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Snowdrift events detection: a comparison of satellite imagery with ground-based remote sensing observations at Princess Elisabeth Station, East Antarctica.

Alexandra Gossart (1), Niels Souverijns (1), Irina Gorodetskaya (1), Stef Lhermitte (1), Jan Lenaerts (1,2), Alexander Mangold (3), Quentin Laffineur (3), Stephen Palm (4,5), and Nicole M.P. van Lipzig (1)

(1) Division of Geography and Tourism,Univeristy of Leuven, Leuven, Belgium , (2) Institute for Marine and Atmospheric Research, Utrecht University, Utrecht, The Netherlands, (3) Royal Meteorological Institute of Belgium, Uccle, Belgium, (4) Science Systems and Applications Inc. , Lanham, MD 20706 , USA, (5) NASA Goddard Space Flight Center, Greenbelt, MD 20771 , USA

Surface mass balance (SMB) strongly controls spatial and temporal variations in the Antarctic Ice Sheet (AIS) mass balance and its contribution to sea level rise. Constraining AIS SMB remains problematic due to the scarcity of observational data and challenges climate modeling, which in turn limits our current understanding of the processes contributing to AIS SMB. Particularly, a large uncertainty exists regarding the impact of drifting snow on local SMB measurements.

This issue is investigated using long-term observations available at the Princess Elisabeth (PE) station. PE station is located in the escarpment area of Dronning Maud Land, East Antarctica (72ºS, 23ºE). Several instruments analyze atmospheric conditions, cloud and precipitation properties, as well as drifting snow. The ground-based remote sensing instruments include a ceilometer providing 910 nm attenuated backscatter profiles at 15-sec temporal resolution. These profiles can not only be used for estimating cloud base heights, but also the top height of the drifting snow layer during cloud-free conditions. Contribution of drifting snow to the local SMB can be estimated using automatic weather station (AWS) measurements, which include boundary-layer meteorology (temperature, wind speed and direction, humidity, pressure), as well as broadband radiative fluxes and snow height changes.

This poster uses the ground-based long-term observations available at PE to evaluate the blowing snow events detection by satellite imagery. The near-surface blowing snow layers are apparent in lidar backscatter profiles (532 nm attenuated backscatter) and enable snowdrift events detection (spatial and temporal frequency, height and optical depth). These data are available for three full-years (2007-2009) and is processed from CALIPSO (Cloud-Aerosol Lidar and Infrared Pathfinder Satellite Observations), at a high resolution (1x1 km digital elevation model extending from 40 km altitude to below sea level). However, the remote sensing detection of blowing snow events is limited to layers of a minimal thickness of 20-30 m. In addition, thick clouds, mostly occurring during winter storms, can impede drifting snow detection from satellite products. Here, we extend the blowing snow detection method to 2015 to study the concordance of the retrieval of drifting/blowing snow events from satellite imagery with the observations at PE and we will present case studies focusing on the days when strong drifting snow conditions were observed at PE.