Modelling crop yield in Iberia under drought conditions

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The improved assessment of the cereal yield and crop loss under drought conditions are essential to meet the increasing economy demands. The growing frequency and severity of the extreme drought conditions in the Iberian Peninsula (IP) has been likely responsible for negative impacts on agriculture, namely on crop yield losses. Therefore, a continuous monitoring of vegetation activity and a reliable estimation of drought impacts is crucial to contribute for the agricultural drought management and development of suitable information tools.

This works aims to assess the influence of drought conditions in agricultural yields over the IP, considering cereal yields from mainly rainfed agriculture for the provinces with higher productivity. The main target is to develop a strategy to model drought risk on agriculture for wheat yield at a province level. In order to achieve this goal a combined assessment was made using a drought indicator (Standardized Precipitation Evapotranspiration Index, SPEI) to evaluate drought conditions together with a widely used vegetation index (Normalized Difference Vegetation Index, NDVI) to monitor vegetation activity. A correlation analysis between detrended wheat yield and SPEI was performed in order to assess the vegetation response to each time scale of drought occurrence and also identify the moment of the vegetative cycle when the crop yields are more vulnerable to drought conditions.

The time scales and months of SPEI, together with the months of NDVI, better related with wheat yield were chosen to perform a multivariate regression analysis to simulate crop yield. Model results are satisfactory and highlighted the usefulness of such analysis in the framework of developing a drought risk model for crop yields. In terms of an operational point of view, the results aim to contribute to an improved understanding of crop yield management under dry conditions, particularly adding substantial information on the advantages of combining vegetation and hydro-meteorological drought indices for the assessment of cereal yield. Moreover, the present study will provide some guidance on user's decision making process in agricultural practices in the IP, assisting farmers in deciding whether to purchase crop insurance.