

# Some Climate Extremes in Bulgaria

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## HOT SPELLS & HEAT WAVES

\*Due to the warming (Fig.1), these phenomena registered in the past in the south regions are observed recently on the whole territory of Bulgaria.

\*The regions that are mostly in danger of extreme hot spells & heat waves are the districts of Blagoevgrad, Haskovo, Kurdzhali, Plovdiv, Yambol, Stara Zagora in South Bulgaria and Pleven, Rousse, Veliko Turnovo in North Bulgaria (Fig. 2).

\*The hot spells in the years 2000, 1987 and 1988, 1994 (the last ones partially, mainly for the most northern and southern regions), correspond to the criteria for heat waves.

### Typical synoptic situations:

\*Prolonged advection of warm air from SW even from Northern Africa during July and/or August in a deep trough in the upper-air over Western Europe and low-pressure field over Northern Europe increases extremely the air temperature on 850 hPa up to 24-26°C.

\*The surface air temperature over Bulgaria increases (additionally by radiation overheating) in the low gradient baric field and in extraordinary cases it can exceeds 40°C for 1-2 days (Fig.3). (Gocheva et al, 2006; Trifonova. et al, 2006).

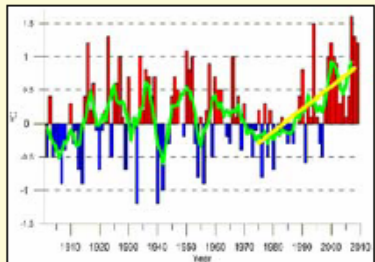


Fig.1 Anomalies of the mean air temperature in Bulgaria towards the normal for (1961 – 1990) period. (Alexandrov, 2010)

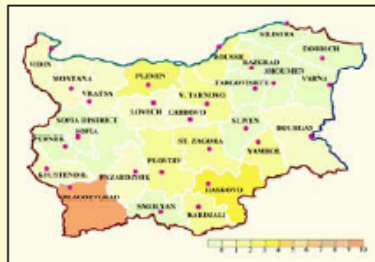


Fig. 2. Risk of hot spells with t above 34°C in at least 5 consecutive days by districts

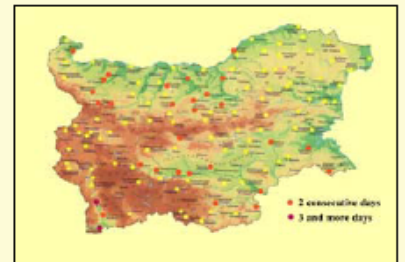


Fig. 3. Stations with t above 40°C in 2 or more consecutive days

## DRY WINDS & DROUGHTY SPELLS

\*During the last decade of the 20-th century the droughty spells (observed at least at 10 stations) as well as the dry wind periods (observed at least at 3 stations) are increased and the obtained results confirm the conclusion for changes in weather conditions in the recent decades and increasing of the climate extreme events, dry wind and t – f droughty spells in particular (Fig. 4). The regions in risk are shown on Fig. 5 and Fig. 6.

### Typical synoptic situations:

\*The typical synoptic situations responsible for the occurrence of t-f droughty and dry wind spells over Bulgaria are: 1) SW and 2) NW advections, 3) radiation overheating and 4) NE advection - very seldom (rather like an exception). (Gocheva et al, 2006; Trifonova et al, 2006)

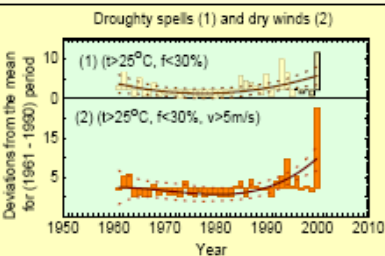


Fig. 4. Dry winds (t > 25°C, f < 30%, v > 5m/s) and droughty spells (t > 25°C, f < 30%) by years (Gocheva et al., 2006)



Fig. 5. Risk of dry winds by administrative districts in Bulgaria

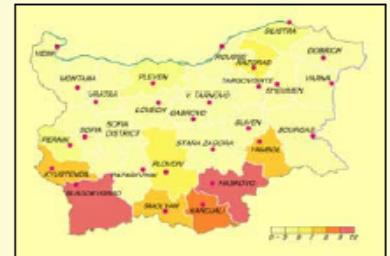


Fig. 6. Risk of both extreme prolonged rainless periods following by t-f droughty spells by districts

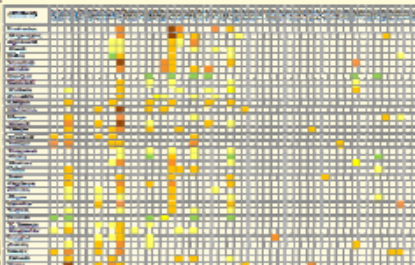
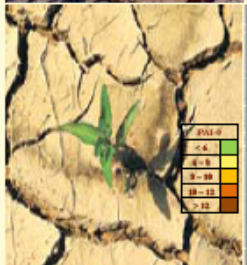


Table 1. Extent of drought based on Palmer Aridity Index. (Gocheva et al, 2010)

\*The droughts in Bulgaria are assessed also by data for the period (1960-2009) from 36 climatically representative stations.

\*Three drought indices with approved applications in neighbour regions – the Carpathians (PAI), Mediterranean (RDI) and in a globe scale (SPI) are used.

\*Some results (PDSI) from investigations of other authors (Fig. 7) are applied for comparison.

\*As a whole, the results allow to conclude that the process of drying up in the country after 1984 is moderate to medium, with peaks in some regions in the years 1993, 2000 and 2007 (see Table 1).

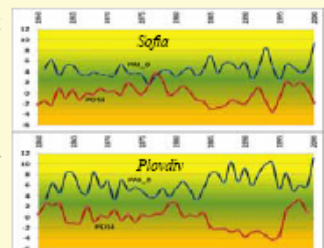


Fig. 7 Long-term variations of Palmer Drought Severity Index. (Alexandrov, source: Kercheva, 2004)

## MAXIMUM & MINIMUM AIR TEMPERATURES POSSIBLE AT LEAST ONCE IN 50 YEARS

\*For the purposes of harmonization of BDS Standards with the EU System of Eurocodes and Eurocode 1 in particular, referring to the building norms and rules, maps showing the absolute maximum and minimum air temperatures with return period at least once in 50 years are developed and will be included in the official Bulgarian Norms and Rules on Building Designing.

\*The maps shown in Fig. 8 represent only the territory up to 1000 m above sea level. (Gocheva and Alexandrov, from a report, 2010)

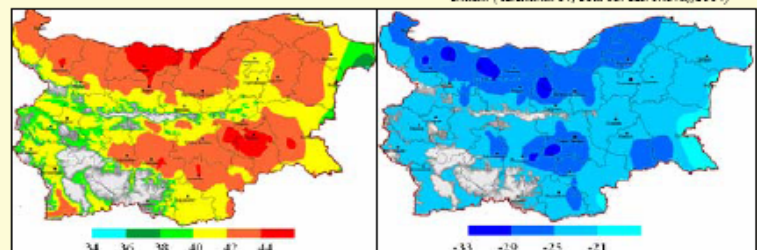


Fig. 8. Maps of maximum and minimum air temperatures with return period at least once in 50 years on real altitude up to 1000 m a.s.l. (Gocheva and Alexandrov, 2010)

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