



The dynamical link between deep Atlantic extratropical cyclones and intense Mediterranean cyclones

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Breaking of atmospheric Rossby waves has been previously shown to lead to intense Mediterranean cyclones, one of the most prominent environmental risks in the region. Wave breaking may be enhanced by warm conveyor belts (WCBs) associated with extratropical cyclones developing over the Atlantic Ocean. More precisely, WCBs supply the upper troposphere with air masses of low potential vorticity that, in turn, amplify ridges and thus favor Rossby wave breaking. This study identifies and validates the relevance of the mechanism that connects Atlantic cyclones and intense mature Mediterranean cyclones through ridge amplification by WCBs. Using ECMWF ERA-Interim reanalyses and a feature-based approach, we analyze the 200 most intense Mediterranean cyclones for the years 1989-2008 and show that their majority (181 cases) is indeed associated with this mechanism upstream. Results show that multiple Atlantic cyclones are associated with each case of intense Mediterranean cyclone downstream. Moreover, the associated Atlantic cyclones are particularly deep compared to climatology.