Blowing snow in Antarctica and its contribution to the surface mass balance

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On the windiest, coldest and driest continent of the world, blowing snow is frequently active, especially during the winter months. Coastal regions with strong katabatic winds are especially prone to blowing snow and its sublimation. However, the contribution of blowing snow to the surface mass balance from snow blown off the continent and blowing snow sublimation is not well constraint by direct measurements. Furthermore, model and satellite assessments disagree on the magnitude of the effect.

Current studies of the Antarctic surface mass balance are mainly based on regional climate models. However, most models rely on rather simple representations of the snow cover as well as blowing snow. With the aim of improving the surface mass balance representation and specifically snow transport and sublimation due to blowing snow, we coupled the well-established snow model SNOWPACK to the Weather Research and Forecasting Model (WRF). The new coupled model, called 'CRYOWRF', is aimed at an improved representation of snow and snow-atmosphere interaction in all cryospheric environments.

CRYOWRF simulations show good agreement with measurements at meteorological stations on the Antarctic continent. Moreover, the timing of modeled blowing snow events agrees well with few local blowing snow measurements. Monthly frequencies of simulated and satellite-derived spatial blowing snow distributions result in similar patterns. We will present estimates of the amount and importance of blowing snow on the surface mass balance in Antarctica based on 8 years of simulations (2010-2018), with a special focus on blowing snow sublimation. The introduced model will be useful for future predictions of surface mass balance estimates, which are important to assess the contribution of the Antarctic ice sheet to sea level rise in a warming world.