

Economic impact of cyclonic structures in Europe

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Cyclonic systems play a crucial role in the European and Mediterranean region meteorology in particular between the late summer and the early winter. Cyclonic systems often induce severe weather condition in terms of heavy and/or long-lasting precipitation with related phenomena such as strong winds and lightning. Recent studies have shown that cyclonic structures confined in the mid-upper troposphere, among which the so-called cut-off low, are responsible of the set-up of instability up to at the lower levels sometimes leading to convective precipitation. On the other hand, the eventual rain pattern associated to a lower levels cyclone it is seen to be related to its vertical structure and to the presence of a driving upper levels low pressure.

In this work the occurrence of cyclonic events (both surface and upper air) is estimated and matched with an economic losses database to derive a relation between the atmospheric structure and their impact on the economic and social environment. Based on the ERA40 Reanalysis, a 10 years database of surface and upper air low pressure systems has been constructed by means of an automatic pattern recognition algorithm, evidencing typical structure, lifetime, path and sources. The economic losses are estimated from insurance company records, with indication of location, date and type of events, and related losses in terms of damages and casualties. Results show the relative high impact of cyclonic structures of human life in Europe, especially if coupled with the physiography of the ground (e.g. coastlines and orography), evidencing the need of further studies on both modeling and observations.