Abstract. We have found recently, from the direct analysis of VLBI observations of celestial pole offsets from IAU2000 model of precession-nutation, that the period of Retrograde Free Core Nutation (RFCN) apparently grows from original 430 days to 460 days during the past ten years (Vondrák et al. 2004). At the same time, we also derived corrections of certain nutation terms from the GPS/VLBI combined solution. A study of indirect determination of RFCN period from the corrected nutation terms through the resonance effects is presented, and the differences between the results of these two approaches are discussed. It is shown that the resonance approach does not confirm the apparent change of RFCN period obtained from direct observations.

Differences between the IVS and IAU2000A model

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Direct observations yield:

- $P_{RFCN} = 435$ days for 1984-2004;
- $P_{RFCN} = 460$ days for 1994-2004.

These corrections are added to IAU2000A nutation terms;

Small corrections (geodesic nutations, sun-synchronous corrections...) given by MHB Tab. 7 are removed;

“observed” transfer function for these 5 terms are calculated, by dividing the observed amplitudes (real and imaginary part, for positive an negative frequency) by rigid-Earth (Souchay et al. 1999) values.

Least-squares fit of largest nutation terms to combined solution:

<table>
<thead>
<tr>
<th>Term</th>
<th>Period[d]</th>
<th>$\delta X [\mu as]$</th>
<th>$\delta Y [\mu as]$</th>
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<tr>
<td>RFCN</td>
<td>460</td>
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<td>$-96.9_{-3.6}^{+3.6}$</td>
</tr>
<tr>
<td>2F-2D+2D</td>
<td>366.26</td>
<td>$-43.5_{-3.6}^{+3.6}$</td>
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<td>1+2F-2D+2D</td>
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The estimation of resonant RFCN frequency:

- All constants in MHB transfer function are kept, with the exception of $s_2$, which correspond to RFCN;
- Two parameters (Re($s_2$), Im($s_2$)) are estimated by weighted least-squares;
- Partial derivatives $\partial T/\partial (\text{Re}(s_2))$, $\partial T/\partial (\text{Im}(s_2))$ were obtained numerically, solution was made by successive approximations.

Conclusion:

- The apparent change of RFCN period after 1994, detected by direct observations, is not confirmed by analysis of resonance effects.
- The new determination of this period, based on five largest nutation terms derived from VLBI/GPS combined solution in 1994-2004, is in good agreement with MHB value;
- The difference of RFCN period, obtained by direct (~460 solar days) and resonance (~430 solar days) method can probably be explained by an excitation (atmospheric or oceanic?) with terrestrial period around 23h 53min.

EGU General Assembly, Vienna, April 2005

References:

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Results:

- $s_2 = -1.00231860 \pm 0.00002534$ $\Rightarrow P_{RFCN} = 430.12_{-0.11}^{+0.11}$ days
- Compare with the MHB values:
  - $s_2 = -1.00231811 \pm 0.00002561$ $\Rightarrow P_{RFCN} = 430.21_{-0.28}^{+0.28}$ days

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