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Storm motion prediction: Incorporating new methods in everyday forecasts

Ioannis Tegoulias and Michalis Sioutas

Hellenic Agricultural Insurance Organization (ELGA), Meteorological Applications Centre, International Airport Macedonia, Thessaloniki, Greece

The Greek National Hail Suppression Program is applied every year from March to September in Central Macedonia and Thessaly, in northern and central Greece. Part of the daily forecast, is the thunderstorm motion and propagation calculation using the available radiosonde wind data. The actual movement of thunderstorm cell complexes (speed and direction), is extracted using radar data. Thunderstorm tracking is based on radar data analysis, determining reflectivity centroids, for the entire life time of the thunderstorms. Data for the warm period of the last five years is examined in order to calculate cell motion and storm propagation for multicell and single-cell thunderstorms. Thessaloniki's radiosonde station wind data were considered for 06:00 UTC at standard pressure levels and, a mean 0 to 6-km layer density-weighted wind was also calculated. Additionally, thunderstorm motion was also identified and compared to the traditional methods, using Corfidi's method, calculating the associated vectors. The results indicated that the movement of thunderstorm cells was not only steered by the 700-hPa level wind but was also well represented by the wind at the 500-hPa level and by the average wind in the layer 0-6 km. Comparison of the applied methods indicated small differences in calculating the cell motion and thunderstorm propagation. Certain cases where large differences were observed, went through further analysis. Based on the data set examined the motion of multicell and single-cell thunderstorms can be adequately predicted using upper air wind data. The new proposed technique can be useful in improving existing methods and therefore providing better results in operational forecasting, despite the fact that the exact prediction of thunderstorm movement remains a challenge.