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Comparison of WRF model with GNSS tropospheric products during intense precipitation events in Bulgaria

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Motivation

Predicting the formation and development of vigorous thunderstorms producing heavy rain and hail is a complex process which among other environmental conditions depend on accurate estimation of water vapor distribution in space and time. The goal of this study is to evaluate the NWP WRF model skills for predicting the temporal and spacial variability of Integrated Water Vapor (IWV), during intense precipitation cases in Bulgaria in 2012.

GNSS tropospheric products and WRF model simulations

The Sofia University Atmospheric Data Archive (SUADA) has GNSS tropospheric products from 30 stations in Bulgaria (yellow pointers in fig. 1a). The WRF model simulations are conducted using: 1) Kain-Fritsch (KF) convective parametrisation and 2) no convective parametrisation (NCP) schemes.

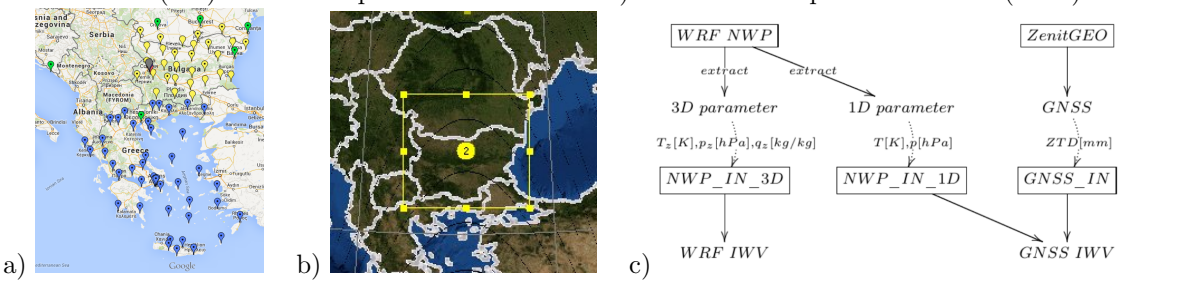
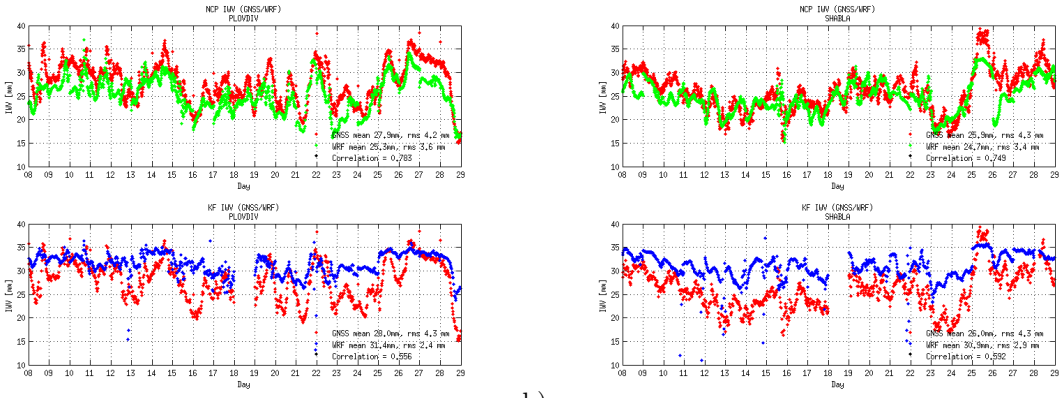


Figure 1: a) GNSS stations in SUADA, b) WRF model domain and c) IWV computation from GNSS and WRF.

IWV from GNSS, WRF-KF and WRF-NCP May 2012.

On figure 2 is presented the temporal variation of IWV from GNSS and WRF at Plovdiv and Shabla for 20 days in May 2012. Clearly seen in the top panels is much better agreement between GNSS and WRF-NCP simulation.



a) b)

Figure 2: IWV from GNSS (red line), WRF-NCP (green line) and WRF-KF (blue line) in May 2012 at: a) Plovdiv and b) Shabla.

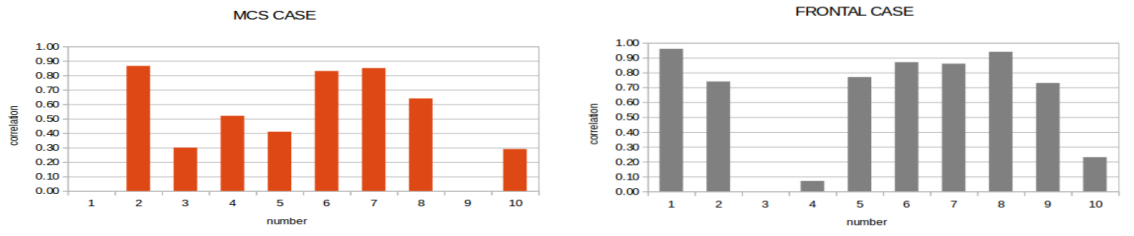


Figure 3: Correlation coefficients for MSC (left) and F (right) cases.

In figure 3 are shown the correlation coefficients between GNSS and WRF-NCP for 20 cases with intense precipitation. The IWV correlation is over 0.7 for: 1) 7 out of 9 frontal and 2) 3 out of 8 MCS cases.

Acknowledgment

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