Jacopo Grazioli

Measurements of precipitation in a coastal region of Antarctica

jacopo.grazioli@epfl.ch

Authors

Jacopo Grazoli, EPFL - LTE, Lausanne,
Christophe Genthon, LGGE, Grenoble, France,
Alexis Berne, EPFL - LTE, Lausanne,

Antarctica is a continent where meteorological measurements are more difficult to conduct than elsewhere and an exemplary case is the measurement of (solid) precipitation. The measurement of snowfall is notoriously difficult, and difficulties are exacerbated in Antarctica. On the high Antarctic plateau, where less than 20 mm of equivalent water are thought to accumulate each year, frost deposition and extreme cold temperature adversely affect traditional precipitation gauges. On the coastal regions, katabatic winds that can reach speeds higher than 200 km/h, induce frequent blowing snow which blur snowfall observation. Furthermore, logistics play a significant role, by limiting the amount of machinery and manpower that can be transported and operated on the continent.

A lack of measurements may be a reason why climate models used to predict climate trends considerably diverge as they considerably disagree for current antarctic precipitation. There is thus a strong need for a model-free dataset of antarctic precipitation to evaluate and validate the models.

The APRES3 (Antarctic Precipitation: REmote Sensing from Surface and Space) campaign was recently launched and a first field experiment took place from November 2015 to February 2016. Within this framework, a suite of instruments dedicated to the observation of solid precipitation have been deployed at the French Antarctic station Dumont d'Urville on the coast of Adélie Land in Antarctica. The location is of significant meteorological interest, being at the sea-continent interface in an area subject to katabatic winds.

Two weather radars, i.e. a 9 GHz dual-polarization scanning radar and a 24 GHz profiler (MRR), were nearly collocated. For measurements of snowfall at the ground level, a weighing gauge (with wind shield), a Biral present weather sensor, and a multi-angle snowflake camera (MASC) were complementing the remote sensing instruments. In addition, daily radiosounding records (and standard meteorological variables) collected by Météo-France were available. The measurements collected by these instruments cover many aspects of precipitation, never measured before in this location: from the vertical development of snow-generating clouds and their large scale (km) features, to the accumulation of snow at the ground level and the shape, size, fall speed of individual ice crystals and snowflakes. This experimental set up is a first step towards understanding Antarctic precipitation at its different scales, as well as to evaluate the added value of remote sensing instruments to monitor snowfall in this extreme environment.