SNOWSENSE: Using satellite navigation, communication and remote sensing for timely access to high-quality and reliable information on snow

Florian Appel, Heike Bach, Franziska Koch, Monika Prasch, Wolfram Mauser
Vista GmbH, Germany

Improved snow information assessment is required for various applications, e.g. flood management hydropower management, and driven by science and user needs. In addition to improved EO (Earth Observation) services, the in-situ component is an essential part of reliable services.

Point measurements of snow properties are very rare and mostly done by observers. The use of automated station measurements is not well established, since automatic sensors are costly and do not always provide a perfect solution (esp. not fail-safe in rough conditions). In addition, these point measurements are geographically not well distributed, since the regions with high snow impact (mountain ranges and Northern regions) are generally difficult to access and therefore scarcely observed and equipped. Remote sensing approaches can help to obtain information about the snow covered area and in certain cases about snow characteristics. Up to date information on the amount of water stored in the snowpack (Snow Water Equivalent) and the liquid water content for small scale and mountainous areas can only be assessed by model approaches or intense field campaigns.

As additional complementing data source, SnowSense is applying novel in-situ snow measurement sensors and methods (developed by the LMU Munich) that make use of Global Navigation Systems (GNSS) signals to continuously assess snow properties. Designed as stable and low cost system, a wider distribution of sensors and a better geographical coverage of globally applicable in-situ measurements are intended. The concept of the design will allow the system to run autonomous with low power consumption, making it suitable also for regions not connected to the power grid. The sensor will be equipped with an appropriate on-board communication unit that allows the direct transmission of the snow measurements also from regions without existing communication infrastructure, like some Northern and Arctic Regions (e.g. Northern Canada, Northern Scandinavia or Greenland).

Together with the applied methods of operational EO snow monitoring (optical and SAR), pushed by the improved data and services in the context of Copernicus, and the regional modelling of dedicated river catchments, the required information for first of all hydrological stakeholders will be approved.

Beyond the scientific and technical questions, the SnowSense project is focused on application driven use-cases and the viability of service applications.

The work presented is part of the ESA IAP SnowSense Feasibility Study. A follow on demonstration study, comprising more users and regions, is targeted.