Geophysical Research Abstracts
Vol. 17, EGU2015-7371, 2015
EGU General Assembly 2015

Soil Moisture derivation from the multi-frequency sensor AMSR-2

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We present a method to derive soil moisture from the multi-frequency sensor Advanced Microwave Scanning Radiometer 2 (AMSR-2). Its predecessor, the Advanced Microwave Scanning Radiometer – Earth Observing System (AMSR-E), has already provided Earth scientists with a consistent and continuous global soil moisture dataset. However, the AMSR-2 sensor has one big advantage in relation to the AMSR-E sensor; is has an additional channel in the C-band frequency (7.3 GHz).
This channel creates the opportunity to have a better screening for Radio Frequency Interference (RFI) and could eventually lead to improved soil moisture retrievals.
The soil moisture retrievals from AMSR-2 we present here use the Land Parameter Retrieval Model (LPRM) in combination with a new radio frequency interference masking method. We used observations of the multi-frequency microwave radiometer onboard the Tropical Rainfall Measuring Mission (TRMM) satellite to intercalibrate the brightness temperatures in order to improve consistency between AMSR-E and AMSR-2. Several scenarios to accomplish synergy between the AMSR-E and AMSR-2 soil moisture products were evaluated. A global comparison of soil moisture retrievals against ERA Interim re-analysis soil moisture demonstrates the need for an intercalibration procedure. Several different scenarios based on filtering were tested and the impact on the soil moisture retrievals was evaluated against two independent reference soil moisture datasets (reanalysis and in situ soil moisture) that cover the observation periods of the AMSR-E and AMSR-2 sensors.
Results show a high degree of consistency between both satellite products and two independent reference products for the soil moisture products. In addition, the added value of an additional frequency for RFI detection is demonstrated within this study with a reduction of the total contaminated pixels in the 6.9 GHz of 66% for horizontal observations and even 85% for vertical observations when 7.3 and 10.7 GHz are used.