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The Constitution Day storm in Budapest: Case study of the August 20, 2006 severe storm

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Abstract—In the evening of August 20, 2006 severe thunderstorms hit Budapest. The storm struck the downtown at the same time when the Constitution Day firework just started, killed five people and wounded hundreds of spectators crowded on the embankments of the river Danube. In this paper weather conditions from synoptic scale to storm scale are investigated to find the special circumstances, which led to formation of the devastating storm. Investigations show that a wave on a cold front, the mid level cold advection, the drift of jet stream above the warm sector, and an intense wet conveyor belt resulted in intense instability. Furthermore, the wind shear and the low level convergence also contributed to the formation of the fast moving squall line. Detailed Doppler-radar analysis proved that the thunderstorm, which crossed the downtown of Budapest, was a supercell. Comparison of the radar reflectivity and the lightning data of the investigated case with that of other severe storm cases shows that the Constitution Day storm was not an extreme event. The unique feature of this case was the extreme high speed of cell motions. High resolution numerical model (MM5) was applied to understand the dynamical structure and predictability of the storm. Model results show the importance of the layer on 3 km above ground level with high value of equivalent potential temperature and the active role of the cold front in the formation of the squall line. The model was able to simulate the structure and motion of the supercell proving the numerical predictability of this type of severe convective storms.

Key-words: squall line, supercell, MM5, severe convective storm, Doppler-radar

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