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On the statistical analysis of explosive-cyclogenesis over the Mediterranean Sea using ERA5 dataset

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The Mediterranean Sea is a semi-enclosed, fairly temperate, mid-latitude marine basin, strongly influenced by the North-Atlantic atmospheric circulations. A wide variety of cyclogenesis mechanisms are known to develop within this basin, including baroclinic waves coming from the Atlantic, Mediterranean cyclogenesis originating from the cut-off of baroclinic waves, Tropical-Like Cyclones (TLC) and explosive-cyclogenesis (EC). Depending on the cyclone type, the frequency of appearance can vary, ranging from tens per month to 1.5 per year, as in the TLC case. ECs are among the rarest and probably most intense and destructive cyclogenesis events that can develop within the Mediterranean basin; they usually originate at high latitudes, during wintertime, and mainly over the sea, preferring areas with high Sea Surface Temperature (SST) gradients. These events are determined by 12 different parameters, among which the main one is the quick drop of pressure, close to 1hPa/hr for 24 hours, within the eye of the cyclone. ECs formation is an extremely complicated process, and in the Mediterranean basin it is probably driven by air intrusions from the stratosphere and by the presence of Atmospheric Rivers. Starting from the analysis of the EC event called "Vaia Storm", occurred in the Central Mediterranean Basin on October 29th 2018, and using ERA5 dataset, we firstly conducted a physical and dynamical analysis of the event, by pointing out some recurring characteristics previously highlighted in other works, on both local and synoptic scale. Secondly, we analyzed the results given by the reanalysis model ERA5 regarding the period January 1st 1950 – January 1st 2020, identifying other cyclogeneses with the same features, such as the event on November 4th 1966. On the basis of these information, the return period of the EC events was defined, as well as its statistical distribution and seasonality and correlation with NAO and EA indexes (both strongly negative). Further analysis are currently undertaken to determine correlations with SCAND index and possible SST anomalies in the Central Mediterranean Basin.