Numerical investigation of severe convective weather using COSMO.GR model: A case study of tornado over western Greece on February 7, 2013

Ioannis Matsangouras (1,2), Euripides Avgoustoglou (2), Panagiotis T. Nastos (1), Ioannis Pytharoulis (3), Theodora Tzeferi (2), Flora Gofa (2), and Howard B. Bluestein (4)

(1) Laboratory of Climatology and Atmospheric Environment, Faculty of Geology and Geoenvironment, University of Athens, Greece (john_matsa@geol.uoa.gr), (2) Hellenic National Meteorological Service, Athens, Greece, (3) Department of Meteorology and Climatology, School of Geology, Aristotle University of Thessaloniki, Thessaloniki, Greece (pyth@geo.auth.gr), (4) School of Meteorology, University of Oklahoma, Norman OK, USA (hblue@ou.edu)

Recent studies have shown that western Greece has been affected by numerous tornado events that caused significant impacts to the local society. On February 7, 2013, several tornadoes developed along western Greece, while the most intense event took place close to Ag. Ilias village, 8 km northwestern from Aitoliko city over western Greece. The tornado developed between 12:30 and 12:45 UTC and lasted only a few minutes. Although it had a short lifetime, the tornado caused numerous damages to properties and crops. The COnsortium for Small-scale MOdeling (COSMO) was formed in October 1998, and its general goal is to develop, improve and maintain a non-hydrostatic limited-area atmospheric model, while the Hellenic National Meteorological Service joined the consortium in 1999. The COSMO model has been designed both for operational numerical weather prediction (NWP) as well as various scientific applications on the meso-β and meso-γ scale. The aim of this study is to investigate the ability of the COSMO.GR atmospheric model to depict the characteristics of severe convective weather, which favored the development of the associated storm, close to Ag.Ilias village. The COSMO.GR atmospheric model was initialized with analysis boundary conditions obtained from the European Centre for Medium-Range Weather Forecasts (ECMWF). The resulting numerical products with spatial resolution of 0.020 ($\sim$2 km) over the geographical domain of Greece depicted very well the severe convective conditions close to tornado formation. The numerical investigation is accompanied by a synoptic discussion of middle and lower atmosphere, numerous datasets from weather observations and remote sensing data, describing the weather situation of February 7, 2013.