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Drought monitoring over the Horn of Africa using remotely sensed evapotranspiration, soil moisture and vegetation parameters

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The need to good drought monitoring and management for the Horn of Africa has never been greater. This ongoing drought is the largest in the past sixty years and is effecting the life of around 10 million people, according to the United Nations. The impact of drought is most apparent in food security and health. In addition secondary problems arise related to the drought such as large migration; more than 15000 Somalia have fled to neighboring countries to escape the problems caused by the drought. These problems will only grow in the future to larger areas due to increase in extreme weather patterns due to global climate change. Monitoring drought impact and managing the drought effects are therefore of critical importance.

The impact of a drought is hard to characterize as drought depends on several parameters, like precipitation, land use, irrigation. Consequently the effects of the drought vary spatially and range from short-term to long-term. For this reason a drought event can be characterized into four categories: meteorological, agricultural, hydrological and socio-economical. In terms of food production the agricultural drought, or short term dryness near the surface layer, is most important. This drought is usually characterized by low soil moisture content in the root zone, decreased evapotranspiration, and changes in vegetation vigor. All of these parameters can be detected with good accuracy from space. The advantage of remote sensing in Drought monitoring is evident.

Drought monitoring is usually performed using drought indices, like the Palmer Index (PDSI), Crop Moisture Index (CMI), Standard Precipitation Index (SPI). With the introduction of remote sensing several indices of these have shown great potential for large scale application. These indices however all incorporate precipitation as the main surface parameter neglecting the response of the surface to the dryness. More recently two agricultural drought indices, the EvapoTranspiration Deficit Index (ETDI) and the Soil Moisture Deficit Index (SMDI), have been proposed to investigate this. The ETDI considers the stress ratio caused by the difference between potential and actual evapotranspiration, while SMDI considers the variation in soil moisture availability to the plant. As there is not a single unique accepted definition of drought, investigation into the impact of drought should not be confined to a single drought index; instead several indices need to be used for this purpose.

The objective of this research is to investigate the drought in the Horn of Africa using several remote sensing drought indices and vegetation parameters. In this research the drought will be investigated using SPI, ETDI, SMDI, NDVI and SPI. For this purpose ETDI and SMDI will be estimated from remote sensing products for the period from 2002 till 2011that are created in framework of the WACMOS project. The research involves the comparison of the different drought indices and the research into possible synergies to enhance drought monitoring.