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Case study: An isolated severe storm with giant hail hit Slovenian capital city Ljubljana on May 25th 2009

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Introduction

A quite unusual weather pattern for month of May with first and early season heat wave of year 2009 resulted in several days of active severe storms across central Europe and Alpine region.

Synoptic situation

On May 25th 2009, an omega block pattern with strong upper-level subtropical ridge extending over Mediterranean and Balkan Peninsula brought stable and warm conditions into Southern Europe. Elsewhere, two large-scale troughs were located over Western and Eastern Europe with very unstable environment. On the nose of the Mediterranean ridge a jet streak with moderate shear was placed while over the Southern Alpine region only weak shear was placed over Slovenia. Rich boundary layer moisture and steep lapse rates within an elevated mixed layer favored extreme amounts of CAPE. After strong diurnal heating and surface wind convergence along the local topography a few convective cells were triggered in the mountainous terrain while deep moist convection over the rest of Slovenia was trapped by the strong capping inversion. In late afternoon several cells from the mountainous terrain interfered with each other and explosive convective cell was initiated along their outflow boundaries. Increasing near surface southeasterly wind flow supported enhanced low-level shear and storm relative helicity which caused this cell to very rapidly grown into an organized supercell storm on the flat terrain in northern Slovenia. This supercell then started racing southeastwards towards Ljubljana, a capital city of Slovenia. It caused extensive hail damage with very large to giant hailstones up to 7cm in diameter falling over parts of Ljubljana and areas north and southeast of the city.

Presentation of research

This case study will go through a research of this very damaging hailstorm, throughout a detailed analysis of the synoptic situation including analysis of satellite, radar and surface observations. At first, forecasting models did not suggest organized convection and severe storms to occur given the only weak wind shear forecasted, while there was extreme amount of instability with CAPE exceeding 2500 J/kg expected. But then, according to the closest modified 12 UTC skew-t diagrams from Udine and unfolding evolution, better instability with CAPE values over 3000 J/kg and moderate near 20m/s 0-6km bulk shear were favorable enough for rapid organization of this isolated storm into such a dangerous severe hailstorm. This paper will also present a visual analysis of this storm as classic textbook supercell structure with accompanied features was documented by many storm chasers from nearby.

References

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