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Discontinuous Cyclone Movement of Mediterranean cyclones identified through formation analysis of daughter cyclones

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A new algorithm developed performs an automated classification methodology for daughter cyclones (DCs) formation, with respect to the thermal field of the parent cyclones (PCs). The classification has been applied to winter Mediterranean Cyclones. The algorithm assigns a DC to one of seven types, according to the following considerations: Has the cyclone formed on a front? Is that a cold, a warm or a quasi-stationary front? Is this front part of the frontal system of the PC or of a non-parental system? If none of the above applies, has the cyclone formed within the warm sector?
The measures used are the temperature gradient, temperature advection and temperature Laplacian, computed at the formation location of the DC and the temperature difference between the DC and the PC, each derived from the 850-hPa wind and temperature fields.
Out of 4,303 DCs analyzed, 85% were identified to belong to one of the 7 predefined types, implying that 15% cannot be related to either baroclinic or thermal factors. More than half were formed at their PCs' frontal system, third on a non-parental frontal system and only 13% within the warm sector of the PC. Most of the cyclones, formed on the PC's cold front, were found at mountain lee locations, whereas cyclones formed on the warm front were generated mostly over the Aegean and the Adriatic Sea. The new methodology exposed a unique DC formation which is actually a Discontinuous Cyclone Movement (DCM), imposed by an encounter with geographical forcing. This formation was identified in 5.9% of the DC formations and is characterized by the following features: 1) parent-daughter distance (d) <1000 Km, 2) the area enclosed by the inner isobar surrounding both the PC and the DC should be less than 2 [U+F070] d, 3) the PC should last no more than 18 hours after the DC has been first detected.
DCM events found among DCs formed on warm fronts of PCs, to their east, are suggested as a mechanism which enables the PC to cross topographic barriers encountered along its way. DCM events found among DCs formed on cold fronts were formed west of their parents, mostly in the northeastern Mediterranean, near Cyprus, and west of Italy. The westward direction of DCMs formed on the cold front might be regarded as a cyclone regeneration mechanism, after the parent cyclone has been moved out from a cyclogenetic area by the steering effect of upper-level westerlies.