Santa Barbara Coastal Long Term Ecological Research (SBC-LTER) Project
Precipitation Measurement Protocol

Precipitation Gauging Stations

- Precipitation gauging stations are located in watersheds representative of land usage and precipitation regime in southern Santa Barbara County (see http://sbc.lternet.edu/sites).
- A precipitation gauging site consists of a tipping bucket rain gauge and data logger.
- These precipitation gauging sites supplement precipitation data obtained from the National Climatic Data Center, Santa Barbara County Public Works Department.

Tipping Bucket Rain Gauge Specifications

- Two types of tipping bucket rain gauges are employed:

  Qualimetrics Model 6011B Tipping Bucket Rain Gauge

  Orifice diameter: 20.3 cm
  Accuracy: 0.5% (at 12.7 mm/hr rain rate)
  Sensitivity and Resolution: 0.1 mm

  * Qualimetrics Model 6011B Tipping Bucket Rain Gauge information and specifications may be obtained at: http://www.allweatherinc.com/meteorological/6011.html

  Sutron Model 5600-0425-2 Stainless Steel Tipping Bucket Rain Gauge

  Orifice diameter: 20 cm
  Accuracy: 0.5% (at 12.7 mm/hr rain rate)
  Sensitivity and Resolution: 0.2 mm

  * Sutron Model 5600-0425 Stainless Steel Tipping Bucket Rain Gauge information and specifications may be obtained at:
  http://www.sutron.com/products/TippingBucketSS0425.htm

- Guidelines from the *Guide to Meteorological Instruments and Methods of Observation* (World Meteorological Organization, 1996) and the *Federal Standard for Siting Meteorological Sensors at Airports* (OFCM, 1994) were used for selecting precipitation gauging sites.
- All gauges are mounted on a horizontal steel plate welded to a steel pole.
- The height of the gauge orifice is generally 1 to 1.3 m, but in some cases it is 2 m to protect the gauge from wildlife.

Precipitation Data Loggers

- Two types of data loggers are used to record tip events from the tipping bucket rain gauges
- A tip event denotes either 0.1 mm (Qualimetrics) or 0.2 mm (Sutron) of precipitation.
- For precipitation gauging sites with easier access, the HOBO Event Logger is used (http://www.onsetcomp.com/products/data-loggers/h07-002-04#tabs-product_page_tabs1-1).
    - This logger records a time stamp for each tip event.
    - Tip event data is downloaded with a field laptop.
- For remote precipitation gauging sites, the Campbell Scientific CR205 spread spectrum radio with integrated mini-logger is used (http://www.campbellsci.com/cr205).
    - This logger records number of tip events that occur in preceding 1 minute intervals.
    - The system includes a battery recharged by a solar panel and an antenna which allows data to be retrieved remotely from another spread spectrum radio connected to a laptop computer.

Precipitation Chemistry

- Precipitation chemistry samples were collected at three sites from 2001 – 2005, and at one site from 2006 – present for ionic nutrient analysis and conductivity (see http://sbc.lternet.edu/sites).
- The precipitation chemistry samples are collected with a 25.4 cm diameter high-density polyethylene (HDPE) funnel directed into a 2 L HDPE bottle.
- Both funnel and bottle are rinsed three times with deionized water prior to collection.
- A 10 cm diameter Tenite Graduated Rain Gauge is used to measure rainfall event totals up to 28 cm.

References

Office of the Federal Coordinator for Meteorological Services and Supporting Research (OFCM), 1994. *Federal Standard for Siting Meteorological Sensors at Airports*. FCM-S4-1994. Available online at http://www.ofcm.gov/siting/text/a-cover.htm, August 1994.

World Meteorological Organization, 1996. *Guide to Meteorological Instruments and Methods of Observation*, 6th ed., number 8, pp. I.6-1-I.6-15, Geneva.