



The influence of spatial variability of polar firn on microwave emission

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Precise measurements of snow structural parameters and stratigraphy are essential to understand and model the radiative properties of the snow cover. However, most snow measurements are limited in spatial resolution and by extensive measurement times, which particularly constrains their applicability in harsh polar environments.

For this reason, we developed a statistical model to derive three major snow structural parameters, density, correlation length and specific surface area solely from a portable, high-resolution penetrometer. We demonstrate the potential of the method by a 25 m long and 1.1 m deep transect through Antarctic firn at Kohnen Station, Antarctica, which reveals the stratigraphic features of the firn clearly.

Based on these data, we run the Microwave Emission Model of Layered Snowpacks (MEMLS) and analyze the influence of the spatial variability of the firn around Kohnen Station on the microwave emission of the snowpack. We discuss the potential and limitations of the method and highlight the need for spatially distributed, quantitative measurements for modeling the microwave emission from polar snow and firn.