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Equatorial Spread-F and Tropospheric Tropical Disturbances[1]

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The ionospheric phenomenon called spread-F has been observed in ground based ionograms, both in polar and tropic regions. The characteristics of this phenomenon, however, differ significantly in the two latitude regions, the main features of which can be summarized as follows: 1) occurrence of spread-F in high latitudes increases with geomagnetic activity (i.e., positively related with Kp-index), while those of equatorial spread-F have negative correlation with Kp-index (Lyon *et al.*, 1958; Shimazaki, 1959; Marasigan, 1960; Calvert, 1962); 2) equatorial spread-F is basically a nighttime phenomenon even observed from top-side, while polar type spread-F has no local time dependence[2] (Calvert 1962; Calvert and Schmid 1964); and 3) equatorial spread-F can be classified, in general, into two types called range-type (early type) and frequency-type (late type). The former appears during the pre-midnight period and the latter in the post-midnight period in the high frequency side of the ionogram (Krishnamurthy and Rao, 1964). On the other hand, the polar type spread-F does not have such clear distinctions in the frequency range and time sequence in its appearance.

The origin of equatorial spread-F is not known, in contrast with that of high latitudes, where it seems to be caused by charged particles impinging in the polar upper atmosphere. Since the tidal motion of the atmosphere is largest along the equator and since the appearance of dynamical effects is larger in the F-region than the E-region where the effects of ion-production and of recombination dominate (Bauer, 1958), a preliminary survey has been made to see if the dynamical motion of the lower atmosphere affects the occurrence of equatorial spread-F. Use was made of the ionogram records and barometric data for six years, from 1956 to 1961, recorded at the tropical stations, the locations of which are shown in Table 1.

TABLE 1. Location of the stations and data used in the present analysis.

Data station	Spread-F Baguio	Barometric pressure Manila
Location		
Geographic	16°25′N 120°35′E	14°35′N 120°59′E
Geomagnetic	5.1N 189.3°	3.3N 189.0°

[1] Presented at the Symposium on Interaction Between Upper and Lower Layers of the Atmosphere, Vienna, May, 1966.

[2] According to the ionogram recorded by the topside sounder (Alouette I), there are some indications that the occurrence of equatorial spread-F seems to be possible even in the daytime, if the ionosphere is extremely quiet such as June 1964 near Quito, Equador (Goldberg, 1966, private communication).