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Evaluation of Spatial and Temporal Characteristics of Different Tropospheric Delay Correction Models in Antarctica

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Troposphere delay is one of the main sources of error in the analysis of space geodetic techniques. The delay depends on the path that a signal must follow in the atmosphere. Zenith Tropospheric Delay (ZTD) modelling has been used to decrease this influence. To provide references to allow suitable models to be chosen by GNSS users for Antarctica, we conduct a comprehensive study of the performances of the UNB3m, EGNOS, GPT2+Saastamoinen, GPT2w+Saastamoinen, GPT2+Hopfield, GPT2w+Hopfield and IGGtropSH models in Antarctica using 8 years of Global Positioning System (GPS)-derived ZTD series data from 64 stations from the International GNSS Service (IGS) and the Polar Earth Observing Network (POLENET). The results show that GPT2/2w+SAAS models can provide tropospheric delay corrections with biases of -0.11 cm and -0.29 cm and root mean square (RMS) values of 2.38 cm and 2.36 cm, respectively; these results are better than those of the five other models. For the UNB3m and EGNOS models, the bias and RMS show obvious seasonal characteristics. When the elevation is below 500 m, the bias and RMS values of the seven models do not change considerably with elevation. As elevation increases, the bias and RMS values of the GPT2/2w+HOP models increase significantly. The GPT2/2w+SAAS models and the IGGtropSH model are not affected by elevation. In Antarctica, the direct modelling of meteorological parameters and ZTD can both achieve good results.