Investigating the impact of space-born radar blind zone on surface snowfall statistics in polar regions.

Currently, global statistics of snowfall are only available from the CloudSat satellite launched in 2006. But from CloudSat, no observations of clouds and precipitation are possible within the so called blind-zone covering the last 1200 m above ground, which is caused by ground-clutter contamination of the CloudSat radar. As a consequence, global snowfall products are estimated from measurements at 1200 m above ground. In this study, the impact of the blind-zone of CloudSat on derived snowfall statistics in polar regions is investigated by analysing three 12-months datasets recorded by ground-based Micro Rain Radars (MRR) from the Belgian Princess Elisabeth station in East-Antarctica and from Ny-Ålesund and Longyearbyen in Svalbard, Norway. By statistical comparison of CloudSat and MRR observations, it was found that the MRR has a sensitivity of -5 dBz and is suited to investigate snowfall the blind zone in polar regions. For this, MRR radar reflectivity profiles are analysed in respect to vertical variability in the frequency distribution, changes in the number of observed snow events and impacts on total precipitation. Besides investigating a blind-zone of 1200 m, also the impacts of a reduced blind-zone of 600 m is analysed to account for future missions which feature a smaller blind-zone. It was found that the blind-zone leads to an underestimation of reflectivity of up to 2 dB, overestimation of the number of events by around 5% and underestimation of the precipitation amount by 10%. Reducing the blind-zone to 600 m leads to better representation of mean reflectivity, but does not improve the bias in event numbers and precipitation amount.