

## 10.2 VERIFICATION OF CLOUDSAT INSTANTANEOUS SNOWFALL RATE RETRIEVALS WITH GROUND-BASED RADAR MEASUREMENTS

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Instantaneous liquid equivalent snowfall rates retrieved from spaceborne CloudSat W-band radar reflectivity measurements are compared to snowfall estimates from ground-based operational and research radars. The comparisons are performed for closely collocated in time and 3D space interpolated products, so uncertainties associated with deriving near surface snowfall parameters from measurements aloft are largely avoided. This allows for evaluation of the retrieval algorithm performance. Although typical uncertainties of both ground-based and spaceborne snowfall rate retrieval approaches are quite high, the results from the standard optimal estimation CloudSat 2C-SNOW-PROFILE algorithm are shown to be on average in good agreement with the US weather service operational S-band radar default snowfall algorithm results with correlation coefficients being around 0.8-0.85. The CloudSat standard optimal estimation snowfall rate products are also shown to be in satisfactory agreement with retrievals from several simple W-band Ze-S relations suggested earlier. Snowfall rate and snow/ice water content (IWC) parameters from the CloudSat 2C-SNOW-PROFILE algorithm are highly interdependent. A tight relation between S and IWC is also evident in other W-band snowfall rate retrieval algorithms. It is introduced in retrievals through an assumption about the ice particle fall velocity which is made in the reflectivity based algorithms. This suggests that ice sedimentation rate estimates can be deduced from applications of numerous IWC- reflectivity relations derived previously for different cloud conditions. Inter-comparisons between different CloudSat snow/ice water content products indicated significant discrepancies in IWC values from different retrieval algorithms. Inter-comparisons of collocated CloudSat and US Department of Energys cloud radar measurements taken at the Oliktok Point Atmospheric Radiation Measurement (ARM) programs Mobile Facility 3 (AMF3) will be also presented.