X-band polarimetric radar data set of alpine precipitation

Jacopo Grazioli, Marc Schneebeli, Danny Scipion, Alexis Berne

Ecole Polytechnique Fédérale de Lausanne (EPFL) - Environmental Remote Sensing Laboratory (LTE), Switzerland, jacopo.grazioli@epfl.ch

Presenter : Jacopo Grazioli

A mobile X-band dual-polarization Doppler radar (MXPOL), belonging to the Environmental Remote Sensing Laboratory (LTE) of EPFL (Lausanne) was deployed in Davos (Switzerland) at an altitude of 213 m from September 2009 to July 2011, in order to observe and analyze the characteristics of alpine precipitation. MXPOL is working at a frequency of 9.4 GHz and allows to compute the principal polarimetric variables as reflectivities (Zh, Zv, Zdr), total differential phase shifts (Ψdp), copolar correlation coefficient (ρhv), mean radial velocity and spectral width. To complement the radar, a video disdrometer and 3 Parsivels were deployed. Data from weather stations managed by the Institute for Snow and Avalanche Research were also available. Polarimetric radar measurements corresponding to more than 100 precipitation events have been collected corresponding to about 2700 hours of data. Out of these events, 50% were snow events, 25% mixed-phase events and 25% pure-rain events. The installation and the operation of a radar system at this altitude and in harsh weather conditions required special care, with frequent maintenance. In particular, the waveguides and the magnetron were rapidly aging and deteriorating and had to be replaced. A particular attention was also given to the heating-cooling system of the electronic parts, facing temperatures as low as -20° C. This unique data set offers the opportunity to investigate many questions related to alpine precipitation. For example a sun-tracking technique to improve the pointing accuracy of radar was developed and implemented, in order to obtain maximum reliability and geographical referencing of the recorded measurements. The dominant microphisical processes in snowfall and their polarimetric signatures were also investigated. On-going work focuses on the spatial variability of snowfall and its link to snow accumulation on the ground, as well as on quantitative snowfall retrieval. The data set of alpine precipitation will be further processed and quality controlled and then made available to the scientific community.