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An estimation of the dual-polarization C-band radar products in the hail events cases.

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This research will focus on finding new operational capabilities from dual-polarization radars as well as on the operational assessment of dual-polarization radar products in connection with hail events. These products will greatly contribute to an enhanced capability for the identification of severe weather threats, precipitation types, and precipitation accumulation. The final aim of this research is to development new ways to extract relevant information for understanding in-cloud processes, especially hail formation and cycling, to development of the new methodology for hail detection and using these new results for dual-polarization radar products into the operational forecast and warning process.
In this study, I use a data-set collected in the framework of the Helsinki Testbed project in 2010. From May to October, WXT 510 weather transmitters reported 17 hail hits. This data-set not only provides records of hail occurrences, but also provides exact location and times of those events. I compared and analyzed the Helsinki Testbed data-set with Probability-Of- Hail (POH), calculation result from FMI, and reports (photos) published in Media. Through the FMI radar data repository browsers tools, I studied radar observations data from the Vantaa C-band dual-polarization radar in those days, times and places when the hail was detected. I conducted studies for the hail events based on such variables as Base reflectivity (Z), Hydrometeor classification (HCL), Differential Reflectivity (ZDR), Correlation Coefficient (RhoHV) and Specific Differential Phase (KDP).
The preliminary study shows that different climate regimes in Finland produce different hail signatures due to the amount of milting. In most cases hail/ graupel observed on a small area at size is often from 200 to 100 m and lasts for several minutes. Therefore, the ground stations cannot record all cases of hail. In most observed hail cases in southern Finland radar hydrometeor classification was reporting graupel or a mixture of hail and graupel. Base Reflectivity Z varied between 50 and 60 dBZ. Dual polarization variables in almost all cases have different values. Differential Reflectivity ZDR varied between 0 and 4 dB, Correlation Coefficient RhoHV varied between 0.92and 0.94 and Specific Differential Phase KDP varied between 0.5 and 5 deg/km.
The results obtained in the study of 17 cases of hail caused many questions and needs further careful study. Using a radar data repository browser tools showed good results in the study of hail cases. In the future, research will be continue for the remaining more than 100 measured cases of hail.