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Applications of GNSS for severe weather in Southeast Europe

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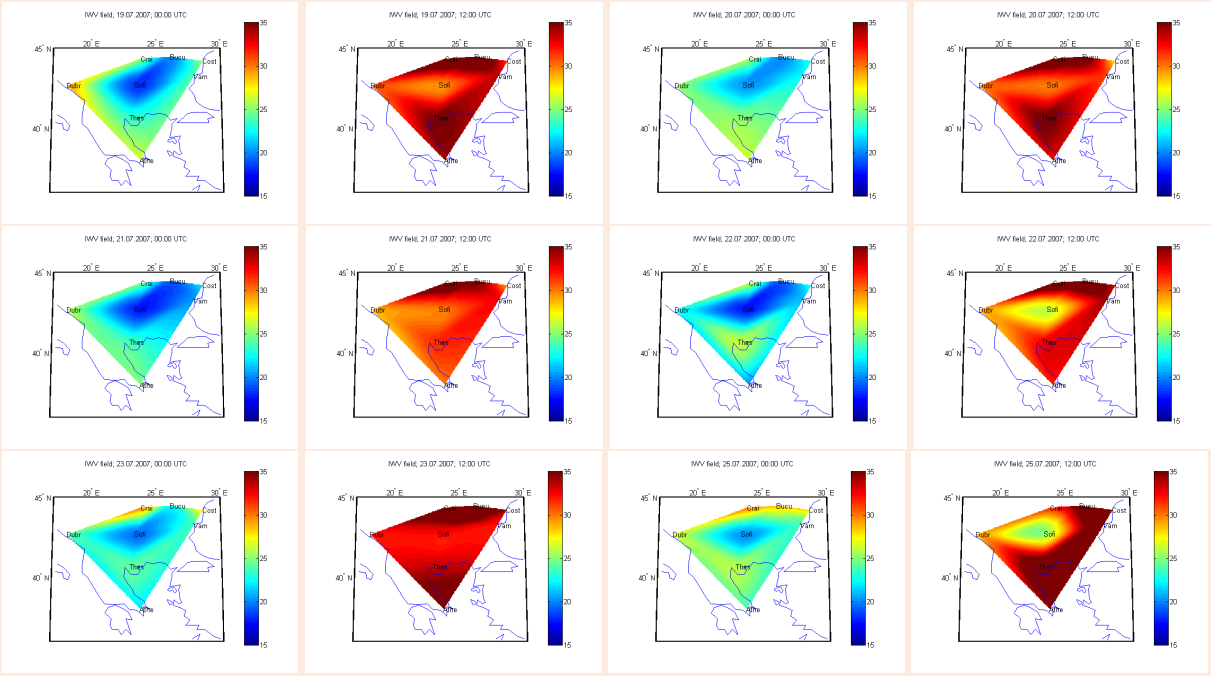
GNSS Meteorology

Our work is contribution to the FP7 Marie Curie project "Exploitation of ground based Global Navigation Satellite Systems (GNSS) for meteorology and Climate studies in Bulgaria/Southeast Europe". The concept of GNSS Meteorology was first suggested in 1992 by Bevis [1]. As the GNSS signal travels trough the atmosphere its propagation is affected by atmospheric gases and in particular water vapour, which has high temporal variation up to 20-30% within a day. Thus vertically integrated water vapour data with high temporal and spatial resolution can be derived from the GNSS signal time delay. We are studying the water vapour behavior with the GNSS Meteorology method during severe weather events (convective storms and heat waves) in the region of Southeast Europe.

2D maps of integrated water vapour during the heat wave 19-25 July 2007

Heat waves have become a common summer feature in the Southeast Europe. During the 2007 summer, three heat waves are reported in June, July and August. Our work covers the July 19-25 2007 heat wave, which has the largest geographical extension reaching Bulgaria. On the figure are displayed the 2D maps of integrated water vapour field over Southeast Europe at 00 (left) and 12 UTC (right). Water vapour data from 8 ground-based GNSS stations (Sofia, Varna, Athens, Thessaloniki, Dubrovnik, Craiova, Bucharest and Constanta) is used to produce the maps.



Figures: Integrated water vapour field [mm].

It is easily recognizable, that the integrated water vapour is almost two times higher during the day (12 UTC) than during the night (00 UTC). Our work will continue with implementation of the 2D mapping method described in Morland et al [2].

Acknowledgment & References

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[1] Bevis et al., GPS Meteorology: Remote sensing of atmospheric water vapour using the Global Positioning System. JGR, 97, 15 787-15 801, 1992.
[2] Morland et al., Spatial interpolation of GPS integrated water vapour measurements made in the Swiss Alps. Meteorol. Appl., 14, 15-26, 2007.