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Temporal trend of microwave brightness temperatures spatial heterogeneity at DOME C, Antarctica

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The SMOS mission will carry the first ever L-band (1.4 GHz) microwave radiometer whose primary objectives are Soil Moisture and Ocean Salinity (SMOS) measurements. Dome C, Antarctica, has been proposed for on-orbit calibration of SMOS mission. Likely, this target (together with tropical forests) will provide the only means of full end-to-end calibration during the mission lifetimes. Ideally, to be used as a calibration target, an area would be spatially homogeneous with respect to brightness temperature, and unchanging with respect to time. Diurnal physical temperature variations are confined to the near surface while the L-band signal comes from the upper 20-40 m of the ice sheet, so the conditions are favorable.

To this aim, it is important to evaluate the spatial homogeneity/heterogeneity and temporal stability of L-band brightness temperatures for the Dome C area. In this direction, one effort has been made to measure the temporal stability of Dome C at L-band, but only at one point using ground based observations. The temporal stability of Dome C has been investigated with forward radiative transfer models, and is consistent with the very low annual snowfall (3cm).

In the meantime that experimental data are collected/available, we investigate the temporal trend of the spatial heterogeneity over large (100 km) areas by using AMSR-E brightness temperatures. First, we report results regarding the seasonal trend of brightness temperature between 6.8 and 89 GHz for the EASE-grid pixel containing the Dome C location, confirming the temporal stability of the low frequencies brightness

temperatures. The values at L band derived from a regression analysis are then compared with the values recently collected at point scale. Then, we will show the results of an analysis studying the spatial heterogeneity of AMSR-E brightness temperatures (through the analysis of mean and standard deviation) when a larger area centred in Dome C is considered. The spatial dependency of brightness temperatures is also investigated through the use of geostatistical techniques. We investigated the temporal trend of the standard deviation along the season when different dimensions of the area understudy are considered. This provides precious information for quantifying whether some periods along the year are better/worse for calibration purposes.