



Using GNSS data to improve precipitation nowcasting and forecasting

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In the framework of the European Union co-funded project “BalkanMed real time severe weather service (BeRTIIS)”, the feasibility of improved precipitation nowcasting and forecastig is assessed, using Global Navigation Satellite Systems (GNSS) data. For this work, one year (2018) data of Integrated Water Vapor (IWP) and Zenith Total Delay (ZTD) hourly values, computed from GNSS stations data, homogeneously distributed over the Greek area, are used. Rain gauge data, provided by the dense meteorological stations network of the National Observatory of Athens (NOA), are used as ground truth. Additional sources of data, like Meteosat Second Generation (MSG) imagery, are also exploited.

Our work has two main goals: (i) Investigating the impact of ZTD data assimilation on precipitation forecasts using the Weather Research and Forecasting (WRF) model. Warm period convective events and cold period large-scale synoptic events were selected for this purpose. Prior to the assimilation experiments, domain-specific model background errors were computed and an observational preprocessing was applied including accuracy assessment, bias correction and quality control. (ii) Developing a methodology, aiming to nowcast heavy precipitation events, based on IWP values, aided by other sources of data (e.g. satellite cloud mask, cloud type, height and microphysics data, Numerical Weather Prediction forecasts and lightning data). Towards achieving this goal, a 1-year seasonality analysis of IWP was also conducted.

Preliminary analysis of the WRF assimilation experiments showed mixed results with slight improvements in probability of detection and frequency bias. Regarding the development of the nowcasting tool, clear indications of feasibility were detected, especially when satellite data are utilized.