EGU22-2702
https://doi.org/10.5194/egusphere-egu22-2702
EGU General Assembly 2022

Development of a global model for zenith wet delays based on the random forest approach

Qinzheng Li[1,2], Johannes Böhm[1], Linguo Yuan[2], and Robert Weber[1]
[1]TU Wien, Vienna, Austria (qinzheng.li@geo.tuwien.ac.at)
[2]Southwest Jiaotong University, Chengdu, P.R. China

Tropospheric delays have been a major error source for space geodetic techniques and the performance of their modeling is significantly limited due to the high spatiotemporal variability of the moisture in the lower atmosphere. In this study, tropospheric zenith wet delay (ZWD) modeling was realized based on the machine learning (random forest approach, RF) and using 10 years (2010-2019) of radiosonde measurements at 586 globally distributed stations. Subsequently, the ZWD modeling accuracy was validated based on the sounding profiles across the globe for the year 2020. We find that ZWD modeling accuracy is significantly improved by taking account meteorological parameters in the functional formulation, especially for surface water vapor pressure. When surface meteorological data are available, the RF-based ZWD models with meteorological parameterization can achieve an overall accuracy of 2.9 cm and the bias close to zero across the globe, which clearly outperforms current empirical models, such as the GPT3, or other models based on surface meteorological measurements. From the analyses of spatial characteristics of the ZWD accuracy, it can be concluded that the RF-based ZWD models especially mitigate the systematic biases in the regions with monsoon climate and tropical rainforest climate types.