



Project acronym: ARCTICWAVE

Project title: Next-generation Microwave Radars for Arctic Snowpack Monitoring

Project leader: Marco Pasian, Università degli studi di Pavia, Italy

Discipline: Engineering & Technology: Other - Engineering & Technology

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

ARCTICWAVE aims to study, develop, and test the first ever self-consistent microwave radar applicable to the Arctic snowpack. Current radar prototypes for snow monitoring must be supplemented by external information to be able to deliver a correct radar profile. For example, the snowpack density must be measured using other means to calculate the speed of the radar wave into the snowpack, in such a way that the radar can return the proper distance of the ground-snow interface from the snow-air interface (i.e., the snowpack depth). Instead, ARCTICWAVE is based on a different working principle, experimentally tested on Alpine snowpacks during the last two winters, which is able to determine, simultaneously, the snowpack depth and wave speed into the snowpack. For dry snow, this means that ARCTICWAVE determines the snowpack depth, density, and SWE using just the information provided by the radar signal. This information on the snowpack is particularly relevant for many Arctic snow-science applications, which will benefit from a rapid, non-destructive, and self-consistent ground-based microwave monitoring. Concerning the methodology, the novel radar architecture will be first 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, adapting the radar frequencies, modulation of the signal, type and position of the antennas. Then, when the optimum setup(s) will be identified, several measurements will be taken at different moments of the day, and at different places, to collect a number of information useful for a statistical evaluation of the results, benchmarked against manual stratigraphy. These will be constantly analysed in situ and remotely, also comparing data with the outcomes of the Alpine campaigns. In this way, any critical issue will be spotted, and fixed, by due time. The entire experimental campaign takes place at the PALLAS-SODANKYLÄ station, Finland.