EMS Annual Meeting Abstracts
Vol. 10, EMS2013-514, 2013
13th EMS / 11th ECAM

An objective synoptic classification of tornadic days over Greece

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Gridded analysis of weather and climate based on high spatial and temporal resolution is getting more and more important for assessing the spatial and temporal variability of severe weather phenomena such as tornadoes and waterspouts. This increased demand requires new efficient methods using synoptic classification tools and geographical information systems (GIS) in order to estimate the vulnerability and thereafter to mitigate the impact on the local society.

The goal of this study is to present the seasonal synoptic classification using the spatio-temporal database of severe weather (tornadoes and waterspouts) of Greece using seasonal synoptic classifications of gridded mean sea level pressure (MSLP) and geopotential height data from 1948 to 2012. The synoptic classifications were produced using the computer program Synoptic Typer Tools (STT). STT is an international synoptic typing system written in IDL 8.2 and uses Principal Component Analysis and K-means Cluster Analysis to classify MSLP and geopotential height data published by the National Centers for Environmental Prediction–National Center for Atmospheric Research (NCEP–NCAR).

A systematic effort in recording tornadoes, waterspouts, and funnel clouds in Greece was started in 2007 by the Laboratory of Climatology and Atmospheric Environment (LACAE), University of Athens. Since then, LACAE has been actively collecting information on severe weather in Greece generating a coherence GIS database. In this study, a seasonal synoptic classification is presented based on tornadoes and waterspouts incidence over the west Greece from 1948 to 2012. The findings of the analysis present an objective weather type classification of MSLP and 500 hPa level, associated with tornado and waterspout development over the Ionian Sea and the west coasts of Greece. It was found that almost the one third of tornado variability over west Greece was accounted for by synoptic type A.