THE DETERMINATION OF THE PRINCIPAL NUTATION TERMS FROM THE OBSERVATIONS WITH ZTF–135 IN 1948.7–1989.0

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ABSTRACT. A re-reduction of observations made with ZTF–135 in Pulkovo during 1948.7-1989.0 (all together about 87 000 observations) has been carried out with the aim of determing the amplitude of the principal terms of nutation in longitude and obliquity. The derived coefficients of nutation M=6".8445±0".0033 and N=9".2028±0".0025 are in good agreement with similar astrometric determinations.

The two observational programmes were used for ZTF–135 in 1948.7– 1989.0. During the first programme (Gordon, 1948) from 1948.7 to 1968.1 about 48 000 observations were made and during the second one (Kostina, 1970) from 1968.1 to 1989.0 about 39 000 observations were made. All individual latitudes were recalculated using the MERIT Standard algorithm and were corrected for polar motion. As the observations are not yet reduced to a uniform system, we estimated nutation coefficients for the two programmes independently. For further culculations we have formed the normal points for each Talcott pair as the mean value from observations made in one season, *i.e.* one normal point in a year for each pair.

Two methods were used in the present work. According to the first one, previously used for ZTF–135 observations (Kulikov, 1949; Romanskaya, 1961; Kostina et al., 1988), we solved by least squares the equation:

$$\varphi=\varphi_0-\Delta\delta-\Delta\mu(t-t_0)-dN(\sin\alpha\cos\Omega-m\cos\alpha\sin\Omega)$$

where dN is the correction to the convential coeffficient of nutation in obliquity, m = 0.7434 is the relation between the axes of nutation ellipse and the other designations are obvious.

Thus we found for the two programmes
N = 9".2028 ± 0".0022 (epoch 1958.4),
N = 9".2147 ± 0".0049 (epoch 1978.5)
and the weighted mean
N = 9".2049 ± 0".0020 (epoch 1968.5).

However, as analysis of the algorithm shows, the coefficient of nutation obtained using such a method significantly depends on the conventional value m. For control we applied this method to

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the latitudes reduced using the Woolard nutation coefficients. In this case we found N=9$''$1955. It is clear that the method discussed is not satisfactory.

Therefore we estimated the coefficients of nutation solving by least square the well known equations:

$$\varphi = \varphi_0 - \Delta\delta - \Delta\mu(t - t_0) - dN \sin\alpha \cos\Omega + dM \cos\alpha \sin\Omega$$

where *dM* and *dN* are the corrections to the convential coefficients of nutation in longitude and obliquity respectively.

Thus we found for the same epochs, given earlier, the values

$M_1 = 6''8414 \pm 0''0035$, $N_1 = 9''2009 \pm 0''0028$,

$M_2 = 6''8645 \pm 0''0094$, $N_2 = 9''2101 \pm 0''0056$

and the weighted mean values

$M = 6''8445 \pm 0''0033$, $N = 9''2028 \pm 0''0025$,

which are in good agreement with other astrometric determinations (Capitaine *et al.*,1988).

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