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O2.8. Heavy precipitation over northern Italy and atmospheric rivers in the Mediterranean

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Several recent studies have revealed the importance of remote sources of water vapour to feed the precipitation systems in the Mediterranean basin, in addition to the local contribution due to evaporation from the sea. In some of the most severe flooding events over northern Italy, and the Alpine area in particular, the transport of moisture organized along narrow a corridor, known as atmospheric river, was a critical ingredient for the occurrence of extreme rainfall.

The national project ARMEX, funded by the Italian Ministry of Universities and Research, aims at exploring atmospheric rivers in the Mediterranean and their connection with extreme hydrometeorological events over Italy. It involves expertise in both meteorological and hydrological modelling as well as in remote sensing monitoring.

On the one hand, a detection algorithm, designed for the open oceans, has been adapted to the peculiar complex morphology of the region and applied to conduct a climatological investigation, exploiting ERA5 reanalysis. The aim is to assess the presence and the frequency of atmospheric rivers in the Mediterranean and their possible relationship with extreme hydrometeorological events over northern Italy during the last decades. On the other hand, high-resolution numerical simulations are used in a case-study approach to investigate dynamical mechanisms and impacts of atmospheric rivers, and to delineate their characteristics. In this context, a tracking method that exploits satellite observations has been developed to reinforce numerical forecasts and for a real-time monitoring application.