



Snowfall rate retrieval and its relation with the Antarctic surface mass balance

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The Antarctic Ice Sheet (AIS) is the largest ice body on earth. In order to understand its contribution to sea level rise, local surface mass balance (SMB) measurements are crucial. Precipitation is generally considered the dominant source term in the SMB budget of the AIS. Both SMB and snowfall are not well constrained in both models and observations, and the relation between both quantities remains unknown.

At the Princess Elisabeth station (East Antarctica), a ground-based vertically pointing 24 GHz Micro Rain Radar provides radar reflectivity measurements. When information about snow particle microphysics is available, one can get an idea of snowfall rates. This is provided by an optical disdrometer (Precipitation Imaging Package). As such, radar reflectivity snowfall rate relations ($Z=a*SRb$) are derived for the East Antarctic escarpment region including an overview of their uncertainties.

The local SMB at the station is measured using an Automatic Weather Station and the link between snowfall rates and accumulation at the surface was investigated. It was found that snowfall events are much more common than accumulation events. During 38% of the snowfall cases observed, the freshly-fallen snow is ablated by the wind during the course of the event. In this study, the conditions for ablation and accumulation are investigated discovering a non-linear relation between snowfall and accumulation at the surface.