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Construction of fingerprints relevant for climate investigations by using GNSS Radio Occultation Observations

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Troposphere is a transition layer between the troposphere and the stratosphere. The exchanges of air mass, water vapor, trace gas and energy between the troposphere and the stratosphere occur through this layer. Accurate and continuous observations of the tropopause on a global scale are crucial for monitoring stratosphere-troposphere exchange and understanding the balance of atmospheric tracers in the upper troposphere and lower stratosphere. In our work, we propose to measure tropopause by using GNSS Radio Occultation (RO) bending angles (BA) profiles. The proposed method fit with a dry model, namely Hopfield one, the BA profiles. Through the layers in which tropopause is contained, the residuals have an anomalous trend. The plot of residuals in this zone form a positive bump that we will try to exploit just to determine the relevant parameters of the tropopause. We will use the huge amount of data provides by the COSMIC mission for tuning the algorithms, perform a validation of the approach and compare our results with those achieved applying different techniques.
The coordinates of a static Global Navigation Satellite System (GNSS) station placed on the ground are estimated together with the delay suffered by the incoming satellite signals through the atmosphere. The tropospheric delay (TD) is formulated as the product of the zenith delay (ZTD) with a mapping function depending on the sine of elevation angles. In processing chain, indeed, the ZTD is estimated together with the coordinates; while the MF is modelled apart, in an independent way, by using atmospheric profiles retrieved with balloon observations (RAOB) as done for the Niell MF in 1996 or provided by climate or Numerical Weather Prediction (NWP) models as done for the Vienna MFs. In the present work we have reconstructed the MF by using atmospheric profiles given by GNSS radio occultation observations (GNSS-RO).
We propose to use the mapping function built with GNSS RO and its evolution in time as a parameter suitable for climate investigations