Statistical aspects of polarimetric weather radar echoes

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Polarimetric weather radar echoes resulting from an observed resolution volume are commonly defined to be the composite of echoes from a large number of individual randomly distributed hydrometeors and refractive index irregularities of the atmosphere. In this contribution we shall examine some important statistical aspects of polarimetric weather radar echoes. The statistical properties of polarimetric weather radar echoes are readily obtained from basic principles, most of them are well known and their properties, from the point of view of interpretation of weather radar observables, are important features. Using time series weather radar data recorded with the coherent polarimetric C-band weather radar "POLDIRAD" (DLR, Wessling, Germany) allows us to examine the statistical properties of polarimetric weather radar echoes and also enables us to examine the dependence of the statistical properties of measured polarimetric weather radar signals on instrumental features. The proposed analysis can be used to detect possible radar-hardware malfunctions and can also serve as a diagnostic tool for validating or trouble-shooting radar hardware modifications.