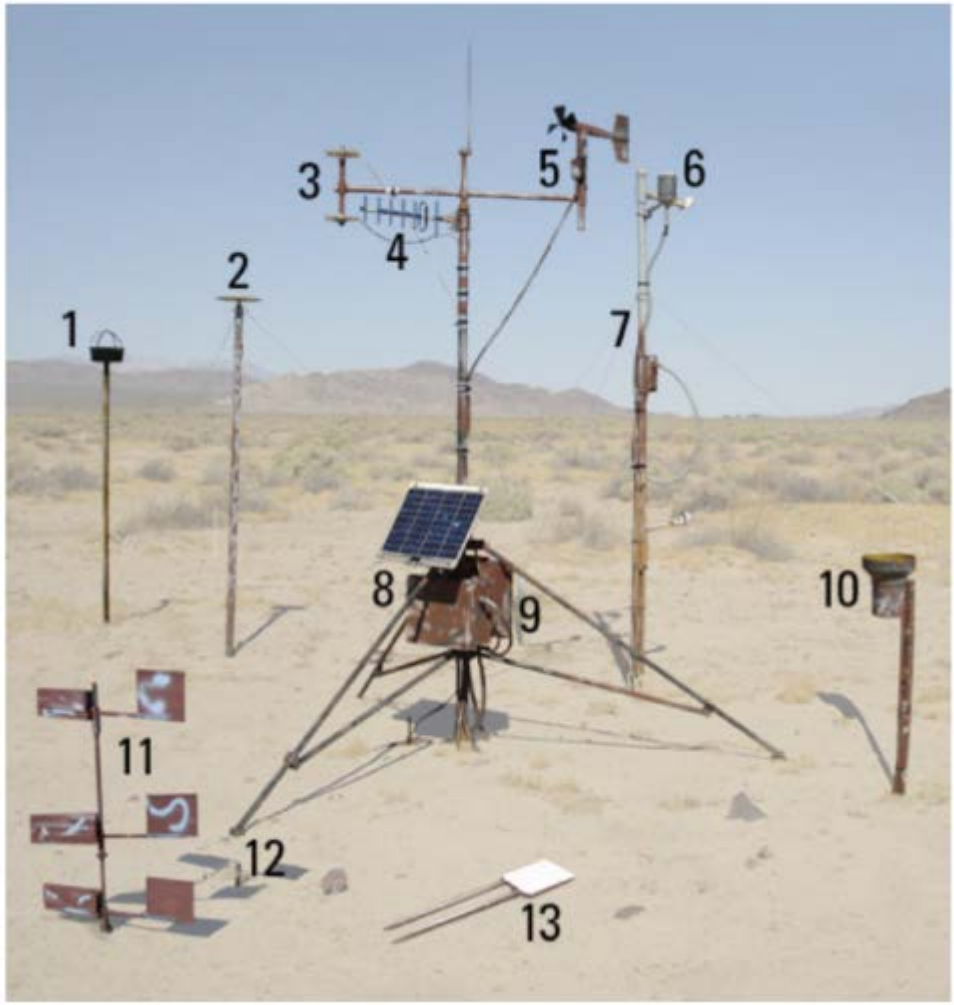
Southwest Climate Impact Meteorological Stations (CLIM-MET)
ASCII Data and Repeat Photography

The CLIM-MET stations are meteorological/geological stations that are designed to function in remote areas for long periods of time without human intervention. These stations measure meteorological and wind-erosion parameters under varying climatic and land-use conditions to detect and describe ongoing landscape changes. Combined with historic and other data, CLIM-MET data can provide inputs into regional climatic models that describe how the Southwest will respond to future climatic conditions.

Instrumentation Details:



1. Marble Dust Trap - The design consists of a single-piece Teflon-coated angel-food cake pan painted black on the outside and mounted on a steel fence post about 2 m above the ground. A circular piece of 1/4-inch-mesh stainless-steel mesh is fitted into the pan so that it rests 3-4 cm below the rim, and glass marbles fill the upper part of the pan above the mesh. The Teflon coating is nonreactive and adds no mineral contamination to the dust sample should it flake. The steel mesh resists weathering under normal conditions. The 2-m height eliminates most saltating sand-sized particles. The marbles simulate the effect of a gravelly fan surface and prevent dust that has filtered or washed into the bottom of the pan from being blown away. The empty space below the mesh provides a reservoir that prevents water from overflowing the pan during large storms. All dust traps are fitted with two metal straps looped in an inverted basket shape and the top surfaces of the straps are coated with Tanglefoot. This sticky material never dries and effectively discourages birds from roosting.
2. Airfoil "frisbee" dust collector - The shape of the collector minimizes the discriminating effects of the turbulent wake over the surface, as wind changes angle of attack. It collects two types of samples: 1) Particles for analysis by microbeam methods, for morphology and chemical composition 2) Bulk deposition for bulk chemical analysis
3. Pyranometer - Instrument Licor LI200X. Measures solar radiation in the Light Spectrum Waveband 400 to 1100 nm.

4. Radio telemetry system - Mojave sites transmit data to a base station computer via a system of 900 MHz radio transceivers. The CR10X datalogger is connected to a radio transceiver and antenna. Campbell Scientific software on a remote base station computer makes scheduled connections to the sites in the field via radio telemetry.
5. Wind speed/direction – Instrument Campbell model 5103.
6. Air temperature and Relative humidity - Instrument Campbell HMP35C.
7. Temperature Gradient Sensor - Instrument custom USGS fabrication. Temperature gradient in degrees centigrade measured between 1 and 3 meters above the ground surface.'
8. Power Module - Modular design that can contain one or two 26 amp gel-cel batteries. Charged by a 10 or 20 watt solar panel.
9. Datalogger – Instrument Campbell CR10X
10. Rain gauge – Instrument Campbell TE525 Tipping bucket
11. BSNE field dust sampler - This is a field dust sampler suitable for collecting airborne dust under natural field conditions. The sampler orients itself into erosive winds. Samples are taken at 15, 50, and 100 cm above the ground surface.
12. SENSIT erosion monitor – Instrument Sensit model H7
13. Soil moisture – Instrument Campbell CS615 Water Content Reflectometer

ASCII Data Information:

Data Storage

Data are stored in the datalogger's internal 124k memory as samples are taken (at 1 second intervals.) At the end of a measurement period (this is currently 1 hour) the data are processed and written to final storage within the datalogger memory and to an external 716k or 4 MB storage module.

Some of the data are converted to engineering units (example: °C) by datalogger software before storage, and other data (from sensor types whose calibrations differ from instrument to instrument) are stored unconverted (as a voltage for example). This is done so instruments that require unique calibrations can be replaced in the field without the necessity of changing calibrations within the datalogger software. These calibrations are then applied in the office after the data are retrieved.

Standard Data Retrieval

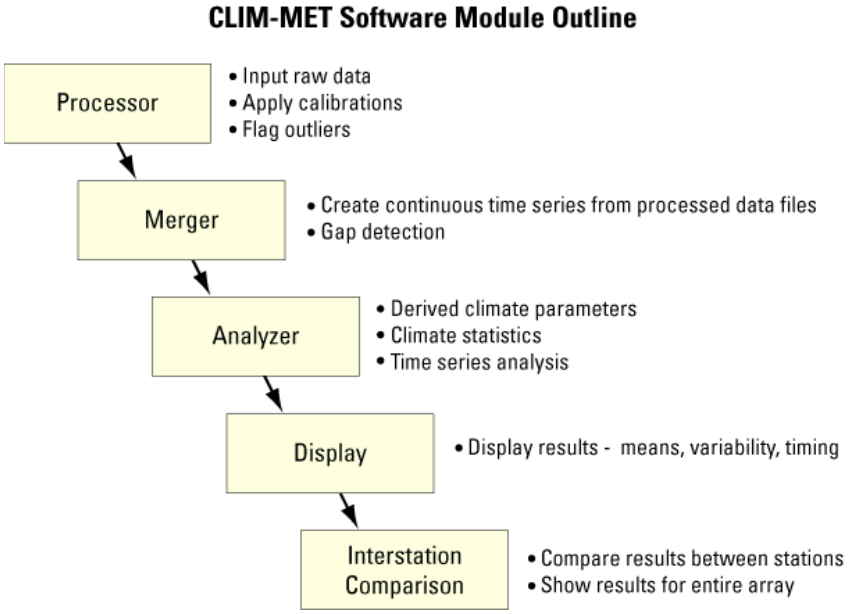
Data are retrieved by disconnecting the storage module from the datalogger, and replacing it with another. The removed module then can be taken to a field office where the data is downloaded, or can be mailed to a central location to be downloaded. The module contains a lithium battery that maintains power and keeps the data intact. Data retrieval software (Campbell Scientific) is used to copy data from the module. The data are read from the module, converted to comma delimited ASCII, and stored to another medium or hard drive. Once the copied data are confirmed as good, the module is erased and is ready to be used again. This operation takes only a few minutes.

Radio Telemetry Retrieval

Mojave sites transmit data to a field - base station computer via a system of 900 MHz radio transceivers. Data at these sites is written to external storage modules as well.

The datalogger at each site is connected to a radio transceiver and antenna. There is also one transceiver and antenna connected to a computer at a local desert studies center. Software on this computer makes scheduled connections to the sites in the field via radio transmission. The data is collected and stored on the computer. The data are then transmitted to the USGS home office through an automated ftp server and satellite internet service. This system allows researchers to access the data in near real time.

Next, the data is read into a custom data processing package (written in MATLAB). See the schematic below that outlines the different modules we have developed to quality check, process, and archive the data.



Data Format and description: Explanation of CLIM-MET Site Data

All sensors are monitored every 4 seconds with the exception of soil moisture which is sampled once per hour. The 4 second resolution measurements are averaged and saved once per hour.

These sites also store higher resolution data (at 5-minute intervals) when either, or both of two conditions occur:

1. The average wind speed for that 5-minute period is above a threshold where it is believed saltation might occur.
2. The sensit erosion monitor has had a particle or particles strike it during that 5- minute period.

This allows a closer examination of the conditions occurring during saltation events. These data are stored in a separate file and are not continuously stored (not a contiguous file). For a given period of time this data file can then be very large or very small depending upon how many saltation events may have (or not have) occurred.

Data from each site is available in several processed resolutions including: Annual, Monthly, Daily, Hourly and 5-minute averages.

Site Information

Each data file has a "metadata" header similar to the text below. Please read and acknowledge use of the data accordingly.

USGS/CLIM-MET site code: SWxxx
USGS/CLIM-MET site name: xxx
latitude: xxx
longitude: xxx
elevation: xxx
install_date: xxx

Definitions

YR: Year of Data Collection
DOY: Julian Day-Of-Year
Hr: Mountain or Pacific Daylight Time
Uspd: Windspeed in m/s
Udir: Wind direction in degrees
Tgrad: Air Temperature Gradient (°C)
SenPC: Total Sensit Particle Count
SenKE: Total Sensit Kinetic Energy Count
Smost: Soil Moisture %
PeakUspd: Peak Windspeed m/s
PeakTime: Peak Windspeed Time
So_d: Downwelling Shortwave Flux (W/m2)
So_u: Upwelling Shortwave Flux (W/m2)
Tair: Air Temperature 3-m above surface (°C)
RH: Relative Humidity %
Tg: Ground Temperature 10-cm below surface (°C)
Rain: Rainfall mm/hour
Alb: Albedo
-999: (data were missing or bad)
NaN: (data were missing or bad)

Variable Names With Added "2" identifier are 5-minute resolution data

Repeat Photography:

Twice a year repeat photographs are taken at each of the seven CLIM-MET sites, once in the spring and once in the fall. Starting from a predetermined point, photos are taken in a 360-degree panorama, showing the site, vegetation and surrounding landscape for that season. In addition to the panoramic site photos, photos are taken of the Sensit instrument, BSNE sediment sampler, and a brick, which is used to characterize surface changes. Occasionally, general independent site photos are taken.

The photos are in compressed zip files, one for each study area and season. Each season contains either all of the Mojave Desert sites (North Soda Lake, Balch and Crucero) or the Canyonlands area sites (Virginia Park, Needles Residence, Dugout Ranch, and Corral Pocket).

Photos are labeled with the site number first, where 02 = Virginia Park, 03 = Needles Residence, 04 = Dugout Ranch, 05 = North Soda Lake, 06 = Balch, 07 = Crucero, and 08 = Corral Pocket. After the site number, the date is displayed in the mm-dd-yy format. Finally, a number or set of letters follows the site number and date. In the case of the numerals they indicate the number of the photo as it was taken in the panoramic sequence. The letter codes indicate the various instruments at the site, with BS = BSNE, BR = Brick, SN = Sensit, and GEN = General site photos. For example 03_09-10-04_SN is the Sensit photo for the Needles site taken on September 10, 2004.

Acknowledgement Policy

If you use USGS/CLIM-MET data:
Please notify us (email) when you begin to use data and for what general purpose.
Please notify us (email) and acknowledge us (references) when USGS/CLIM-MET data are used or presented in published media.
Current citation: "CLIM-MET data obtained from http://gec.cr.usgs.gov/projects/sw/clim-met/"
Please send us paper or electronic copies of any published media that use USGS/CLIM-MET data.

Contact Information

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