

Preliminary investigation on ionospheric total electron content forecasting over China

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A new model for forecasting total electron content(TEC) distribution over China, suitable for both scientific and operational purposes is proposed in this paper. Firstly, the historical observation (from 1996 to 2005) is interpolated using Kriging interpolation. Then the Empirical Orthogonal Function (EOF) analysis is used to investigate the spatial and temporal distribution of TEC. Finally, an empirical TEC model is built based on the coefficients and basis functions obtained from EOF analysis. We find that many properties of GPS TEC vary in a random yet spatially correlated fashion, and using kriging for interpolation enables us to estimate the confidence in any interpolated value in a way better than the earlier methods do. In EOF analysis, the fundamental orthogonal basis functions are naturally obtained during the calculation procedure. They possess the inherent characteristics of original data, and the eigen series converges much more quickly. The coefficients of EOF basis functions can well signify the solar activity, seasonal, and semiannual variations of TEC. The model constructed in the paper has fewer coefficients than that constructed by Fourier series analysis and has much higher precision than IRI.