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Drought influence on vegetation behavior in Mediterranean basin

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The strong dependence of Mediterranean vegetation on water availability has been for long known. Drought events are relatively frequent in Mediterranean countries and prolonged intense drought episodes are responsible for the most negative impacts on vegetation, such as losses in crop yields, increases of fire risk, declines of forest growth and land degradation and desertification.
The aim of the present work is to analyze in detail the impact of drought episodes on vegetation behavior in the Mediterranean region during the last three decades. For this purpose we use the Normalized Difference Vegetation Index (NDVI) from the Global Inventory Modeling and Mapping Studies (GIMMS) dataset, as obtained from NOAA-AVHRR sensor and the recently developed multi-scale drought index Standardised Precipitation-Evapotranspiration Index (SPEI, Vicente-Serrano et al, 2010).
The study aims to analyze the drought impacts on vegetation dynamics since the early 1980s over the entire Mediterranean region, with the purpose of determining the most sensitive areas and land cover types. Additionally we need to evaluate this impact on a seasonal basis and identify which drought-time scales are more prone to cause negative effects on vegetation. Thus, correlation maps between fields of monthly NDVI and SPEI for time scales ranging between 1 and 24 months were computed in order to identify the regions and seasons most affected by climatic droughts. The role played by vegetation density and aridity on drought impacts on vegetation were also analyzed for different regions of the Mediterranean basin. Vegetation affected by drought presents high spatial and seasonal variability, with a maximum in summer and a minimum in winter. During February half of these affected pixels correspond to time scale of 6 months, while in November the most frequent time scale corresponds to just 3 months, representing more than 40% of the pixels affected by drought. While in February sparse vegetation is the most affected land cover type, rainfed crops are the most affected land cover during summer and autumn. Furthermore, for Iberian rainfed crops, we found a clear dependence of drought impacts with aridity and annual mean of NDVI.

Vicente-Serrano S.M., Beguería S., López-Moreno J.I., 2010: A Multi-scalar drought index sensitive to global warming: The Standardized Precipitation Evapotranspiration Index – SPEI. Journal of Climate 23(7), 1696-1718, DOI: 10.1175/2009JCLI2909.1