



Diagnosis of an episode with severe thunderstorms in Portugal

J. Sousa (1,2), M. Fragoso (3), and J.A Santos (1)

(1) Centre for the Research and Technology of Agro-Environmental and Biological Sciences, University of Trás-os-Montes e Alto Douro, Vila Real, Portugal, (2) Instituto Português do Mar e da Atmosfera, (3) Centre for Geographical Studies, Institute of Geography and Spatial Planning, University of Lisbon, Lisbon, Portugal

The present study is focused on the analysis of the atmospheric conditions underlying the occurrence of a week-long episode of severe thunderstorms in Portugal in the period from 10 to 17 September 2007. Precipitation series at several weather stations, provided by the European Climate Assessment and Dataset project, as well as a dataset of cloud-to-ground flashes over Portugal, collected by the Portuguese lightning detection network, are used. Several atmospheric variables (e.g. mean sea level pressure, geopotential heights, vorticity, lifted index, convective available potential energy, relative humidity and wind components) are also used for assessing the atmospheric conditions during the episode. These variables were retrieved from the ERA-Interim and MERRA reanalysis datasets. Besides the important precipitation amounts recorded throughout the country, particularly in its southern half, strong lightning activity was also recorded. The number of flashes peaked on 10 September (4952 flashes over Portugal), whereas there was a strong decrease in the following two days. Then, the values remained nearly constant (~ 1500 CGD day $^{-1}$) until the end of the episode (17 September). A total of 16873 flashes (37% of the whole year) were recorded over Portugal across the episode. All episode days are classified into a typical summertime lightning regime in Portugal, already identified in previous studies. This regime is characterized by high near-surface temperatures and a weak low pressure system over southern Iberia, but accompanied by a strong mid-to-high tropospheric cold-core trough. This dynamical structure triggered deep convection and several thunderstorms. These features are confirmed by the different atmospheric parameters referred above. Further, this analysis is also complemented by several synoptic charts, satellite images and radio-soundings.