



## **Comparison of the Ionospheric Total Electron Content Estimation Methods using GNSS reference station network**

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Ionosphere is a part of the atmosphere which affects propagation of the GNSS signal the most. Ionospheric delay is frequency-dependent and proportional to electron content. This effect can be easily eliminated with a linear combination of dual-frequency observations. The dual-frequency measurements can also be used to model vertical total electron content (VTEC).

With ongoing development and densification of GNSS reference networks comes the possibility to increase the accuracy of regional VTEC models. Also, the opportunity to limit the model to a small area has arisen, since the amount of data obtained from various reference networks seem to be sufficient to provide a precise ionospheric characteristic almost in real-time.

The aim of the research was to evaluate the performance of several VTEC estimation methods. Two dual-frequency GPS data sets from a subnet of 13 reference stations of a Polish GBAS ASG-EUPOS were used in the process, thus limiting the area of the network to 270x200 km. Model coefficients were estimated along with the hardware delay (DCB) of the receivers. The VTEC models were tested on two reference stations not included in the modelling process. DCB results were compared to those provided by the UWM Ionosphere Monitoring Service over Europe. The observations were then adjusted respectively to obtain an unbiased solution. Presented research proved that model accuracy varies from ionospheric activity, test station location relative to reference station network and function parameters. Results show that the local solution represents changing ionospheric conditions properly and potentially might be applied in precise positioning.