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FOSMEX: A remote sensing forest soil moisture experiment using microwave radiometers

M. Guglielmetti (1), **M. Schwank** (1), C. Mätzler (2), C. Oberdoerster (3), J. Vanderborght (3), and H. Flühler (1)

(1) Institute of Terrestrial Ecosystems, ETH Zurich, Universitätstr. 16, 8092 Zürich, Switzerland, (mike.schwank@env.ethz.ch); (2) Institute of Applied Physics, University of Bern, Sidlerstrasse 5, 3012 Bern, Switzerland; (3) Agrosphere, ICG-IV, Forschungszentrum Jülich, D-52425 Jülich, Germany

The ground based microwave FOrest Soil Moisture EXperiment (FOSMEX) was performed above a deciduous forest at the Research Center in Jülich (Germany). The data-set recorded during the one-year lasting campaign consists of dual- and single-polarized L-band and X-band measurements with a time-resolution of two hours. Ground-truth forest-soil moistures, temperatures, and meteorological data were measured simultaneously for comparison with remotely sensed data. A non-scattering radiative transfer approach and a coherent model for estimating forest-ground reflectivities were used for linking remotely sensed with ground-truth data. Sensitivities of L-band brightness temperatures with respect to forest soil moistures were modeled for different conditions of a leaf-layer on the ground. After giving a general overview of the experiment and of the entire data-set, we present a sub-experiment where the forest ground was masked with a metallized foil and a sub-experiment where the ground was artificially irrigated. On the one hand this enabled estimating the L-band transmissivity Γ of the canopy at different seasonal states and on the other hand the effect of wetting the ground on the L-band brightness was examined. The experimentally based transmissivity was in the order of 0.45 rather independent of the forest foliation. Sprinkling the ground affected the L-band measurements only for a short time until the water drained through the leaf-layer. This observation corroborates the modeled dominating role of the leaf-layer moisture on the ground reflectivity. This data-base is highly valuable for testing and improving radiative transfer models used for interpreting microwave data received from future space born L-band radiometers flying over

areas comprising a considerable fraction of deciduous forest.