Improvement of soil moisture dataset combining AMSR2 soil moisture products

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Abstract: Soil moisture has been considered as an important variable in hydrological systems affecting the water cycle in the atmosphere, land surface and subsurface. It is considered that microwave remote sensing provides a unique capability for retrieving soil moisture at the global scale and a number of microwave-based soil moisture products have been used in various fields of Earth sciences in the past decades. While microwave can provide near-real time observation (global coverage every 1-3 days for the majority of the sensors), its direct applications have been limited due to the coarse spatial resolution (>100 km^2) and uncertainties resulting from a number of complex factors that affect the radiative transfer model. In this aspect, it is essential to validate the accuracy prior to actual applications and to improve the dataset itself and the retrieval algorithms. As a first step to do this, two remotely sensed soil moisture products from the Advanced Microwave Scanning Radiometer 2 (AMSR2), retrieved by the Japan Aerospace Exploration Agency (JAXA) algorithm and the Land Parameter Retrieval Model (LPRM) are assessed and structural errors noted. The main findings are: 1) The JAXA algorithm generally underestimates the ground soil moisture, whereas LPRM algorithm tends to overestimate soil moisture. 2) Correlation coefficients between AMSR2 products and ground measurements decrease when the mean temperature decreases below approximately 290K. 3) In general the LPRM correlations increase as the surface becomes rougher whilst the JAXA correlations decreases. 4) The performance of JAXA is affected in areas with dense vegetation, particularly for mean EVI greater than 0.30. 5) Distributions of bias and RMSE of LPRM are relatively insensitive to variation of mean ground soil moisture; however JAXA performs better in dry condition. As it is found that the two products are complementary under the various conditions, a combinatorial approach is presented for improving the accuracy of soil moisture dataset. The approach is a linear combination technique which applies a spatio-temporal weighting, calculated based on error statistics of the products, to each product.

Keywords: *AMSR2, JAXA, LPRM, Soil Moisture*