



Sensor: Soil Climate Observations

Manuf/Model: Stevens Water Monitoring Systems, Inc. / Hydra Probe II Soil Sensor Model SDI-12

Measurement Method: Coaxial impedance dielectric sensor with a built-in thermistor

How is it installed?

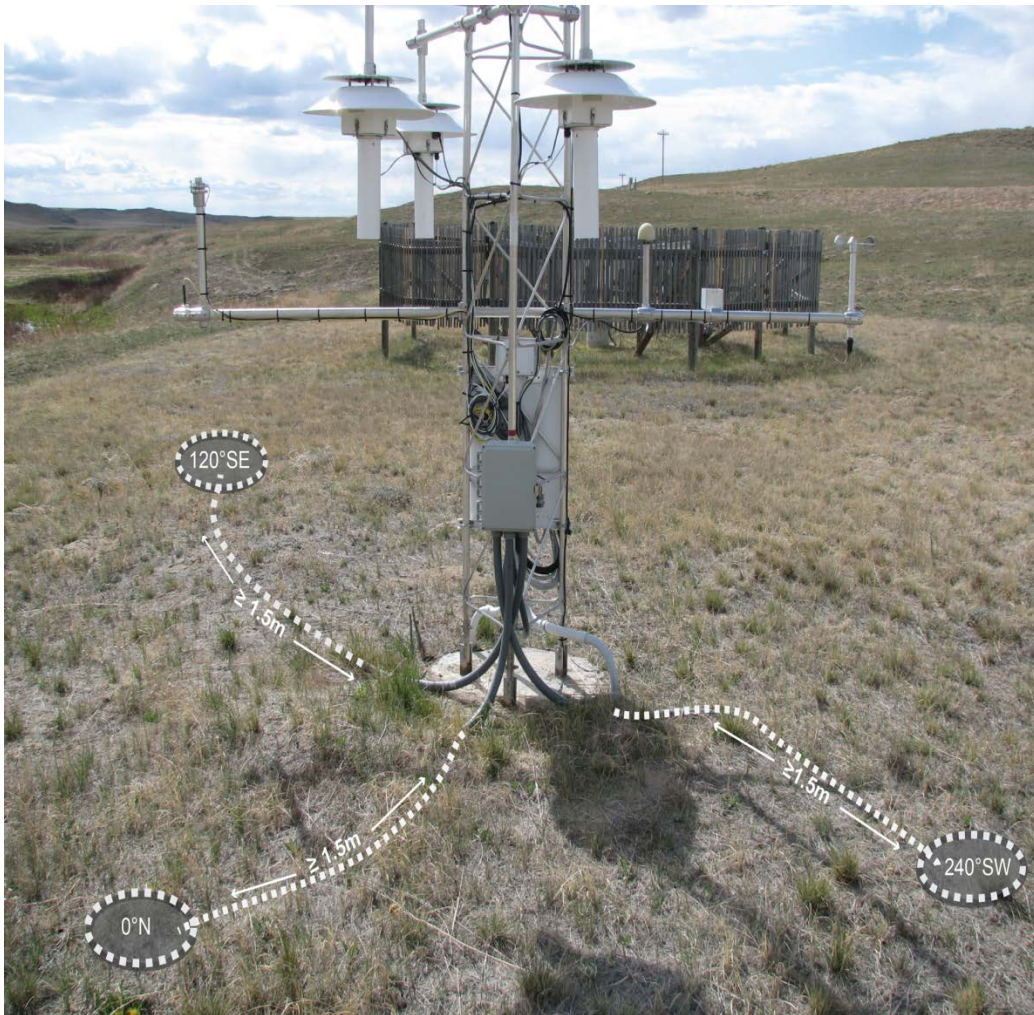
Three probe sets are installed at a minimum of 1.5 meters away from the instrument tower at 0°, 120°, and 240° compass directions around the base. Obstacles and rocks can cause the installation angles to vary, so these are recorded for each plot in station metadata. The probes are installed in a vertical profile at depths 5 cm, 10 cm, 20 cm, 50 cm, and 100 cm. Stations with soils that are not compatible with deep installations due to hard layers and rocky regolith have only 5 cm and 10 cm probes installed.

Why measure this parameter?

Soil moisture and soil temperature observations are primary variables of the USCRN Program. In addition to tracking underground climate change over time, these measurements will allow for improved monitoring of drought in the United States.

How are the data recorded?

Standing electromagnetic waves at a radio frequency of 50 MHz are reflected from the soil, and the return signal is processed to generate soil moisture related variables such as the real dielectric permittivity. A separate thermistor in the base plate of the probes measures soil temperature. Soil dielectric and temperature measurements are sampled hourly at the four lower depths and every 5 minutes at the 5 cm depth. Dielectric measurements are then converted after transmission to volumetric soil moisture content using an empirical relationship (Seyfried, M.S., et al. 2005. *Vadose Zone J.* 4:1070-1079).



Three separate sets of soil probes are placed around each USCRN station, typically at N, SE, and SW directions, except for deviations caused by local rocky conditions.