DIFFERENCES IN CHANGES OF BOROWIEC GEOGRAPHICAL COORDINATES CAUSED BY THE REPLACEMENT OF FK4 CATALOGUE BY FK5

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ABSTRACT. Astronomical observations of time and of geographical latitude carried out by means of Danjon's astrolabe OPL No. 31 in the years 1982–1988 have been reduced to the system FK4. After the introduction of the FK5 catalogue in 1989, the earlier observations were re-reduced. The geographical latitude results, before and after introducing the FK5 catalogue, are given.

At the turn of 1988/89, the new fundamental catalogue FK5 (Schwan 1989) was disseminated. In the case of the astrolabe, when the equal altitudes method of the observation reduction theory (Débarbat *et al.* 1970) was applied, the corrections to the star coordinates do not transpose directly to the final result. Logically, the character of these corrections with regard to right ascension does not have any correlating effect on geographical coordinate changes observed during the year.

The following questions regarding the effects of differences in changes of geographical coordinates were brought up for discussion:

1) how will the "mean" coordinates change;
2) how should their periodic components, particiularly in annual terms, change;
3) how will the dispersion of derived results change.

Taken into consideration were the geographical Borowiec latitude observations, carried out by means of Danjon's astrolabe, which were grouped in 5-day intervals. The corrections for the polar motion were deduced from BIH-IERS (1982-1989), and so the results were computed in the "BIH 1979" system. The statistical analysis is given in Table 1 (*Before*). The basic results of Pearson's χ^2 test (Konys *et al.* 1975; Fisz 1967) proved the existence of a characteristically systematic error in the series of received latitude observations. In all cases $\chi^2_{0.05}$ is 13.8.

The series of received observations underwent spectral analysis (Jaks *et al.* 1980; Andersen 1974), and using the least suqares method the amplitudes and phases of periodical components were computed. The analysis was based on the model of observed changes of the geographical Borowiec latitude which considered 3 periodic terms: 432 days, annual and semiannual terms. Since all results were computed in the "BIH 1979" system, the global amplitudes of the 3 periodic terms mentioned above were eliminated. The estimated results of the model, using the 3 aforementioned terms, are

J. H. Lieske and V. K. Abalakin (eds.), Inertial Coordinate System on the Sky, 389–390.

Table 1. Basic statistical analysis results of received Borowiec latitude observations, before and after estimation of 3 periodic terms.

Characteristic	*FK4 (Before)*	*FK5 (Before)*	*FK4 (After)*	*FK5 (After)*
ϕ (52°16' +)	38".740	38".700	38".738	38".690
max-min	0".526	0".447	0".475	0".455
σ	0".093	0".078	0".079	0".073
χ^2_{calc}	11.7	22.4	8.6	7.7

shown in Table 1 (*After*). In the table one can observe a significant decresase of parameters within the annual term in the FK5 system while the other components remain relatively unchanged.

The "mean" latitude change which exceed the error estimate is worth noting. The determined terms treated as the model of systematic changes have been successively removed from the observed latitude values. The statistical testing of the goodness of fit of the normal distribution of residuals has been performed. The derived descriptive characterization of the Pearson χ^2 test are shown in Table 2.

Table 2. The parameters of periodic terms in the model of observed Borowiec geographical latitude.

Term		*FK4*	*FK5*
ϕ = 52°16' +		38".748 ± 0".006	38".703 ± 0".006
432-day	Amplitude	0".026 ± 0".007	0".023 ± 0".007
	Phase	255° ± 17°	246° ± 19°
365.24-day	Amplitude	0".048 ± 0".008	0".016 ± 0".007
	Phase	252° ± 10°	238° ± 23°
182.6-day	Amplitude	0".031± 0".007	0".030 ± 0".007
	Phase	6° ± 15°	27° ± 15°

In the series of latitude observations discussed, the introduction of the FK5 caused a significant decrease of the amplitude of the annual term, while the other components remain unchanged. The results presented here show the predominance of the FK5 system over the FK4 system; however, this system still is not free of systematic error sources.

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