



Project acronym: RADARC

Project title: Radar Monitoring on Arctic Snow

Project leader: Marco Pasian, University of Pavia, Italy

Discipline: Engineering & Technology: Other - Engineering & Technology

Station(s): Pallas-Sodankylä Research Station (Finland)

RADARC was built following ARCTICWAVE and ARCTIC-GBR, which were funded under previous INTERACT TA calls. It was intended to supply in situ data on the snowpack conditions, done with a dual-receiver radar architecture called SNOWAVE, to be compared with data collected by other means (e.g., manual analysis, ground truth, SENTINEL-1). This data will be possibly used in the framework of the WINMET project, funded by the Academy of Finland, to retrieve a model for methane emission over wetlands. Moreover, different configurations (above-the-ground) and working frequencies (from L-band to C-band) has been tested for the first time in an Arctic environment for this type of radar.

To carry on these measurements, this innovative microwave radar was designed in such a way to be relatively light and, most of all, portable. With this easy configuration it was possible to measure different areas and give an approximation of the spatial variability of the snow.

Consequently, the research methods have follow a schema as outlined in following list:

- a) During the first days different setups, in terms of radar frequencies, modulation of the signal, type and position of the antennas, has been tested on two/three specific areas of the Arctic snowpack to identify the best solutions and trade-off in terms of accuracy and repeatability of the radar profile;
- b) From the second half of the first week, and continuing during the second, once identified the best above-the ground radar setup (S-band radar mounted on a 5 m platform), several radar profiles have been taken in different moments of the day. In the meantime, measurements were taken also on the ground in L- and C-bands in several different places, in order to collect a number of information useful for a statistical evaluation of the results;
- c) Starting from the second week, we also had the possibility to monitor wet snowpacks.

In this phase, the information collected by the radar will be used to identify and track the evolution of the melting process and to understand how it affects the soil underneath.

d) The flux of data has been constantly analysed in situ using a normal laptop and forwarded to the University of Pavia for further preliminary evaluation analysis.

e) All radar profiles have been benchmarked against a manual stratigraphy.

f) Other instruments were used