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Evaluation of polarimetric parameters from a new dual-polarization C-band weather radar in an alpine region

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The first weather radar with dual polarization capabilities was recently installed in Austria. In contrast to conventional weather radars, where the reflectivity is measured in one polarization plane only, a dual polarization radar provides transmission in either horizontal, vertical, or both polarizations while receiving both the horizontal and vertical channels simultaneously. The back-scatter from precipitation particles is different for horizontal and vertical polarization, because these particles are usually far from being spherical. Information on size, shape, and material density of precipitation particles is obtained by comparing the reflected horizontal and vertical power returns and their ratio and correlation. The use of polarimetric radar variables can therefore increase the accuracy of the rain rate estimation compared to standard Z-R relationship of non-polarimetric radars. For the new weather radar different polarimetric rain rate estimators, which are based on the horizontal polarization radar reflectivity, Zh, the differential reflectivity, Zdr, and the specific differential phase shift, Kdp, are used. The rain rate estimators are further combined with an attenuation correction schema. In this study several radar observations of rainfall events are used to test the rain rate estimators and the attenuation correction. The results of the different algorithm are presented and a comparison with rain gauge measurements is made. Also the operational quality of the radar parameters is discussed and the implication of radar measurement errors on the accuracy of polarimetric rain rate estimations is shown.