

NEW DAILY TEMPERATURE RECORDS IN OLTENIA PRONOUNCED THERMAL CONTRASTS AT THE BEGINNING OF THE SUMMER 2013

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ABSTRACT. New daily temperature records in Oltenia. Pronounced thermal contrasts at the beginning of the summer 2013. The heat waves represent one of the consequences of the globally climate's warming. These are usually associated with thermal discomfort and drought and sometimes are followed by intervals characterized by a high-degree atmospheric instability and/or significant cools. In recent years at temperate latitudes an increase in the intensity and frequency of these weather events can be observed. In this context, we are proposing to make a synoptic analysis of a succession of such weather events produced in southwestern Romania in June 2013, comparing with the Oltenia's climatology.

Keywords: thermal deviations, anomaly, synoptic characteristics.

1. INTRODUCTION

The migration of the Azores and the East-European anticyclone to the north and the deepening of Asia Minor depression in Southern Europe, leads to an intensification of atmospheric circulation. Thus, in our country, the first summer month is characterized by alternating cold and hot days and also a maximum rainfall. In Oltenia monthly average temperatures increases from north to south, and are between 18°C and ~ 22°C, and the precipitation summum is 55-60 mm in the southern region to 90-100 mm in the Carpathian area. Figure 1 shows that in the

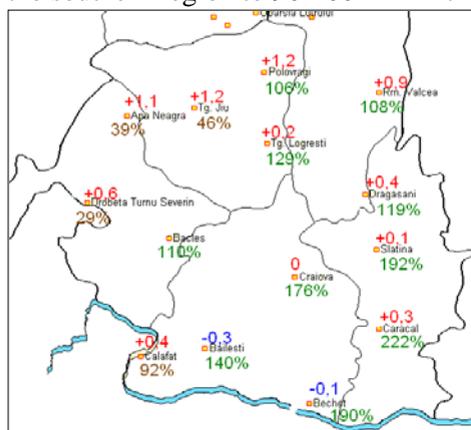


Fig. 1. The average temperature deviation, June 2013 (red/blue); amounts of multiannual average precipitation of June (green/brown)

The baric configuration of June at

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Sea Level Pressure – SLP- highlighted for Romania a northern sector atmospheric circulation for 18 days (60%), the north-eastern sector circulation being preponderant (11 days). In the middle altitude, at 500 hPa level, the main atmospheric circulation is from southwestern sector (not shown in this paper).

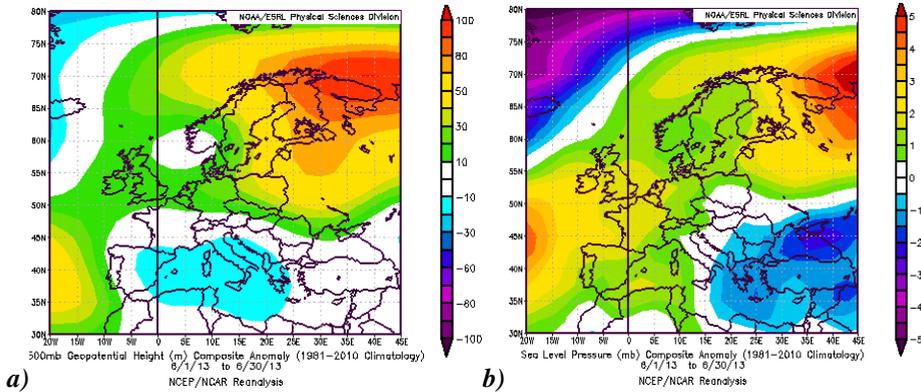


Fig. 2. Composite Anomaly, June 2013: a) 500 hPa Geopotential High; b) SLP

In the figure 2a) can be observed that, at 500 hPa level, over the Mediterranean basin is a negative anomaly in the geopotential field while the rest of the continent is characterized by an positive anomaly. In Sea Level Pressure field (Fig. 2 b) there is positive anomaly over the most part of the Europe with two nuclei placed nearby the origin areas of Azores High, respectively East-European High. Only a small area in southeastern Europe has a negative anomaly.

2. DATA AND METHODS

More datasets were used for this paper: a real dataset, a reanalysis dataset and a numerical model outputs. The observational data used in the paper were recorded at 14 meteorological weather stations from Oltenia, validated and administrated by the National Meteorological Administration. Some statistical methods were applied in order to classify the weather for the analyzed interval. The multiannual climatological averages considered are for the 1981-2010 period. For the synoptic analysis we used the GFS and COSMO models outputs, satellite images and reanalysis datasets provided by NCEP / NCAR.

3. RESULTS

The graph in the figure 3 highlights the intensity of cooling or heating processes from Oltenia in June, when significant thermal deviations can be seen:

16 - 24 period, which was characterized by hot weather, local heat waves, the THI frequently exceeding 80 units, the peak of the period was touch on 19 June, when at all meteorological weather stations in Oltenia the maximum temperature recorded the highest value for the calendar date of the last 52 years;

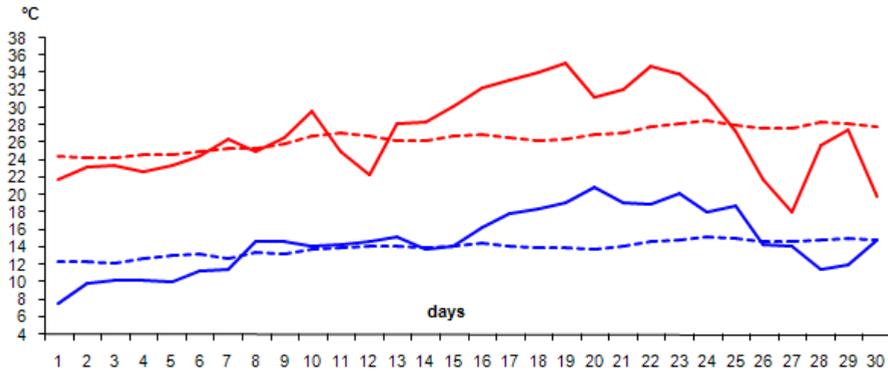


Fig. 3. The variation of mean maximum/minimum temperatures in Oltenia, June 2013 (red/blue solid line); multiannual mean maximum/minimum temperatures, June 1981-2010 (red/blue dash line)

26 - 27 period, when the weather was cold, locally, extremely cold for this 27th date of month, when the average daily maximum temperatures had a negative deviation of 9.5 °C; Thus, on 27 June, the maximum temperature recorded the lowest value for the calendar date (for 1961-2012 period) at five meteorological stations in Oltenia.

Synoptic features of 16 - 24 June 2013 period

In the analysed period, in the middle altitude, at 500 hPa level (Fig.4 a), the largest part of Europe was under the influence of geopotential ridge extended up to the Baltic Countries, sustained at 850 hPa level by a thermal ridge, the 283.5 K isotherm reaching 55 ° N latitude.

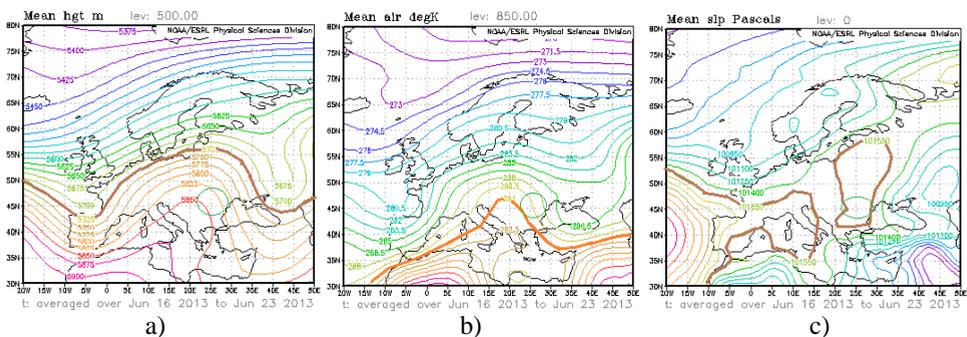
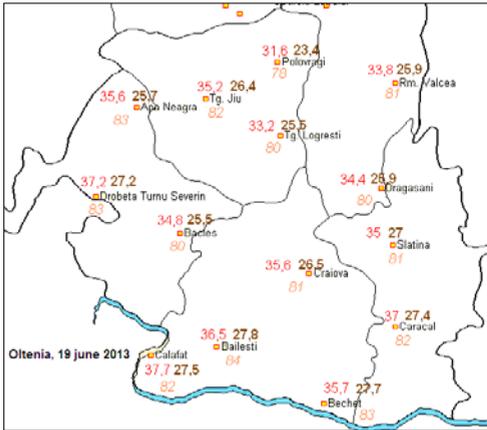


Fig. 4. Averaged parameters used in the first study case

At ground level southwestern Europe was under the influence of Azores anticyclone's ridge, that was extended over the continent to Italy; also over Central-Eastern Europe have activate a relatively high pressure field. The rest of the continent was under the influence of a low pressure fields (Fig. 4c).



During this time Romania was under the influence of the thermal and geopotential ridge which determined a heat weather in the analyzed area, canicular weather in most of the region. Thus, in 19 June maximum temperatures were higher with 8-10°C than the multiannual values, and THI has reached or exceeded 80 units at almost all stations in Oltenia (fig.5).

Fig. 5. Max. temperature (red, left up), multiannual max. temperature (brown, right up), THI (orange, down).

On 19 June at 500 hPa level (Fig. 6 a, b) over Oltenia can be observed a positive anomaly of the geopotential field of 15-16 damgp and the temperature profile at 850 hPa level highlights a positive deviation of ~ 8°C (Fig. 6 c, d).

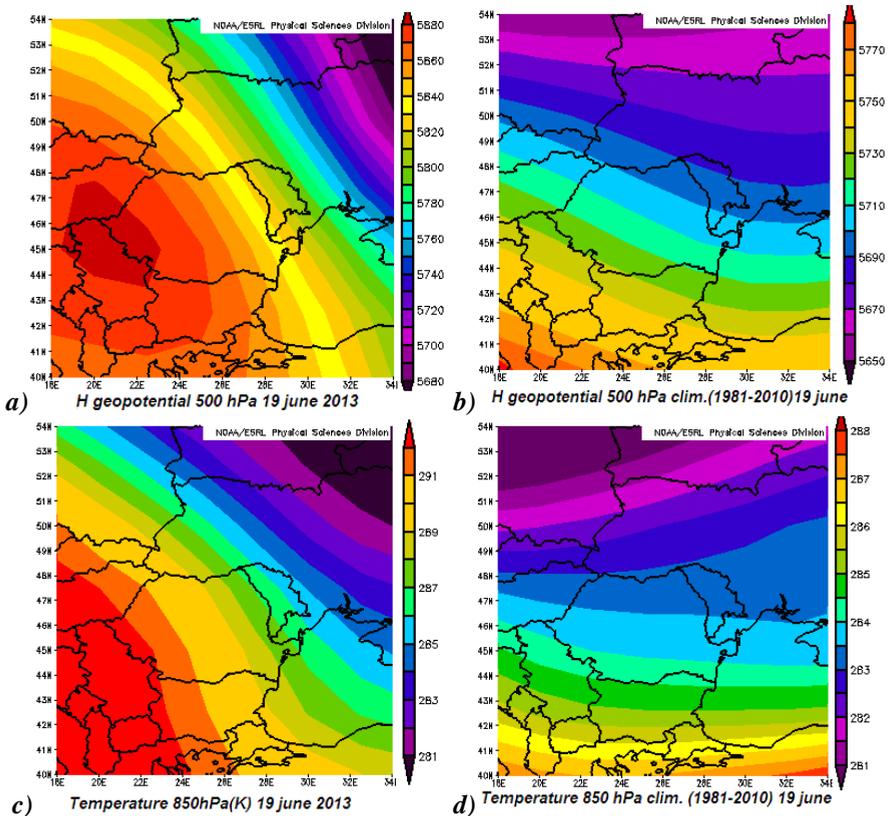


Fig. 6 Geopotential height (m) at 500 hPa and temperature (K) at 850 hPa

Synoptic features of 26 - 27 June 2013 period

Analyzing the synoptic situation from 26.06.2013 00 UTC hours, we can see that at ground level, the Western Europe was under the influence of Azores High, while Eastern Europe was in a low pressure field, in which it highlights the cyclonic nucleus from North of Poland.

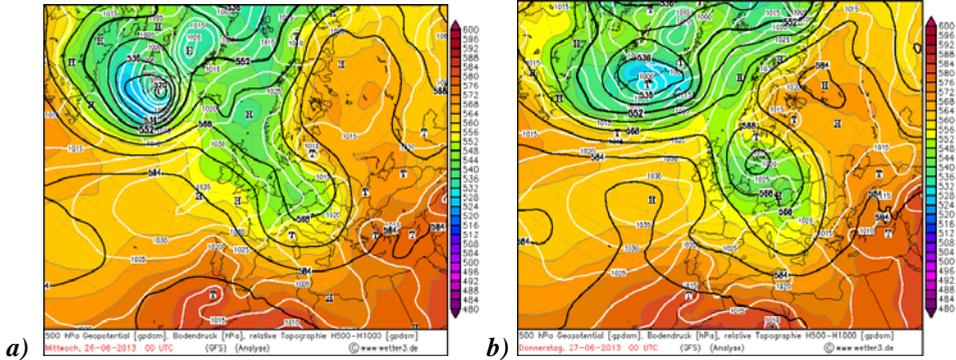
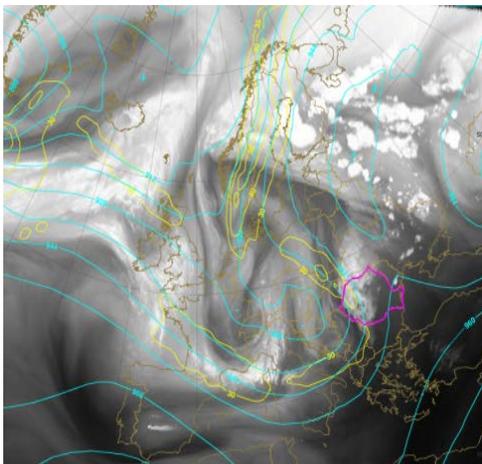


Fig. 7.

In the middle altitude, at 500 hPa level, most of Europe was in a high geopotential field; exception makes the northwestern of the continent which was in a low geopotential field with a thalweg oriented NW-SE extended over Central Europe. Configuration of the relative topography (500-1000 hPa) describes the thermal structure of the lower and middle troposphere; noted being the warm ridge from the East of the continent that was extended up to 65 ° N latitude and it was a blocking factor (Fig.7a). In the next 24 hours above Central Europe cold advection continued and the geopotential thalweg was getting deeper (Fig.7b).



The extension of the Azores anticyclone favored a predominately north circulation, facilitating the penetration of cold air masses down to the our country latitudes. In the high troposphere, at the 300 hPa level, the positioning of the jets axis alongside the isohypses acts to maintain the structure of the jet stream (Fig. 8).

Fig. 8. WV 6.2 Satellite Image, 300 hPa Geopotential Height (cien), 300 hPa izothacs (yellow), 27.06.2013 12UTC hours .

During this interval, Romania was situated on the ascending side of the geopotential thalweg, having an accentuated thermal contrast and being affected by the periphery of the cold front associated the above mentioned trough (Fig. 9).

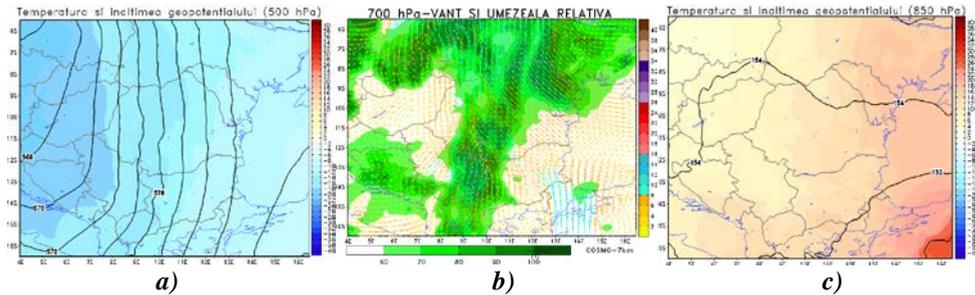
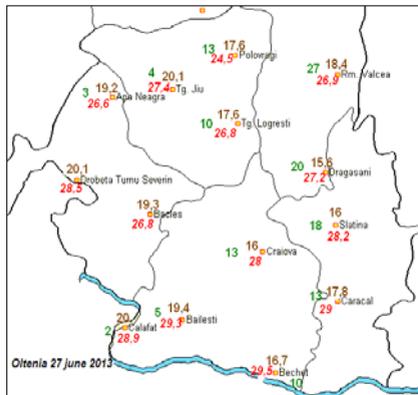


Fig. 9. a) 500 hPa Geopotential Height and Temperature; b) 700 hPa Relative Humidity and wind; c) 850 hPa Geopotential Height and Temperature, 27.06.2013 12 UTC hours COSMO model



This synoptic context had determined, a unstable weather in the analyzed area, wind intensification in the first day and a gradual decrease of the temperature. Thus, on 27th June, in Oltenia the weather was locally very cold. Maximum temperatures values were 7-13 °C, lower than the multiannual averages of this date (Fig. 10).

Fig. 10. Max. temperature (red), multiannual max temperature (brown), 24 hours precipitation amounts (green).

4. CONCLUSIONS

The frequent appearance of northeastern circulations in cyclonic regim can explain the excess amount of precipitation and also the thermal deviations in southeastern Oltenia for June 2013.

Persistency of the thermal and geopotential ridge between 16th and 24th June favored a blocking circulation which has determined for the Southwestern Romania registration of daily records of maximum temperature values. On June 19th all the meteorological weather stations in Oltenia maximum temperature had the highest values for the entire observational period 1961-2012.

Between 25-30 of June the slow movement of geopotential ridge towards east allowed the expansion of Azores ridge which on his anterior side facilitates the penetration of cold air masses down to Central Europe till over our country. Thus, on June 27, the maximum temperature recorded the lowest values in the last 52 years for five meteorological stations in Oltenia.

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