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Pole coordinates data prediction by combination of least squares extrapolation and double autoregressive prediction

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Future Earth Orientation Parameters data are needed to compute real time transformation between the celestial and terrestrial reference frames. This transformation is realized by predictions of x, y pole coordinates data, UT1-UTC data and precesion-nutation extrapolation model. This paper is focused on the pole coordinates data prediction by combination of the least-squares (LS) extrapolation and autoregressive (AR) prediction models (LS+AR). The AR prediction which is applied to the LS extrapolation residuals of pole coordinates data does not able to predict all frequency bands of them and it is mostly tuned to predict subseasonal oscillations. The absolute values of differences between pole coordinates data and their LS+AR predictions increase with prediction length and depend mostly on starting prediction epochs, thus time series of these differences for 2, 4 and 8 weeks in the future were analyzed. Time frequency spectra of these differences for different prediction lengths are very similar showing some power in the frequency band corresponding to the prograde Chandler and annual oscillations, which means that the increase of prediction errors is caused by mismodelling of these oscillations by the LS extrapolation model. Thus, the LS+AR prediction method can be modified by taking into additional AR prediction correction computed from time series of these prediction differences for different prediction lengths. This additional AR prediction is mostly tuned to the seasonal frequency band of pole coordinates data.