Geophysical Research Abstracts
Vol. 17, EGU2015-11656, 2015
EGU General Assembly 2015

Drought impacts and resilience on crops via evapotranspiration estimations

Joris Timmermans and Saeid Asadollahi Dolatabad

University of Twente, International Institute for GeoInformation Sciences and Earth Observation, Water Resources, Netherlands (j_timmermans@itc.nl)

Currently, the global needs for food and water is at a critical level. It has been estimated that 12.5 % of the global population suffers from malnutrition and 768 million people still do not have access to clean drinking water. This need is increasing because of population growth but also by climate change. Changes in precipitation patterns will result either in flooding or droughts. Consequently availability, usability and affordability of water is becoming challenge and efficient use of water and water management is becoming more important, particularly during severe drought events.

Drought monitoring for agricultural purposes is very hard. While meteorological drought can accurately be monitored using precipitation only, estimating agricultural drought is more difficult. This is because agricultural drought is dependent on the meteorological drought, the impacts on the vegetation, and the resilience of the crops. As such not only precipitation estimates are required but also evapotranspiration at plant/plot scale.

Evapotranspiration (ET) describes the amount of water evaporated from soil and vegetation. As 65% of precipitation is lost by ET, drought severity is highly linked with this variable. In drought research, the precise quantification of ET and its spatio-temporal variability is therefore essential. In this view, remote sensing based models to estimate ET, such as SEBAL and SEBS, are of high value.
However the resolution of current evapotranspiration products are not good enough for monitoring the impact of the droughts on the specific crops. This limitation originates because plot scales are in general smaller than the resolution of the available satellite ET products. As such remote sensing estimates of evapotranspiration are always a combination of different land surface types and cannot be used for plant health and drought resilience studies.

The goal of this research is therefore to enable adequate resolutions of daily evapotranspiration estimates for monitoring crop health during the severe drought events. The presentation will provide results of the investigation into Droughts using time series of coarse resolution daily evapotranspiration produced from the SEBS remote sensing model, on basis of MODIS data. The evapotranspiration will be converted into drought severity using the evapotranspiration deficit index (ETDI). Afterwards the disaggregation to plot scale will be investigated. This disaggregation will be performed as a weighted filtering on basis of crop-coefficient at high resolution. These growth stage of the vegeation (needed for the estimation of the crop coefficients) are estimated on basis of Normalized Difference Vegetation Index (NDVI) using Landsat 5,7 and 8 observations. The final result of the research provides good statistical information about drought resilience and crop health.