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Geophysical causes of pole coordinates data prediction errors

W. Kosek (1,2)

(1) Environmental Engineering and Land Surveying, University of Krakow, Poland, (2) Space Research Centre, Polish Academy of Sciences, Warsaw, Poland

The analysis of Earth Orientation Parameters (EOP) prediction results from the EOPPCC (Earth Orientation Parameters Prediction Comparison Campaign) and the EOPCPPP (Earth Orientation Parameters Combination of Prediction Pilot Project) have shown that the combination of least-squares and autoregressive (LS+AR) prediction is one of the most accurate prediction technique for pole coordinates data. In this prediction technique the autoregressive prediction enables forecasting of wideband least-squares extrapolation residuals which are mostly excited the equatorial components of joint atmospheric ocean excitation functions. To show such excitation mechanism the pole coordinates model data were computed by numerical integration of differential equation of polar motion with joint atmospheric-ocean excitation functions. The wavelet spectra and time-frequency polarization functions of these extrapolation residuals of pole coordinates data and pole coordinates model data are very similar. The skewness and kurtosis of both least-squares extrapolation residuals showed that their probability distribution is not normal.

Additionally, the differences between pole coordinates or/and pole coordinates model data and their LS+AR predictions were tested using skewness and kurtosis computed for different prediction lengths. These two statistics showed that these differences do not satisfy normal distribution either. The skewness significantly exceeds from zero which means that their probability distribution is nonsymmetrical and the kurtosis decreases with prediction length which means that their probability distribution becomes more flat when the prediction length increases. The spectral analysis of time series of the differences between pole coordinates data and their LS+AR predictions for different prediction lengths showed existence of seasonal oscillations in them. The detected quasi annual variations in these differences is mostly caused by phase variations of the annual oscillation in polar motion data driven by wideband annual oscillation of the joint atmospheric-ocean excitation function. The annual oscillation phase variations in pole coordinates data and pole coordinates model data were computed by wavelet technique.