Harvard Forest Data Archive HF072−02

Data File:

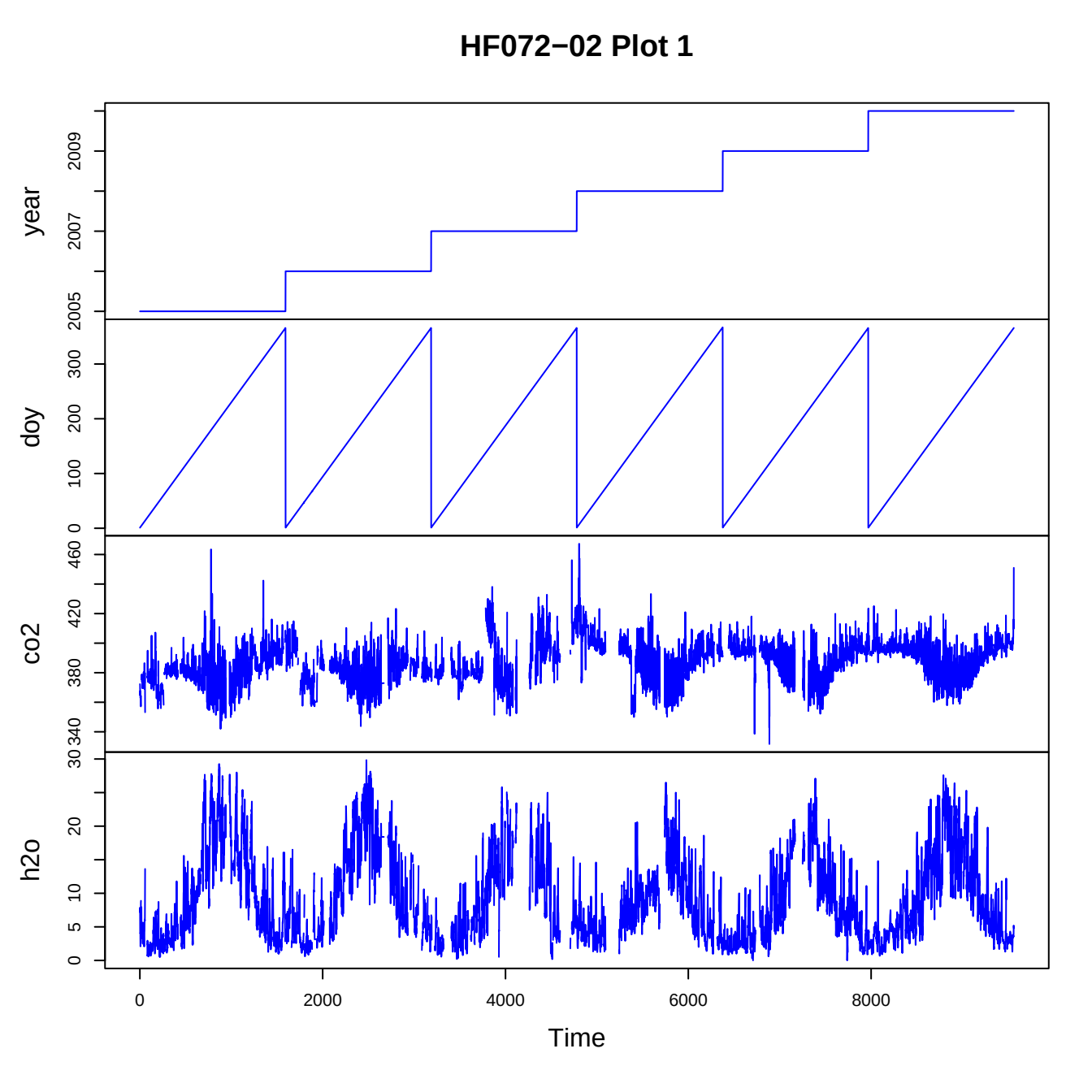
Name = hf072−02−eddy−2005−2010.csv
Description = eddy flux (2005 to 2010)
Rows = 105167  Columns = 25
MD5 checksum = b9fb26b00d39bcd956a46c0840c26f36

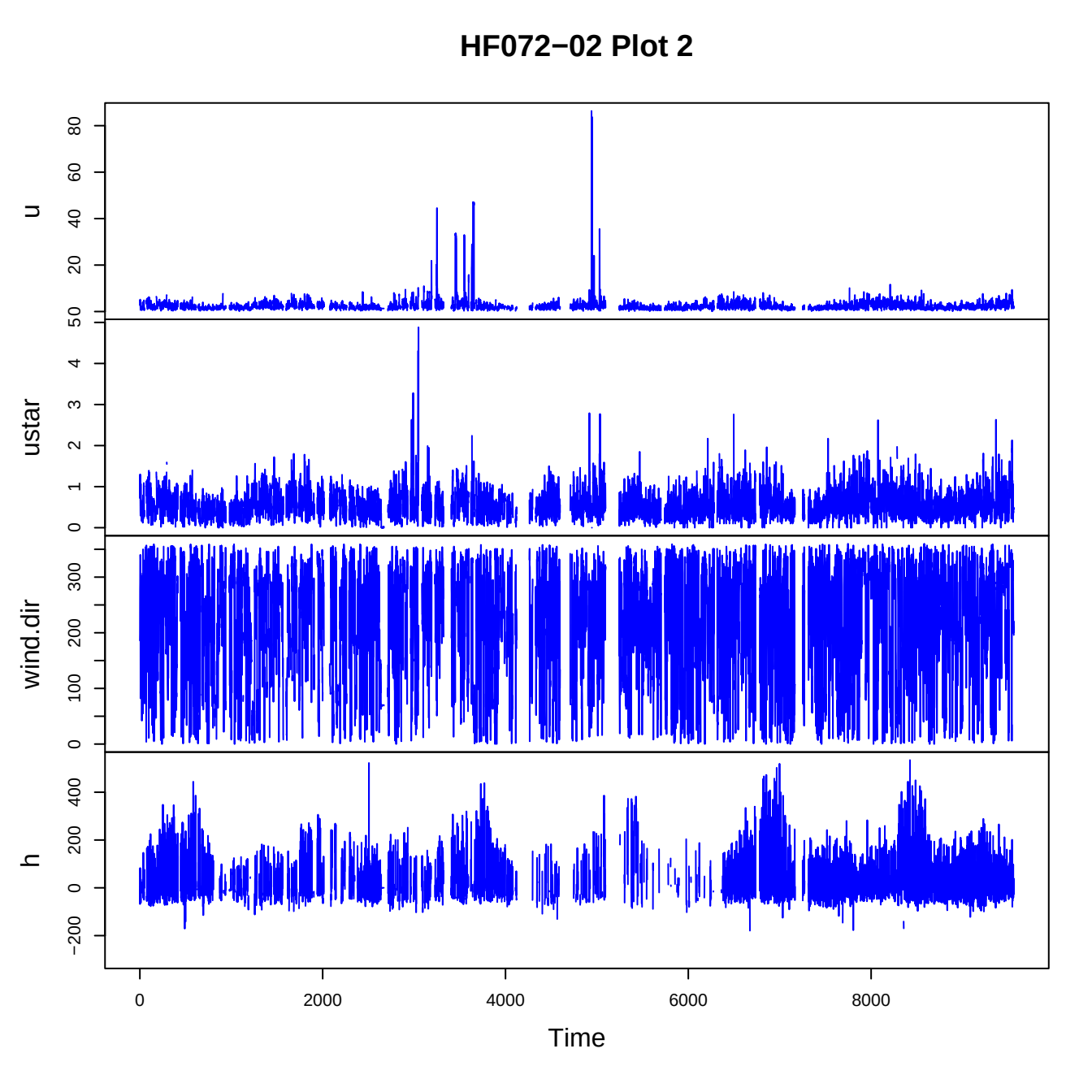
Variables:

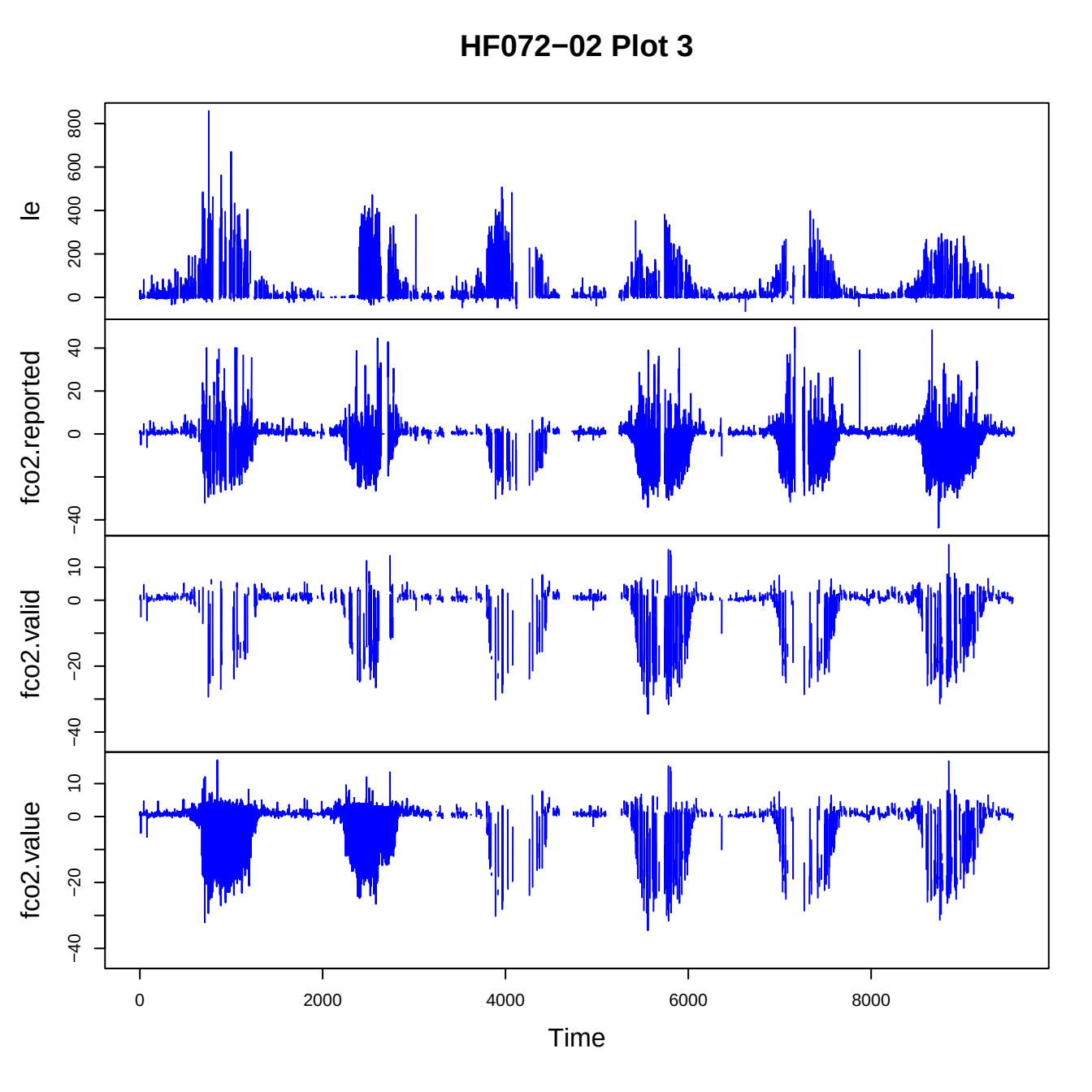
year = year
doy = day of the year with hours and minutes converted to a decimal
   fraction of a day (nominalDay)
co2 = carbon dioxide concentration of the air drawn into the eddy
   covariance system at 21 m above ground or 4.5 m above the average tree
   canopy top (dimensionless)
h2o = water vapor concentration of the air drawn into the eddy
   covariance system at 21 m above ground or 4.5 m above the average tree
   canopy top (dimensionless)
u = wind speed measured by the sonic anemometer at 21 m or 4.5 m
   above the average tree canopy top (metersPerSecond)
ustar = friction velocity measured by the sonic anemometer. Friction
   velocity is the square of momentum flux from the atmosphere above the
   sonic to the air layers below the sonic, and is a measure of
   atmospheric turbulence (metersPerSecond)
wind.dir = compass direction in degrees of the average wind vector,
   with 0 and 360 degrees indicating geographic north (degree)
h = sensible heat flux from the forest to the atmosphere, calculated
   by the sonic anemometer from the covariance of air temperature and
   the vertical component of wind velocity (wattPerMeterSquared)
le = flux of latent heat (heat used in evaporating water) from the
   forest to the atmosphere, calculated by multiplying FH2O (see definition
   below) by the heat of evaporation of water (wattPerMeterSquared)
fco2.reported = measured carbon dioxide flux from forest to
   atmosphere. Includes all data collected, some of which are invalid (see
   below) (micromolePerMeterSquaredPerSecond)
fco2.valid = FCO2 data after removal of data that are invalid due to
   wind direction or low atmospheric turbulence (see Methods description)
   (micromolePerMeterSquaredPerSecond)
fco2.value = best estimate of FCO2, using either valid measurement
   from the column to the left, or a model estimate
   (micromolePerMeterSquaredPerSecond)
fh2o = measured water vapor flux from forest to atmosphere. Includes
   all data collected, some of which are invalid (see below)
   (millimolePerMeterSquaredPerSecond)
fh2o.valid = FH2O data after removal of data that are invalid due to
   wind direction (see Methods description). Low turbulence data are not
   removed as the H2O flux during the foliated season for the trees is from
   the canopy, which therefore does not act as a barrier to movement of
   H2O, as it does for the large amount of CO2 produced by soil and
   forest−floor litter. When trees do not have foliage, the leafless canopy is
   not a significant barrier to evaporation of water from the soil,
   which occurs primarily when the ground and air near the ground are
   warm, generating upward movement of air.
   (millimolePerMeterSquaredPerSecond)

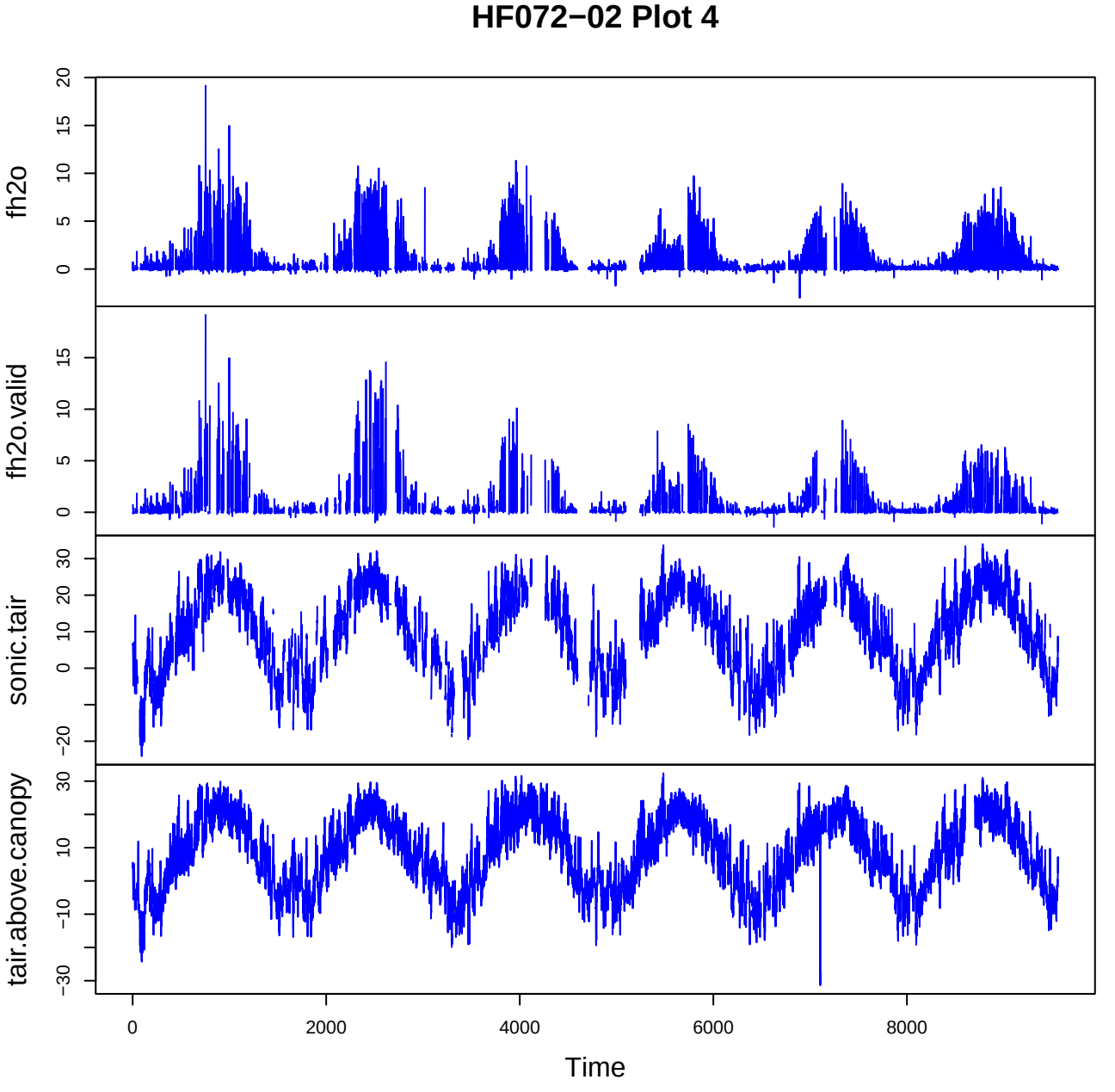
sonic.tair = air temperature estimated from the speed of sound measured by the sonic anemometer. This estimate is based on air density which is directly related to the speed of sound. The sonic air temperature estimate can differ from actual air temperature by a few degrees due to the presence of water vapor, which lowers air density. (celsius)
tair.above.canopy = air temperature measured at 23 m height, or about 6.5 m above the average tree canopy top (celsius)
rh.above.canopy = relative humidity measured at 23 m height (same location as Tair.above.canopy) (dimensionless)
vpd.above.canopy = water vapor pressure deficit (equals saturation water vapor pressure at Tair.above.canopy minus actual water vapor pressure) (kilopascal)
tsoil.10cm = soil temperature measured at 10 cm depth. The average of 3 to 4 values at randomly located points within 15 m of the flux tower base. (celsius)
par = photosynthetically active radiation measured at 22 m height, or about 5.5 m above the average tree canopy top (micromolePerMeterSquaredPerSecond)
net.radiation = net radiant energy exchange, all wavelengths, measured by a sensor about 27 m above ground, or 10.5 m above the average tree canopy top (wattPerMeterSquared)
understory.tair.20cm = air temperature 20 cm above the soil surface. The average of 2 values at randomly located points within 15 m of the tower. This data is not accurate if the sensors receive direct sunlight. The data is used to identify low−turbulence periods at night or near dawn or dusk when air temperature near the soil is significantly lower than above the canopy, contributing to cold air drainage and invalidating FCO2 and FH2O measurements. (celsius)
understory.tair.1m. = air temperature 1 m above the soil surface. The average of 2 values at randomly located points within 15 m of the tower. Also not accurate if the sensors receive direct sunlight. (celsius)

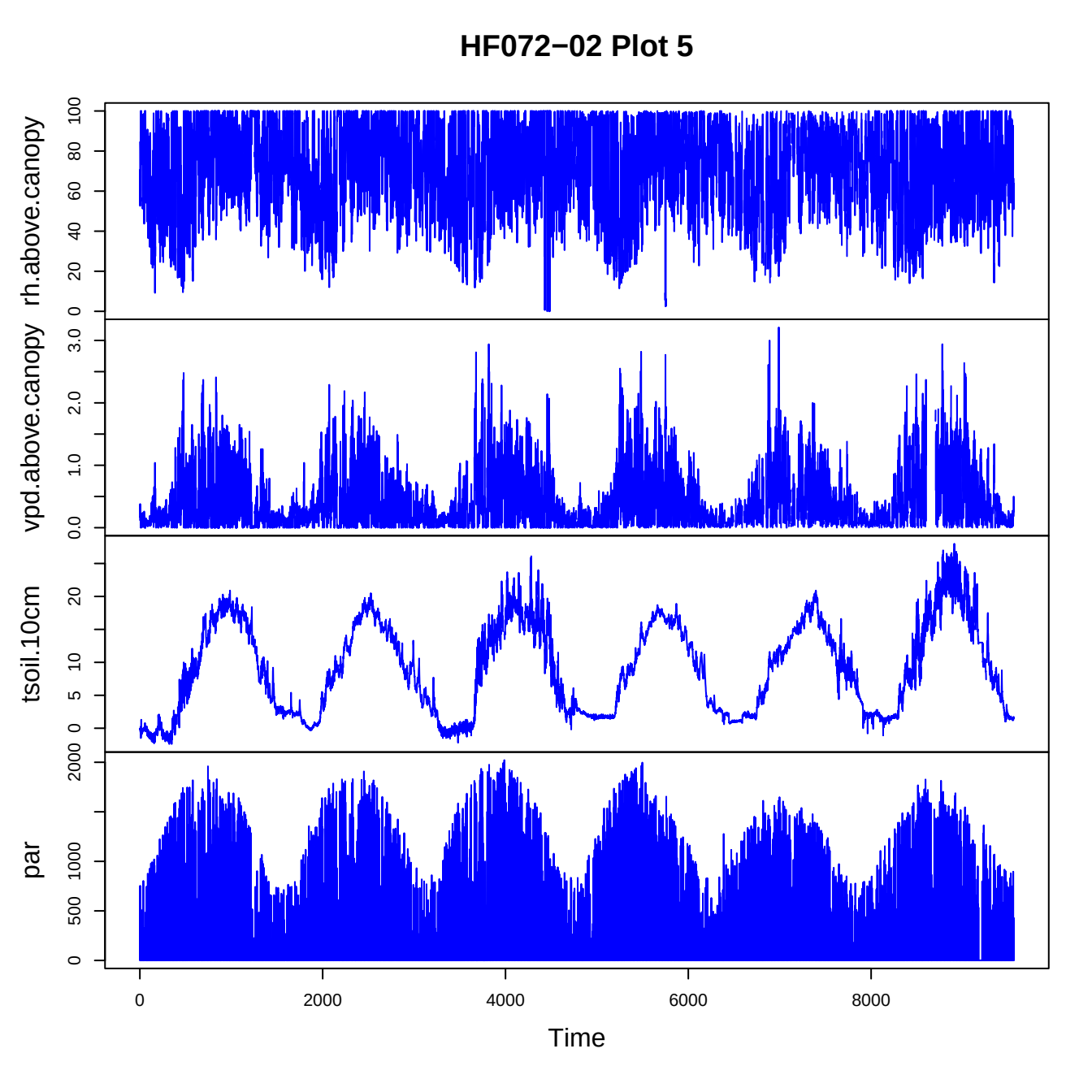
| Variable | Min | Median | Mean | Max | NAs |
|---|---|---|---|---|---|
| year | 2005.000 | 2008.000 | 2007.500 | 2010.000 | 0 |
| doy | 1.020 | 183.600 | 183.596 | 367.000 | 0 |
| co2 | 330.100 | 388.040 | 387.151 | 497.700 | 17908 |
| h2o | 0.000 | 7.500 | 9.157 | 29.840 | 15813 |
| u | 0.030 | 2.020 | 2.593 | 92.950 | 17797 |
| ustar | 0.000 | 0.520 | 0.571 | 7.870 | 19221 |
| wind.dir | 0.000 | 226.000 | 215.212 | 360.000 | 16511 |
| h | −314.700 | −2.900 | 28.234 | 628.300 | 43459 |
| le | −133.200 | 4.600 | 31.971 | 858.000 | 50584 |
| fco2.reporte | −43.650 | 0.650 | −0.478 | 76.450 | 32269 |
| fco2.valid | −43.650 | 0.550 | −2.298 | 30.580 | 72904 |
| fco2.value | −43.650 | 0.800 | −1.465 | 30.580 | 48054 |
| fh2o | −5.210 | 0.090 | 0.660 | 19.150 | 22596 |
| fh2o.valid | −2.970 | 0.140 | 0.838 | 20.000 | 60907 |
| sonic.tair | −24.100 | 10.500 | 9.667 | 34.300 | 20519 |
| tair.above.c | −32.000 | 8.600 | 8.014 | 32.500 | 2466 |
| rh.above.can | 0.000 | 74.300 | 72.242 | 100.000 | 4518 |
| vpd.above.ca | 0.000 | 0.210 | 0.376 | 3.520 | 8526 |
| tsoil.10cm | −2.700 | 8.900 | 9.157 | 28.100 | 537 |
| par | 0.000 | 8.000 | 286.577 | 2210.000 | 80 |
| net.radiatio | −137.600 | −1.300 | 77.687 | 772.000 | 43763 |
| understory.t | −25.500 | 8.600 | 8.056 | 35.000 | 8715 |
| understory.t | −25.100 | 8.900 | 8.374 | 33.800 | 8061 |

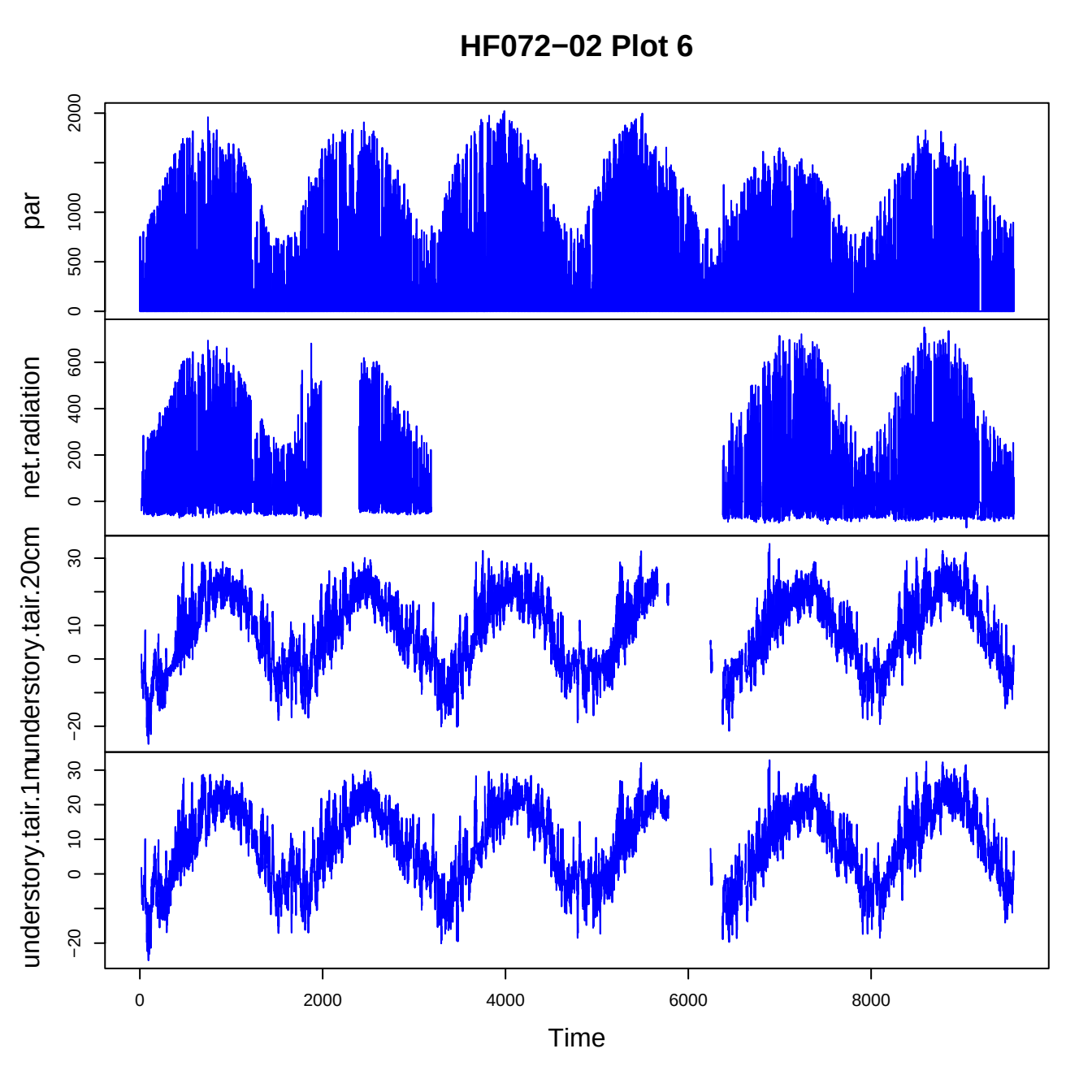

HF072−02 Plot 1
year
2005
2007
2009
doy
0
100
200
300
co2
340
380
420
460
h2o
0
5
10
20
30
0
2000
4000
6000
8000
Time


HF072−02 Plot 2
u
ustar
wind.dir
h
Time
0
2000
4000
6000
8000


HF072−02 Plot 3
le
fco2.reported
fco2.valid
fco2.value
0
200
400
600
800
40
20
0
−40
10
0
−20
−40
10
0
−20
−40
0
2000
4000
6000
8000
Time


HF072−02 Plot 4
fh2o
fh2o.valid
sonic.tair
tair.above.canopy
Time
0
2000
4000
6000
8000


HF072−02 Plot 5
rh.above.canopy
vpd.above.canopy
tsoil.10cm
par
Time
0
2000
4000
6000
8000


HF072−02 Plot 6
par
net.radiation
understory.tair.20cm
understory.tair.1mu
Time
0
2000
4000
6000
8000