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An evaluation of the Cloudsat snowfall climatology over Antarctica

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Precipitation is the dominant source term in the surface mass balance of the Antarctic Ice Sheet (AIS). However, direct observations of this quantity are scarce and often limited to proxies. In 2006, the Cloudsat satellite was launched carrying a 94-GHz nadir-looking radar on board, able to detect precipitation profiles. This instrument allowed to get a first coherent observational dataset of radar reflectivity, snowfall rates and ice water content for the whole AIS. However, these data products have not yet been evaluated over the AIS and only a very coarse-resolution snowfall map for the AIS is currently available (Palerme et al., 2014).

In this study, both individual Cloudsat overpasses and Cloudsat climatological precipitation are evaluated using ground-based Micro Rain Radars available at three stations over the AIS. Cloudsat is able to adequately represent the climatology of precipitation, but its performance highly depends on the spatial resolution of the resulting snowfall map. Omission and commission errors are identified and attributed to distinct phenomena as the radar's blind zone and the choice of the averaging algorithm (Palerme et al., 2014). Furthermore, the effect of conditional sampling of Cloudsat (having an overpass frequency of $\sim$ 5 days over coastal Antarctica) on the resulting snowfall climatology is investigated, indicating high uncertainties.