



## **Anomalies of hydrological cycle components during the 2007 heat wave in Bulgaria.**

Bilyana Mircheva (1), Milen Tsekov (1), Ulrich Meyer (2), and Guergana Guerova (1)

(1) Bulgaria, Sofia University (bmircheva@uni-sofia.bg), (2) Switzerland, University of Bern

Heat waves have large adverse social, economic and environmental effects including increased mortality, transport restrictions and a decreased agricultural production. The estimated economic losses of the 2007 heat wave in South-east Europe exceed 2 billion EUR with 19 000 hospitalisation in Romania only. Understanding the changes of the hydrological cycle components is essential for early forecasting of heat wave occurrence. Valuable insight of two components of the hydrological cycle, namely Integrated Water Vapour (IWV) and Terrestrial Water Storage Anomaly (TWSA), is now possible using observations from Global Navigation Satellite System (GNSS) and Gravity Recovery And Climate Experiment (GRACE) mission.

In this study anomalies of temperature, precipitation, IWV and TWSA in 2007 are compared to 2003-2013 period. In 2007, positive temperature anomalies are observed in January ( $5^{\circ}\text{C}$ ), February ( $3.4^{\circ}\text{C}$ ) and July ( $2.1^{\circ}\text{C}$ ). There is a negative IWV and precipitation anomalies in July 2007 ( $-2.7\text{ kgm}^{-2}$ ,  $-56\text{ mm}$ ) that coincides with the heat wave in Bulgaria. TWSA in 2007 are negative in January, May and from July to October being largest in August. Long-term trends of: 1) temperatures have a local maximum in March 2007, 2) TWSA has a local minimum in May 2007, 3) IWV has a local minimum in September 2007, and 4) precipitation has a local maximum in July 2007. The TWSA long-term trends of Bulgaria and Hungary show similar behaviour as compared to those of Bulgaria and Poland which is in agreement with the cross correlations of the time series of 0.9 and 0.7 respectively. ALADIN-Climate describes the anomalies in temperature and IWV more successfully than precipitation and TWSA.