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High-resolution numerical study of Mediterranean Heavy Precipitating Events: characterisation of the moisture feeding the systems.

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The Western Mediterranean region is regularly affected by Heavy Precipitating Events (HPE) potentially causing devastating flash-floods. Most of them are associated with quasi-stationary mesoscale convective systems. The meteorological ingredients favouring these events are quite well-known. A slow-evolving synoptic environment associated to a conditionally unstable and moist low-level converging flow impinging an orographic barrier enables the release and the support of deep convection. Middle troposphere dry air masses also impact on the precipitating convective system by favouring the evaporation of precipitation, thus enhancing the downdrafts and the formation of a cold pool which behave as a new orographic barrier. The characteristics of the moisture field play a major role in the initiation and life of the precipitating system. This study aims at featuring these characteristics and determining more precisely their impact on the release, stationarity, localisation and intensity of the system.

High-resolution numerical simulations of HPE are performed with the research model Meso-NH. Moisture flow and dry air masses are identified and characterised. The sensitivity of the localisation and intensity of the precipitating systems to the horizontal distribution and the speed of the moisture flux is investigated. Backward trajectories are computed using eulerian passive tracers to diagnose the interactions and the origin of the different air masses involved in the precipitating systems. Past studies have shown that the Mediterranean Sea is an important local source of moisture but that other remote sources such as extra-tropical transitions of cyclones could contribute significantly to the intense precipitations. The relative importance of the various moisture sources is here quantified. The time scales and distances over which the moisture is transported to the precipitation region are also assessed.