



## **Extreme precipitation events over the Western Mediterranean: statistical characteristics and links to ex-hurricane activity over the North Atlantic**

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Large-scale meteorological conditions leading to hydrological extreme events over Northwest Italy are investigated. Using an extensive database of hourly rain gauge data, the most extreme events from 1948 until 2005 are identified and classified based on hydrological criteria: annual daily rainfall maxima exceed a defined threshold, previously calculated on the basis of a 2-components extreme value distribution. Based on ERA40 data, the diagnostic analysis of the synoptic developments is performed by analysing the role of cyclones, moisture advection, and the possible influence of recurving North Atlantic tropical storms on the development of the events. A hierarchical cluster analysis is applied to the rainfall annual maxima observed in the study area. Subsequently, the resulting clusters are evaluated with respect to associated weather patterns and the role of recurving hurricanes. The clustering revealed that the extraordinary rainfall events associated with large-scale forcing (in particular those associated with ex-hurricanes) are attributed to three clusters (of eight), clearly separated e.g. from the (much more frequent) convective events that affect smaller areas. The local triggering of the events is in almost all cases associated with cyclogenesis in the Western Mediterranean. The additional moisture advected from the North Atlantic into the Mediterranean Basin plays a major role in the magnitude of the events. Therefore, it is concluded that the extraordinary rainfall events over Northwest Italy feature different synoptic developments, which reflects in identifiable differences in their statistical

characteristics.