Development of advanced satellite based products for drought monitoring

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The focus of this work is on the development of satellite based products for drought monitoring that can be easily interpreted by non specialists. Currently satellite images are used to monitor vegetation activity by international and national organisations through the production of Normalised Difference Vegetation Index (NDVI) images. An image for a particular time of year is normally compared with the corresponding long term average NDVI image and/or the previous period or year NDVI image by calculating a difference image. However, this does not take into account variations in terms of cover types and because the range of NDVIs will be different for different locations, the severity of seasonal variations can not be easily inferred. This makes the interpretation of these products difficult to be made particularly for non specialists.

For a given location, there is often a strong relationship between rainfall and the NDVI. However, this relationship is likely to change for a different location with a different land cover type. When plotting the average NDVI profile from long term NDVI archives, different cover types will exhibit different profiles with some always showing higher values than others and different duration of the vegetation development.

Map products based on the NDVI were put into historical context and stratified to remove effects of the main vegetation types in order to assess vegetation status. The historical data were extracted from the Africa Data Dissemination Service NDVI archive hosted by the US Geological Survey and processed to obtain a statistical distribution of the NDVI for each 10-day period of the year and vegetation type by applying techniques commonly used in hydrology for the prediction of extreme events. The quintile probability ranges were used to define five classes of a Vegetation Productivity Indicator (VPI).

NOAA-AVHRR images acquired in real-time through direct reception from the satellite or downloaded from the internet can be processed to derive a VPI map for each 10-day period. In Etosha National Park and in Zambia, the VPI was strongly related to the rainfall and the VPI maps provided improved information on the spatial variations. The VPI for the main agricultural region of Zambia was significantly correlated with maize production. The VPI methodology was also applied operationally in Botswana and Namibia. A series of map products were produced to assist decision makers at government level on determining the extent and severity of drought conditions. For the successful implementation of the VPI methodology, the issue of ownership and institutional support must be carefully considered.