Assessing the added-value of dense GNSS networks and multi-GNSS observations for tomographic applications

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The growing number of GNSS (GPS, GLONASS, Galileo) satellites and ground receivers will in the next several years significantly increase the number of radio navigation signals probing the Earth's atmosphere. In this study, the added-value of using dense national GNSS networks, in addition to the EUREF Permanent Network (EPN), is investigated for performing ionospheric as well as tropospheric tomography over Europe. For this purpose, the focus will be on the geometry of the satellite-receiver ray distribution traversing the atmosphere. This investigation shows that dense national networks mostly provide an added-value for tropospheric tomography reducing significantly the empty zones, while their interest for ionospheric tomography is less evident.

Additionally, 52% of the EPN stations are presently capable of tracking GLONASS and 90% of new antennas installed in the EPN are able to observe the three GNSS. The results show how GLONASS and/or Galileo observations, in addition to GPS, not only increase the number of rays, but also extend the observation zone, possibly contributing to a better sounding of the atmosphere.