A CASE STUDY OF SEVERE CONVECTION OVER CENTRAL EUROPE WITH THE DETAILED ANALYSIS OF DEVELOPMENT OVER CROATIA ON 22ND AND 23RD JUNE 2007

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I. INTRODUCTION

Thunderstorms belong to the short-living weather phenomena. Due to the associated risk of damage caused by lightning, heavy rainfall or hail they are of great interest to the customers. A precise forecast of convection is therefore one of the most important tasks for the forecasters. Remote sensing data combined with synoptic information give the opportunity to monitor the relevant developments, especially for nowcasting purposes.

This study deals with a case of severe convective development over Central Europe which happened from 21st to 23rd June 2007. Large areas of Germany, Austria, Czech Republic and Croatia were affected by heavy thunderstorms. Hail and wind bursts killed several people and caused damage in millions of Euros.

II. THE CASE – ANALYSIS OF CONVECTIVE DEVELOPMENT OVER CROATIA

In the strong SW flow over Croatia the humid and warm air was coming from the West Mediterranean in front of the cold front. Strong convective activity occurred during the night of the 22nd in the coastal regions of the North Adriatic and during the early morning of the 23rd in the central and north-east part of Croatia (FIG. 1). Convection was triggered by the orography and the passage of the cold front.

The atmosphere over Croatia was very unstable. Forecast values of Showalter index over the central parts of Croatia were below -3 (FIG. 3). This high instability resulted in the development of many convective cells with radar reflectivity up to 55 dBz (FIG. 2). The convection over the central Croatia had rather good fit with the model.

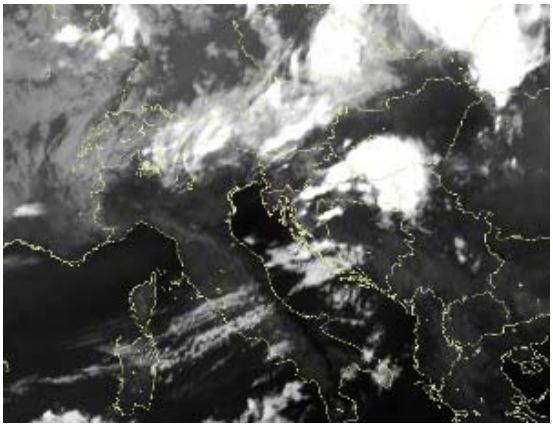

FIG. 1: Meteosat 8 IR 10.8 image for 23 June, 00 UTC - developing convective cells over the central and east Croatia.

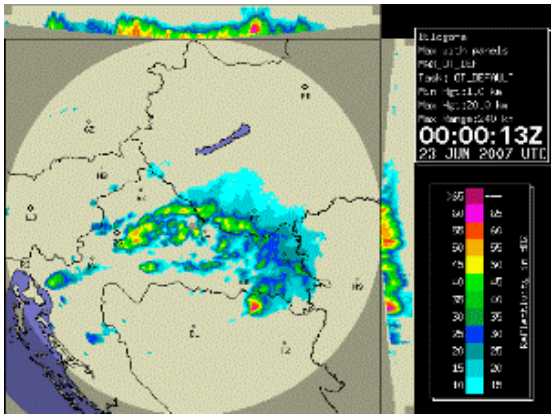

FIG. 2: Radar reflectivity in dBz for 23 June, 00 UTC – strong convection over the central and north Croatia with reflectivity over 55 dBz - hail occurrence is highly probable.

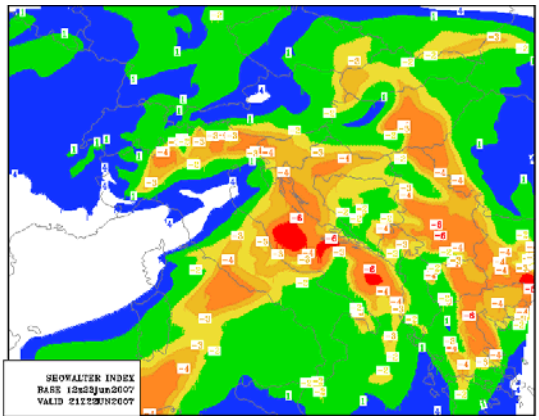

FIG. 3: Showalter index (ALADIN/HR model) valid for 23 June, 00 UTC. Values under -3 – heavy thunderstorms is highly probable.

III. NOWCASTING PRODUCTS

Several nowcasting products based on satellite data were used in detailed analysis of convective development and movement of the cells over Croatia. One of them is the cloud motion vector product, combined with forecast cloud contours overlaid on the Meteosat 8 IR 10.8 μm image.

Expected displacement of the cloud feature within 1 hour time period in the strong westerly flow is shown in FIG. 4. Isolines delineating the area of different cloud top temperature (inner with temperature lower then -60 °C) have a good forecast value during severe convective development over the north and north-east Croatia, and further to the east.

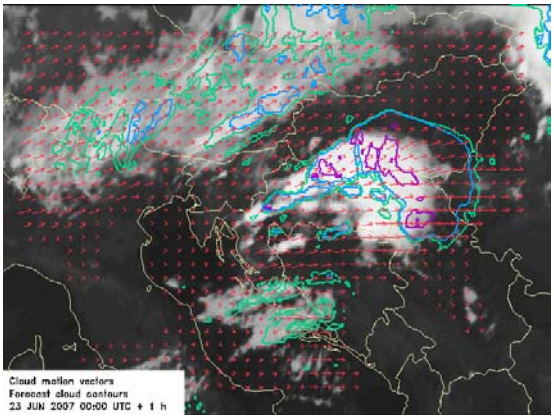

FIG. 4: Meteosat 8 IR 10.8 image for 23 June, 00 UTC overlaid with cloud motion vectors and forecast cloud contours.

Temperature enhancement of Meteosat 8 IR 10.8 μm image resolves the temperature of the cloud tops in more detail and helps discriminating different cloud-top features. This enables the study of the cloud features like cold-U shape and cold-ring shape which can be the indicators of storm severity (Setvak et al, 2008).

In FIG. 5 the majority of severe convection moved from the east Croatia to the north Serbia where a well-defined cold-ring feature (marked with an arrow) can be seen.

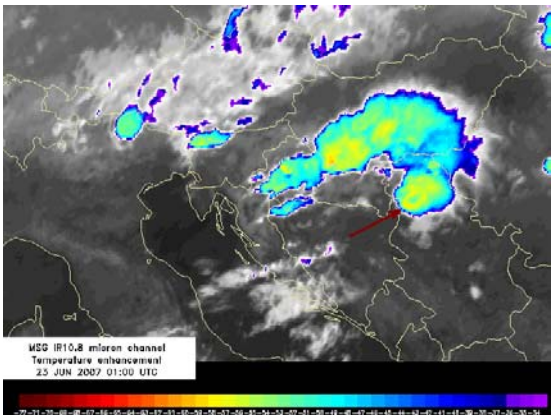

FIG. 5: Meteosat 8 IR 10.8 enhanced image for 23 June, 01 UTC . Cold-ring feature marked with an arrow.

IV. SUMMARY

Convective development over Croatia was only a part of heavy convection episode which happened from 21st to 23rd June in large part of central Europe.

The north part of Adriatic coast and some parts of the inland of Croatia were devastated by severe storm accompanied by hail. Strong convective activity started ahead of the cold front, induced by orography.

The atmosphere was very unstable. That can be seen in the numerical fields of stability indices as well as in radar and satellite images. On the smaller scale convective development was followed by using some nowcasting products based on satellite data.

Severe convective development over some parts of Croatia was well witnessed also by using colour enhanced infrared 10.8 μm images.

V. AKNOWLEDGMENTS
(TIMES NEW ROMAN 10-BOLD CENTRE JUSTIFIED CAPITAL)

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VI. REFERENCES
(TIMES NEW ROMAN 10-BOLD CENTRE JUSTIFIED CAPITAL)

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Setvak M. et al., 2008: Cold-ring shaped storms in Central Europe. *2008 EUMETSAT Meteorological Satellite Conference, Proceedings (http://www.eumetsat.int).*

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