ON THE 500-MB HEIGHT TENDENCY FIELD IN THE TROPICS

Recently, a few papers have established evidence of a westward propagating surface pressure wave of about 5 days period in the tropics. The wave has a zonal wave number one. Planetary scale of the pressure tendency oscillations of 4-5 days period was reported in a paper by Ananthakrishnan and Misra (1970). That the oscillation was due to a westward propagating wave in the tropics was first proposed in a paper by Wallace and Chang (1969). A recent paper by Misra (1972) gives detailed characteristics of this wave.

We wish to present here the results of the spectral examination of the 500-mb height tendency field in the tropics. The study forms a part of an investigation into the coupling between lower and upper tropospheric phenomena.

The daily 500-mb height data recorded on microcards for the IGY period (1 July 1957 to 31 December 1958 — 549 days) constitute the data for the study. The twenty-two stations chosen for the analysis are given in Table 1.

The record for all stations is for 00 GMT except for Dovala, Bangui and Maun, for which the record is for 06 GMT. Spectrum analysis is done on the 24-hour tendency series with the Tukey window and lag 20.

The logarithmic spectral estimates for the stations are given in Fig. 1. It can be seen that they do not show preference to any periodicity the spectra resembling more or less that of white noise. Also, there is very little difference between the spectrograms of one station and the other and thus the conclusion that the tendency field in the tropics has no local characteristics. In an earlier paper, Eliasen and Machenhauer (1965), had also analysed the 500-mb height tendency field. By expanding the heights of the pressure surface into a series of spherical harmonic components and utilising the geostrophic balance condition on the computation of the stream function, they had commented that the 24-hour tendency field shows a 'more or less regular westward propagation corresponding to a period of about 5 days'. Since the balance equation does not hold itself suitable for the computation of streamfunction in the tropical latitudes (Eliasen
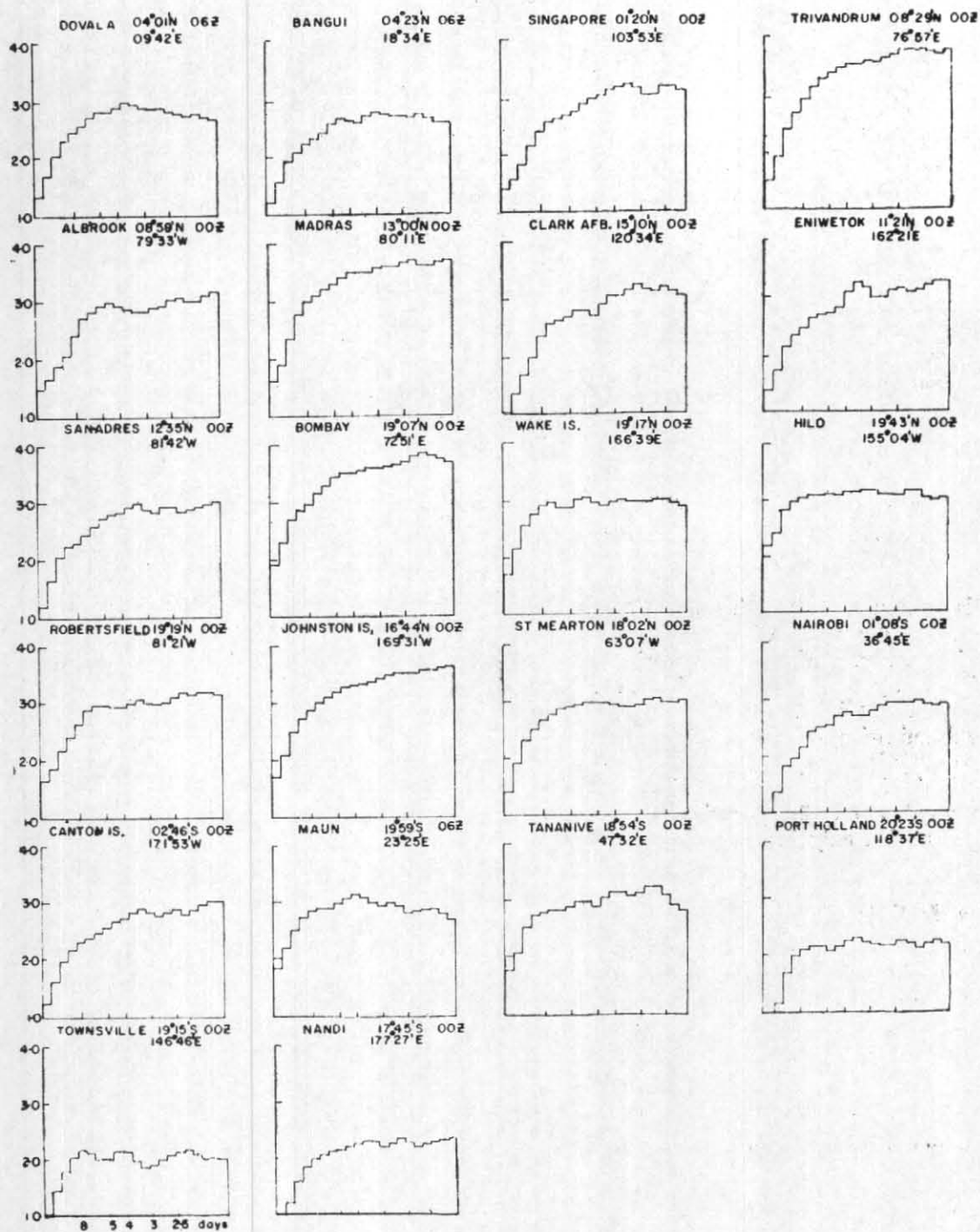
Fig. 1

Spectrograms of 500-mb height tendencies for stations in the tropical belt 20°N 20°S. The ordinates represent the logarithm of the spectral power

TABLE 1

Station	Latitude	Longitude	Station	Latitude	Longitude
Northern hemisphere			Hilo	19°43′N	155°04′W
Dovala	04°01′ N	09°42′E	Robertsfield	19°19′N	81°21′W
Bangui	04° 23′N	18° 34′E	Johnston Is.	16°44′N	169°31′W
Singapore	01°20′ N	103°53′E	St. Mearton	18°02′N	63°07′W
Trivandrum	08°29′N	76°57′E	*Southern hemisphere*		
Albrook	08°59′N	79°33′W	Nairobi	01°08′S	36°45′E
Madras	13°00′N	80°11′E	Canton Is.	02°46′S	171°53′W
Clerk Afb.	15°10′N	120°34′E	Maun	19°59′S	23°25′E
Eniwetok	11°21′N	162°21′E	Tananive	18°54′S	47°32′E
San-Andres	12°35′N	81°42′W	Port Holland	20°23′S	118°37′E
Bombay	19°07′N	72°51′E	Townsville	19°15′S	146°46′E
Wake Is.	19°17′N	166°39′E	Nandi	17°45′S	177°27′E

and Machenhauer 1969) and because of the fact that we do not see any preferential behaviour in the 500-mb height tendency field, there can arise a scope for discrepancy over the observations made in the earlier paper of Eliasen and Machenhauer. For a closer examination, one of the authors did some further analysis (to be published elsewhere), wherein he obtained the result that the isobaric height fields do show the 5-day period wave-number one progression only in the lower troposphere and the 500-mb level is the highest limit to which one can trace out this wave structure. But the variance contribution to the frequency pertaining to the periodicity of 5 days is not significantly different than the neighbouring frequencies as one sees in the surface pressure (Misra 1971). Thus the 500-mb height tendency field in tropics does not have any variance preference, but does show the wave-number one progression in 5 days time.

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June 8, 1972

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