

VARIATION OF THE BELGRADE MEAN LATITUDE

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SUMMARY: The variation of the Belgrade mean latitude over the period 1949 - 1985 is analysed. Several periodic variations are found among which that of 11-year period has the highest amplitude.

1. INTRODUCTION

We carried out analysis of the variation of the Belgrade mean latitude using the observational material obtained with the visual zenith telescope (*Askania*, 110/1287 mm) which covers the longest observational period (1949 - 1985) ever treated at the Belgrade Observatory. The observational material has been homogenised as much as possible. It has been reduced to the same declination system (FK4). In the period 1960 - 1985 there were two permanent observers with some short interruptions. The observations were performed following the old observing programme (Djurković et al., 1951) between 1949 and 1960, and following the new one (Ševarlić and Teleki, 1960) between 1960 and 1985. Due to the difference in the latitudes obtained by using the two programmes, established by their comparison (Teleki and Ševarlić, 1964) (and also bearing in mind the different observers in the programmes), the analysis is carried out separately for the two programmes. The mean-latitude values are derived by applying the well-known Orlov formula (Kulikov, 1962).

2. DATA ANALYSIS AND RESULTS

The Belgrade mean latitude resulting from the observational data mentioned above for every 0.1 yr is presented in Fig. 1. In Fig. 1. we also present the linear approximation (L) of the mean-latitude variations. Given also is its analytical expression.

A negligible slope like that found here is in accordance with the results of the Earth-pole secular variation investigations obtained up to now. According to these investigations the terrestrial pole moves along a meridian which is about 90° westwards from the Belgrade meridian. Such a polar motion cannot produce significant changes in the value of the Belgrade mean latitude. Applying the spectral analysis (Jovanović, 1987) to the obtained mean-latitude values we get the spectrograms for the period 1949 - 1960 (old observing programme) presented in Fig. 2 and for the period 1960 - 1985 (new programme) presented in Fig. 3. The periods obtained in the calculations are 7.8, 3.5, 2.3 (old programme) and 10.7, 6.7, 4.1, 3.1, 2.2, 1.1 (new programme). They are expressed in years.

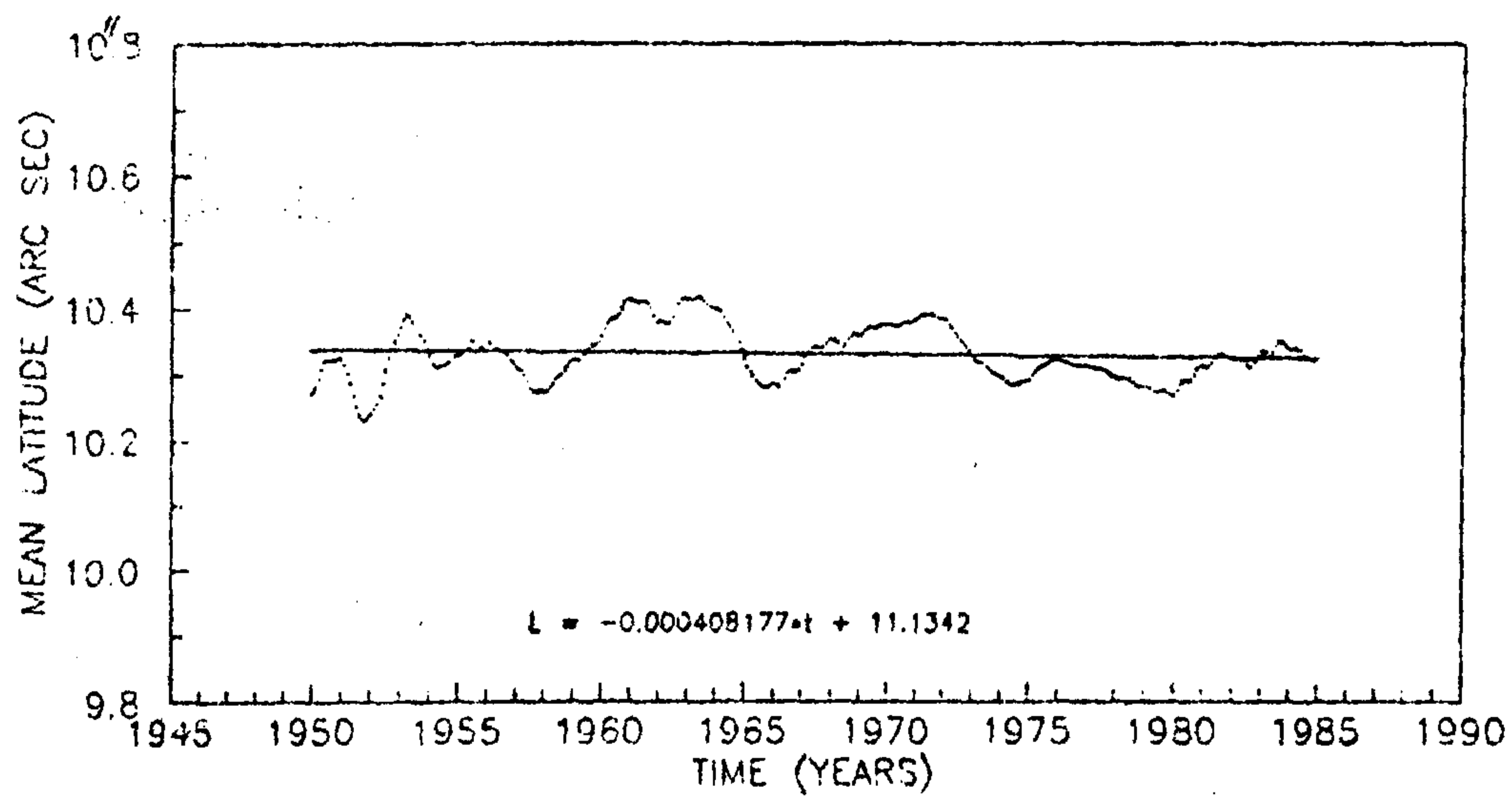


Fig. 1. Variations of Belgrade mean latitude with their linear approximation (L).

The most prominent is the 10.7 years, period or 11 rounded off, found for the new programme clearly evokes the solar-activity period. The reason that in the case of old-programme the presence of this period is not conspicuous is, certainly, its relatively short duration (11 years only). One should say that this, together with other periods, has been found earlier also in the solar-activity study by using Wolf's number (W), the geomagnetic field (Aa) and the differences UT2 - UTC (UT) (Djurović, 1981; Djurović, 1985). Except for some papers by Djurović (1978; 1983) there are only a few analyses in this field which use the data of the Belgrade Observatory

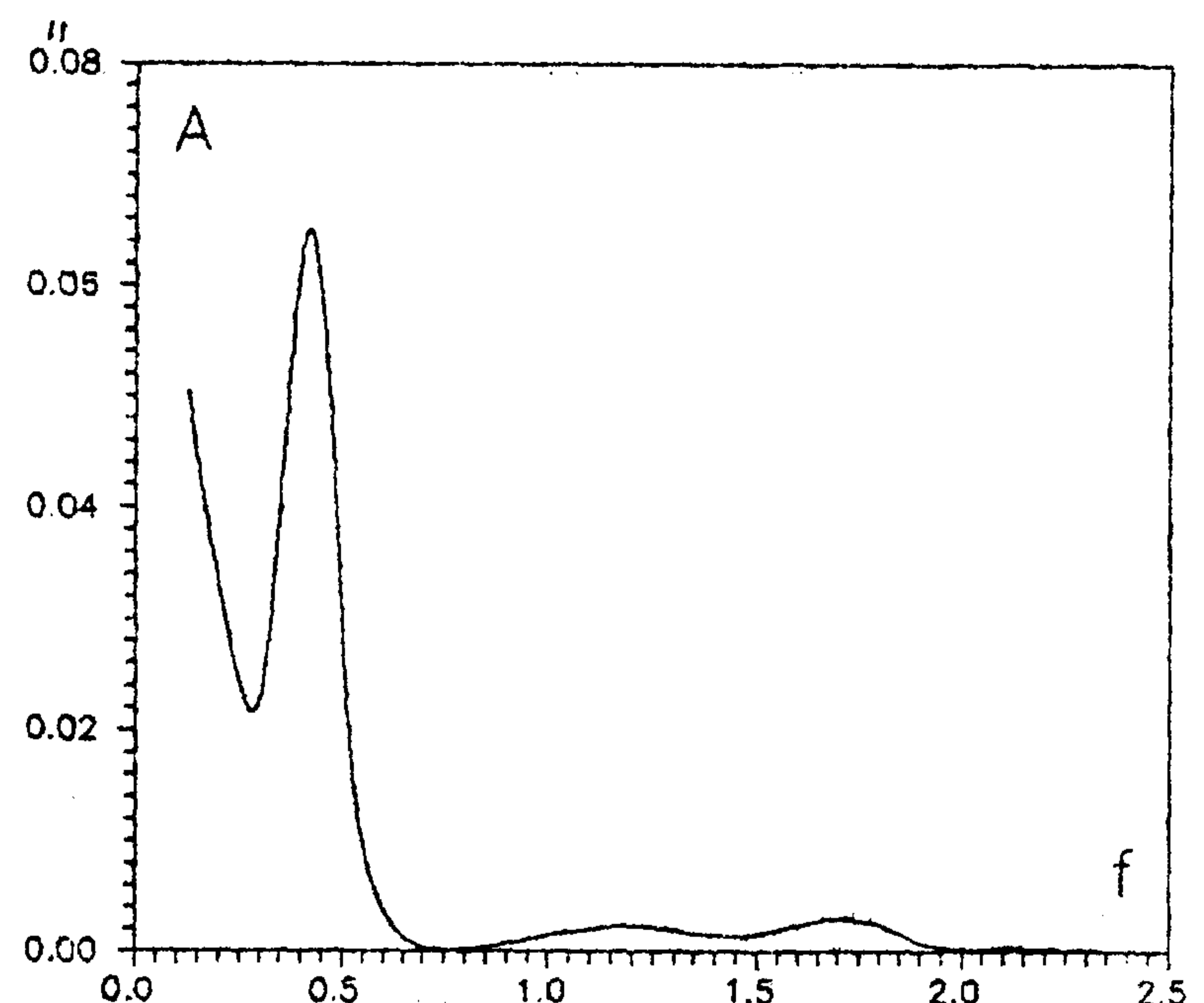


Fig. 2. The spectrogram of Belgrade mean latitude for the period 1949 - 1960 (old programme).

concerning the longitude and latitude variations.

In these papers Djurović found periods approximately equal to ours, but also others of about 1.0 yr and shorter. A comparison of the periods found here and those found by Djurović is presented in Table 1.

Table 1 Periods (P) in years as found in this paper (RG,BJ) for the old programme (Old) and for the new one (New) and those from Djurović's papers (DDJ) for the quantities examined (W,Aa,UT) and from the zenith-star analysis (ZS)

Author	Programme	P (yr)					
RG,BJ	Old		7.8	-	3.5	2.3	-
	New	10.7	6.7	4.1	3.1	2.2	1.9
RG,GT,BJ	ZS	11.0	7.0	4.9	3.6	2.5	-
DDJ		(11.0, 10.8)	(7.4, 6.6)	(5.4, 5.3)	(3.5, 3.3)	(2.3)	(2.0, 1.9)
		UT,W,Aa	UT,W,Aa	W,Aa	UT,W,Aa	UT	Aa,W

It is curious to notice that approximately the same periods have been obtained also from the examinations of the declination variations for the Belgrade Zenith Stars in System 1 (Teleki and Grujić, 1987) for which the observational material originates from the observing period of the new programme (1960-1985). The results of these examinations are contained in another paper of ours published recently

(Grujić et al., 1991). The mean values of the periods resulting from the analysis of the Zenith Stars are also contained in Table 1 (ZS).

As seen from Table 1, a more significant disagreement in the period lengths appears only for the 4.1 years period from the present paper and for that of 5.4 years from Djurović's examinations. In our opinion this is a consequence of the same effect.

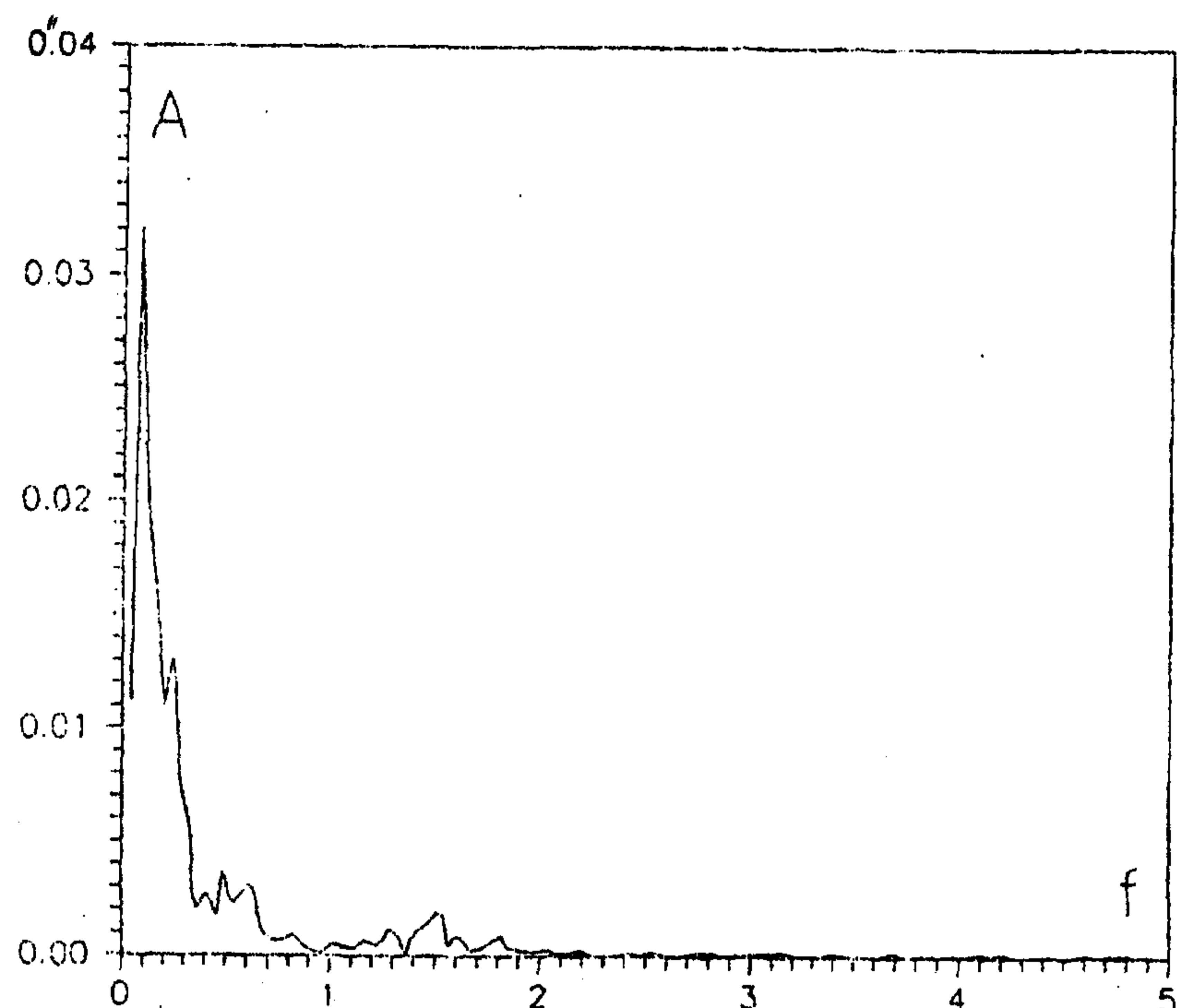


Fig. 3. The Spectrogram of Belgrade mean latitude for the observing period 1960 – 1985 (new programme).

3. CONCLUSION

The analysis of the variations in the Belgrade mean latitude from the zenith-telescope observations performed at the Belgrade Observatory during 1949–1985 reveals several periodic variations among which the one lasting 11 years is the dominant (with highest amplitude). These results agree well with ones from other examinations, such as those of the declination variations of the Belgrade Zenith Stars, then those concerning the UT2 – UTC variation and geomagnetic solar activity effects on angular velocity of the Earth. In order to obtain a more complete insight

into these phenomena and into how they affect the terrestrial rotation and the Earth's polar motion, i.e. the latitude variations, the examinations in this field should be continued.

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ПРОМЕНЕ СРЕДЊЕ ШИРИНЕ БЕОГРАДА

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 Оригинални научни рад

Анализиране су промене средње ширине Београда у интервалу 1949 – 1985. Међу уоченим

периодичним променама, највећу амплитуду има промена са 11-годишњим периодом.