ACCURACY ASSESSMENT OF THE ERP PREDICTION METHOD BASED ON ANALYSIS OF 100-YEAR ERP SERIES

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ABSTRACT. A new method has been developed at the Siberian Research Institute of Metrology (SNIIM) for highly accurate prediction of UT1 and Pole motion (PM). In this study, a detailed comparison was made of real-time UT1 predictions made in 2006–2011 and PM predictions made in 2009–2011 making use of the SNIIM method with simultaneous predictions computed at the International Earth Rotation and Reference Systems Service (IERS), USNO. Obtained results have shown that proposed method provides better accuracy at different prediction lengths.

1. INTRODUCTION

Currently used methods for Earth rotation parameters (ERP, comprising UT1 and polar motion) forecast are mostly based on statistical analysis of time series of observed EOP estimates. Usually, relatively short time series of the 2–6 years length are used to adjust the parameters of prediction model used. Thus these models take into account only short-term variations in Earth's rotation which are not stable enough at decadal time scales. For this reason, such an approach can cause the loss of important information on the long-term behavior of the Earth, which can influence the accuracy of the ERP prediction.

During the last several years, a new method for prediction of Earth rotation parameters (ERP) has been developed at the Siberian Scientific Research Institute of Metrology (SNIIM). It is described in detail in Tissen et al. (2009, 2010). The main distinctive feature of this method is making use of long-time series, up to 100 years, to estimate the trend component in the predicted ERP series. The trend component is modeled as a polyharmonic time series consisting of 20 and more terms with periods from several months to several decades. After removing the trend, the residuals are predicted making use of a modified autoregression technique.

To assess the accuracy of the method, we performed a detailed comparison of real-time ERP predictions computed making use of this method in 2006–2011 with simultaneous predictions computed at the International Earth Rotation and Reference Systems Service (IERS). Results of comparison are shown in the next section.

2. TESTING

The method was tested by means of comparison with the predictions made by the IERS Rapid Service/Prediction Center at USNO. To provide such a comparison, operational ERP series computed daily at USNO were extrapolated at SNIIM soon after appearance of the USNO ERP series in public access. Operationally computed SNIIM predictions were then stored together with the IERS Bulletin A predictions made on the same day. In total, 671 UT1 predictions made from January 2006 till August 2011 and 423 polar motion (PM) predictions made from October 2009 till August 2011 were used in this work. Results of our comparison of SNIIM and USNO predictions are shown in Figure 1.

It should be mentioned, that the frequency of SNIIM predictions gradually increased from about twice a month in 2006 to daily from September 2010 (the beginning of the IERS EOPCPPP campaign). As a consequence, predictions made in different years have different weight in the summary plots presented in Figure 1, especially for UT1. To make a more rigorous and detailed conclusion, a separate comparison was made for each year of data, which confirmed the main results obtained for whole the interval.

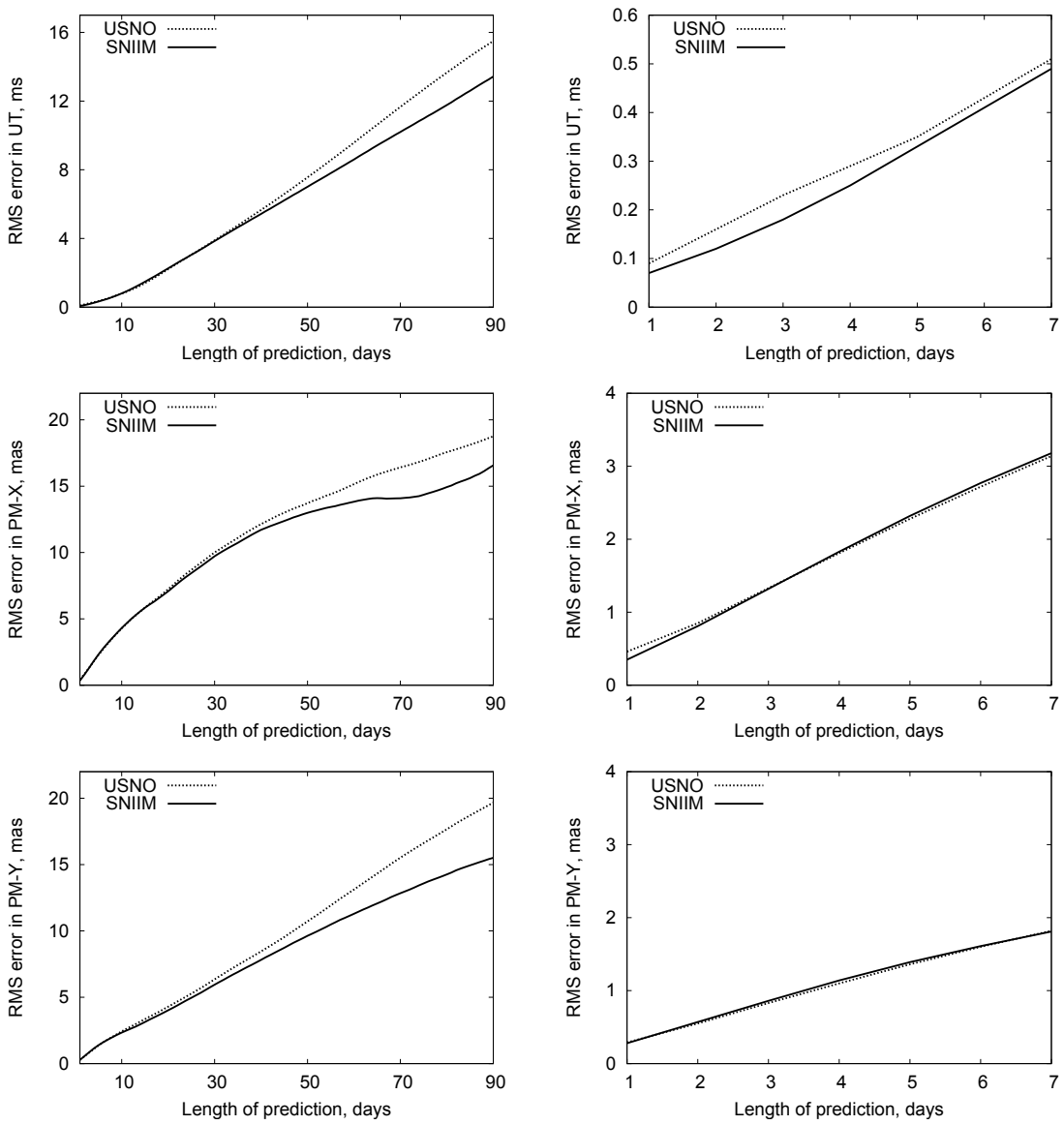

Figure 1: Comparison of the UT1 and polar motion prediction errors made in USNO and SNIIM.

3. CONCLUSIONS

The method of ERP prediction developed at SNIIM has been tested by comparison with the USNO results using 671 UT1 predictions for 2006–2011 and 423 PM predictions for 2009–2011. The SNIIM method has shown the better accuracy for medium-term (up to 3 months) predictions of UT1 and PM. Accuracy of ultra-short-term (several days) PM predictions is practically the same for SNIIM and USNO, but for UT1 prediction SNIIM method showed clear advantage. The latter is especially important for practical applications.

4. REFERENCES

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