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5 Minute ISFS Data for METCRAXII

These data contain surface meteorology measurements of the Integrated Surface Flux System (ISFS) during the second Meteor Crater Experiment (METCRAXII), at the Barringer Meteor Crater, Arizona, during October of 2013.

For general information about the operations of the ISFS during METCRAXII see https://www.eol.ucar.edu/content/isfs-metcraxii.

The ISFS five minute datases contain first moments and some second moments of variables measured by the NCAR ISFS.

See the tables at https://www.eol.ucar.edu/content/isfs-metcraxii for information on the sensors that were deployed.

The data are stored in NetCDF files. Information on the NetCDF file format and software is available at http://www.unidata.ucar.edu/software/netcdf/. Information specfic to ISFS NetCDF files is available at https://www.eol.ucar.edu/content/isfs-netcdf-files.

5 Minute Datasets and Download URLs

Two 5 minute datasets are available. They each contain QC'd 5 minute statistics of sampled variables, and some derived variables.

- netcdf_qc_geo_tiltcor, http://data.eol.ucar.edu/codiac/dss/id=386.001: All wind vectors have been rotated to geographic coordinates (+U is wind to the east, +V is wind to the north), and 3D wind vectrors are corrected for tilt of the anemometer relative to a plane of mean flow (see #SonicTiltCorrection).
- netcdf_qc_geo_notiltcor, http://data.eol.ucar.edu/codiac/dss/id=386.005: Same variables as in netcdf_qc_geo_tiltcor, but the 3D winds have not been corrected for sonic tilt.

Quality Control, Corrections, Derivations

The QC procedure consists removing the high rate data (i.e. replacing it with the missing data value) during periods where it is determined that the data does not meet QC criteria. This is done before the 5 minute statistics were computed.

See Notes On Quality Control for details. Here is a quick summary:

- **u**, **v**, **w**, **tc** from the CSAT3 sonic anemometers have been removed when **ldiag,** from the the CSAT3 diagnostic bits, is non-zero.
- water vapor values from krypton hygrometers were removed during periods of low signal (usually due to liquid water on the optics), spiking and known periods of faulty sensor performance.
- values for **P.nne.flr**, **P.sw.flr**, **P.w.flr** were removed during periods of sensor problems, as determined by anomalous data.
- **T**, **RH** values removed when the aspiration fan current, **Ifan**, of the ventilated hygrothermometer was out of normal range and during periods of other sensor problems.
- Radiometer **Rpile** and **Rsw** values removed when **Wetness** indicated the presense of liquid water, when notes in the field log indicated the optics were dirty, when the radiometers were being cleaned, and for periods of known wiring problems.
- Soil temperatures, **Tsoil**, removed during periods of obvious faulty data.

The online field logbook logbook has detailed information about sensor issues that were noted in the field.

The following corrections and derivations have been applied to both datasets

- All horizontal wind components, **U** and **V** from 2D anemometers, and **u** and **v** from fast 3D anemometers, have been rotated to geographic coordinates, where +**U** is wind to the east, +**V** is wind to the north. These rotations are based on compass measurements of the anemometer orientations.
- **ldiag** is a logical value derived from the CSAT3 sonic diagnostic word, which will be 0 when all bits are clear, and 1 when one or more diagnostic bits are set. The 5 minute average of **ldiag** is then the fraction of time that any bits were non-zero during the period. As noted above, **u**, **v**, **w** and **tc** are not included in the statistics when **ldiag** is non-zero.
- water vapor from Campbell kryption hygrometers (**kh2o.3m.flr**, **kh2o.3m.near** and **kh2o.3m.far**) and well as all covariances with each 3D wind component, has been corrected for the signal absorption by oxygen. The results of the correction have been written to variables with **h2o** instead of **kh2o** in the variable names. **kh2o** variables are uncorrected. The corrected variance of water vapor: **h2o'h2o'**, is not available, only the uncorrected value: **kh2o'kh2o'.**
- eddy covariances of **h2o** have been additionally corrected for WPL80 and the spatial separation of the hygrometers from the sonics.
- long wave radiation, **Rlw**, has been derived from the pyrgeometer thermopile measurement (**Rpile**) and case temperature (**Tcase**)

measurments, using the Albrecht-Cox equation.

- Philip correction has been applied to the soil heat fluxes, **Gsoil**, using the measured thermal conductivity of the soil.
- Surface heat flux, **Gsfc,** has been derived from **Gsoil** and the heat storage above the heat flux plate, as determined by soil temperature, **Tsoil**, and the soil heat capacity.

NetCDF File Names

Each NetCDF file contains one day of data, from 00:00 to 24:00 UTC. The file names are of the form "isfs_YYYYMMDD.nc", where YYYYMMDD is the year, month and day in UTC.

Time Representation

The **base_time** variable contains one value, the time of the start of the file, as a number of POSIX (non-leap) seconds since 1970 Jan 1, 00:00 UTC.

Values for each time-varying measurement will be found in the NetCDF files, as a variable with a **time** dimension. There are 288 five minute periods per day, so the time dimension will be 288 for a complete file.

The **time** variable contains the time to be associated with each sample, in units of seconds since **base_time**, or 00:00 UTC of the day. Each time value is the middle of the averaging period, and will have values of 150 (00:02:30 UTC), 450 (00:07:30), etc, up to 86250 (23:57:30 UTC).

Dimensions

The NetCDF dimensions in each file are:

Dimension name	size	description
time	288	number of 5 minute periods in a day
site	5	index for the five ISFS sites at METCRAXII: flr, rim, base, near, far

Short Name Attributes

Each measured variable will have a **short_name** NetCDF attribute. The field before the first period in the **short_name** is a generic variable name, such as **T** for temperature, **Rsw** for short wave radiation, or **u** for the U component of the wind.

For second moments, such as variances and co-variances, the first field of the **short_name** will contain single quote marks after the variable name to indicate it is an average of a deviation. For example, a leading short name of **w'tc'**, indicates the quantity is a covariance, an average of (**w**-mean(**w**)) * (**tc**-mean(**tc**)), where mean(x) is the 5 minute mean of the variable x, **w** is the vertical wind component, and **tc** is the sonic temperaure from the speed of sound.

Higher Moments

For each of the 3-D sonic anemometers, the following second moments in **u**,**v**,**w** and **tc** are provided for the computation of eddy-correlation fluxes, where **tc** is the sonic temperature. **h2o** is the water vapor density from a Campbell Krypton hygrometer (corrected as described above), measured at 3 meters at the far, near and floor sites.

Second Moments

	u	v	w	tc	h2o
u	u'u'	u'v'	u'w'	u'tc'	u'h2o'
v		v'v'	v'w'	v'tc'	v'h2o'
w			w'w'	w'tc'	w'h2o'
scalar variances				tc'tc'	h2o'h2o'

Heights

The height in meters above ground of the measurement, if appropriate, will be indicated in a second field after a period in the **short_name**, for example **RH.30m.rim**, or **u'tc'.30m.near**.

Tower Sites

The last period-separated field in the **short_name** attribute is the site name, "flr" (crater floor), "rim", "base" (10 meter tower next to ISFS base trailer), "near" and "far".

NetCDF Variable Names

The actual NetCDF variable names will have underscores, '_', in place of periods and single quotes. Therefore a variable with a **short_name** attribute of **w'h2o'.3m.near** will have a NetCDF variable name of **w_co2__3m_near**.

Units and Long Names

Variables have a NetCDF attribute specifying the units of the measurement. Many variables have a **long_name** attribute giving more information on the measurement.

Sample Counts

Variables from sensors used in eddy-covariance flux measurements will have a **counts** attribute indicating the name of an associated counts variable, which contains the number of samples that were averaged in each statistic. The 3D sonics and krypton hygrometers were sampled at 20 Hz, so the 5 minute counts values will usually be 6000 +- 1. A value less than that indicates the sensor was not reporting for the entire period, or some samples in that 5 minute period were rejected during QC.

Missing Data

The missing data value is 10^{37}. A missing value indicates either that the sensor was not reporting at the given time or it was detemined that the data value did not meet QC criteria.

Sonic Tilt Correction

The 3D sonic anemometers were installed as level as was possible, but not perfectly "bubble" level.

The **netcdf_qc_geo_tiltcor** dataset contains 3D wind vectors and second moments which have been rotated to a coordinate system where the mean **W** component is zero, as described in /content/sonic-tilt-corrections.

‹ 30 Second ISFS Data for METCRAXII	up	High-rate ISFS Data for METCRAXII ›