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A new soil moisture product by combining L and C-band Brightness Temperature

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Passive microwave remote sensing technique, which has a large spatial coverage, high temporal resolution and is sensitive to surface water content, has been shown to be an efficient approach for large scale soil moisture (SM) monitoring. AMSR-E (subsequent AMSR2) has been proved an effective source for SM retrieval in last decade, several SM products (such as NASA, JAXA, LPRM) have been developed by using AMSR-E or AMSR2, each method based on using the multi-frequency (10–36 GHz) and multi-polarization data. Considering the stronger penetration and more sensitive to the SM of the L-Band, in this study, based on the $\tau - \omega$ model, we present a new SM product by combing the L and C-Band brightness temperature (Tb).

The aim of this study was to improve the multi-frequency SM product which is to be as independent as possible from auxiliary data.

Firstly, this study uses SMOS Level 3 ascending Tb as L-band input and AMSR2 L2 descending Tb as C-band input. To illustrate the effective of incident angle, The L-Band Tb under 42.5° and 52.5° incidence angle were selected.

According to the recent results, the new effective scattering albedo (ω) and soil roughness parameter (Hr) are considered in this product. The calibrated ω values depended on the type of vegetation based on the International Geosphere-Biosphere Programme (IGBP) can been found in Fernandez-Moran, and C-band Hr obtained from global maps computed by Shu et al, L-band Hr can be found by Parrens et al. The parameter values used in this study differ from the JAXA AMSR2 standard algorithm. Value currently AMSR2 algorithms didn't consider the impact of surface coverage types on parameters, ω is equal to 0.061 (V polarization) and 0.063 (H polarization) over low vegetation under 10.65GHz. Similarly, Hr is set to be 0.873.

Avoid using vegetation parameter (b) to calculate vegetation optical thickness as JAXA, the product in this study allowed simultaneous retrieval of the soil moisture and vegetation optical depth. To the end, a four year (2012-2015) inter-comparison of this new result and AMSR2 SM. the result can be concluded that combined the L-band and C-band Tb algorithm is an acceptable accuracy and is expected to be improve the application in soil moisture estimation.