

SEVERE WEATHER EPISODES IN ROMANIA ASSOCIATED WITH CYCLONIC ACTIVITY RE-ENHANCEMENT. CASE STUDIES

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I. INTRODUCTION

The Romanian relief, the Mediterranean and Black Sea proximity and the air circulation are important factors in heavy precipitation episodes explanation. The new forecasting methods for such episodes are related to the conceptual models. Some of this models use the satellite images and the anomaly of potential vorticity field, correlated with the evolution of the upper tropospheric waves (Santurette and Georgiev, 2005)...

II. PRESENTATION OF RESEARCH

A. The episode from 17th to 19th of April 2005

Between 13th and 27th of April 2005, the cumulated amounts of precipitation were registered as records values for this month in South-Western part of Romania (more than twice and a half higher than the climatologically average amounts (1961-1990). On 17th of April, 12h, the frontal system was already over Romania; as there still was a cold advection in the middle and upper troposphere over the Central Europe toward Mediterranean Sea, another frontal system will form, associated to a cyclone with an upper-level precursor. Analyzing the model outputs and satellite images, one can recognize a cyclogenesis upper-level precursor...

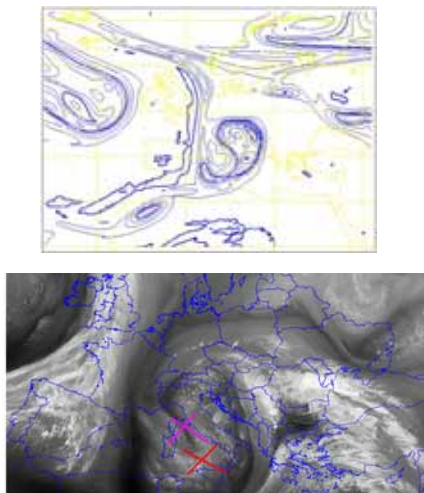


Fig.1: 17th of April 2005: MSG-WV (down) 16h, 300 hPa PV anomaly, ECMWF model, 12h analysis (up). The higher anomaly is inside the blue higher gradient contour.

One can also recognize on the WV image, the baroclinic leaf, which gets to undulate, as the white zone and the PV anomaly approaches. The 1.5 PV high map (dynamic tropopause), confirm the interpretation: the circle indicates the zone with the lower tropopause-the higher PV anomaly (the 1,5PVU level is around 7000m, corresponding approximately, to the 350-400hPa level)...

The proximity of Black Sea assures a considerably amount of water vapor, so the distinction between the two warm sectors (the initial one and the second, advancing from Aegean Sea, seems to disappear. This is why, in this case, the upper-level precursor seems to re-enhance the pre-existent cyclone activity rather than to initiate a new cyclogenesis process...

B. The episode from 21st to 24th of March 2007

In March 2007, the heavy rains were registered on the mountain, especially on the Southwestern part of Romania.

At the beginning phase of baroclinic development, on WV image and also on RGB product, one can see the light feature in the leading part of the trough-the leaf pattern; immediately on the left, the jet stream, in black (WV) and red (RGB). At the next moment, the cyclone warm sector is already well defined, over Romania (intense light, strong ascendance). Also, the PV anomaly approaches and extends itself. In the final stage, the PV anomaly is over Southern part of Romania, in phase with sea level cyclone...

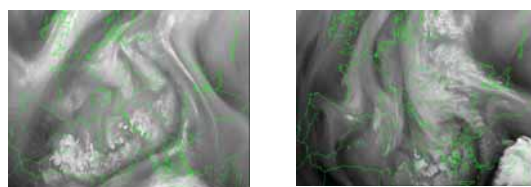


Fig.2:MSG- WV, 22.03. 00h (left), 23.03. 12h (right)

The interpretation is in good concordance with the 300 hPa PV anomaly. The jet stream is well indicated by the strong gradient of the PV values. The lack of anomaly over Romania must be associated with the developing of warm sector, with ascending movements...

The mid-troposphere structure is analyzed with absolute vorticity distribution maps. One can find the position of cold front, in front of highest absolute vorticity zone (dark pink).

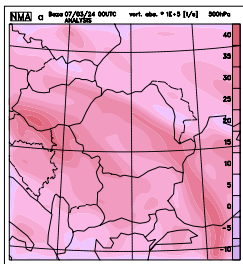


Fig.3: The 500hPa absolute vorticity, ALADIN model, 24.03.00h, analysis.

III.RESULTS AND CONCLUSIONS

The analyzed cases illustrate similarities with the conceptual models of the cyclogenesis with upper-level precursor and cyclogenesis with baroclinic troughs.

The extreme meteorological events in Romania, associated with heavy rains (often caused by Mediterranean cyclones, moving on the trajectory over South-Eastern part of Europe) can be explained by PV anomalies correlated with satellite imagery.

The upper-level forcing emphasized by PV plays a very important role in enhancing or re-enhancing the cyclonic activity over the Romanian territory.

IV. REFERENCES

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Santurette P., Georgiev C., 2005: Weather Analysis and Forecasting-Applying Satellite Water Vapor Imagery and Potential Vorticity Analysis, Elsevier Academic Press.

