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Seasonal precipitations in the Central Mediterranean basin and large scale climate patterns

Marina Baldi (1), John David Dalu (2), Giorgio Bartolini (3), Daniele Grifoni (1,3), Gianpiero Maracchi (2), Bernardo Gozzini (1,3), Giovannangelo Dalu (1,2)

(1) Institute of Biometeorology, CNR - Ibimet, Rome, Italy (m.baldi@ibimet.cnr.it), (2) Climate and Sustainability Foundation, Florence, Italy, (3) LaMMA Consortium, Sesto Fiorentino (FI), Italy

The Mediterranean climate is characterized by dry warm seasons and rainy cold seasons, with important seasonal differences in the rainfall distribution at sub-basin scale and a large month-to-month variability. Since the Mediterranean climate is a complex and articulated system, the focus of this work is mainly on those large scale climate patterns which can have an impact on the rainfall variability in the central part of the Mediterranean basin (CM). The analysis is done using NCEP-NCAR reanalysis and 50 years of rainfall gauge data. The approach used in this work is based on previous results obtained by other authors on the rainfall distribution in the Mediterranean region. The configurations of the SSTs and of the jetstream, the vorticity field and the CAPE production are analyzed in relation to anomalous wet or dry seasons in the Central Mediterranean basin.

Most of the rainfall accumulation occurs in the cold months. In wet years, the south-east edge of the Atlantic jet joins the north-west edge of the African jet; i.e. the south-eastwards bending of the Atlantic jet, induced by the cold Euro-Asia land mass, reduces the distance of the exit region of Atlantic jet from the entrance region of the African jet to the east of the Italian peninsula. With this jetstream configuration, the vortex in the Gulf of Genoa is rather intense; and the convective available potential energy (CAPE) released over the Tyrrhenian Sea by the south-eastward flow in its west flank is fully replenished by the CAPE generated over the Adriatic Sea by the north-eastwards flow in its east flank. In dry years, when the Atlantic jet points towards North Europe, the vortex in the Gulf of Genoa is less intense, and less CAPE is released in the west flank of this vortex, while only about one third of the CAPE is replenished in the east flank.

On a seasonal time scale, the wettest season is fall, followed by spring, winter and summer. The seasonal variability is rather large, with wet winters as wet as falls, and wet summers as wet as winters. On a monthly time scale, the rainiest month is November, and the driest month is July. The month-to-month variability is large, but, on a yearly base, the rainfall cumulated in wetter months is almost compensated by a lesser rainfall accumulation in dry months. In summer, when the West Africa monsoon strengthens, the Libyan anticyclone invades the CM, and this basin is mostly dry. Summer months are wet when a strong African jet flows along the coast of North Africa, confining the Libyan high in the Sahara desert, and importing perturbations originated over the Tropical Atlantic into the Mediterranean basin.