SOLUTION OF HIGH FREQUENCY VARIATIONS OF ERP FROM VLBI OBSERVATIONS

B. ZHANG, J.L. LI, G.L. WANG, M. ZHAO
Shanghai Astronomical Observatory
80 Nandan Road, Shanghai 200030, China
e-mail: zb@shao.ac.cn

In the astrometric and geodetic VLBI data analysis software CALC/SOLVE (Ma et al., 1990), the high frequency variations of the Earth Rotation Parameters (ERP) are determined by a constrained continuous piecewise linear model, that is, the ERP rate within two epoch nodes is constrained to be smaller than a limitation setting, and the ERP is forced to be continuous at epoch nodes. Observation analysis shows that when the data points are not very dense the constraint and the continuation requirement are helpful to the improvement in the stability of the solution, but degrade the independence of ERP solutions at epoch nodes as well. By using the Userpartial entry of CALC/SOLVE a direct solution module (referred as ERPPART) of the high frequency variations of ERP is realized without any constraint on the rate nor the requirement of continuation at nodes. It is shown from real observation reduction that the direct solution mode is feasible.

According to Richter (2001) & Weber et al. (2000), the celestial pole offsets could not be solved together with the hourly resolution polar motion because the errors in the nutation model will expressed as retrograde nearly diurnal polar motions after coupling with the Earth rotation and so correlated with the solution of the hourly resolution polar motion. However, in the data analysis of long time span, the errors in the nutation model could not be neglected. There are generally two ways to deal with this case. One is to take the nutation series (could be fitted series from observations) directly as *a priori* inputs. The other is to take the corrections to nutation terms as global parameters in order to pick up the effects of nutation model errors. In CALC /SOLVE system the global and the arc parameters are solved for separately. The global parameters are solved firstly and by substituting back into the observation equations the arc parameters are solved secondly. Therefore by taking corrections to nutation terms as global parameters the correlation between the hourly resolution ERP and the nutation model errors could be resolved. In CALC/SOLVE the first way is already realized. For the second way, by using the User-Partial feature a new solution module (EOPPTWG) is compiled.

Global solutions of thousands astrometric and geodetic VLBI sessions are performed by using the original solution mode of SOLVE (referred as NORMAL) and the newly developed mode ERPPART and EOPPTWG. The ERP series within CONT02 (October of 2002) with two hours resolution were extracted. Fig.1 shows the adjustments (high frequency variation) and formal errors of the x component of polar motion. The curve in Fig.1 represents the model prediction given by Gipson (1996). From Fig.1 it is clear that the stability and the precision of the solution are becoming better from NORMAL, ERPPART to EOPPTWG.

In conclusion, when the data points are sufficient the constraint as well as the requirement of continuation of ERP at epoch nodes is not necessarily used. When observations with long time span are analyzed the possible errors in nutation model should be taken into consideration.

Compared with the NORMAL mode, solutions of the high frequency variation of ERP from ERPPART and EOPPTWG at different epoch nodes are more independent and so are more reasonable to use.

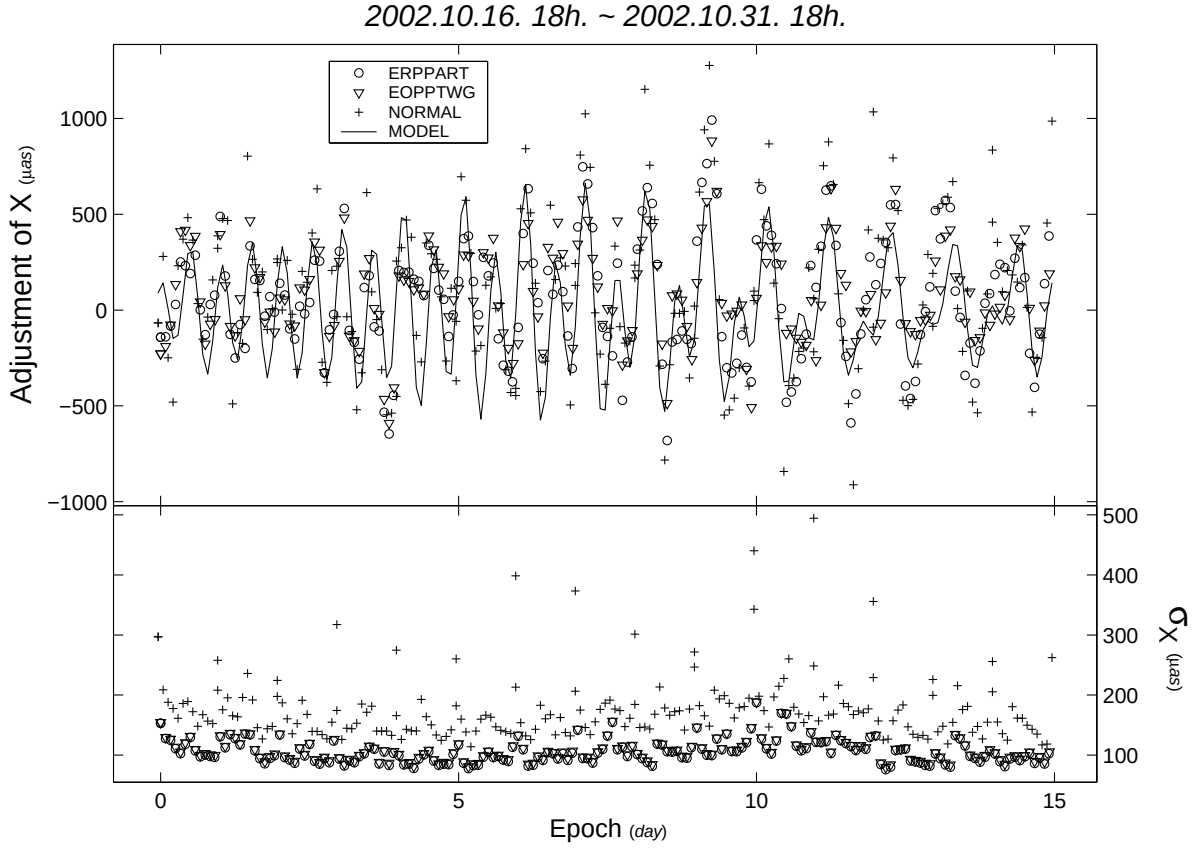

Figure 1: Solution comparison of X component of polar motion by ERPPART, EOPPTWG and NORMAL (see the text) mode (CONT02)

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