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Improved drought monitoring in the Greater Horn of Africa by combining meteorological and remote sensing based indicators

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Drought is a complex and insidious natural hazard. It is hence difficult to detect in its early stages and to monitor its spatial evolution. Defining drought is already a challenge and can be done differently by meteorologists, hydrologists or socio-economists. In each one of these research areas, various indicators were already set up to depict the development of drought. However they are usually considering only one aspect of the phenomenon. The development of integrated indicators could help to detect faster/better the onset of drought, to monitor more efficiently its evolution in time and space, and therefore to better trigger timely and appropriate actions on the field.

In this study, meteorological and remote sensing based drought indicators were compared over the Greater Horn of Africa in order to better understand:
(i) how they depict historical drought events ;
(ii) if they could be combined into an integrated drought indicator.

The meteorological indicator selected for our study is the well known Standardized Precipitation Index, SPI. This statistical indicator is evaluating the lack or surplus of precipitation during a given period of time as a function of the long-term average precipitation and its distribution.

Two remote sensing based indicators were tested: the Normalized Difference Water Index (NDWI) derived from SPOT-VEGETATION and the Global Vegetation Index (VGI) derived form MERIS. The first index is sensitive to change in leaf water content of vegetation canopies while the second is a proxy of the amount and vigour of vegetation. For both indexes, anomalies were estimated using available satellite archives.

Cross-correlations between remote sensing based anomalies and SPI were analysed for five land covers (forest, shrubland, grassland, sparse grassland, cropland and bare soil) over different regions in the Greater Horn of Africa. The time window for the statistical analysis was set to the rainy season, as it is the most critical period for vegetation growth. Moreover the behaviour of those indicators was also investigated during major historical droughts reported in the Emergency Database (EM-DAT) of the Centre for Research on the Epidemiology of Disasters (CRED, Leuven Belgium). Results of both analyses will be discussed during the conference.