Geophysical Research Abstracts
Vol. 13, EGU2011-8409, 2011
EGU General Assembly 2011

A strategy for global drought monitoring using SMOS soil moisture observations

Alok Sahoo (1), Eric Wood (1), Justin Sheffield (1), Ming Pan (1), Ahmad Albitar (2), Delphine Leroux (2), and Yann Kerr (2)

(1) Princeton University, Princeton, New jersey, United States (aksahoo2004@gmail.com), (2) CESBIO, Toulouse, France

Drought monitoring for agriculture and water resources applications is increasingly relying on remote sensing to provide large-scale and often high resolution (field scale) assessments of water availability, water use and crop productivity. Soil moisture is potentially well suited for quantifying vegetative and moisture stress, and for understanding how drought is linked through the surface energy balance. Importantly for drought assessment, needed datasets are becoming available for several years to over a decade, which allows for the construction of a climatology against which current conditions can be compared.

In this presentation, we use satellite observations to demonstrate the ability of long term remote sensing products for drought monitoring. Soil moisture data are retrieved from AMSR-E brightness temperature globally for 2002 onwards (at a 25 km spatial and daily temporal scale) using the Princeton Land Surface Microwave Emission Model (LSMEM). As the LSMEM contains a large number of field-based or empirical relationships between soil/vegetation properties and their emission characteristics, which are uncertain for large-scale applications, the model has been calibrated globally against 10.65 GHz brightness temperature using soil moisture from validated land surface model output. The satellite-derived soil moisture time series is then used to construct a drought index, where the retrieved soil moisture is related to its long-term probability percentile – an approach that has been successfully used in developing a land surface model based drought index over the USA.

We apply the drought index to evaluate the depiction of drought over various scales, from regional to global, and over a number of years to capture multiple drought events. Comparisons are made of their ability to detect changes in stress based on the drought index that normalize the data across space and time. The drought index data can successfully identify dry and wet periods across regions where surface vegetation allows for remote sensing retrievals, and compare well to the inter-annual variability in top layer soil moisture from observation-driven land surface models.

We strategize on a pathway for developing and including the newly available SMOS SM products into existing drought monitoring systems to enhance future drought monitoring. The European Space Agency (ESA) Soil Moisture and Ocean Salinity (SMOS) mission was launched in November 2009, and has been providing 1.4GHz (L-band) observations. The advantage of using the L-band channel is its better surface penetration capability, which will allow expanded spatial coverage over denser vegetated surfaces and should improve the retrieved surface soil moisture estimates. The latter will offer information that can be used to estimate deeper soil layer moisture conditions, which is important for agricultural and hydrologic drought assessments. A number of ongoing SMOS-related research efforts have been focusing on retrieving and validating top 5cm surface soil moisture measurements at 50 km spatial resolution.