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Development of a temporal- spatial Disaggregation Scheme for coarse scale remotely sensed Soil Moisture Products

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Soil moisture estimates are currently obtained by in-situ measurements, land surface modeling or remote sensing techniques. Each of the three approaches offers advantages and disadvantages in terms of spatial resolution, temporal resolution and accuracy. First, in-situ measurements achieve soil moisture information as point measurements, but are barely able to show spatially variability representatively over larger areas. Second, land surface models predict soil moisture as a part of the hydrological cycle whereas the accuracy of these estimates depends on the model structure as well as model input data. Third, remote sensing techniques offer the possibility to acquire soil moisture information over wide areas whereas the spatial scale of each soil moisture data point is correspondingly large.

This presentation demonstrates a new method to disaggregate coarse scale soil moisture measurements in order to improve the spatial resolution of existing remote sensing data. A global soil moisture product was derived from the European Remote Sensing (ERS)-Scatterometer and contains two data sets: first the soil moisture content in the top layer ($<$2cm) of the soil and second in combination with an infiltration model the Soil Water Index (SWI) (Wagner et al.1999). The spatial resolution is 50x50km and so far this data set can only be used for modeling on global scale. An application of this data set at a regional scale would be a valuable tool for validation and as a data source, in particular for ungauged basins. Therefore, the objective of the study is a quantification of its usefulness for regional hydrological modeling, using the Great Letaba River, a tributary of the Olifants River, in southern Africa as an example case.

The disaggregation scheme is based on the assumption that the value of one Scat-

terometer pixel reflects the moisture conditions as an integral response over the area. In order to represent the process oriented variation of soil moisture within one pixel the concept of hydrological response units (HRUs) (Flügel 1995) was used. These entities served as input data for the distributed hydrological model J2000 that simulates soil moisture in a finer resolution in terms of time and space than the original Scatterometer data.

The presentation will concentrate on showing results from a correlation analysis of the simulated soil moisture values with the coarse scale soil moisture values. The application of further statistical tools, such as residual analysis and temporal stability analysis, to help identify additional spatial distributed parameters which are driving soil moisture variability, will also be demonstrated. The results indicate that the technique is a useful tool for improving spatial resolution of remotely sensed data.

References:

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