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Synoptic-dynamic anomalies connected with the genesis of Mediterranean cyclones responsible for rain floods in central Europe

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Cyclonic disturbances causing high impact weather in the Mediterranean occasionally leave the Mediterranean region and move to higher latitudes. They often reach central Europe where they are usually responsible for heavy, widespread and steady rains producing floods in the major rivers in the warmer half-years. The potential dangerousness of such a development motivated us to investigate synoptic-dynamic conditions preceding and accompanying the genesis of the disturbances in more detail.

In the first step, we define the set of the most significant rain flood events which occurred in the Czech Republic from 1958 to 2002. The selection criterion takes into account both the aggregate area of affected catchments and the return period of respective peak flows. We further consider only the events which were characterized by the passage of a Mediterranean cyclone across central Europe. In the next step, we employ re-analyses ERA-40 with the horizontal resolution of 2.5 degrees. In order to investigate synoptic-dynamic conditions of the selected events, we apply a method of synoptic-dynamic anomalies. The method quantifies the anomalousness of the values of any dynamic and thermodynamic characteristics of the atmosphere by the value of cumulative distribution function in individual grid points. The analysis of the spatio-temporal correspondence of the anomalies reveals that the genesis of cyclonic disturbances is regularly preceded and accompanied by synoptic-dynamic anomalies not only in the vicinity of the disturbances but also outside the Mediterranean region, particularly over the Atlantic.