

S-F2 - Microwave remote sensing of vegetated and snow-covered soils (S. Paloscia, M. Kurum, P.Pampaloni, M. Hallikainen, R. Lang)

#### MODELING MICROWAVE EMISSION FROM VEGETATION USING AMSR-2 DATA

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The interest in monitoring vegetation biomass and its dynamic distribution on a global scale is rapidly increasing, due to the impact of vegetation cover on the Earth's climate evolution and the recent dramatic changes that are reasonably supposed to get worse in a near future.

Information on vegetation canopy is usually derived from optical sensors, which nevertheless besides being only sensitive to the surface layers of canopies, are strongly influenced by atmospheric effects. Microwave sensors have the capability of penetrating clouds and, depending on frequency, canopy cover and underlying soil. Moreover, taking advantage of the high sensitivity of microwaves to the water of the vegetation material permittivity, the use of this spectral band allows an investigation of the aboveground vegetation and therefore the direct estimate of the vegetation water content (VWC).

Experimental relationships between PI and VWC of agricultural crops, obtained using ground-based sensors at X and Ka bands, were positively compared with model simulations in previous research works and showed a decrease of PI as a function of increasing vegetation biomass, which was rather steep at Ka band and more gradual at X band.

Maps of VWC retrieved from X band PI were obtained in the context of an algorithm based on an Artificial Neural Network (ANN) method developed for generating soil moisture, snow depth, and vegetation biomass maps from the Advanced Multifrequency Scanning Radiometer AMSR-E. This algorithm was implemented on the basis of experimental relationships and the well-known tau-omega solution of the radiative transfer equation, assuming a dependence on the square root of wavelength between the vegetation optical depth ( $\tau$ ) and VWC at X and Ka bands.

The algorithm was implemented and tested considering two years of AMSR2 acquisitions (from July 2012 to June 2014) on a test area in Africa, and covering a large variability of vegetation types and biomasses, from bare surfaces (Sahara desert) to dense vegetation (Equatorial forest). An independent validation of the algorithm has been then carried out considering the entire Australian continent, and all the AMSR2 data collected in different seasons in 2013. These areas were selected as representative of the entire annual cycle of the vegetation.