF206−02 Plot 1
datetime
1.70e+09
1.55e+09
1.40e+09
year
2022
2018
2014
dec_date
300
200
100
0
par
1500
500
0
0
2000
4000
6000
8000
10000
Time

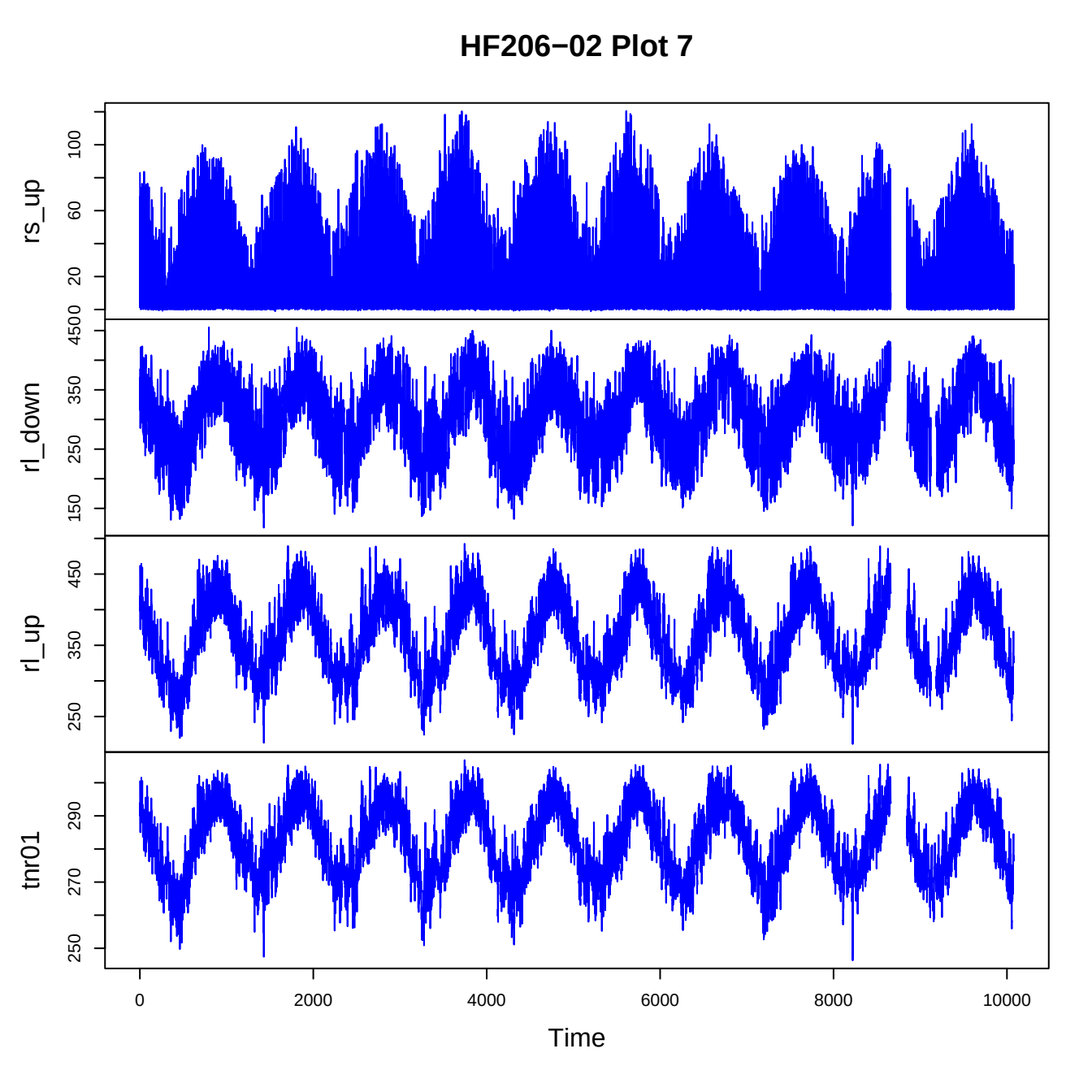

HF206−02 Plot 2
net_rad
tair_ac
rh
tair_ac_toc
Time
0
2000
4000
6000
8000
10000

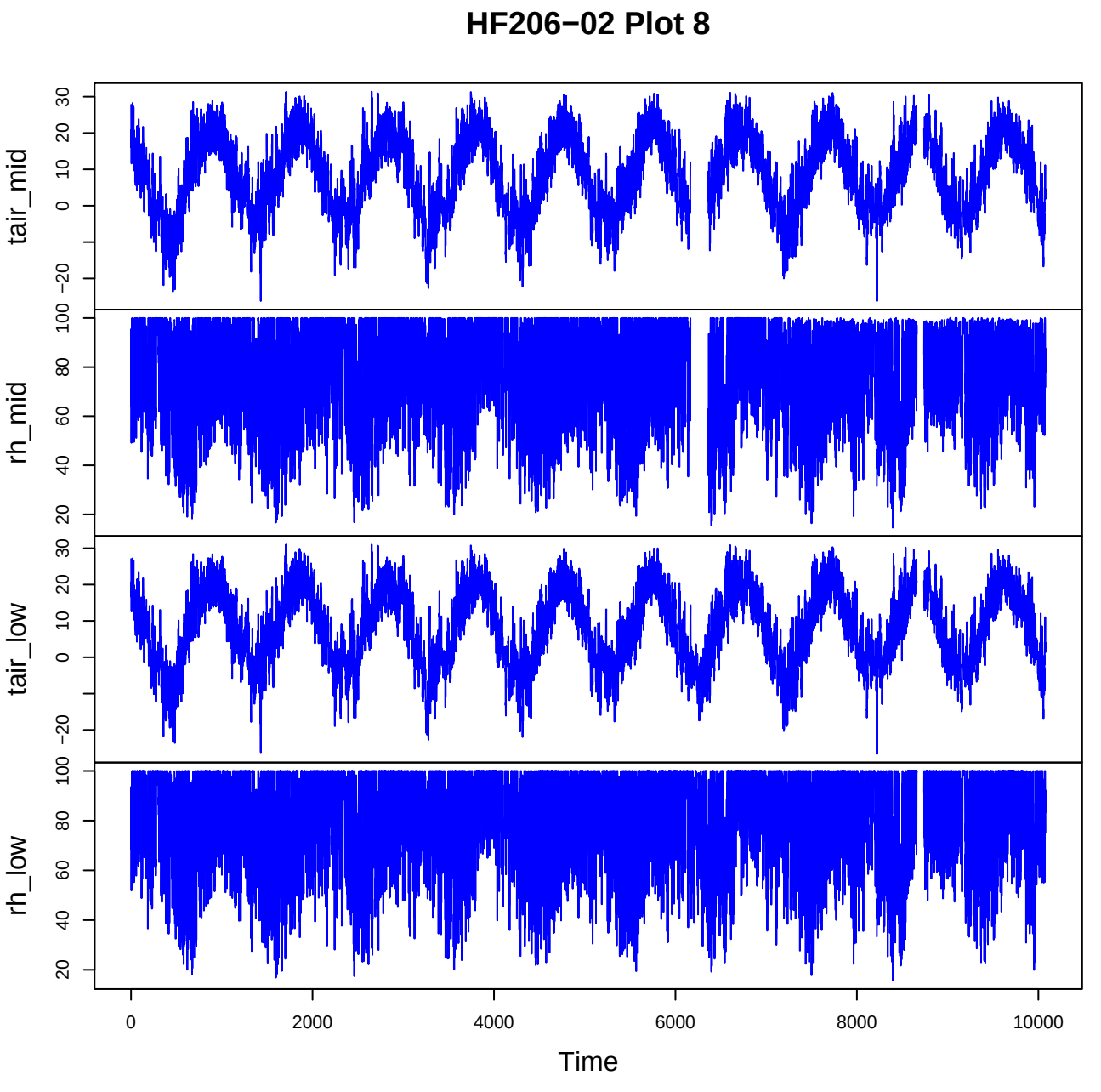

HF206−02 Plot 3
wvp
wvp_act
vpd
tair_us_1m
Time
0
2000
4000
6000
8000
10000

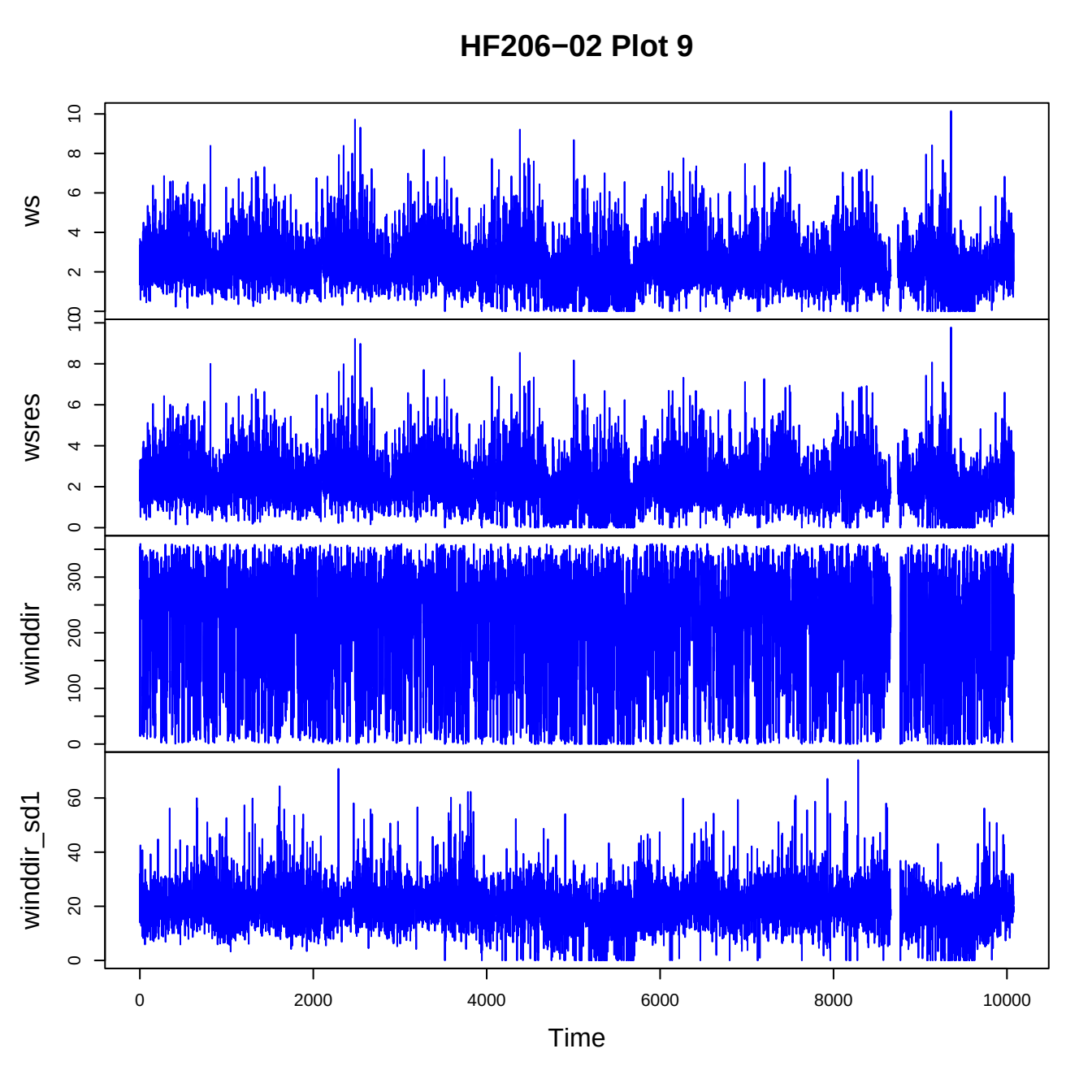

HF206−02 Plot 4
tsoil1
tsoil2
tsoil3
tsoil4
0
5
10
15
20
0
2000
4000
6000
8000
10000
Time

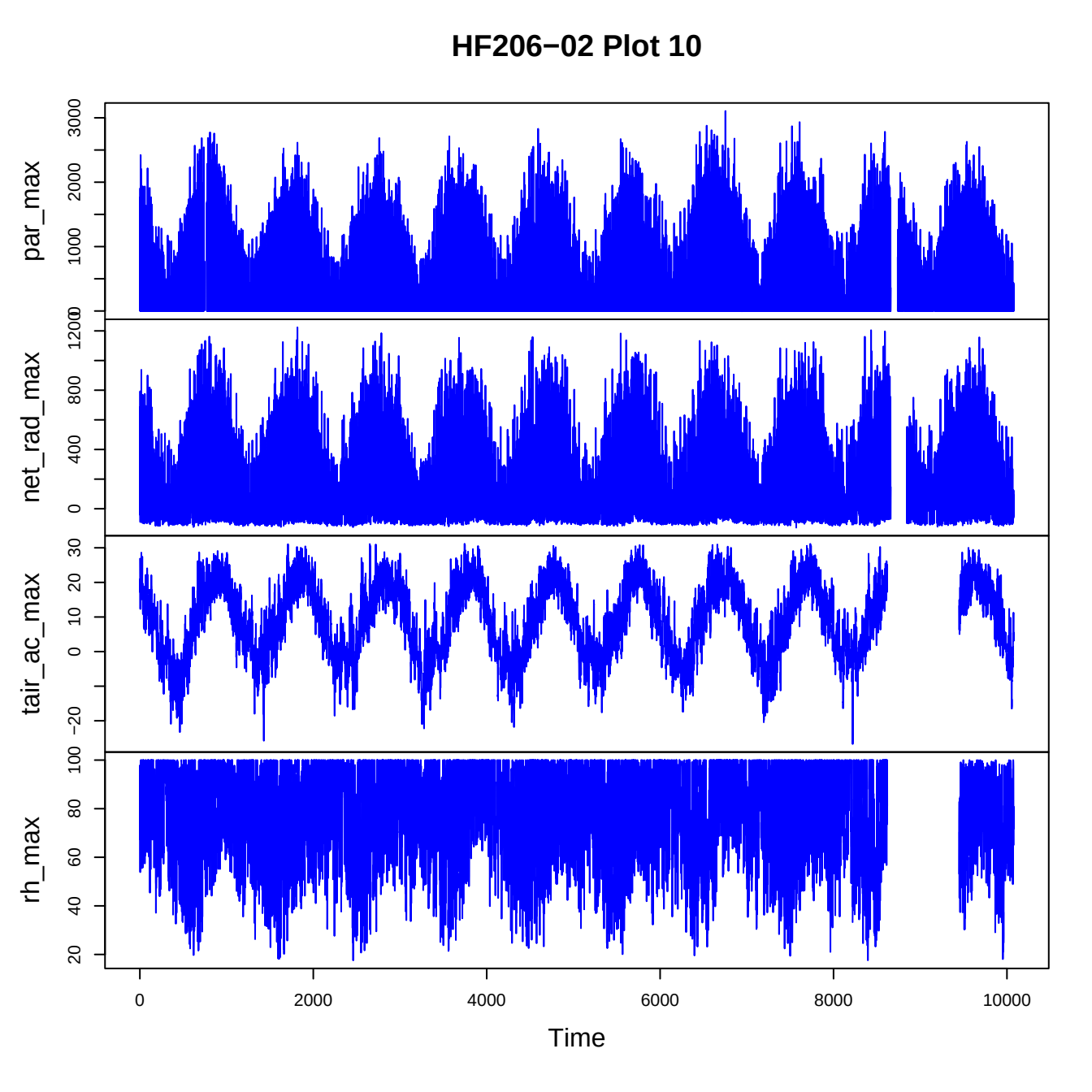

HF206−02 Plot 5
tsoil5
tsoil6
tsoil_ave
par_ac_down
0
5
10
15
20
40
80
120
0
2000
4000
6000
8000
10000
Time

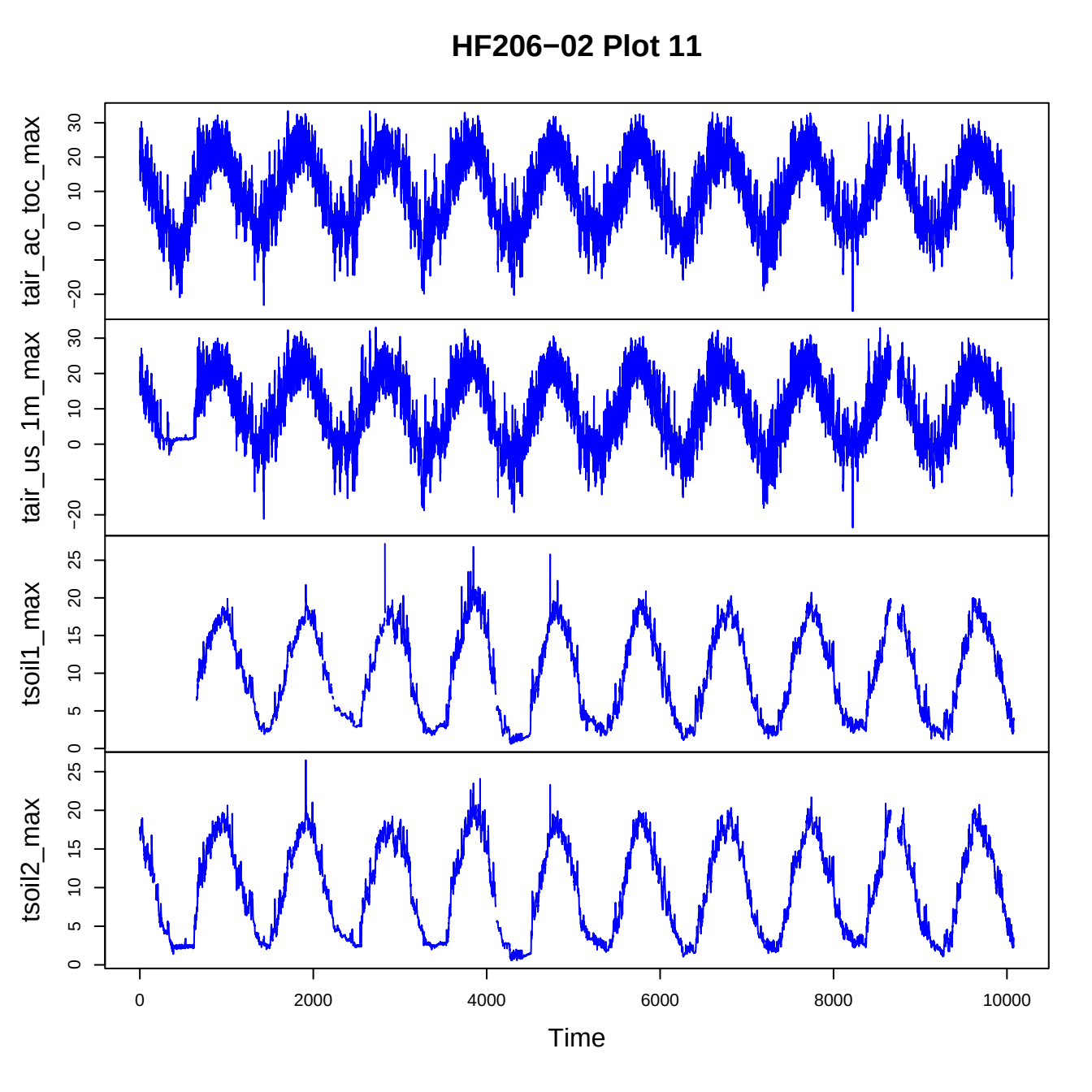

HF206−02 Plot 6
par_mid
0
500
1000
par_low
0
200
600
albedo
0.0
0.2
0.4
0.6
0.8
rs_down
0
200
600
1000
0
2000
4000
6000
8000
10000
Time

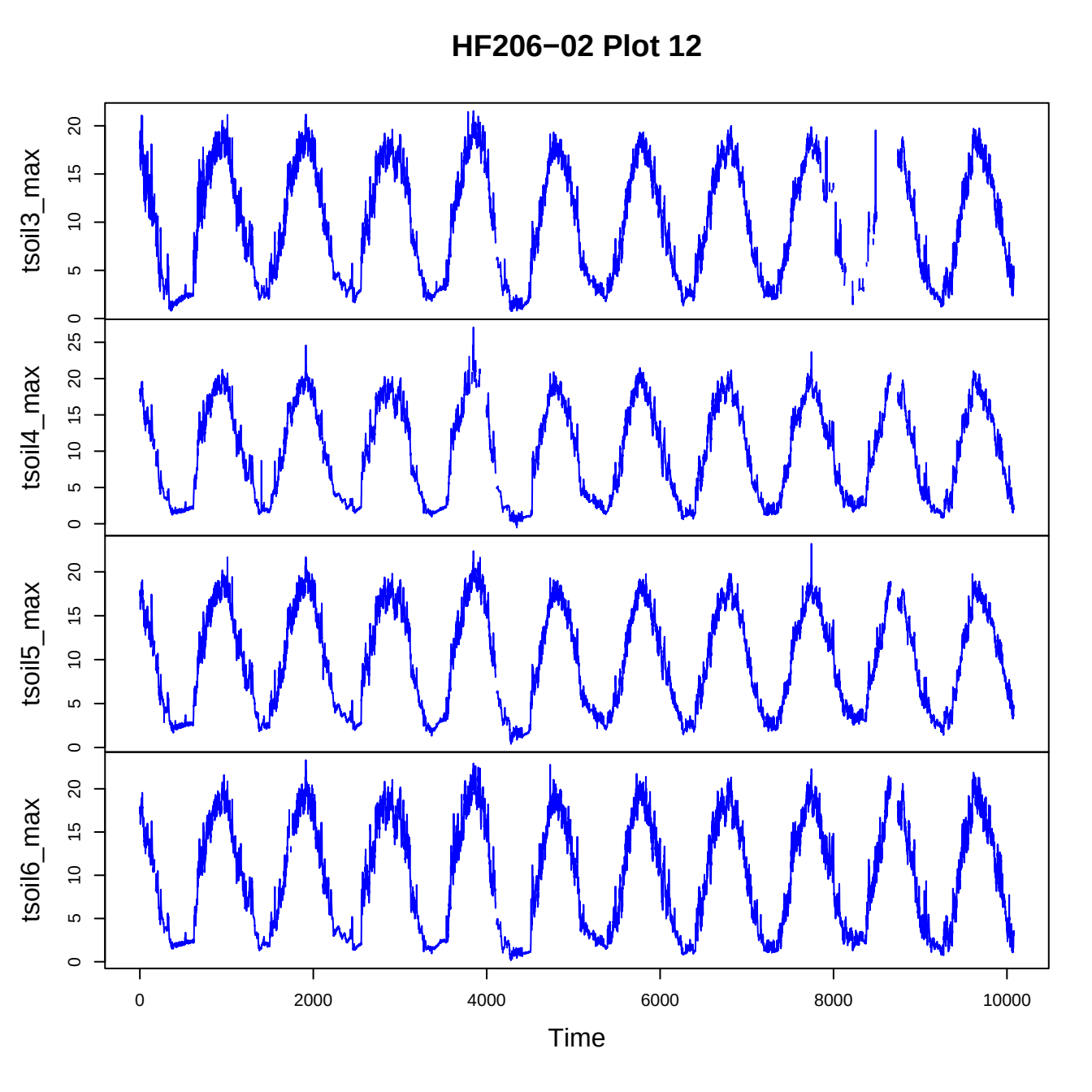

HF206−02 Plot 7
rs_up
rl_down
rl_up
tnr01
Time
0
2000
4000
6000
8000
10000

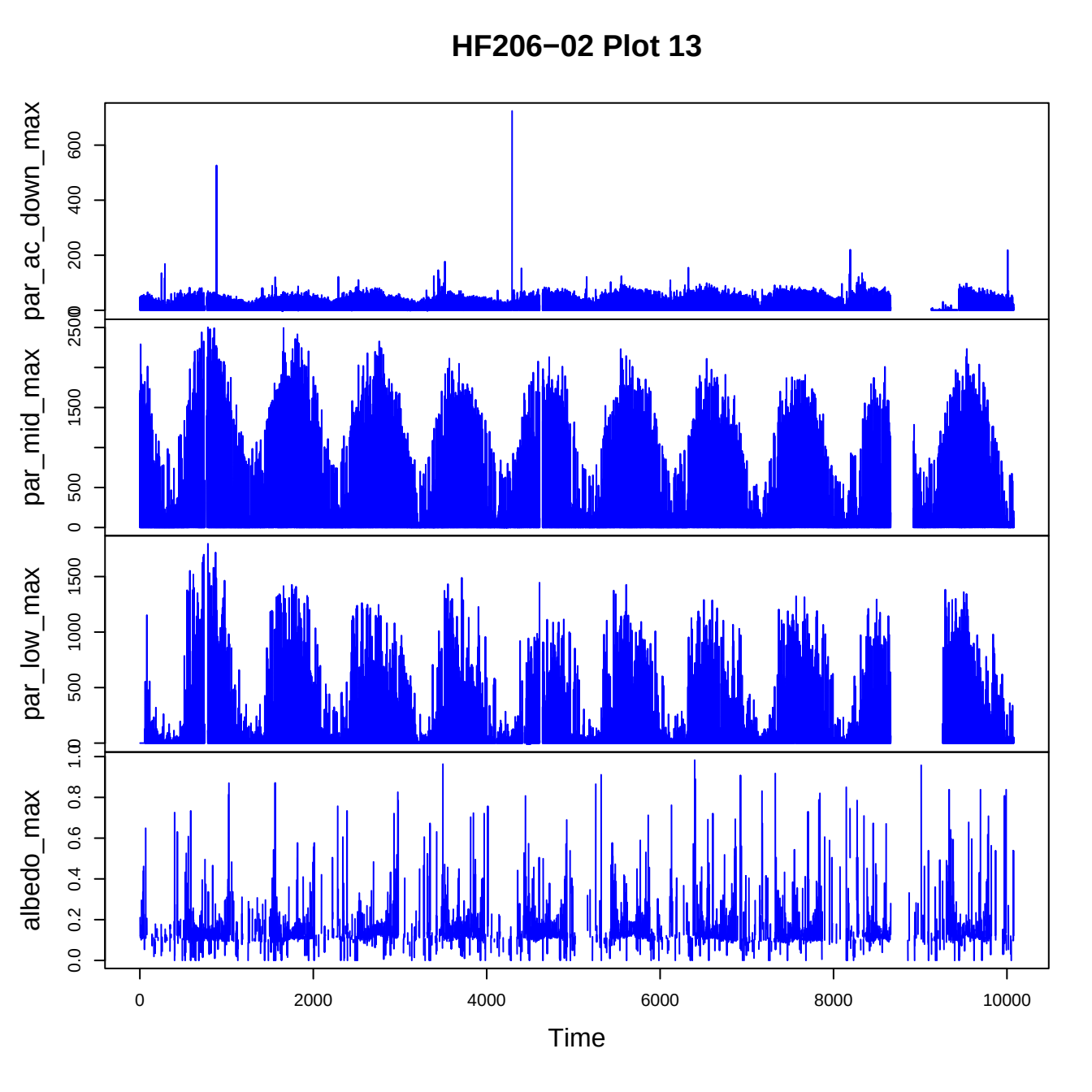

HF206−02 Plot 8
tair_mid
rh_mid
tair_low
rh_low
30
20
10
0
−20
100
80
60
40
20
0
2000
4000
6000
8000
10000
Time

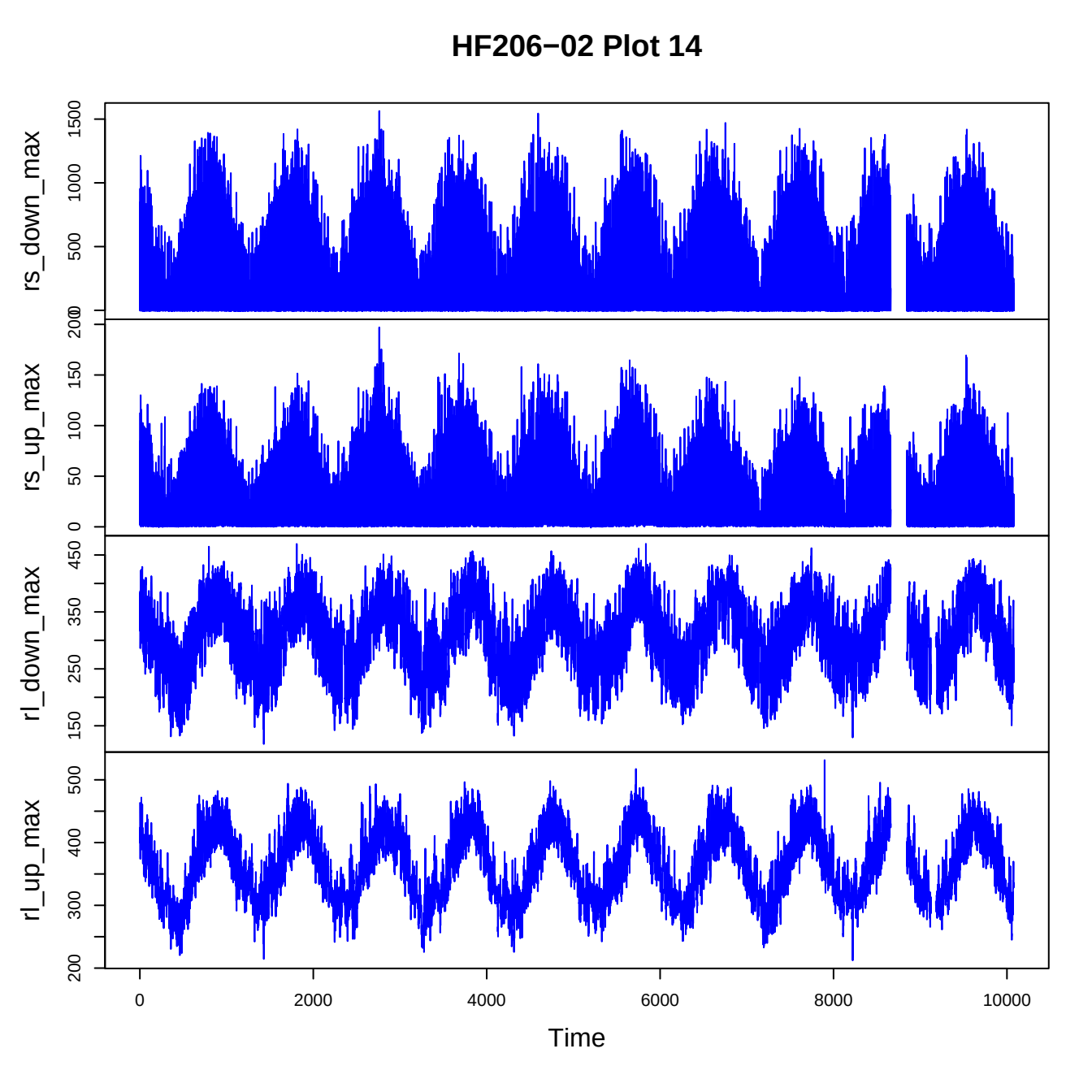

HF206−02 Plot 9
ws
wsres
winddir
winddir_sd1
0
2
4
6
8
10
0
100
200
300
0
20
40
60
0
2000
4000
6000
8000
10000
Time

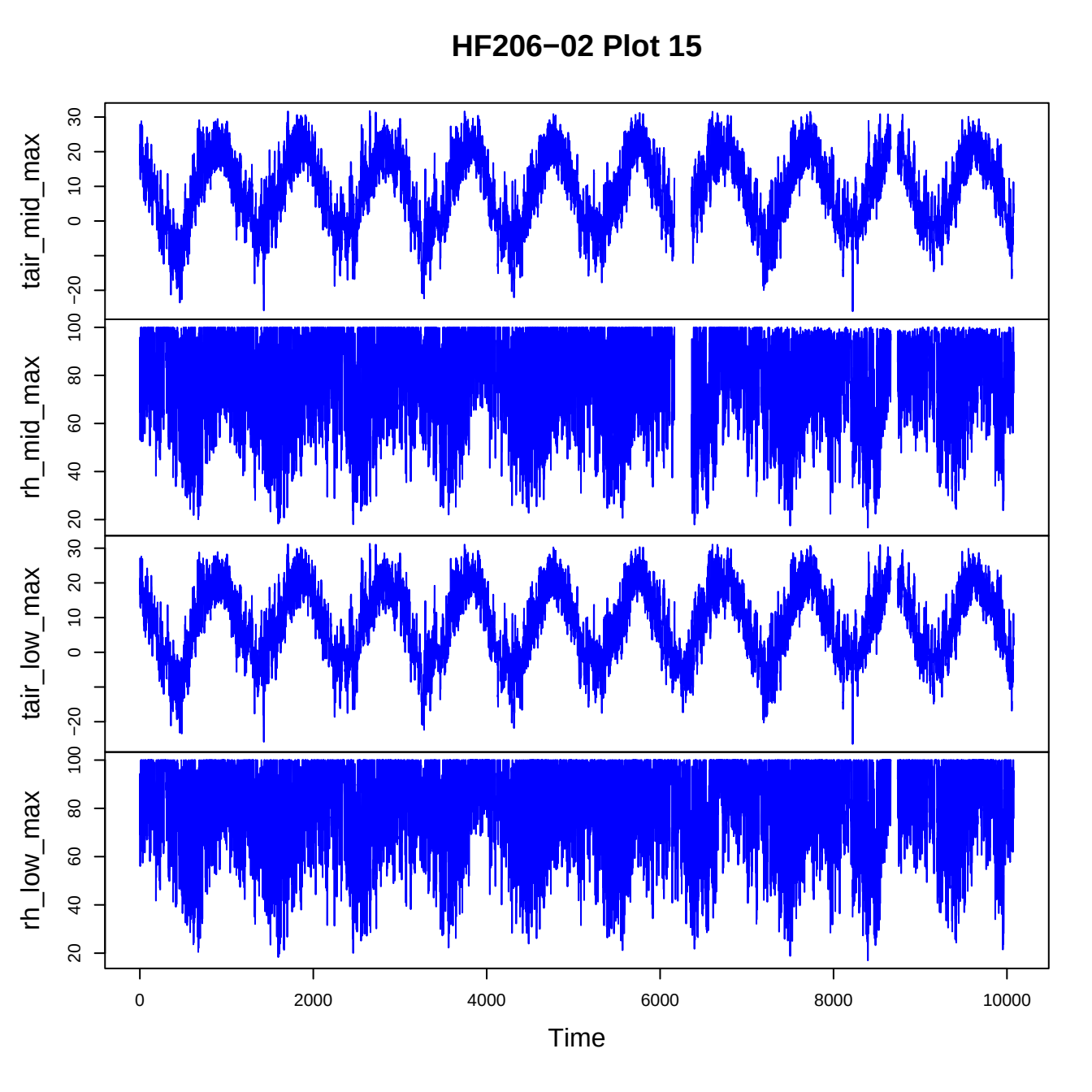

HF206−02 Plot 10
par_max
net_rad_max
tair_ac_max
rh_max
Time
0
2000
4000
6000
8000
10000

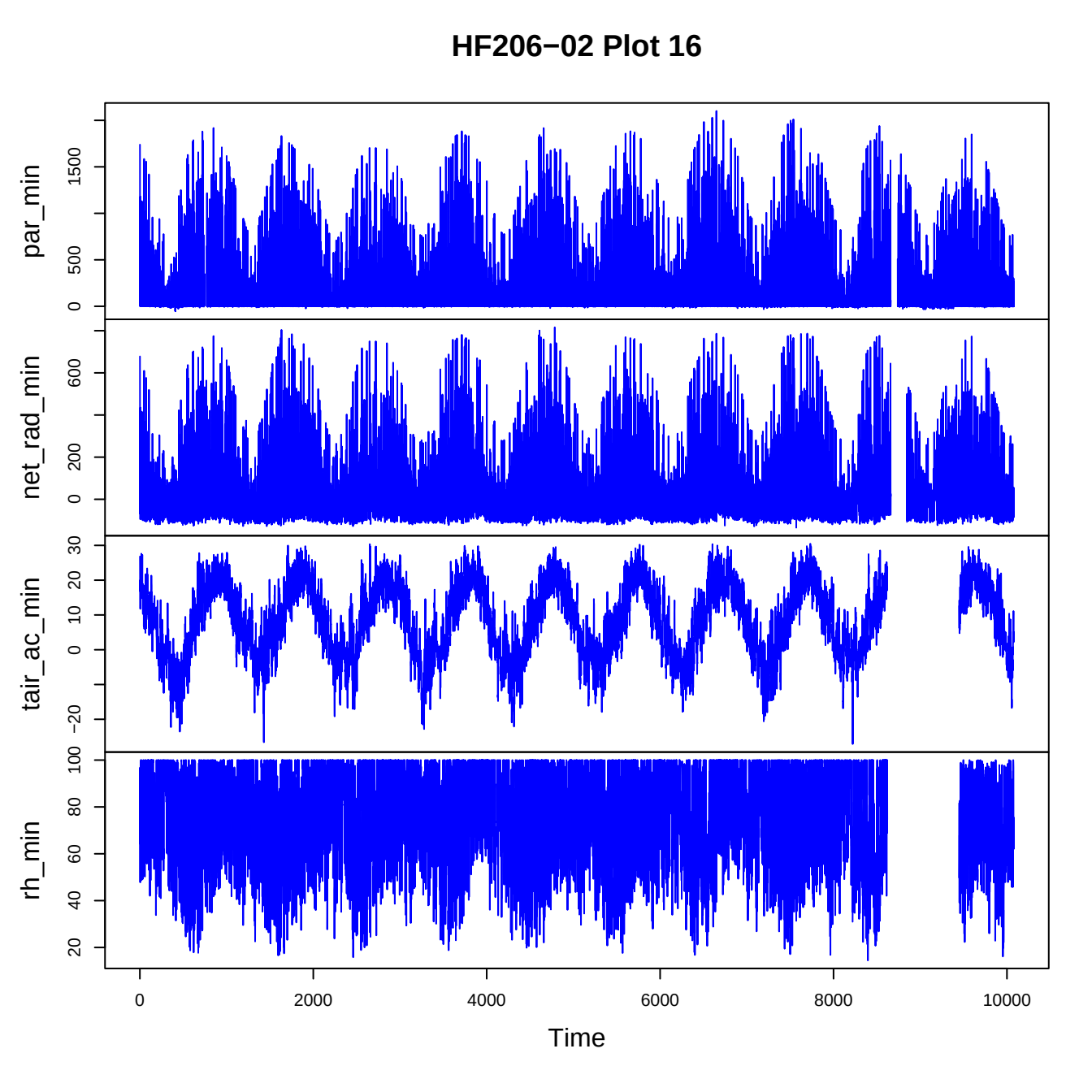

HF206−02 Plot 11
tair_ac_toc_max
tair_us_1m_max
tsoil1_max
tsoil2_max
Time
0
2000
4000
6000
8000
10000

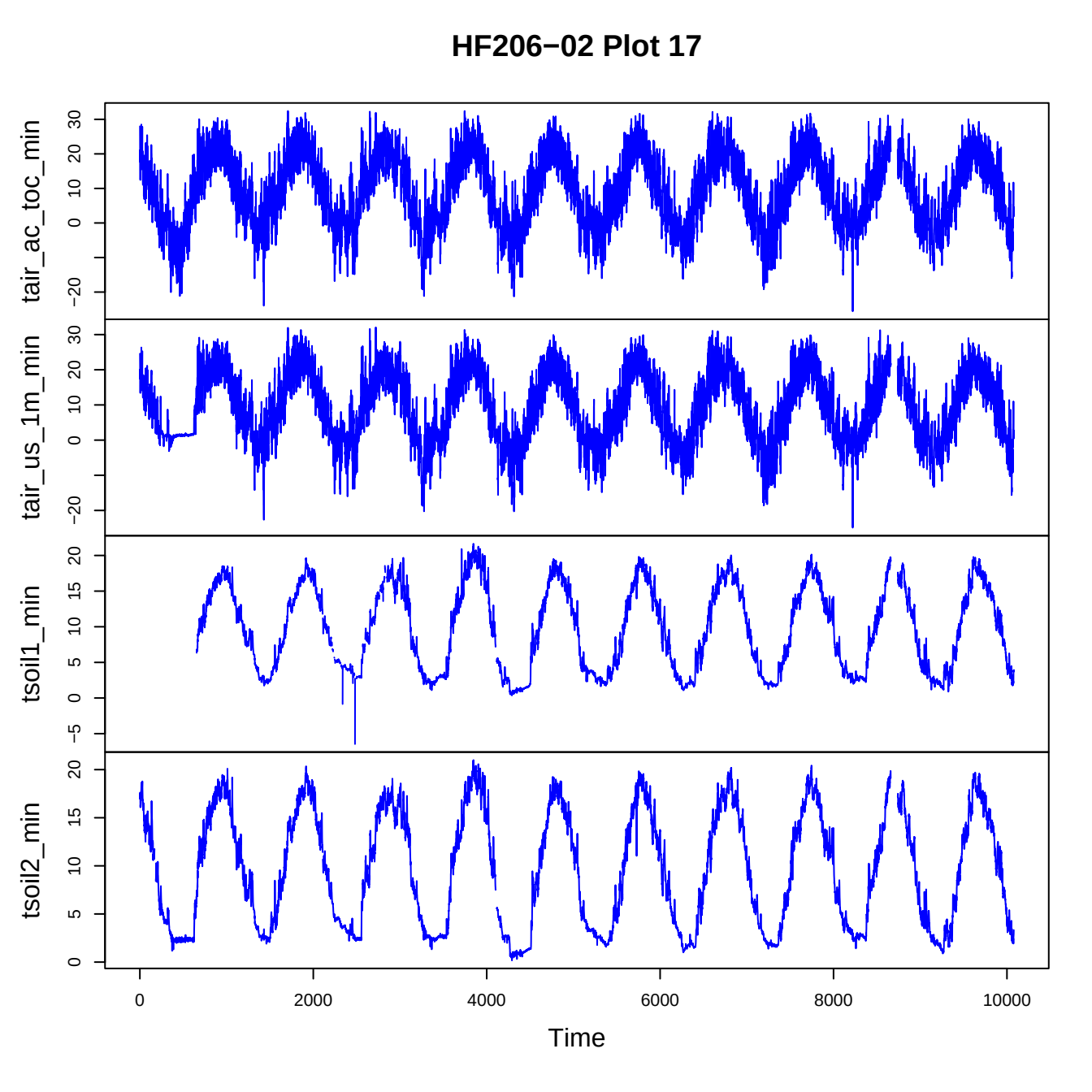

HF206−02 Plot 12
tsoil3_max
tsoil4_max
tsoil5_max
tsoil6_max
0
5
10
15
20
25
0
2000
4000
6000
8000
10000
Time

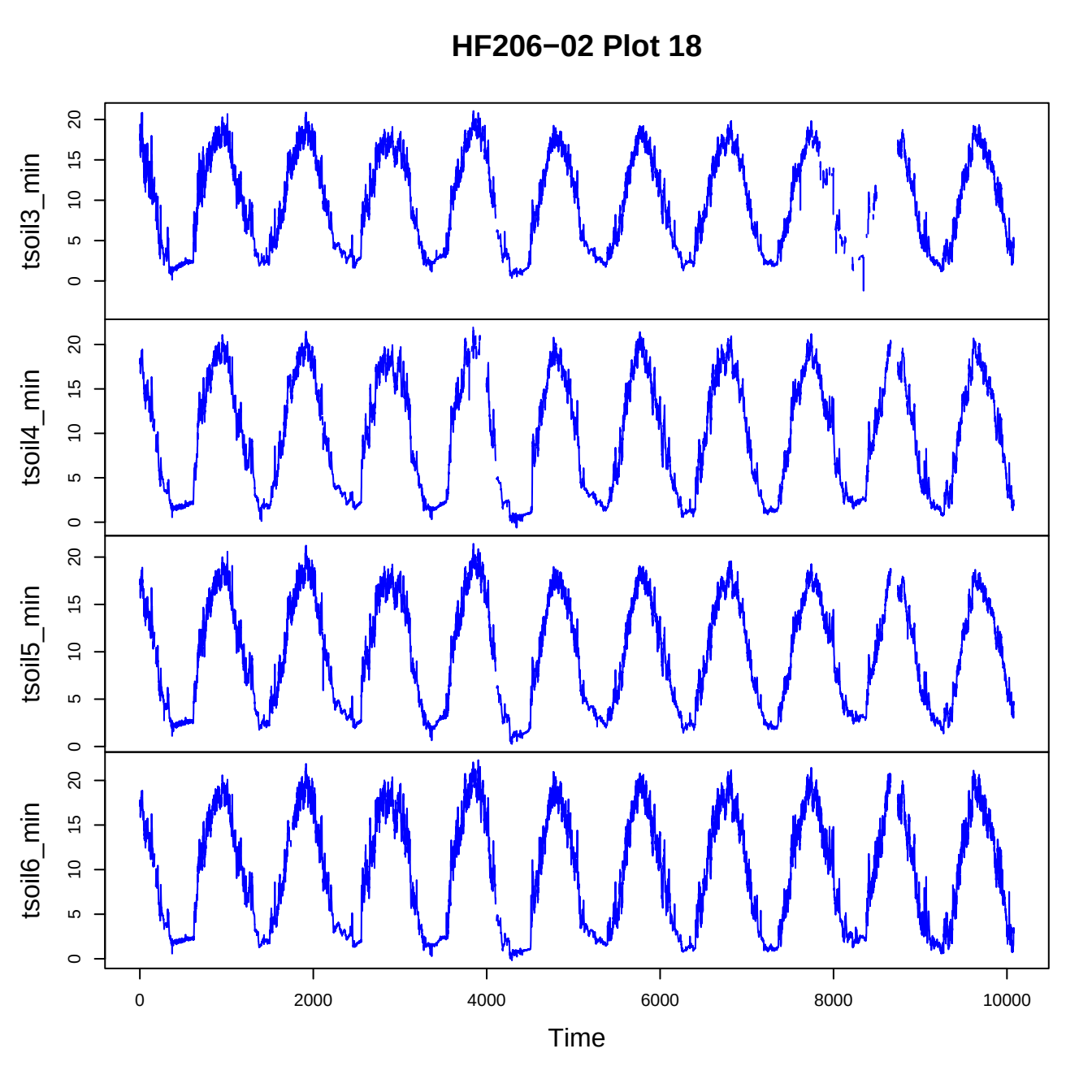

HF206−02 Plot 13
par_ac_down_max
0
200
400
600
par_mid_max
0
500
1500
2500
par_low_max
0
500
1000
1500
albedo_max
0.0
0.2
0.4
0.6
0.8
1.0
0
2000
4000
6000
8000
10000
Time

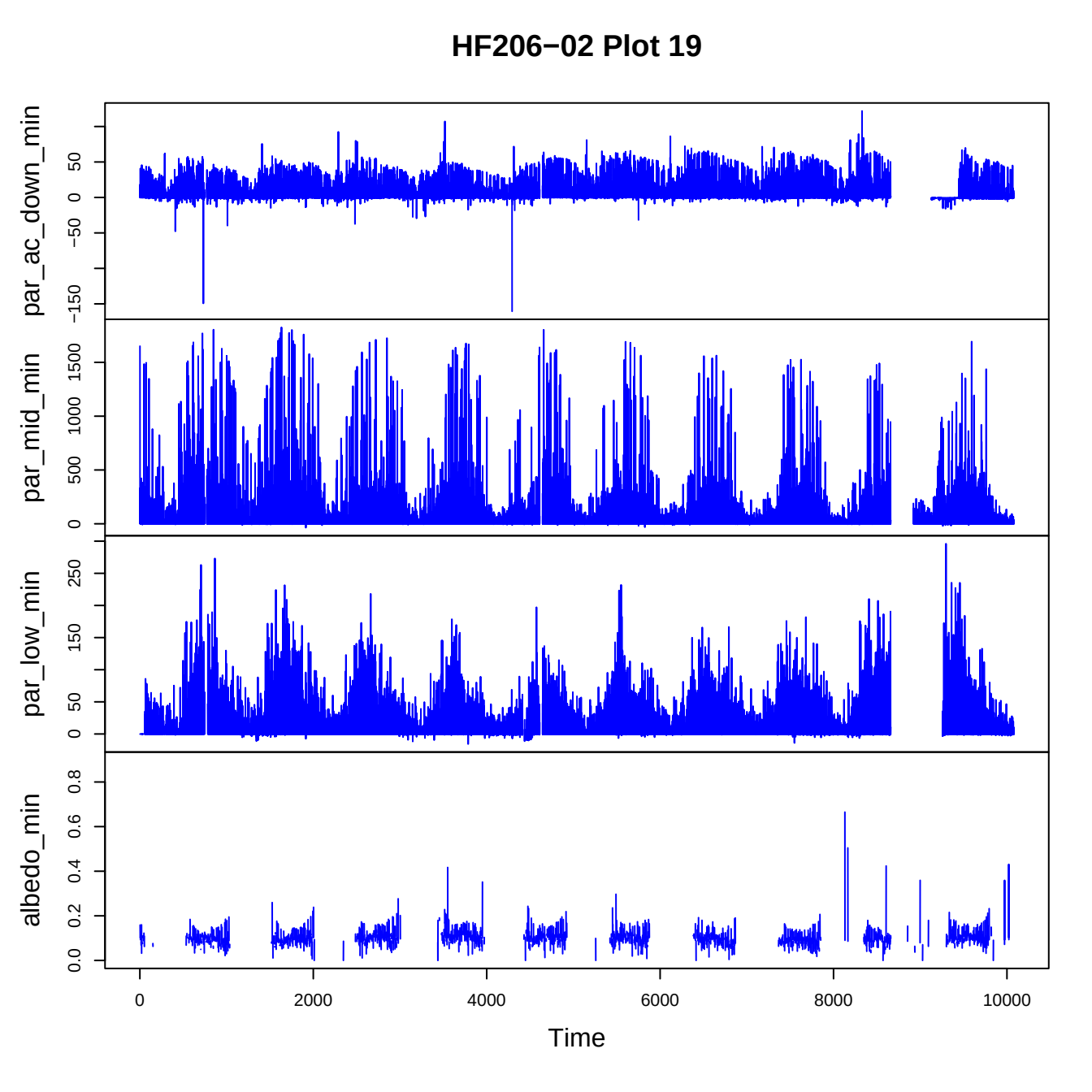

HF206−02 Plot 14
rs_down_max
rs_up_max
rl_down_max
rl_up_max
Time
0
2000
4000
6000
8000
10000

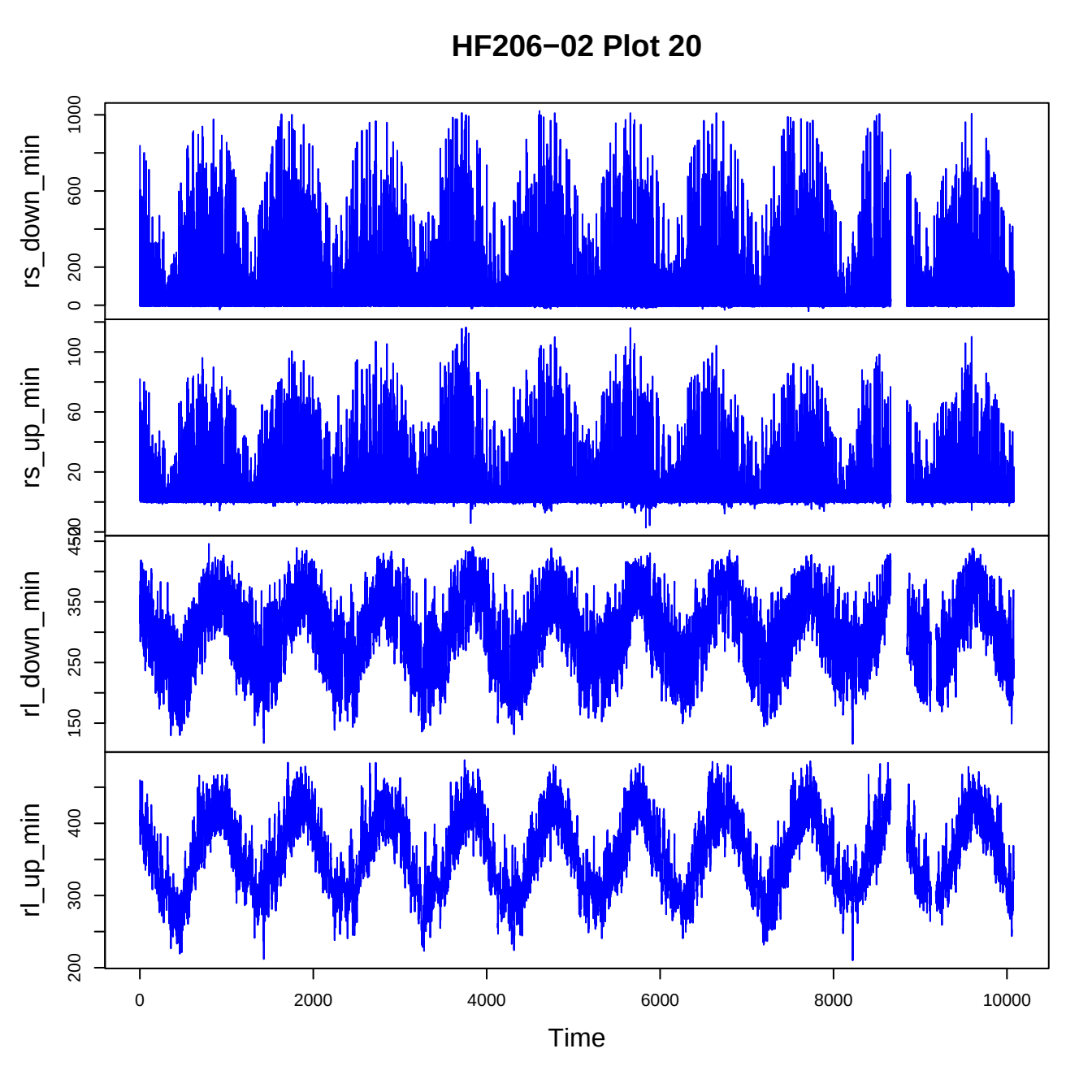

HF206−02 Plot 15
tair_mid_max
rh_mid_max
tair_low_max
rh_low_max
Time
0
2000
4000
6000
8000
10000

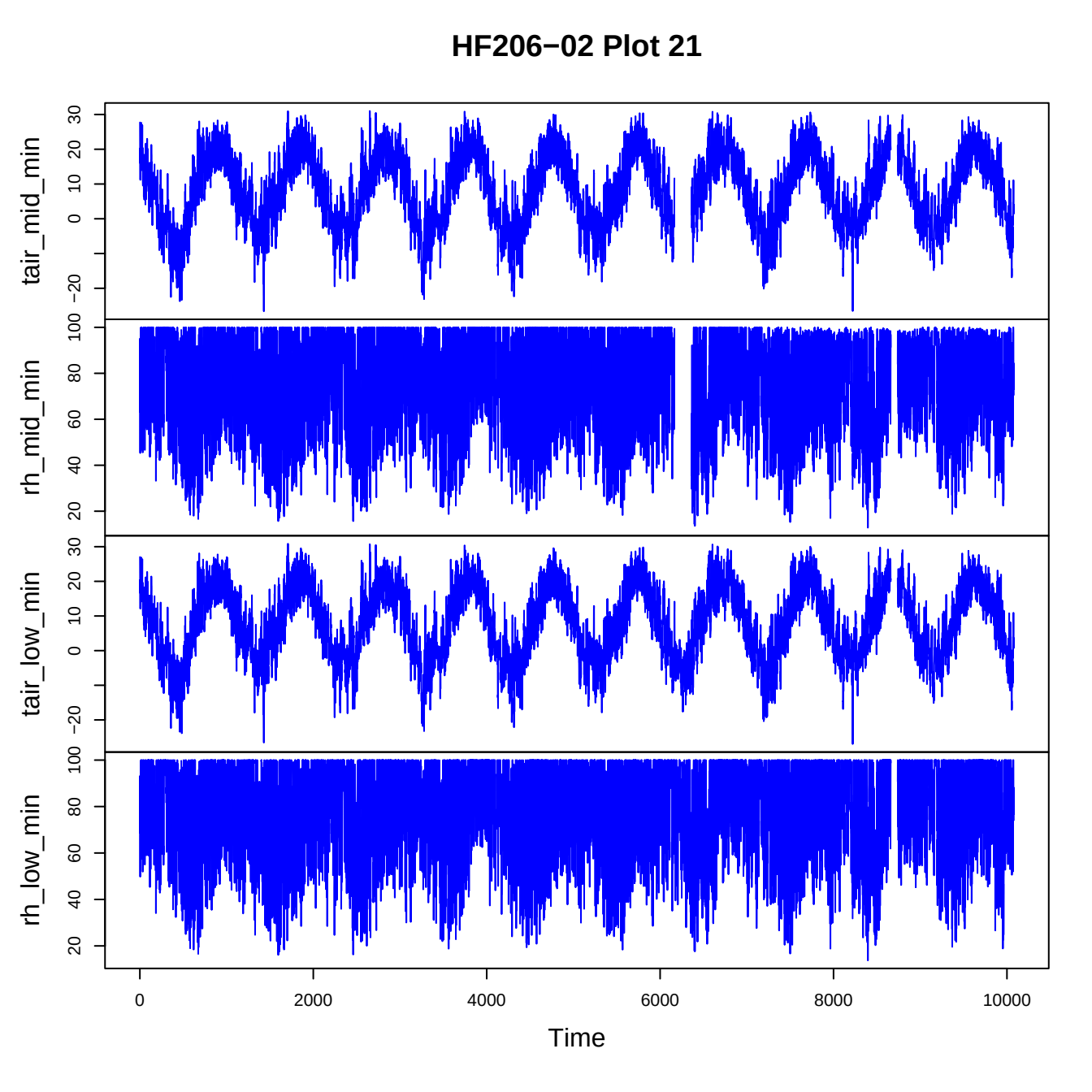

HF206−02 Plot 16
par_min
0
500
1500
net_rad_min
0
200
600
tair_ac_min
−20
0
10
20
30
rh_min
20
40
60
80
100
0
2000
4000
6000
8000
10000
Time


HF206−02 Plot 17
tair_ac_toc_min
tair_us_1m_min
tsoil1_min
tsoil2_min
Time
0
2000
4000
6000
8000
10000


HF206−02 Plot 18
tsoil3_min
tsoil4_min
tsoil5_min
tsoil6_min
0
5
10
15
20
0
2000
4000
6000
8000
10000
Time


HF206−02 Plot 19
par_ac_down_min
par_mid_min
par_low_min
albedo_min
Time
0
2000
4000
6000
8000
10000


HF206−02 Plot 20
rs_down_min
0
200
600
1000
rs_up_min
20
60
100
rl_down_min
150
250
350
450
rl_up_min
200
300
400
0
2000
4000
6000
8000
10000
Time


HF206−02 Plot 21
tair_mid_min
rh_mid_min
tair_low_min
rh_low_min
Time
0
2000
4000
6000
8000
10000