Assessing spatial and temporal patterns of agriculturally relevant extreme events by means of agroclimatic indices

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In many areas of Europe, the summer of 2015 has been characterized by extreme high temperatures, coming very close in terms of temperature anomalies to the record-breaking summer of 2003. Concerns about the effects of this recent heat-wave on agricultural production have stressed once more the need for a comprehensive assessment of the occurrence of agriculturally relevant extreme events across the European agricultural landscape. Using agroclimatic indicators for gauging extreme heat and drought and based on gridded weather data from the E-OBS database, we present in this contribution an evaluation of the temporal and spatial patterns of extreme heat and drought for the period 1951-2013.

Our results indicate that 15-20% of the agricultural area have been in drought, on average, during this time. They also show that the fraction of crop area under extreme heat has significantly increased since the 1980s, if shifts in crop phenology are not taken into account. We show, however, that increasing temperatures have caused a faster crop development. In the case of winter wheat, for instance, there has been an anticipation of the date of maturity by about 10 days during 1981-2000. This has implication of the occurrence of extreme heat, has a faster crop development implies a higher likelihood of avoiding critical conditions during summer.

Complementing this analysis, we finally present a new web-based tool (webXTREME, http://modextreme.org/webxtreme/) which, given time series of precipitation and daily maximum and minimum temperatures, allows for a quick assessment of the occurrence of extreme conditions in crop production.