

Snow Water Equivalent monitoring at the regional level by a Finapp Cosmic Rays Neutron Sensors network

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Cosmic Rays Neutron Sensing (CRNS) is a technology of increasing importance in a variety of fields that can benefit from the ability of directly measure the amount of water in the environment, within a large footprint and in depth. This indeed includes snow, which opened to the possibility to directly quantify the Snow Water Equivalent (mm SWE) within the sensor footprint, using a specialized and properly calibrated CRNS setup.

CRNS is based on the detection of neutrons, particles naturally flowing from space and capable to travel across matter while strongly interacting with water molecules. They therefore carry information about the presence of water in any form, naturally averaging the amount within a footprint up to hectares. When applied to SWE measurement, the approach overcomes crucial hurdles faced by traditional techniques, where additional modelling is needed to derive SWE data from point measurements of the snow height provided by nivometers, or from the remote sensing of snow coverage over large areas by satellites.

Finapp developed a compact and easy to install CRNS probe, suitable for large-scale deployment. Requiring low power supply and minimal maintenance, it can operate autonomously also in remote areas while transmitting the data for a real-time monitoring. As the knowledge of the water content in the snowpack is paramount for a rational management of the resource and for wider climatological considerations, we aim to the deployment of Finapp networks on mountain ranges to support the critical task of hydrological balance at the basin or regional scale.

The first full nivological network of Finapp probes has been acquired and deployed by the Regional Environmental Protection Agency of Veneto (ARPAV), including them into the ARPAV nivological stations in view of the 2023/2024 winter season. We will present the outcome of the first operational season of the new network, its expected impact, and potential developments.