Dual-Polarization Radar Particle Classification Results during the Sochi Olympic Games

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Forecast and Research in the Olympic Sochi Testbed (FROST-2014) is a WMO WWRP project whose objectives include the demonstration of modern forecast and nowcast systems in mountainous terrain for meteorological support of the Sochi 2014 Winter Olympic Games.   One of Environment Canada's contributions to FROST-2014 is the adaption and implementation of a real-time research dual-polarization radar fuzzy logic based particle classification algorithm (PCA) for the Akhun C-band radar near Sochi, Russia. This study verifies the applicability of the algorithm in a complex geographical setting.

PCA results are evaluated at low (1.1°) and high (3.1°) elevation angles using a combination of upper air soundings, surface observations and atmospheric profiling instrument data available from FROST-2014. The separate stages of PCA are assessed: data pre-processing and noise correction, melting layer identification, attenuation correction, and particle type classification.

Additionally PCA is compared against the Meteo method of Vaisala's IRIS/RVP900 HydroClass algorithm (HCA).   In contrast to PCA, HCA employs a height membership function and uses a product method, rather than additive, in the particle type inference stage. Also different weighting factors and membership functions are applied.

A number of mixed phase precipitation events around the Olympic and Paralympic Games (February 6 – March 19, 2014) are examined. Many of the PCA-HCA differences can be attributed to the determination of the melting layer and its use in the algorithms.

This study will benefit the operational implementation of PCA in the diverse climatic conditions across the Canadian radar network and coincides with the dual-polarization upgrade of ten radars in 2015-2016 as part of Environment Canada's Radar Renewal Project.