1.15 CHARACTERISATION OF THE MELTING LAYER VARIABILITY IN THE SWISS ALPS USING POLARIMETRIC X-BAND RADARS

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The melting layer (ML) is a typical feature in radar observations of the vertical structure of stratiform precipitation and designates the transition region from solid to liquid precipitation. The well-known signature in the (polarimetric) radar variables which characterises the ML, with a notable increase in the horizontal reflectivity factor (ZH) and a reduction of the copolar correlation coefficient (Rhohv), facilitates its identification with automatic detection algorithms. The ML is often assumed spatially and temporally homogeneous by algorithms for quantitative precipitation estimation (QPE) and vertical profile of reflectivity (VPR) correction. However as the VPR shape is dependent on both microphysical processes and the vertical profile of temperature, this assumption may not be accurate for wintertime precipitation in an orographic context. As yet, the spatial variability of the ML remains poorly documented, and this work presents a method based on the Fourier transform for the quantification of the variability of the ML at various spatial and temporal scales. The proposed method can accurately and concisely describe the the spatial variability of the ML and can therefore also be used as a tool for comparison of variability between datasets. In the context of this research the method has been applied to datasets from two measurement campaigns with the same radar; one in the Spring of 2014 on the densely populated Swiss plateau and a second one in the Winter of 2016-2017 in the main valley of the Swiss Alps. A melting layer detection algorithm was first applied to the range-height indicator (RHI) scans of the two campaigns and approximately 2000 scans with sufficiently long melting layers were retained for further analysis with the Fourier transform method. Consistent with previous studies, the statistical distributions of the values of the polarimetric variables within and around the ML showed very little differences between the datasets. The Fourier analysis on the other hand, indicated a higher relative importance of variability at the smaller spatial scales in the case of the Alpine dataset. The same method was also applied on the vertical scans of the radar in order to study the temporal variability of the ML and to assess the spatio-temporal coherence of the ML variability.