



The 2005 and 2012 major drought events in Iberia: monitoring vegetation dynamics and crop yields using satellite data.

Célia M. Gouveia (1,2) and Ricardo M. Trigo (1)

(1) Universidade de Lisboa, Instituto Dom Luiz, IDL, LISBOA, Portugal (cmgouveia@fc.ul.pt), (2) Escola Superior de Tecnologia de Setúbal, Instituto Politécnico de Setúbal, Portugal

The Iberian Peninsula is recurrently affected by drought episodes and therefore by the adverse effects associated that range from severe water shortages to economic losses and related social impacts. During the hydrological years of 2004/2005 and 2011/2012, Iberia was hit by two of the worst drought episodes ever recording in this semi-arid region (García-Herrera et al., 2007; Trigo et al., 2013). These two drought episodes were extreme in both its magnitude and spatial extent. A tendency towards a drier Mediterranean for the period 1970-2010 in comparison with 1901-70 has been identified (Hoerling et al., 2012), reinforcing the need for a continuous monitoring of vegetation stress and reliable estimates of the drought impacts.

The strong effect of water scarcity on vegetation dynamics is well documented in Mediterranean and other semi-arid regions. Despite the usual link established between the decrease of vegetation greenness and the lack of precipitation during a considerably long period, the impact on vegetation activity may be amplified by other climatic anomalies, such as high temperature, high wind, and low relative humidity.

The recent availability of consistent satellite imagery covering large regions over long periods of time has progressively reinforced the role of remote sensing in environmental studies, in particular in those related to drought episodes (e.g. Gouveia et al., 2009).

The aim of the present work is to assess and monitor the cumulative impact over time of drought conditions on vegetation over Iberian Peninsula. For this purpose we have used the regional fields of the Normalized Difference Vegetation Index (NDVI) as obtained from the VEGETATION-SPOT5 instrument, from 1999 to 2013. The entire 15-yr long period was analysed, but particular attention was devoted to the two extreme drought episodes of 2004-2005 and 2011-2012. During the hydrological years of 2004-2005 and 2011-2012 drought episodes negative anomalies of NDVI were observed over large sectors of Iberia for up to seven months (out of eleven) of the vegetative cycle. While in the case of the drought episode of 2005 the impact on vegetation covered roughly 2/3 of the Iberian Peninsula (Gouveia et al., 2012), whereas in the recent episode of 2012 the deficit in greenness affected a more restrictive area located in central Iberia. The vegetation response to water stress was also analysed and compared for different land cover types. Results revealed a stronger vulnerability to drought events for arable land with severe impacts on cereals crop productions and yield (namely wheat), for Portugal and Spain in both years, however slightly less severe for 2012. In conclusion, and from an operational point of view, our results reveal the ability of the developed methodology to monitor vegetation stress and droughts in Iberia.

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