

Statistical analysis of the vertical profile of reflectivity in East Antarctica using vertical pointing radars in K-band

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The knowledge about the vertical structure and processes of precipitation in Antarctica is key to improve the current climate models, but has remained limited due to the lack of observations in this region.

Recently two observatories of clouds and solid precipitation have been deployed at the Belgian station Princess Elisabeth (PE) and at the French station Dumont d'Urville (DDU) in East Antarctica. Among other instruments, both stations have a vertically pointing micro rain radar (MRR) working at K-band. PE measurements are carried out during summer campaigns since 2010 and at DDU they are continuously collected since the austral summer 2015-2016. In both study areas local relationships between radar reflectivity and snowfall rate were derived in previous studies for quantitative precipitation estimation.

In this work, the statistics of the vertical profiles of reflectivity (VPR) and vertical profile of velocity (VPV) are analyzed for different seasons. Preliminary results show that sublimation of the snowfall particles near the surface has an important impact on the structure of the VPR. On average, the height of the maximum reflectivity is located between 0.85 and 1.5 km for both stations, where the maximum precipitation occurs, then it decreases towards the surface. Comparing the total amounts of the maximum snowfall rates in the vertical profiles at different temporal scales with the total precipitation near to the surface, the total sublimated fraction is slightly larger at DDU than at PE. On the other hand, VPV presents important differences for DDU and PE, with a fast increase of particle fall speed near to the surface only observed at DDU, which suggests the presence of different ice growth processes, such as riming and aggregation.