EGU2020-2850
https://doi.org/10.5194/egusphere-egu2020-2850
EGU General Assembly 2020

Microphysics of Antarctic precipitation in climate models : recent advances and challenges

Étienne Vignon[1], Josué Gehring[1], Simon P. Alexander[2], Georgia Sotiropoulou[3], Nikola Besic[4], Nicolas Jullien[1], Noémie Planat[1], Jean-Baptiste Madeleine[5], and Franziska Gerber[6,7]

[1]École Polytechnique Fédérale de Lausanne, Laboratoire de Télédetection Environnementale, Lausanne, Switzerland (etienne.vignon@epfl.ch)

[2]Australian Antarctic Division, Hobart, Tasmania, Australia

[3]Laboratory of Atmospheric Processes and their Impacts (LAPI), École Polytechnique Fédérale de Lausanne, Switzerland

[4]Météo France, Toulouse, France

[5]Laboratoire de Météorologie Dynamique / Sorbonne Université, Paris, France

[6]CRYOS, École Polytechnique Fédérale de Lausanne, Switzerland

[7]WSL Institute for Snow and Avalanche Research SLF, Davos, Switzerland

The current assessment of the Antarctic surface mass balance mostly relies on reanalysis products or climate model simulations. The ability of models to reproduce the precipitation field at the regional and continental scales not only depends on the simulation of the atmospheric dynamics over the Southern Ocean and of the advection of moisture towards the ice sheet, but also on the representation of the microphysical processes that govern the formation and growth of ice crystals and snowflakes. This presentation reviews recent studies to stress the importance and challenges of evaluating the precipitation microphysics over Antarctica in climate models. It also discusses how recent observational campaigns including ground-based remote-sensing instruments can help pinpoint key processes that should be represented in models. We then present tangible examples of evaluation and improvement of microphysical schemes in the Polar WRF model thanks to radar and lidar observations acquired near Dumont d'Urville and Mawson stations on the Antarctic coast. Particular attention is devoted to three processes : i) the sublimation of snowfall within the katabatic layer that considerably reduces the amount of precipitation that actually reaches the surface ; ii) the snowflake aggregation responsible for rapid depletion of crystals within clouds ; iii) the generation of supercooled liquid water in frontal clouds that leads to crystal/snowflake riming. Such studies, albeit preliminary, could pave the way for further evaluations of clouds and precipitation in climate models in different Antarctic contexts, especially in the cold and pristine atmosphere of the Plateau.