



Validation of the SMOS-MIRAS Soil Moisture Product (SML2UDP) in the Pampean Region of Argentina

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A validation campaign was carried out to evaluate the SMOS-MIRAS Soil Moisture (SM) SML2UDP product (v5.51) in the Pampean Region of Argentina on February 2013. The study area was selected because it is a vast area of flatlands containing quite homogeneous rainfed croplands, with prevalence of soybean crops, considered SMOS nominal land uses (i.e., crops with vegetation heights not exceeding 1 to 2 m by opposition to trees).

Transects of ground SM measurements were collected by Delta-T ThetaProbe ML2x SM probes within four ISEA-4H9 DGG SMOS nodes. The SM data obtained by each probe transect in each parcel were checked by collecting soil samples in the same parcels at the same time and measuring their masses. The gravimetric method was used to obtain reference values. An uncertainty of $\pm 0.03 \text{ m}^3 \text{ m}^{-3}$ was obtained for the ML2x probes. Additionally, they were calibrated in the laboratory for different SMs by saturating and drying a specific and representative variety of soil samples collected from the experimental parcels (loam, clay loam and silt loam samples). This calibration showed again accurate operations for the ML2x probes, which even attain uncertainties of $\pm 0.01 \text{ m}^3 \text{ m}^{-3}$, in agreement with the manufacturer.

The comparison of the SM transect data collected during the campaign with the SMOS-MIRAS SML2UDP product values showed a negative bias between concurrent SMOS data and ground SM measurements, which means a slight SMOS-MIRAS underestimation, and a standard deviation of $\pm 0.06 \text{ m}^3 \text{ m}^{-3}$.

The validation sites were selected taking as reference the locations of permanent SM stations property of the Argentinean Comisión Nacional de Actividades Espaciales (CONAE, National Commission of Space Activities), Instituto Nacional de Tecnología Agropecuaria (INTA, National Institute of Farming Technology) and Instituto de Hidrología de Llanuras (IHLLA, Plain Hydrology Institute). During the campaign several transects were carried out in the parcels where permanent SM stations were located, mainly in those within one of the nodes (with 5 stations inside). The objective was to evaluate the station SM data reliability at the SMOS spatial resolution with the aim of using station data series as reference for SMOS-MIRAS SM product validations. A linear correlation was obtained between the ground SM values and the SM station data within the node, with a coefficient of determination of 0.98 and a fitting error of $\pm 0.010 \text{ m}^3 \text{ m}^{-3}$. Therefore, the station data adjusted to obtain node representative values are being evaluated as reference data to extend the validation of SMOS-retrieved data beyond the campaign results.