The long period components of the K index at Las Acacias and Trelew observatories.

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Abstract.
The behavior of the K index during the period 1977.0 - 1988.0 determined from the record obtained at the Trelew (φ = 43° 16.1 S, λ = 65° 22.9 W) and Las Acacias (φ = 35° 00.4 S, λ = 57° 41.4 W) observatories are studied.
The spectra show the evolution of the semiannual, annual, 1.6, 3.6 and 11-yr waves according to the 3-hr UT interval.
The time series attained from the subtraction of the data of each observatory, to study the behavior of the index with the latitude, is also analized.

Introduction.
The dimensionless Ks local index assigned to each 3-hr interval is determined from the records obtained at the geomagnetic observatories of Las Acacias (Prov. of Bs. As.) since 1965.0 and Trelew (Prov. of Chubut) since 1957.7 up to the present.
The index measures the geomagnetical effect at the ground level of the high frequency variations also called magnetic agitation, activity or noise (Mayaud P.N. 1967).
The purpose of this paper is to determine, starting from the monthly means in each 3-hr UT interval the modulation of the semiannual and annual variations, as well as of the other periods present on the spectra (Malin S. R. and Mete Isikara A. 1976; Bhargava B. N. 1972).

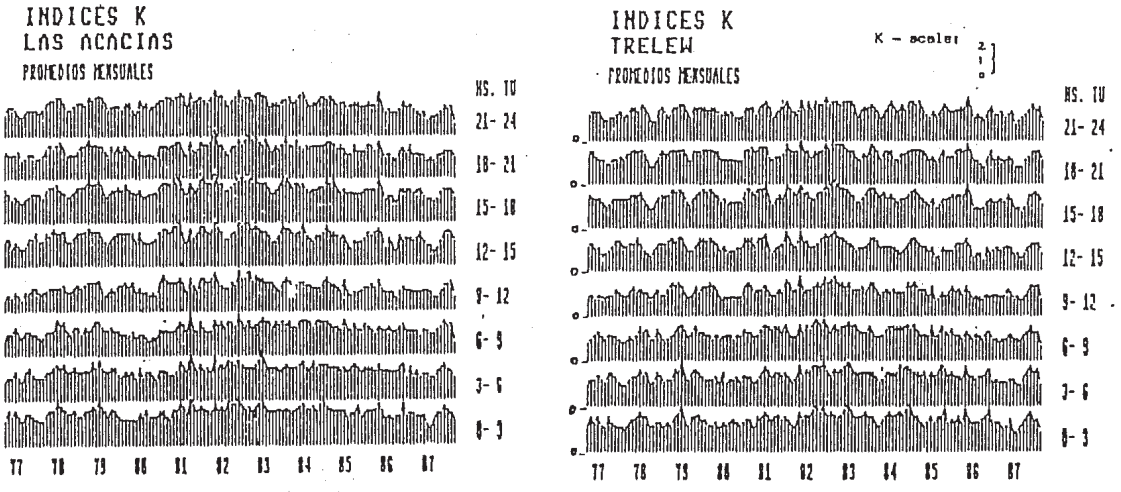


Fig.1

Data analysis and Results.

The time series are represented by values in the range Ø-9 of the K index (K = 9 of 350 nT for Las Acacias and 300 nT for Trelew) averaged in monthly intervals (Fig.1) and filtred by mean of a Gaussian operator of 7 points. Then, we have applied a Fourier's analysis to the discrete time series of the indexes from each observatory.

Starting from the harmonics of these spectra the representative amplitude of the waves to be studied are obtained thus showing their UT evolution.

The estimate error for the amplitude of the 11-yr, annual and semiannual waves taking into account an error of Ø.3 in the K index range, is of Ø.Ø6. This comes from the relation:

$$Ø.3 / \sqrt{3Ø}$$

from the monthly means of each interval (Whittaker E. and Robinson G. 1965), where the Ø.3 range value is taking as the probable error due to the factor construction of the scale.

The results of the K index spectra where the semiannual, annual, 1.6, 3.6 and 11-yr waves were determined, are shown in Fig.2. On it, the

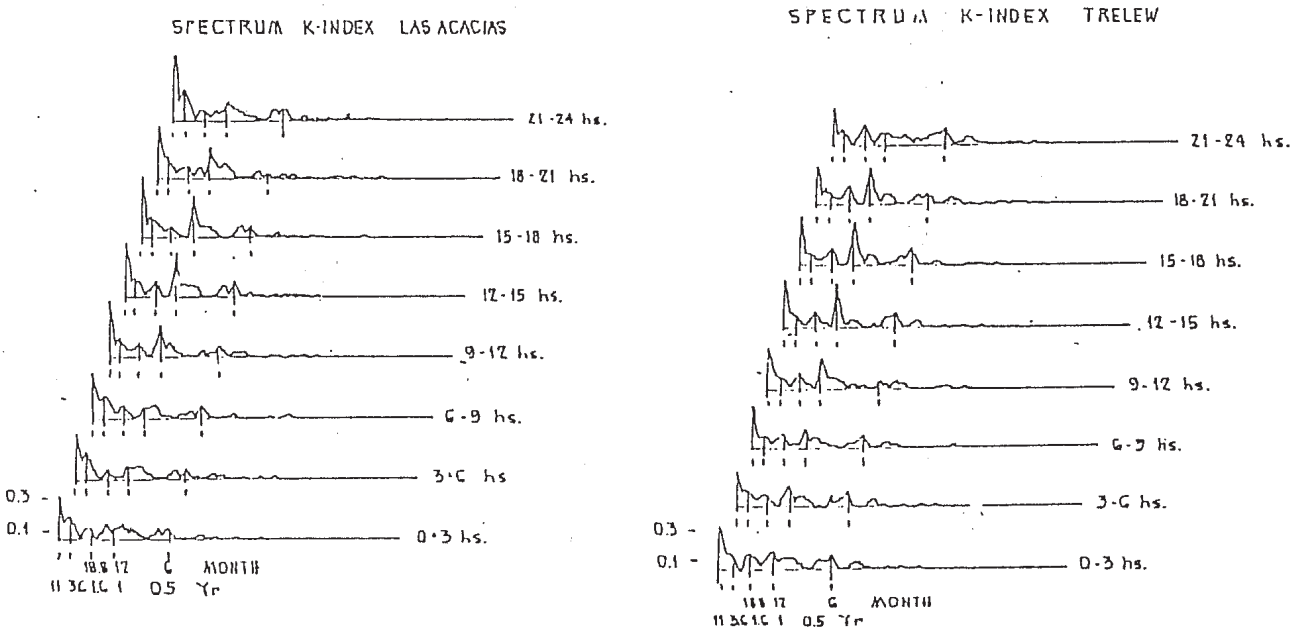


Fig.2

evolution of these waves is graphyted according to the 3-hr UT interval. The interaction effects of the solar wind with the magnetosphere nose and the high frequency disturbences of the current systems are perfectly demarcated in UT interval 9 - 21 hr.

Fig.3 shows the amplitudes of the annual and semiannual variations as well as the evolution of the annual wave according the UT. While at Las Acacias the maximum amplitude of the annual wave is observed in the interval 12 - 15, at Trelew this maximum is transfered to the UT

interval 15 - 18 hr. No definite behavior is observed concerning the semiannual variation.

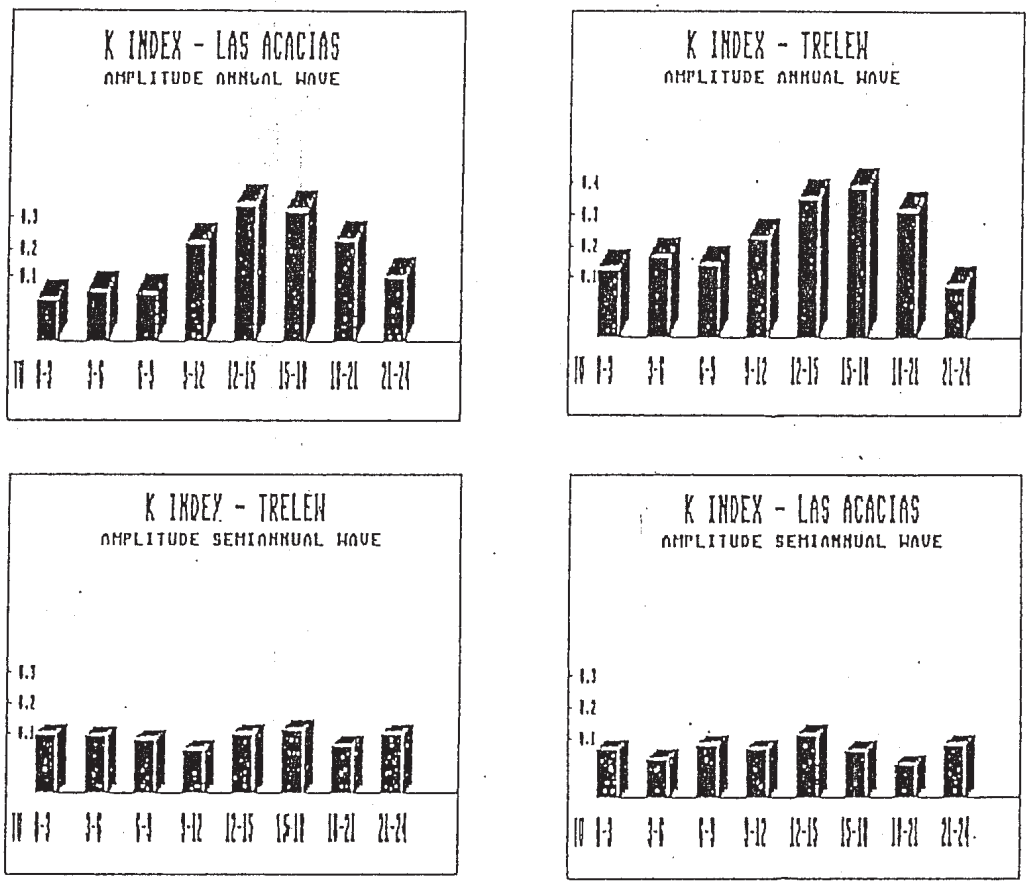


Fig.3

To study the index characteristics according to the latitude, the time series from Las Acacias and Trelew were subtracted one from the other (Fig.4). At the UT interval 12 - 15 the effects of the ionospheric disturbances are markedly greater at Las Acacias than at Trelew. This shows the elevated effect of the equatorial most latitude of the current circuits.

The subtraction spectrum shows (Fig.5) in the night UT interval the magnetospheric current systems. Is specially predominant at the UT interval 21 - 24 hr, decreasing after the Greenwich midnight.

On Fig.6 is plotted the polar diagram of the annual wave from Las Acacias and Trelew, and the counterclockwise evolution is observed. The 11-yr wave is present at both stations with almost equal amplitudes.

Fig.7 shows the polar diagram of these waves just behavior in phase is similar at UT interval Ø - 9 hr but differs for the rest on the Greenwich day.

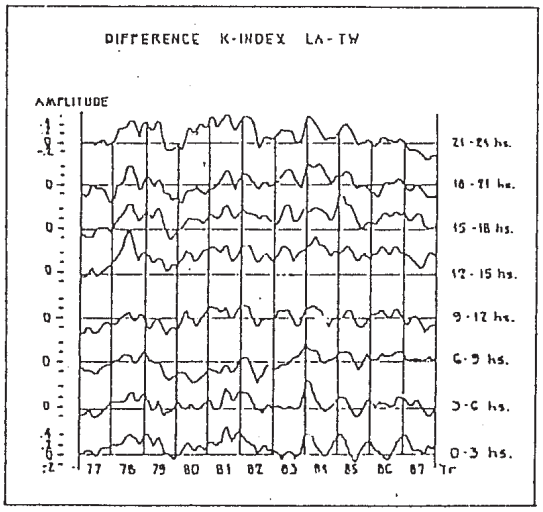


Fig.4

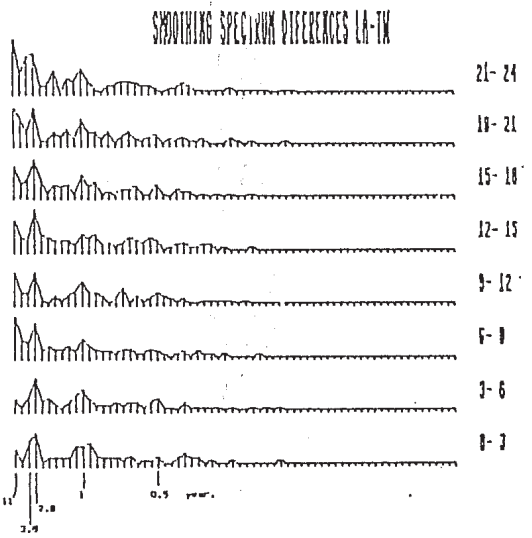
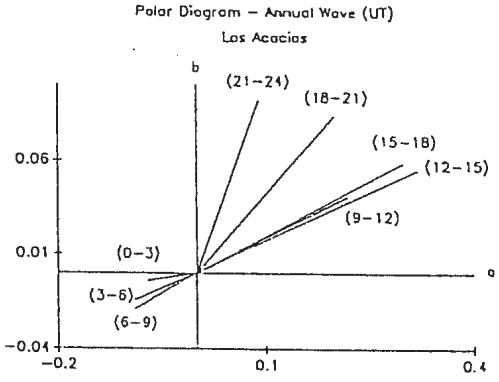


Fig.5



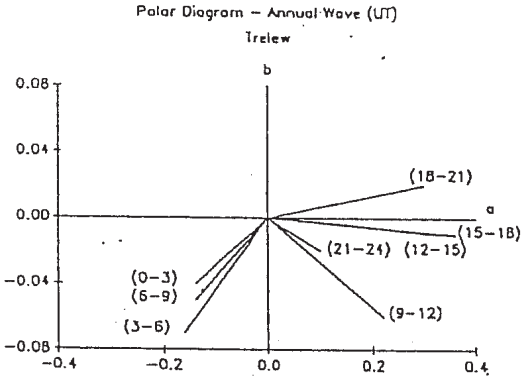
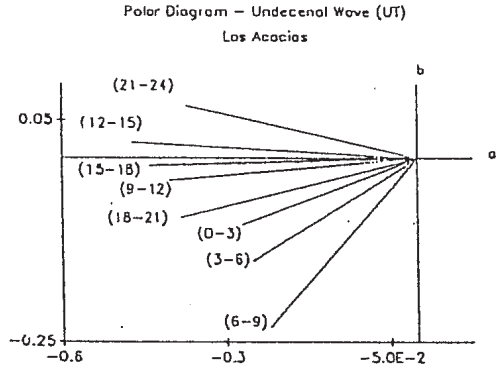


Fig.6



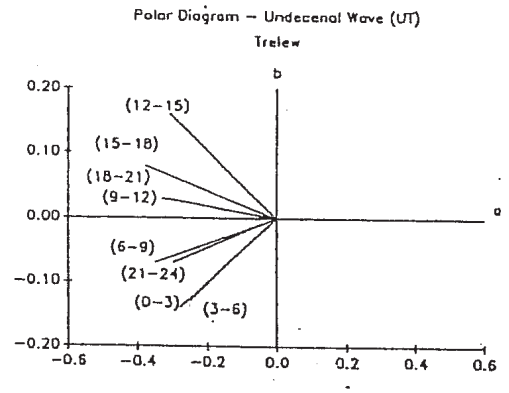


Fig.7

Conclusions.

From the spectra analysis of this K index is well defined that, between the UT interval 9 - 21 hr the interaction of the solar wind with the magnetosphere nose at the high frequency disturbences at the current systems are perfectly determined.
By observing the evolution of the annual variation it is possible to deduce that there is a great interaction among the several current systems. This is not so evident in the semiannual wave (near inexistent).

References.

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