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ASSESSMENT OF ATMOSPHERIC BIAS IN GEODETIC SURVEYING APPLICATIONS EXPLOITING THE S/N RATIO OF GNSS RECEIVERS

Abstract

The Tropospheric delay (TD) introduce a bias in the measurement of the range between the GNSS satellite and the receiver on Earth. It can be modelled as a Zenith Tropospheric delay (ZTD) unless of a slant factor (or Mapping Function) depending on the shape (almost spherical) of the atmospheric bulge. So in the processing chain, ZTD is estimated together with the coordinates. If the atmospheric layers were flat the MF would be the cosecant of the elevation angle. But this is no so. The more proper shape of the MF is indeed a nested function depending on the cosecant of elevation (or equivalently the sin of elevation) truncated at third stage as Marini-Murray (MM) suggested in 1972. Thus in these last decades the more and more refined MF were built to reduce the uncertainties on coordinates due to the atmosphere. The three coefficients of the M-M nested function have been expressed in function of parameters such as surface pressure, temperature, latitude, longitude, the Day Of the Year (DoY), topography and/or tropospheric height etc. according to the model proposed. The observations used to estimate the MM coefficients have been till now atmospheric profiles retrieved with balloon observations (RAOB), GNSS Radio Occultations or Numerical Climate and Weather Models. With the present work we plan to estimate the MF using a new unexpected source of data: the signal to noise ratio of the GPS signals usually recorded in the RINEX files. The rationale of this approach is that the weakening of the signal mainly depends on the number of air masses crossed by the signal. The number of air masses crossed by the signal increases for low elevation angles (at zenith the MF is =1). But the Number of air masses is given by the MF multiplied by extinction coefficient. We plan to assess the level of precision of the MF built using S/N. If the MF built in such a way will reveal promising, the advantages could be really meaningful. We would built MF tailored just for each station of a network and not according a geographical gridding with more or less resolution as usually now it is done. Furthermore it can contribute to model in a more refined way the atmospheric artefacts helpful to improve the precision and the geographyc range of real time applications of GNSS as RTK and PPP.