Preliminary Study of Modeling the Precipitable Water Vapor Based on Radiosonde Data

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SUMMARY

GNSS meteorology is the determination of the water vapor content of the troposphere from Global Navigation Satellite System (GNSS) data. Moreover, the water vapor content is estimated from the techniques such as water vapor gradiometers, solar spectrometers, radiosondes, and lidars. Unlike GNSS, these techniques are expensive and their spatial and temporal solutions are weak. In addition, they cannot work in all weather conditions and have limited range of global coverage. Thus, GNSS has become an indispensable tool for providing the water vapor content in climate and meteorological studies. One of the applications of GNSS is the estimation of the tropospheric zenith delay derived from ground-based GNSS data. The estimated tropospheric zenith delay is then used for the determination of the water vapour. For this reason, Askne and Nodius (1987) have developed the equation of the index of refraction. Water vapor is estimated from the wet part of the tropospheric zenith delay. There are two models to map the wet tropospheric zenith delay onto the precipitable water vapour: Tm model and conversion factor Q. In this study, another regional Tm model is developed using a radiosonde analysis algorithm which can determine the transformation parameters between the wet tropospheric zenith delay and the precipitable water vapour. The outcomes of the algorithm are the weighted mean temperature, the wet tropospheric zenith delay, and the precipitable water vapour. The wet tropospheric zenith delay and the precipitable water vapour acquired from the algorithm is compared with the wet tropospheric zenith delay and the precipitable water vapour derived from the data of continuous GNSS stations to check accuracy and reliability of these parameters and the algorithm.