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A multi-frequency, -polarisation and -annual microwave snow dataset — Results and lessons learned from ESA's Snowlab Project

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The aim of the ESA SnowLab project is to provide a comprehensive multi-frequency, multi-polarisation, multi-temporal dataset of active and passive microwave measurements over snow-covered grounds. The dataset is used to further investigate the relationship between effective snow and ground parameters and their specific microwave response, measured by radars and radiometers. In recent years several microwave snow campaigns were conducted leading to new insight in the scattering- and emission processes of microwaves. The findings stimulated a number of microwave model developments and field campaigns, as well as hardware developments. An important part for the development of microwave models is the micro-structural characterisation.

The ESA SnowLab project covers 3 campaigns with the ESA SnowScat X- to Ku-Band scatterometer and macro- and micro-structural analysis of Alpine winter snow. To extend the available sensors and benefit from synergies we cooperate with other projects such as the MicroVegSnow project (L- and X-Band radiometers), ETH Zurich (GPS measurements), and investigate the development of new hardware to enhance the frequency range of SnowScat (ESA WBScat). Furthermore, we benefit from the recently established Cryonet testsite Davos Laret http://globalcryospherewatch.org/cryonet/sitepage.php?surveyid=194, Switzerland that became available in November 2016.

The first winter campaign was conducted at Gerstenegg, Switzerland in winter 2015/16. The aim of this campaign was the further testing and development of the SnowScat tomographic hardware and the data acquisition of multi temporal, multi-frequency and multi-polarisation tomographic profiles.
The second campaign was conducted during the winter 2016/17 at the new site Davos Laret. Here the emphasis was on the acquisition of the backscatter signature of the evolving snowpack throughout the winter with snow characterisation at bi-weekly to weekly intervals (Snow Micropen, traditional pit profiles) and, for selected snow profiles, micro CT imagery. The campaign was conducted in close collaboration with the MicroVegSnow project. The collaboration allowed using synergies in the snow characterisation and to extend the SnowScat measurements with radiometric measurements at L and X-Band.
The third campaign is currently ongoing at Davos Laret. It is a continuation of the previous year with a slightly improved setting.

In our contribution we will present the current campaign setup, show results of the Davos Laret campaigns and share lessons learned within the ESA SnowLab project.