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Assessment of tropospheric bias on GNSS ground stations using GNSS radio occultation data

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The coordinates of a static GNSS station placed on the ground are estimated together with the delay suffered by the incoming satellite signals through the atmosphere. The tropospheric bias (hereafter TD) is formulated as the product of the zenith delay (ZTD) with the number of air masses crossed by the signal and expressed as a function of the sine of elevation angles (the so called mapping function. Hereafter MF). In processing chain indeed ZTD is estimated together with the coordinates; while the MF is modelled apart in an independent way by using atmospheric profiles retrieved by using balloon observations or provided by the models. With the present work we plan to reconstruct the MF by using atmospheric profiles given by GNSS radio occultation observations (GNSS-RO).
Indeed the several space missions devoted to GPS-RO like : COSMIC-FORMOSAT, METOP, CHAMP, GRACE and the Italian experiments on OCEANSAT_2, AQUARIOUS-SAC-D and Megha-Tropique; are providing a huge amount of data which makes worthwhile to be attempted the reconstruction of a new mapping function based on such kind of data. The results and validation activities of the new MF are shown and deeply discussed.
Finally the ray tracing technique (hereafter RTT) is demonstrating a promising approach, alternative to the MF, and capable to compute the TD needed to solve for the coordinates of a ground GNSS station. The GNSS RO data are also in this case used to compute the TD by using RTT technique. Then the TD is subtracted from the RINEX files of each station. Finally RINEX TD-free are processed swithing –off the routines concerning the estimation of the TD.