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Evaluation of Ionospheric Delay and Models Performance

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The ionosphere is the portion of the upper atmosphere that contains free electrons and ions that significantly affect the propagation of radio waves causing delay errors of the [GPS satellite signals](#). Therefore, the investigation and prediction of [ionospheric](#) propagation errors are crucial for precise measurements and further improving the accuracy of the GPS positioning. This research aimed to investigate the ionospheric delay and prediction models in the equatorial region, wherein the equatorial region, the variations of the ionospheric delay are recognized to be high when compared with the mid-latitude and high-latitude. The International Reference Ionosphere model (IRI-2012) with the three topside electron density options: NeQuick, IRI-2001, and IRI01-corr was used. Besides the time series Holt-Winter model and the Autoregressive Integrated Moving Average ([ARIMA](#)) models were tested. The ionospheric delay is predicted in the diurnal monthly and seasonal variation. The ionospheric prediction models were evaluated during the [geomagnetically](#) quiet and disturbed periods. The models were validated with the actual data to test the efficiency and accuracy of the ionospheric model. The result showed that the maximum actual ionospheric delay was around 8 m, where the maximum difference between the actual and the predicted delay was around 0.5 m. The lowest value in the seasonal variation was observed in summer and the maximum in the equinox season. The Holt-Winter method proved to be capable of predicting the ionospheric delay with better accuracy compared with IRI and ARIMA models.

Biography

Nouf Abd Elmunim is currently an assistant professor, in the Electrical Department, College of Engineering, at Princess Nourah Bint Abdul Rahman University, Saudi Arabia. She holds a PhD from the National University of Malaysia, Faculty of Engineering and Space Science Centre at Malaysia, with a focus of upper atmospheric layer, GPS satellite signals, and ionospheric models.

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