Implementation and Field Validation of a Passive Radioisotope SWE Sensor in the Catskill Mountains, NY

DAVID KELLEY[1]

ABSTRACT

Snow water equivalent (SWE) is an important environmental variable in studies of the hydrologic cycle, water availability, and climate change. Conventional methods of SWE measurement are labor intensive and can produce errors during freeze/thaw cycles. Automated non-contact samplers can reduce or eliminate these issues. We tested a Campbell Scientific CS725[2] at one site in the upper Neversink River Basin for possible inclusion in the USGS Next Generation Water Observing System. The instrument determines SWE by passively monitoring the attenuation in the snowpack of radiation emitted by potassium and thallium in the soil. To maximize the number of comparable datasets, the instrument was co-located at the long-term Frost Valley YMCA National Atmospheric Deposition Program monitoring site in the Catskill Mountains at Claryville, NY. Data were collected in 6-hour intervals for three seasons. To verify the accuracy of the CS725, conventional measurements of SWE were collected whenever substantial changes in snowpack occurred. Measurements were made at four locations along a 30-meter snow course running through the experimental site. At each location SWE was measured using a Snowmetrics[2] 12-inch tube sampler and a 250cc wedge sampler. The mean SWE was calculated from the conventional measurements and compared to the CS725. The difference between the methods ranged from -16.9 mm to +11.2 mm. In general, the CS725 measurement was 5-20% higher than the conventional method, with a median of 11%, which falls within the 5-35% range found in similar studies of the CS725.

[1] New York Water Science Center, U.S. Geological Survey, Troy, NY, USA

[2] Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government

Corresponding author: dkelley@usgs.gov