MESOSYNOPTIC AND STORM SCALE FEATURES ASSOCIATED WITH THREE SEVERE FLASH FLOODS EVENTS IN ROMANIA

Irina Carolina Oprea[1], Bogdan Antonescu[1], Aurora Stan-Sion[1]

[1]*National Meteorological Administration ,Sos. Bucuresti-Ploiesti-97,013686,Bucharest, Romania,*
carolina.oprea@meteo.inmh.ro

Dated

I. INTRODUCTION

Flash flooding is responsible for more fatalities in the Romanian territory than any other convective storm-related phenomenon. This flooding occurs when a large amount of rain falls at a certain location in a short period of time. The synoptic and mesoscale atmospheric conditions most often responsible for bringing these ingredients together have been well documented in the literature (Doswell el al.,1996, Maddox et al..1979). This study examines three severe flash floods cases in Romania using composite analysis to elucidate the synoptic and mesoscale conditions associated with large amount of precipitation.

II. PRESENTATION OF RESEARCH

Heavy precipitation events in the Romanian region typically occur downstream of a significant cyclone aloft, often exhibiting "cut-off" cyclone characteristics. Mediterranean and Black Sea proximity provide a source of moisture for Romanian territory and the "S" shape of the Carpathian Mountains provide local circulations that help the forcing. The ways by which basic ingredients for heavy precipitation are brought together can vary substantially from case to case and also between different parts of the country.

Upon the installation of the eight Doppler radars, five of which are WSR-98Ds, the Romanian forecasters could document and analyze many cases and identify similarities between them. Answers to questions such as what is the prevalent storm type that causes severe weather and where severe weather happens more often are beginning to emerge.

The flash flood events selected for analyse occurred as follows: the first of it on 23-th of August 2005 in central part of Romania, the second on 30 July 2006 in north-east part of Romania and the third on 19 September 2006 in south-east of Romania. In all three cases a large amount of precipitation has been accumulated in the superior parts of the small basins, in less than three hours. Each rain event's life cycle was observed using radar reflectivity data from the WSR-98Ds. The localization of the convection on 23 August 2005 and 30 July 2006 flash flood cases appear to have been the result of interaction between the low level flow and the orography. In 23 August 2005 and 19 September 2006 flash flood cases, initiations of severe convection was a surface boundary, and new cells were growing along the rear flank, and were reinforcing the low level boundary (Fig.5). In this way the convective cells traversed the same aria over several hours, in so called "back building" system. Development of the convection on the surface boundary it was very well observed in the radar reflectivity images from the Bobohalma (Fig.1) and Medgidia (Fig.2) WSR-98D-S band.

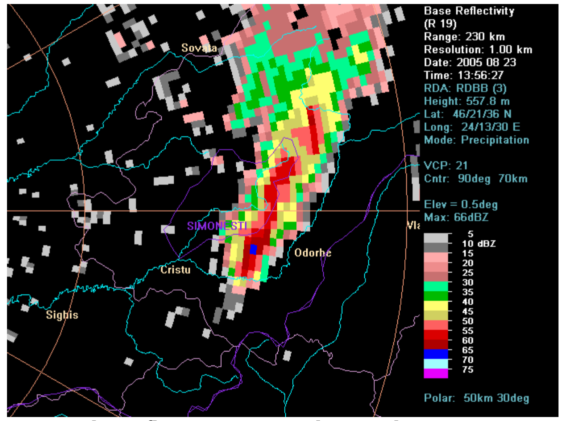

Fig.1.Radar reflectivity at 0.5 degree elevation at 13.56 UTC, from the WSR-98D S-band from Bobohalma (central part of Romania) on 23.08.2005

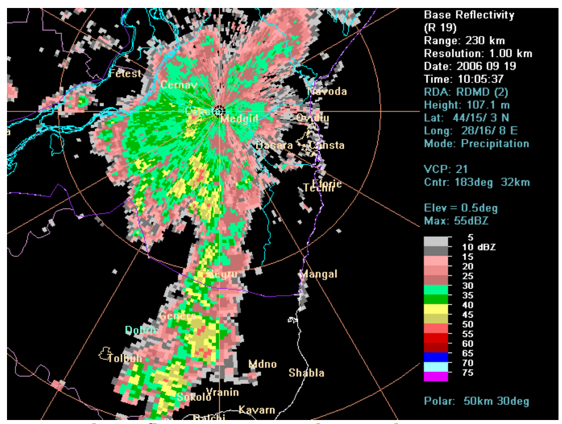

Fig.2.Radar reflectivity at 0.5 degree elevation at 10.05 UTC, from the WSR-98D S-band from Medgidia (south-east part of Romania) on 19.09.2006

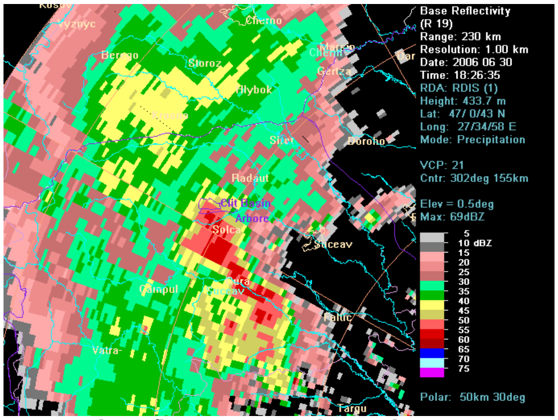

Fig.2. Radar reflectivity at 0.5 degree elevation at 18.26 UTC, from the WSR-98D S-band from Barnova (north-east part of Romania) on 30.06.2006

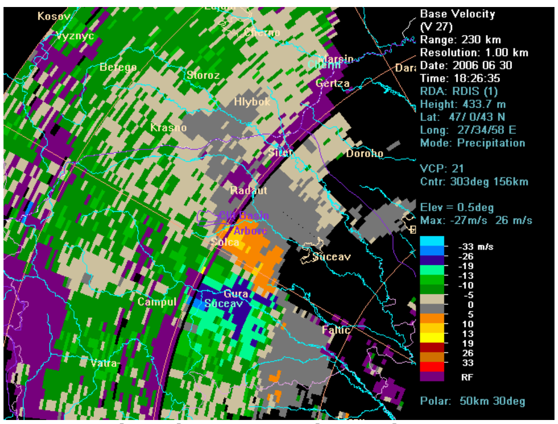

Fig.3. Doppler velocity at 0.5 degree elevation at 18.26 UTC, from the WSR-98D S-band from Barnova (north-east part of Romania) at 30.06.2006

In 30 July 2006 flash flood case, WSR-98D Doppler radar depicted a persistent rotation pattern in the radial velocity field (Fig.3). This case was produced by a long lived HP supercell, where inflow was enhanced and sustained by the orientation of the valley in respect to the low level flow (Fig.5).

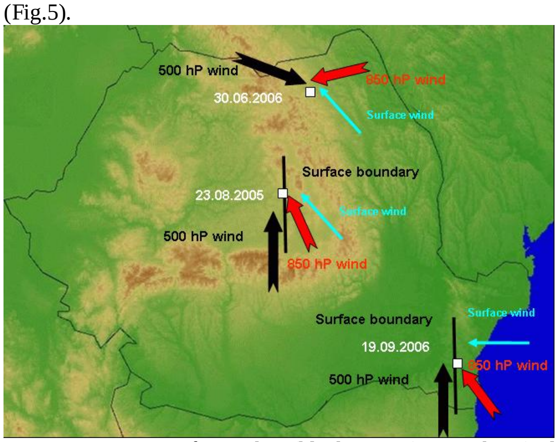

Fig.4. Composite of 500 hP (black arrow), 850 hP (red arrows) and surface wind (blue arrows) direction for those three flash flood cases. With black line are suggested locations of low level boundaries.

This study suggest that there are common factors that yield to cause extreme rainfall events in Romania. One of them is the presence of southerly strong moisture flow at low levels associated with surface boundary aligned roughly parallel to the mean flow (Fig.4). Such an alignment increases the chances of cell training along the boundary (Doswell at all, 1996). Another factor that can produce strong rain rate is development of the rotational structure that yield to grout of duration of rainfall events.

Flash flood situations represent a spectrum of synoptic and mesoscale possibilities. Conceptual models can help forecasters to choose a relevant forecast approach from a set of diagnostic possibilities. Recognition of a particular situation can lead to a greater understanding of the flash flood potential. The study presents the specific interaction between the general flow and the local orography and how these features can be represented on a composite map. The aim of this map is to highlight the similarities, when is the case, with well known conceptual models developed for flash flood situations in Romania.

III. REFERENCES

Doswell, C. A., III, H. E. Brooks, and R.A, Maddox.1996: Flash flood Forecasting: An ingredients-based methodology. *Wea. Forecasting*, **11**, 560-581.

Maddox, R. A., C. F. Chappell, and L. R. Hoxit, 1979: Synoptic and meso-α scale aspects of flash flood events. *Bull. Amer. Meteor. Soc.*, **60**, 115-123