Multi-GNSS tomography and comparison with ICON-D2 forecasts for the flood in Europe in July 2021

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Abstract

Natural hazards can have a dramatic impact on population and aviation. In July 2021, an extreme weather took place over Europe. Several countries were affected by severe floods. Some were catastrophic, causing deaths and widespread damage.

As part of a combined effort from the AMUSE (Advanced MUlti-GNSS Array for Monitoring Severe Weather Events) funded by the German Research Foundation DFG and the ALARM H2020 SESAR project (https://alarm-project.eu), this work highlights the interest of multi-GNSS tomography for the 3D-modelling of the total refractivity of the neutral atmosphere and the water vapour density. Using external observation from radiosondes, GNSS radio-occultation and remote sensing, precursor information of the initiation of deep convection from ground-based GNSS technique is investigated. Slant observations are used to validate the weather forecasts from numerical weather model ICON-D2, and for providing relevant tool and products for nowcasting applications.