

Evaluation of Norwegian snow pillow stations

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As 50 percent of annual precipitation falls as snow in Norway access to real time snow data - including snow water equivalent (SWE) - is of great importance. Snow data is primarily used for hydropower planning (98.3% of total Norwegian energy production) and flood forecasting.

Norwegian Water Resources and Energy Directorate (NVE) runs a network of 24 automatic snow stations with snow pillows. NVE's snow pillows are located from 58°N to 78°N at altitudes of 35-1500m. The snow pillows measure annual SWE max between 200 and 1700mm. Each station will have at least one Ø2m white PVC pillow filled with ethanol or glycol, with pressure sensors measuring the hydrostatic pressure. 14 of the stations have ultrasonic snow depth sensors. Data is transferred by cellular networks and the stations run on solar power. The longest running snow pillow time series is from 1967.

NVE aim to find the best possible setup of snow pillows for Norwegian conditions and do currently test varying snow pillow sizes, different antifreezes and are investigating small scale variability on two snow sites by running several snow pillows next to each other. One site is also equipped with a 25m² weight device to investigate how bridging effects are reduced with increased measurement area. Next winter we will test different snow pillow material, rigid pillow top and new antifreezes. In areas prone to thaw/ refreeze NVE wishes to find a different mean of SWE measurements, where passive gamma sensors seems to be the currently best option.