

## **Investigation of melting layer model assumptions through comparison to radar and in situ observations carried out during GPM GV campaigns**

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In this study we characterize influence of different melting layer model parameters and approximations by comparing different model realizations to GPM ground validation campaign radar and in situ data.

Over the past decades several melting layer models have been developed with variety of the assumptions of the microphysical parameters such as e.g. snow fall velocity, snow density, and their dependence of melted mass fraction (e.g. Yokoyama and H. Tanaka, 1984, Mitra et al. 1990, Szyrmer and Zawadski, 1999) and of melting rate dependence to environmental conditions (e.g. Matsyo and Sasyo, 1981). Because of the diversity of the problem these presented assumptions are not comparable to each other and general conclusion of the accuracy of them cannot be extrapolated. We have studied the impact of the modeled parameters to the shape and intensity of the bright band and tested the modeled values against ground, aircraft and remote sensing observations of the layer.

Our measurement data is from GPM ground validation campaigns, 2010 Light Precipitation Validation Experiment (LPVEx) in Finland and 2012 GPM Cold-season Precipitation Experiment (GCPEX) in Canada. During the campaigns data sets of microphysical parameters and observations with W-band cloud radar were gathered with the airborne instrumentation relative to ground-based radar data. The aircraft flew spiral ascents/descents in the melting layer providing data of particle size distribution, area ratio, the 2D-shadow images of the particles, humidity and temperature profile above, inside and under the melting layer. These quantities reveal the stages of melting as a function of height and, together with the melting layer model, the computed reflectivity factor and the reflectivity-weighted fall velocity as a function of melted mass fraction can be compared with the measured values. Verification of the modeling results and constraint to particle size distribution is obtained using the surface measurements from optical and 2d-video disdrometers.