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Spatial and temporal variability of Mediterranean drought events

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The original Palmer Drought Severity Index (PDSI) and a recent adaptation to European soil characteristics, the Self Calibrated PDSI (or scPDSI) proposed by Schrier et al (2005) were used. We have computed monthly, seasonal and annual trends between 1901 and 2000 but also for the first and second halves of the 20th century. Results were represented only when achieving a minimum level of statistical significance (either 5% or 10% using a Mann-Kendall test) and confirm that the majority of the western and central Mediterranean is getting drier in the last decades of the 20th century while Turkey is generally getting wetter (Trigo et al., 2006). The spatio-temporal variability of these indices was evaluated with an EOF analysis, in order to reduce the large dimensionality of the fields under analysis. Spatial representation of the first EOF patterns shows that EOF 1 covers the entire Mediterranean basin (16.4% of EV), while EOF2 is dominated by a W-E dipole (10% EV). The following EOF patterns present smaller scale features, and explain smaller amounts of variance. The EOF patterns have also facilitated the definition of four sub-regions with large socio-economic relevance: 1) Iberia, 2) Italian Peninsula, 3) Balkans and 4) Turkey. The inter-annual variability of the regional spatial droughts indices for each region was analyzed separately. We have also performed an evaluation of their eventual links with large-scale atmospheric circulation indices that affect the Mediterranean basin, namely the NAO, EA, and SCAND.

Finally we have evaluated the main sources of moisture affecting two drought prone areas in the western (Iberia) and eastern (Balkans) Mediterranean. This analysis was performed by means of backward tracking the air masses that ultimately reach these two regions using the Lagrangian particle dispersion model FLEXPART (Stohl et al., 1998) and meteorological analysis data from the ECMWF to track atmospheric moisture. This was done for a five-year period (2000–2004) and using ECMWF operational analysis available every six hours (00, 06, 12 and 18 UTC) with a 1ºx1º resolution (Sthol et al., 2004). Following the approach used by the authors for the Sahel (Nieto et al., 2006) and Tropical south America (Nieto et al., 2008) we traced (E-P) backwards from both regions, limiting the transport times to 10 days, which is the average time that water vapor resides in the atmosphere. In order to evaluate possible shifts in the origin of the moisture sources (between wet and dry years) this analysis was performed independently for dry and wet winter seasons.

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