



The role of the jetstream on the extreme precipitation in the Euro-Mediterranean region: the 2009-2010 case study.

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This case study refers to winter 2009-2010 and spring 2010, when the Euro-Mediterranean region experienced anomalous climate conditions, with particularly abundant precipitation. In this study, the relationship between the rainfall anomalies in the Mediterranean basin in DJF 2009-2010 and in May 2010 is analysed in relation to the position of the jetstream in the Euro-Mediterranean region.

Having divided the Mediterranean region (MB, 10°W-40°E, 30°N-50°N) in three subregions (western, WM; central, CM; eastern, EM), the analysis of the rainfall shows that the monthly precipitation exceeded the 90th percentile (1979-2010 base period) in December 2009 in MB and EB; in January 2010 in MB; in February 2010 in MB, WM, CM, EM; and in May 2010 in CM.

During DJF 2009-2010, the Atlantic and African jets were almost aligned, the westerly flow was anomalously strong over southern Europe, because of the anomalous southerly position of the Atlantic jet, which carried a number of Atlantic storms into the Mediterranean basin causing an excess of rainfall. The jetstream anomaly was associated to a positive (negative) vorticity anomaly aloft over the northern (southern) MB, with mid-tropospheric ascending motions induced by the meridional ageostrophic circulation, accompanied by abundant precipitations. Moreover, in the lower troposphere there was an increase of CAPE, and in the higher troposphere there was an increase of vertical velocity.

In May 2010, the heavy precipitation anomaly in central Europe were associated to a general reinforcement and to an enhanced south-eastern tilt of the Atlantic jet, accompanied to a northward displacement of the African jet into the Mediterranean basin. This anomalous distribution of the jetstream was associated to a positive (negative) vorticity anomaly aloft over the northern-central (southern-eastern) MB with wet (dry) anomalies in the central (western and eastern) MB. The western-central Mediterranean was also interested by a decrease of CAPE, associated to the ageostrophic circulation in the tail of the African jet, and, from west to east, a negative-positive-negative pattern in the vertical velocity was observed.

Concluding, the analysis shows that the extreme precipitation anomalies in the Mediterranean during winter 2009-2010 and spring 2010 were associated to significant anomalies of the jetstream intensity, displacement and tilt. The winter positive rainfall anomalies in the MB were associated to a merging of the Atlantic and African jets along the North African coast and to positive anomalies in the CAPE tendency in the lower troposphere. The spring positive rainfall anomalies in the CM were associated to a northward migration and intensification of the African jet, which generated upward motions in the higher troposphere.