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LATITUDE-DEPENDENCE OF MICROPULSATION-PERIODS

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The micropulsations of the Earth's magnetic field are quasi-sinusoidal variations with maximal amplitudes of a few gammas (in the magnetic field) or a few tens of mV/km (in the electric field) and with periods of 0,2 to 600 sec. No explanation has hitherto been offered about their origin.

For solving the problem the analysis of the geographical distribution of the pulsations seems to allow a possible approach. It has been observed that similar pulsations have been recorded at very distant stations, although the frequency of their occurrence is mainly a function of the local time.

Every researcher in this field agrees in an amplitude-increase from the equator to the poles. The opinions about the period of these pulsations are, however, rather different. Some of the recent results are contained in Table I. The authors cited deal, mainly, with *pc3* and *pi2* pulsations.

The present author extended her investigations to more stations and pulsation-events. Records of 28 stations (Fig. 1) were at disposal, but only 21 of them yielded records suitable enough for a qualitative determination of the coherences of synchronous pulsations (by correlation of the phases).

On the selected 13 days (between 1958—61) about 75 *pi*2-s were worldwide events.

In about 50 per cent of the cases, the pulsations had the same period and an amplitude decreasing at a similar rate in almost all the stations (Fig. 2).

In about 43 per cent of the events some records differed from the others: on the others: on the day-hemisphere a *pc*-modulation, in the auroral zone a bay could be observed in the moment of the *pi* 2-s.

In about 7 per cent of the events, however, a period-increase revealed itself toward the higher latitudes ($\Delta T \leq 15-20$ sec at $\Delta|\Phi| > 60°$). It is possible that these are merely local phenomena, for longer periods occurred in altogether a few stations of higher latitude.

No poleward period-increase occurred in the analyzed 14 *pc3* time-intervals, either. In the auroral zone a pulsation of 3—4 min did, however, occur synchronously with the *pc* of $T = 30$ sec in several cases.

There was an interesting event: the period of the *pc* day-pulsation of about 75 sec was equal in the range $3° < |\Phi| < 60°$. At the two stations in the auroral zone, however, there occurred a pulsation of longer (together with some shorter!) period (Fig. 3) at *the same* time.

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Author	Origin of data	Character of periods
Obayashi, Jacobs, 1957.	9 stations (mainly in the Pacific region) ($40{,}4° < \|\Phi\| < 67{,}1°$)	for $T \approx 60$ sec (at $\Phi \approx 50°$) $T \sim \cos^{-2} \Phi$
Jacobs, Sinno, 1960.	17 stations (Pacific region)	*pi2* and $T > 30$ sec *pc*-s equal
Ellis, 1961.	3 stations (Australia) ($28° < \|\Phi\| < 51°$)	neither day- nor night-pulsations depend on latitude
Duncan, 1961.	the data of Ellis, completed with other ones ($28° < \|\Phi\| < 51°$)	for midday-*pc* $\Delta T = 8$ sec at $\Delta\Phi = 23°$
Voelker et al., 1961.	3 German stations ($48{,}9° < \|\Phi\| < 54{,}6°$)	for horizontal components of day-*pse* and *pc* $\Delta T \leq 12$ sec; *pi2*-s and declination of day-pulsations equal
Lock, Stevens, 1961.	2 stations (Pacific region) ($\Phi_1 = 51°$ $\Phi_2 = -8°$)	*pi2*-s equal; *pc*-s' range equal, but apparently incoherent
Bolshakova, Zübin, 1964.	4 Soviet stations ($36° < \Phi < 63°$)	the most persistent *pc* latitude-dependent
Komack, Orange, 1964.	3 Caribbean stations ($20° < \Phi < 40°$)	$T \approx 20$—30 sec *pc* independent of latitude
Herron, Heirtzler, 1966.	8 American stations ($36° < \Phi < 63°$) compared to the base at $\Phi = 50°$	neither *pc*, nor *pi2* latitude-dependent
Usher, Stuart, 1966.	3 stations in England ($54{,}6° < \Phi < 62{,}5°$)	no regularity
Fanselau, 1966.	Wingst ($\Phi = 54{,}6°$) and Niemegk ($\Phi = 52{,}2°$)	for $T = 20$ sec *pc*-s $\Delta T \approx 0$, for $T = 50$ sec *pc*-s $\Delta T \approx 8$ sec
Tátrallyay, 1967.	21 observatories, 6 different days' (synchronous recordings from 8—14 stations)	from 33 *pi2* tests 23 not varied, 5 varied ($\Delta T/\Delta\|\Phi\| \leq 0{,}5$ sec/grad) 5 irregular
Verő, 1969.	Niemegk ($\Phi = 52{,}5°$) Nagycenk ($\Phi = 47{,}2°$) Tamanrasset ($\Phi = 25{,}4°$)	for the most frequent *pc3* shorter on lower latitudes

Table I.

Change of micropulsation-periods with the latitude, investigated by different authors.

I. Táblázat

Különböző szerzők által talált változások a különböző szélességű állomásokon észlelt pulzációk periódusában

Таблица I.

Изменение периодов микропульсаций с широтой, изученное различными авторами

Fig. 1
1. ábra
Puc. 1.

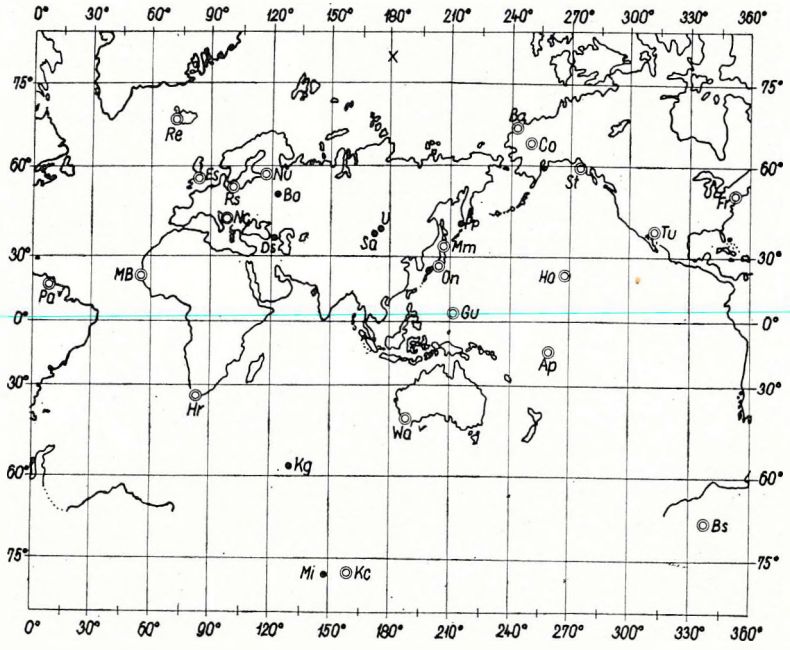


Fig. 2
2. ábra
Puc. 2.

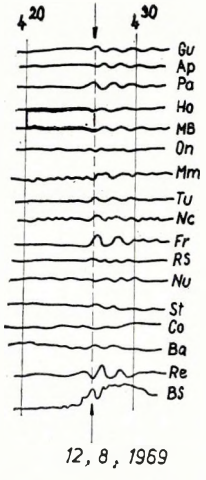
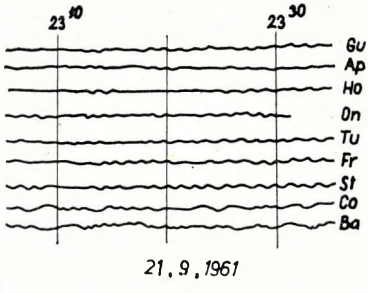
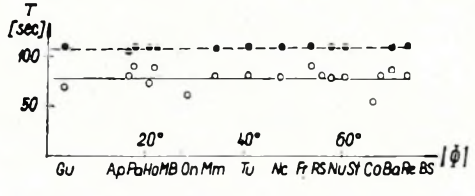
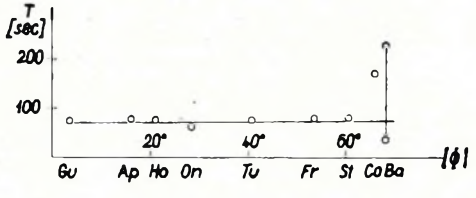


Fig. 3
3. ábra
Puc. 3.







A comparison between *pc5* of distantly situated stations is rather questionable: there is no guarantee for the coherence of the variations involved. The phases of the *pi2*-s, however, can be identified without correlation-calculations, basing exclusively on characteristic amplitude-maxima.

The phenomenon itself is a statistical one. Besides, the quality of records, the difference of the recording equipments contribute to hindering the interpretation.

The *pc* period-agreement dealt with in the present paper is, therefore, insufficient to support or object any of the results of Table I.

To attain a final decision, the following requirements should be met: a chain of not too distantly located stations in a N-S alignment, in geologically well-known environment, equipped with equal instruments.

A reliable result, however, is that *pi2*-s, at least outside the auroral zone, vary insignificantly only.