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Inter-Comparison of Retrieved and Modelled Soil Moisture and Coherency of Remotely Sensed Hydrology Data

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A neural network algorithm has been developed for the retrieval of Soil Moisture (SM) from global satellite observations. The algorithm estimates soil moisture from a synergy of passive and active microwave, infrared and visible satellite observations in order to capture the different SM variabilities that the individual sensors are sensitive to. The advantages and drawbacks of each satellite observation have been analysed and the information type and content carried by each observation have been determined. A global data set of monthly mean soil moisture for the 1993-2000 period has been computed with the neural network algorithm (Kolassa et al., in press, 2012). The resulting soil moisture retrieval product has then been used in an inter-comparison study including soil moisture from (1) the HTESSEL model (Balsamo et al., 2009), (2) the WACMOS satellite product (Liu et al., 2011), and (3) in situ measurements from the International Soil Moisture Network (Dorigo et al., 2011). The analysis showed that the satellite remote sensing products are well-suited to capture the spatial variability of the in situ data and even show the potential to improve the modelled soil moisture. Both satellite retrievals also display a good agreement with the temporal structures of the in situ data, however, HTESSEL appears to be more suitable for capturing the temporal variability (Kolassa et al., in press, 2012). The use of this type of neural network approach is currently being investigated as a retrieval option for the SMOS mission.

Our soil moisture retrieval product has also been used in a coherence study with precipitation data from GPCP (Adler et al., 2003) and inundation estimates from GIEMS (Prigent et al., 2007). It was investigated on a global scale whether the three observation-based datasets are coherent with each other and show the expected behaviour. For most regions of the Earth, the datasets were consistent and the behaviour observed could be explained with the known hydrological processes. In addition, a regional analysis was conducted over several large river basins, including a detailed analysis of the time-lagged correlations between the three datasets and the spatial propagation of observed signals. Results appear consistent with the knowledge of the hydrological processes governing the individual basins.

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