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Seasonal precipitation changes in Western Mediterranean areas from 1945 to 2005

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We present an evaluation of seasonal precipitation trends over Spanish conterminous land, using recently developed high resolution grid (1/10 degree longitude and latitude) derived from the MOPREDAS database. Original database comprise 2670 complete and homogeneous monthly precipitation series for the 1946-2005 period, and grid includes 5334 points.

Given that spatial distribution of seasonal precipitation regimes in the Iberian Peninsula shows a complex pattern, traditionally described space domains of seasonal rainfall regimes in Spain may be changing accordingly seasonal trends. To this end, we calculated and compared the seasonal precipitation regimes observed in two consecutive 30-year periods (1946-1975 and 1976-2005).

Winter precipitation decreased in the whole of conterminous Spain during the study period, except along the Mediterranean coast and in isolated areas of the northern plateau. The areas with the strongest negative signal ($p<0.10$) affect approximately 10.4% of the territory. The negative spring signal trend affects almost 40% of the territory ($p < 0.10$). The spatial distribution of the summer trend is similar to that of spring, but the statistical significance is lower The areas affected ($p<0.10$) account for approximately 17% of the territory. Finally, positive significant trend ($p<0.10$) in autumn were detected in approximately 10% of the territory. As a consequence seasonal contribution trend (in %) changed: being the most notable results the global decrease in spring, and, to a lesser extent, the summer and winter contributions, whereas the contribution of autumn precipitation to total annual increase covers practically the whole territory.

We found that, from the total of 24 possible permutations between winter, spring, summer and autumn as dominant, 12 coexist over Spanish conterminous land. On comparing the two 30-year sub-periods, the percentage of territory in which winter constitutes the dominant precipitation season decreases from 51.1% to 42.7% of the total study area. Similarly, spring was the dominant precipitation season in 36.1% of the territory in the 1946-1975 period, whereas in the 1976-2005 period, it is the dominant one in less than half (15.1%) the territory. This contrasts with areas where autumn constituted the main precipitation season, which increased from 10.8% (restricted to the Mediterranean coast) to 41.4% of the territory. The variations of seasonal precipitation patterns can be explained by a sub-tropicalization of the IP climate (with a reduction of rainfall amounts from winter to summer), and by increase in the autumn rainfall percentage.