COMPARATIVE ANALYSIS OF THE NEW NUTATION SERIES

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ABSTRACT. Different approaches can be used for construction of the nutation series. For comparative analysis we took series that were based on empirical, semi-analytical and on the Hamiltonian analytical theories. For the VLBI data set covering the period from 1982 to the 2002, the angles $\Delta\varepsilon$ and $\sin\varepsilon_0\Delta\psi$ were calculated on base of each nutation theories.

1. INTRODUCTION. The comparison with the VLBI observations for modern nutation series (MHB2000(Mathews et.al. (2002)),GF99(Getino and Ferrandiz(2000)),Huang et. al. (2001) and preliminary ZP2002 series(Zharov and Pasynok (2002))) were made. For data processing we used the IVS *.ngs files for VLBI observations from 1980 to 2002. The package OCCAM5.0 (Titov and Zarraoa(2001)) was used for calculation of corrections for each theory.

As results the files with corrections to the nutation angles $\Delta\varepsilon$ and $\sin\varepsilon_0\Delta\psi$ for each theory were obtained.

2. NUMERICAL RESULTS AND RESUME. The corrections for the angle $d\varepsilon$ are shown at Fig.1. The wrms errors are shown in Table 1. The corrections to the IAU 1980 precession rates are shown in Table 2.

Main factors which determine the wrms errors of the theories at sub-milliarcsecond level of accuracy are the non-linear terms in the gravitational torque and the FCN model. Therefore, the theories can be divided on three groups. The best accuracy was achieved in the theories which include the FCN model as well as non-linear terms (MHB2000 with FCN); the second group includes the theories in which the non-linear terms are taken into account but not the FCN model (MHB2000 without FCN and GF99), and the third group contains the theories which not include both the FCN model and the non-linear terms.
The small linear drift of the IERS observations series compared with the VLBI observations

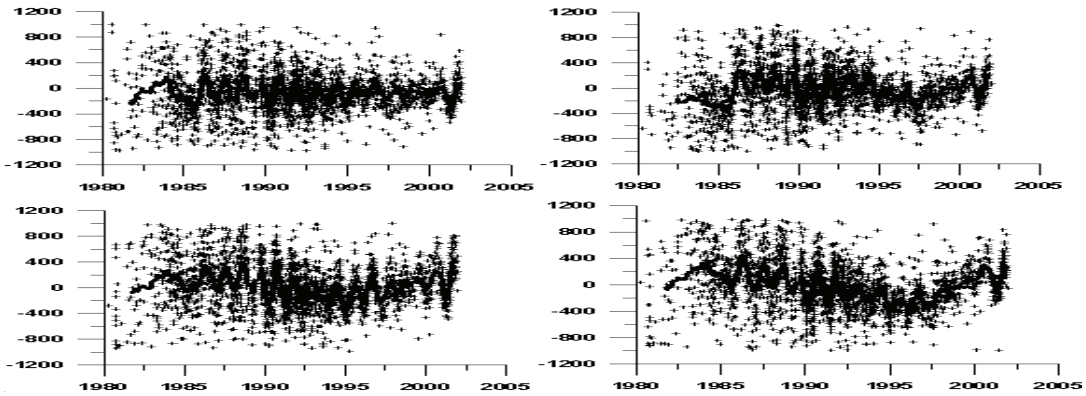

Figure 1: Corrections $d\varepsilon$ to the theoretical nutation angle ε for the nutation theories: MHB2000 without FCN (left upper), GF99(right upper), preliminary ZP2002 theory without FCN (left bottom), Huang et. al. 2001 (right bottom). The solid line is the running average.

Table 1: The wrms errors for the nutation series.

	MHB2000 with FCN	**ZP 2002 with FCN**	**MHB2000 without FCN**	**GF99**	**ZP 2002 without FCN**	**Huang et. al. 2001**
$d\varepsilon(\mu as)$	186	173	218	232	287	288
$d\psi(\mu as)$	291	447	430	434	508	560
$\sin\varepsilon_0 d\psi(\mu as)$	116	178	171	173	202	223

Table 2: Corrections to the IAU1980 precession rates for the nutation series.

	MHB2000	**GF99**	**ZP 2002**	**Huang et. al. 2001**
$d\varepsilon(arc\sec/c)$	-0.0252	-0.024	-0.023	-0.028
$d\psi(arc\sec/c)$	-0.2997	-0.304	-0.309	0.300

series was detected. Therefore VLBI observations series for fitting process can be recommended.

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3. REFERENCES

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