On the origin of the Equinox Non-Precession Motion in Fitting dynamical with fundamental reference frames.

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Using an angle measuring instrument, The geometrical model of the principal circles and points on the sphere can be constructed by α_k, δ_k for the Sun obtained by the differential method in the system of the catalogue K together with α_e, δ_e calculated by the adopted motion theories. This model is used then to derive equations containing unknown corrections to the catalogue zero-points and corrections to the Earth's orbital elements. We obtain the equations of the form:

$$[\alpha_k - \alpha_e, \delta_k - \delta_e] = [\Delta A, \Delta\delta_0, \Delta L_0, \Delta_\mu, 2e\Delta\pi, 2\Delta e, \epsilon_1 - \epsilon_e]M_1 \qquad (1)$$

In the equation (1), ΔA and $\Delta\delta_0$ denote the corrections to α_k and δ_k for reducing them to the dynamical zero-points. For comparison we consider the equation system generally used in practice for reduction of observations of the Sun:

$$[\alpha_k - \alpha_e, \delta_k - \delta_e] = [\Delta A, \Delta\delta_0, \Delta L_0^{'}, \Delta_\mu^{'}, 2e^{'}\Delta\pi^{'}, 2\Delta e^{'}, \Delta\epsilon_1]M_2 \qquad (2)$$

$\Delta\alpha_0$ in the equation 2 is also generally called as a correction to the catalog right ascensions. We show that some elements of the matrix M_2 differ from the corresponding elements of M_1 , therefore the primed corrections in (1) and unprimed in (2) are distinct by their geometrical essence. Comparing (1) with (2) we have

$$\Delta\alpha_0 = \Delta A + (\lambda_1 - \lambda_e)cos\epsilon \qquad (3)$$

In (3), the difference of longitudes reckoned from the catalogue and dynamical equators can be represented through the corrections to the Earth's orbital elements by the formulae:

$$\lambda_1 - \lambda_e = (1+2ecosM)\Delta L_0 + (1+2ecosM)(t_i - T_0)\Delta\mu - cosM.2e\Delta\pi + (2+5ecosM)sinM.\Delta e \qquad (4)$$

Subtituting in (2) the initial element epoch T_0 by the mean moment of the observation sets $t_0 = 1/N. \sum_{i=1}^{N} t_i$ (a procedure followed in reducing real observations), we obtain solutions for $\Delta\alpha_0$ and $\Delta\delta_0$. Comparing the estimates of $\Delta\alpha_0$ obtained for different observation sets of the Sun we can find a relationship of the form

$$(\Delta\alpha_0)_{t_0} = (\Delta\alpha_0)_{T_0} + \Delta\dot{\alpha}(t_0 - T_0) \tag{5}$$

where $\Delta\dot{\alpha}$ is the so-called non-precessional equinox motion per century. The equinox motion $\Delta\dot{\alpha} \simeq 1.3$" is truly known in practice according to w. Fricke. With this in mind, the inference is made that the non-precessional equinox motion is a result of the reduction procedure of observations of the Sun and planets used in practice together with the imperfect Earth's motion theory proposed by Newcomb as early as in 1895 and applied above 70 years for calculating α_e andδ_e The main result are as follows. A more perfect geometry model is constructed for fitting the stellar and planetary reference frames. The equation system is obtained for calculating the zero-point corrections of the fundamental catalogue. An explanation of the non-precessional equinox motion is proposed. The discrepancy is found between the geometrical interpretation of values determined by the traditional method and the method suggested in this paper. The results of this investigation are of fundamental importance for solving the problem on fitting the stellar reference frame with planetary one using the ground-based and space observations of the Solar system bodies.