CHEESEHEAD Jackson State University (JSU) Mobile Datasets Readme

Dataset Title: Mobile Surface Meteorology: Automobile

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Dataset Overview:
Surface meteorology parameters were measured by sensors mounted to an automobile which was driven on roads and trails within CHEESEHEAD core domain and surrounding region during Intensive Observing Periods (IOPs).

Time Period: 2019/07/08 15:00:00 to 2019/09/27 04:00:00

Area Bounding Box: 45.00 to 47.00 latitude; -91.00 to -89.00 longitude

Data Frequency: All data are logged at 2-s intervals. Primary time reference is UTC from GPS (not from datalogger).

Data Spatial Type: Consecutive point data

Dataset Description:
Data are primarily collected while mobile, but stationary data may also be collected for short periods (either between mobile legs or at stops in transit).

Times in descriptive data log file are rounded to nearest minute. Stops longer than 1-2 minutes are noted in Description column, along with waypoints and landmarks. Min/max of temperature, relative humidity, and dewpoint are summarized for each leg, only considering times when moving. (Maximum solar radiation includes all times.)

Procedures:
The .dat files from CR23X logger are manipulated in Excel to separate logs and calculate derived parameters. Each leg is saved as separate .csv file compatible with QGIS, as well as a full day csv file. Stops longer than 10 minutes will generally break to a new leg.

File Naming Convention:
IOPx_car_MMDDYYYY_legx
where the first x denotes the IOP (1-3) and the second x counts the data collection legs on the day (beginning at 1).

Instrument Description:

- Campbell Scientific HygroClip HC2S (2)
- LiCor LI-200 pyranometer
- Campbell Scientific PTB101-B barometer with pressure port
- Campbell Scientific IRTS-P Infrared Temperature Sensor
- Garmin GPS16X-HVS
- CR23-X datalogger
- 10-plate Gill radiation shield
- NSSL U-tube shield

Description of parameters directly measured on mobile system

- Datalogger time: HHMM SS.S
- GPS time in UTC: HH MM SS
- GPS latitude: DDMM .MMMM
- GPS longitude: DDMM .MMMM
- GPS elevation (m)
- Number of GPS satellites
- GPS reception quality
- Datalogger panel temperature (C)
- Incoming solar radiation (kW/m^2)
- Temperature in Gill shield (C)
- Relative humidity in Gill shield (C)
- Temperature in U-tube shield (preferred in rain)
- Relative humidity in U-tube shield (preferred in rain)
- Station pressure (hPa - 1000)
- Battery voltage (not normally operating off of battery power)
- Upward looking infrared temperature (IRTS) (C): View of cloud base, overhanging canopy, etc.

Description of derived/calculated quantities

- Decimal GPS latitude
- Decimal GPS longitude
- Dewpoint calculated from Gill shield temperature and humidity (C)
- Potential temperature calculated from Gill shield temperature and station pressure (K)
- Dewpoint calculated from U-tube shield temperature and humidity (C)
- Potential temperature calculated from U-tube shield temperature and station pressure (K)
- Vapor pressure calculated from Gill shield dewpoint (hPa)

- Mixing ratio calculated from Gill shield vapor pressure and station pressure (g/kg)
- Vapor pressure calculated from U-tube shield dewpoint (hPa)
- Mixing ratio calculated from U-tube shield vapor pressure and station pressure (g/kg)
- IRTS minus Gill shield temperature (C)
- Gill shield temperature minus U-tube temperature (C)
- “Pseudospeed”: Approximate measure of motion from difference of latitude/longitude over time interval (degrees of lat/lon)
- “Pseudodistance”: Accumulation of pseudospeed since beginning of transect leg (degrees of lat/lon)
- Road ID: SR = state route; US = U.S. federal route; CR = county route; FR = forest road; “parking” for parking areas or stationary (text)

Formulas used for calculations:

Dewpoint: $T_d = (RH * 0.01)^{0.125} * (112 + 0.9 * T) + (0.1 * T) - 112$

Potential temperature: $\theta = (T + 273.15) * \left(\frac{1000}{p}\right)^{(287/1004)}$

Vapor pressure: $q_p = 6.112 * e^{\left(\frac{17.67 * T_d}{T_d + 243.5}\right)}$

Mixing ratio: $q_r = \frac{q_p * 621.97}{p - q_p}$

Pseudospeed: $d = \sqrt[2]{(\varphi_i - \varphi_{i-1})^2 + (\lambda_i - \lambda_{i-2})^2}$