Preliminary analysis of vertical profiles of polarimetric radar observables in complex orography for operational purpose

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The vertical variations of reflectivity are largely studied in radar meteorology with the aim to identify the predominant shape of the precipitation profiles. Such identified profiles, usually categorized for convective and stratiform rain regimes, are then used to project radar observations, at given altitudes, to levels close to the ground.

The calculation of the vertical profiles is composed by some typical steps: i) identification of homogeneous areas in terms of precipitation regimes, ii) calculation of the apparent profile or some of its apparent features, iii) compensation for the antenna convolution effects to obtain the "true" vertical profile, iv) application of the identified profile to project observations at the ground level.

This work is aimed at investigating the impact of various methodologies for the identification of vertical profiles on the accuracy and precision of surface rainfall estimations (R). Profiles of reflectivity (ZHH) and specific differential phase (KDP) will be analyzed in details in order to evaluate the impact that they have on R-ZHH and R-KDP rain estimators.

A sensitivity analysis on the methods for a) the profile calculation; b) for the identification of melting layer (using the correlation coefficient RHV and or the Doppler spectra, or not); c) for the compensation of convolution effects.

Data from the Italian operational network of C-Band radars, managed by the Department of Civil Protection, will be used for this study. Most of the Italian radar sites are in a complex orography environment so that, the vertical profiles might result incomplete. This aspect makes the final estimation of rain precipitation particularly challenging. Such situation will be carefully treated trying to propose solutions that are effective from an operational point of view.