Use of GNSS water vapour for severe weather studies in Bulgaria: hail and heavy rain in 2012

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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. Remote sensing of water vapour with GPS receivers has both temporal resolution and accuracy. Application of Global Navigation Satellite Systems (GNSS) in Meteorology is a well established research field in Europe and GNSS data from 1 800 stations are available for model validation and assimilation in the state-of-art models used for operational weather prediction by the National Meteorologic Services. Application of GNSS derived Integrated Water Vapour (IWV) to study cloud initiation is an emerging research topic.

The goal of the present work is to assess the GNSS-IWV potential for application in operation short term forecasting of severe weather. The work is focused on the investigation of the IWV variations during formation and development of several vigorous convective clouds, producing heavy rain or hail over Bulgaria in 2012. Studied is also the IWV relation to Vertically Integrated Liquid (VIL) derived from S-band Doppler radars. In addition, evaluated is simulated IWV from regional Numerical Weather Prediction model (WRF) during the selected cases in Bulgaria.