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

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**Objectives:**
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. These products are rather complex and thus their proper interpretation will require deeper investigations and some broader experience. The final aim of this research is to develop 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.

**Methods:**
In this study, I use a dataset collected in the framework of the Helsinki Testbed project in 2010. From May to October 2010, WXT 510 weather transmitters reported 17 hail hits. This dataset not only provide records of hail occurrences, but also provides exact location and times of those events. I was compared and analyzed the Helsinki Testbed dataset with to Probability-Of-Hail (POH) calculation result from FMI and Reports (photos) published in Media. Through the FMI Radar Data Repository Browsers Tools, which was developed 2015-2017 in FMI (developer Markus Peura), I studied radar observations data from the Vantaa C-band dual-polarization radar in those days, times and places when the hail was detected. The browser is developed in the last 2-3 years. Unfortunately, at the present time in the FMI are no WXT sensors, therefore I use the Testbed data. 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).

**Results:**
The preliminary study shows that different climate regimes in Finland produce different hail signatures due to the amount of melting. Of the 17 cases only 7 were confirmed hail graupel events. In most cases, hail graupel observed on a small area at size is often from 100 to 1000 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, and base reflectivity 2 varied between 50 and 60 dBZ. Dual polarization variables in almost all cases have different values. ZDR varied between 0 and 4 dB, RhoHV varied between 0.92 and 0.94 and KDP varied between 0.5 and 3 deg/km.

**Conclusion:**
The detection and forecasting of hail is a key issue for hail mitigation. 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. This browser created for users and researchers and it is easy to use, but some errors must be considered:
- The geographical precision: it is not verified;
- Hydro Class PseudoRHI product: is not a “finished” product, because it Classification codes are interpolated in the same way as physical Intensities;
- The Vantaa Radar settings were not completely effective at the beginning of the use

In the future, research will be continued for the remaining more than 100 measured cases of hail.