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Development of the specific surface area of snow: Observations from Kohnen Station, Dronning Maud Land, Antarctica

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The energy balance in polar regions depends on the albedo of the snow cover. In Antarctica the snow is nearly free of impurities so that the albedo is mainly linked to the grain size, which shows a seasonal evolution due to metamorphic processes at the snow's surface. However, a prediction of grain size evolution only based on the dynamics of snow metamorphism seems not to be sufficient because the surface is sporadically refreshed by new accumulated snow or is redistributed by wind.

We present a study in which we investigated the temporal and spatial development of the specific surface area (SSA) of surface snow in Dronning Maud Land, Antarctica. During seven weeks of the austral summer season 2012/2013 we sampled the snow surface on a daily basis along a 50 meter long profile.

Our measurements show a decrease of spatially averaged SSA from 40 m^2 kg^{-1} to 10 m^2 kg^{-1} accompanied by a series of short-time fluctuations. The decrease in SSA corresponds to an increase of optical grain size from 80 μm to 320 μm during the summer period. By analyzing the SSA-development in respect to the weather conditions we conclude that at low accumulation sites like DML, Antarctica, redistribution and erosion processes of the surface snow have a larger impact on grain size respectively albedo evolution than sporadic precipitation events.