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Long-lasting deep convective systems occurring in the Mediterranean basin: a four years (2007-2010) study

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A large part of natural disasters in the Mediterranean are directly or indirectly caused by convective systems (Funatsu et al., 2008). Since this basin has been identified as one of the most responsive to global climatic changes (Giorgi, 2006), the study of deep convective systems (DCS) is becoming a hot topic to deeply investigate. The major reason to go through the mechanisms driving such events is given by the growing need to have timely and precise predictions of severe weather events, especially in areas that show to be more and more sensitive to their occurrence.

When dealing with severe weather events, either for research purposes or operational forecasting activities, it is necessary to precisely know the conditions under which these events take place to upgrade conceptual models or theories, and consequently to improve the quality of forecasts as well as to establish effective warning decision procedures (Brooks and Dotzek, 2008).

The spatial and seasonal variability of DCS occurrence have been investigated, as well as the most favourable synoptic precursors for their initiation, using geostationary Meteosat Second Generation (MSG) satellite data, supported by the European Centre for Medium-Range Weather Forecasts (ECMWF) analyses and severe weather reports recorded by the European Severe Weather Database (ESWD).

The analysis has shown the existence of some preferential areas of DCS genesis and development, mainly located in the western and central Mediterranean (i.e. around Balearic Islands and Ionic and Tyrrhenian seas, respectively), where these systems develop and grow preferentially in fall (i.e. September and October). The analysis of a selected set of Synoptic Precursors (SPs) has shown how the totality of the identified cases has occurred downstream a mid-tropospheric (500 hPa) disturbance (trough or cut-off) within a southerly flow, with high values of θe (at 850 hPa) and precipitable water. Moreover, the approaching of an upper level tropopause dynamical anomaly coupled with a local maximum of upper and low level horizontal wind speed, seems to play a very important role in triggering convection. Finally, a careful crosscheck of the detected cases with the ESWD reports has allowed to investigate the severity of these systems, as they often affect population and produce significant damages.

In a long-term perspective, this study aims at collecting a climatological database of long-lasting DCS occurring in the Mediterranean sea that may critically impact on the Italian peninsula and potentially affect population: an objective procedure able to support meteorological services in early decisions and accurate nowcasting has planned to be developed to fully respond to this issue.