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On the effective penetration depth of L-band radiometry and the validation of SMOS data: a case study

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In the framework of the Soil Moisture and Ocean Salinity (SMOS) Mission preparation, several field and airborne campaigns have been carried out in order to test, validate and better understand radiative transfer models at L-band.

Some of them have shown that in order to accurately model bare soil emission, it was necessary to adjust one parameter as a function of soil moisture. In this way, an exponential and linear dependency of roughness with soil moisture was found by Wigneron *et al. 2001* and Escorihuela *et al. 2007* respectively. While Schneeberger *et al. 2004* fitted a coherent emission model with a transition zone whose thickness depended also in soil moisture. This kind of parameterizations pose the problem that are site dependent and thus their application at the satellite scale is not straight forward. Furthermore, they seem to indicate that the actual effective soil moisture depth is somewhat different that the one provided by the field sensors.

In this context the objective of this study is to analyze the influence of the soil moisture profile in the parameterizations of a bare soil emission. The SMOSREX dataset was used for that purpose. A more detailed profile of soil moisture was obtained with a soil heat and water flows mechanistic model *Chanzy and Bruckler 1993*. It was found that (1) the effective soil moisture is shallower than provided by widely used field moisture sensors, (2) when not taken into account the effective soil moisture depth, the

estimated emission has a much lower dynamic range than observed. This conclusions are crucial for the calibration and validation of SMOS data.