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MICROWAVE REMOTE SENSING OF ANTARCTIC FIRN PROPERTIES

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ABSTRACT:

Most of the antarctic continent has never experienced melt. In those regions snow properties such as grain sizes and density mainly depend on temperature, wind and accumulation rate. As these parameters shape the physical properties of the firn, a climate record is stored within the snowpack. Spaceborne sensors operating at microwave frequencies are well-suited for monitoring the polar regions, since they are independent of solar radiation and cloud cover. Since microwave radiation is sensitive to firn microstructure properties, climate parameters such as accumulation rate can in principle be retrieved from the data. However, the interaction between snow and microwave radiation is a complex process, and great care needs to be taken when interpreting the satellite data. Current approaches to determine snow accumulation rates from microwave remote sensing data still exhibit large uncertainties. In order to improve the methods for snow accumulation rate retrieval, several issues need to be addressed:

- The representation of snow microstructure in radiative transfer modeling of snow-microwave interaction. We will examine the influence of snow grain size and firn layering on the microwave signal and validate model results with measured firn profile data.
- Wind data and local topography. The term snow accumulation refers to the net amount of snow which is deposited at a specific site. This, in turn, means that the wind redistribution of snow is an important factor. However, only few studies exist which consider the influence of the wind field on snow accumulation rates. We will address this point in our study, focusing the location of the Kottas traverse in Dronning Maud Land, Antarctica, where we have an extensive data set of measured accumulation rates available for validation purposes.

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