

SeFaS - Monitoring avalanches in Northern Norway using SAR and UAV borne sensors

Eirik Malnes, Rune Storvold, Regula Frauenfelder, Árni Jónsson,
Christian Jaedicke
Norut, Tromsø and Norwegian Geotechnical Institute (NGI), Norway

In this paper we review preliminary results and introduce planned activities for a Centre for Remote Sensing of avalanches (SeFaS). In the SeFaS project we will use Synthetic Aperture Radar (Radasat-2, Sentinel-1 and TerraSAR-X) together with Unmanned Aerial Vehicle (UAV) borne instruments (GPR and camera) to monitor avalanches in Northern Norway.

We first demonstrate how Synthetic Aperture Radar can be used to both detect and study temporal evolution of wet snow in avalanche prone areas, and how this data can be used in expert avalanche warning and forecasting. Depending on how much and how fast water is being released and/or added to a snowpack, its stability can decrease rapidly, leading to wet snow avalanches. Moreover, ice layers may form in the snowpack which can act as sliding planes for avalanches, or as vapor barriers, favouring the growth of weak snow layers. We demonstrate a few cases where SAR could provide valuable information in an avalanche context.

The project will also develop further concepts for detection of avalanches with high-resolution SAR modes such as RS-2 ultrafine (3m) which allows us to detect avalanche deposit areas. Here, we show some examples from an earlier project of detected avalanche deposits in Northern Norway in spring 2013. In the current project, we shall discuss how SAR can be useful as a monitoring tool for avalanche warning

authorities.

All snow parameters relevant for avalanche monitoring, such as snow depth and snowpack layering, are still not measurable with Synthetic Aperture Radars. We therefore aim to use a UAV-borne ground penetration radar (GPR) that will allow us to obtain detailed data on snow depths and snow stratigraphy on a local scale.