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Spread-*F* in Baguio through half a solar cycle

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Abstract—A 6-year statistical survey is made of spread-*F* occurrence in Baguio. An attempt is made to explain the observed periodicity by the randomness of density–distribution introduced by the predominance of collision–detachment and by the random downward velocities.

Introduction

The phenomenon of spread echoes in the *F*-region has been the object of extensive investigations for the past two decades. Recent experiments by Bateman *et al.* (1959), positively establishing a correlation between spread-*F* and the Far East anomaly, have stimulated further study. With a view towards contributing to this aspect of the problem, a statistical survey is here made of the Baguio data on spread-*F*. It is hoped that such a survey may suggest additional clues with which to evaluate or supplement current theories.

Presentation of Data

Considered for this investigation are the nightly sequences of hourly ionograms at Baguio, from 1900 to 0800 hours (local time) inclusive, from January 1953 to December 1958. A count is made of those ionograms on which spread-*F* is present. (Spread-*F* is considered "present" when its intensity is sufficient to make the scaling of (*M*3000)*F2* uncertain.) This count is divided by the number of ionograms in the group under consideration, and the quotient is the "percentage occurrence" for the group. Two groupings are made, an hourly grouping and a monthly grouping. The results of the first group are shown in Fig. 1. They clearly reveal a striking difference between the period 1953–1955 (years of low sunspot number) and the period 1956–1958 (high sunspot number). Consequently, both groups are further re-grouped and averaged according to their place in the solar-cycle, low and high. The graphs of these results are shown in Fig. 2. They have the following features: (1) maximum spread-*F* occurs at about 0100 hours and in summer of years of low sunspot count; (2) maximum spread-*F* occurs at about 2100 hours and in the equinoxes of years of high sunspot count; (3) spread-*F* occurs rarely in winter.

Theories of Spread-*F*

Any theory of spread-*F* must be consistent with the above trends. For instance, if the explaining mechanism is the *E*-region turbulence (Dagg, 1957), some parameter of this source and/or its ability to influence the *F*-region must vary with the periodicity described above. Alternatively, such periodicity must somehow fit in with the mechanism postulated by Martyn (1959) wherein the inhomogeneities are generated and dissipated by the tidal motions of the *F*-region under the influence of electrodynamic forces.