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METEOR OBSERVATION BY THE KYOTO METEOR RADAR

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The Kyoto Meteor Radar is a monostatic coherent pulsed doppler radar operating on the frequency of 31.57 MH (Aso et al 1979). The system is computer-controlled and uses radio-interferometry for echo-height determination. The antenna, an improvement of the initial system, can be directed either to the north or the east.

The system has been in operation in Shigaraki (35 N, 136 E) since 1977, collecting data almost continuously in recent years as shown in Table 1. Winds at meteor heights are the main subject of the radar observation. The meteor echo rate has also been measured as illustrated in Fig. 1 where the echo rate distribution with height and the daily variation in height integrated echo rate are shown. These results are consistent with well-known meteor behavior (e.g. McKINLEY 1961). Fig. 2 shows the monthly mean of the echo rate. Note that the Kyoto Meteor Radar discards all echoes from over-dense meteor trails which are of no use for wind observation.

A large amount of wind data is now available. TSUDA and KATO (1981) were successful in deducing the lunar tides (both M2 and 01 components). Fig. 3 shows the spectrum of the observed wind varying with season. For instance, the two-day period wave is clearly enhanced in summer. Penetration of this wave into the ionosphere, giving rise to an ionospheric dynamo, has been discussed elsewhere (ITO et al 1985). Investigations of atmospheric tides are being pursued by cooperative observations between our meteor radar and the partial reflection radar in Adelaide (VINCENT, Private Communication, 1985). One example is illustrated in Fig. 4. A novel approach to the study of gravity waves has recently been attempted using our meteor radar which is able to detect the horizontal propagation of the waves by observing the changing phase through the region illuminated by the radar (YAMAMOTO et al 1986).

Whilst the MU radar is now in operation in Shigaraki, the Kyoto Meteor Radar is still playing a role because the latter is more suited for continuous observation throughout both day and night for longer periods.

References

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2. Itoh, R., T. Tsuda and S. Kata, A consideration on ionospheric wind dynamo to be driven by planetary wave with two day period, J. Atmos. Terr. Phy. (in press)

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4. Tsuda, T. and S. Kata, Lunar tides at meteor heights, Geophys. Res. Lett. 81, 191, 1981.

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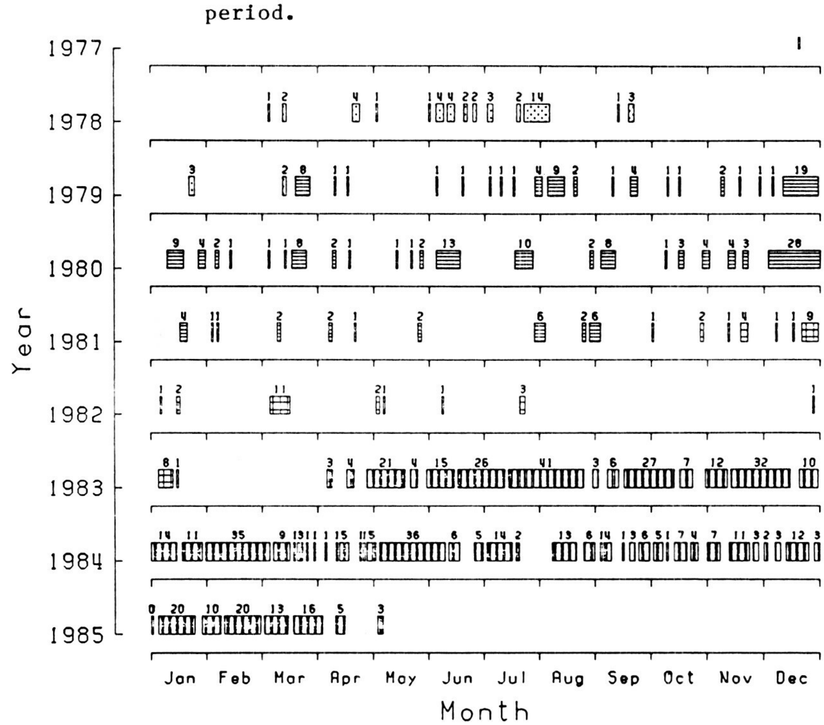
Table 1

Kyoto meteor radar observation period. The shaded area shows the observation period.



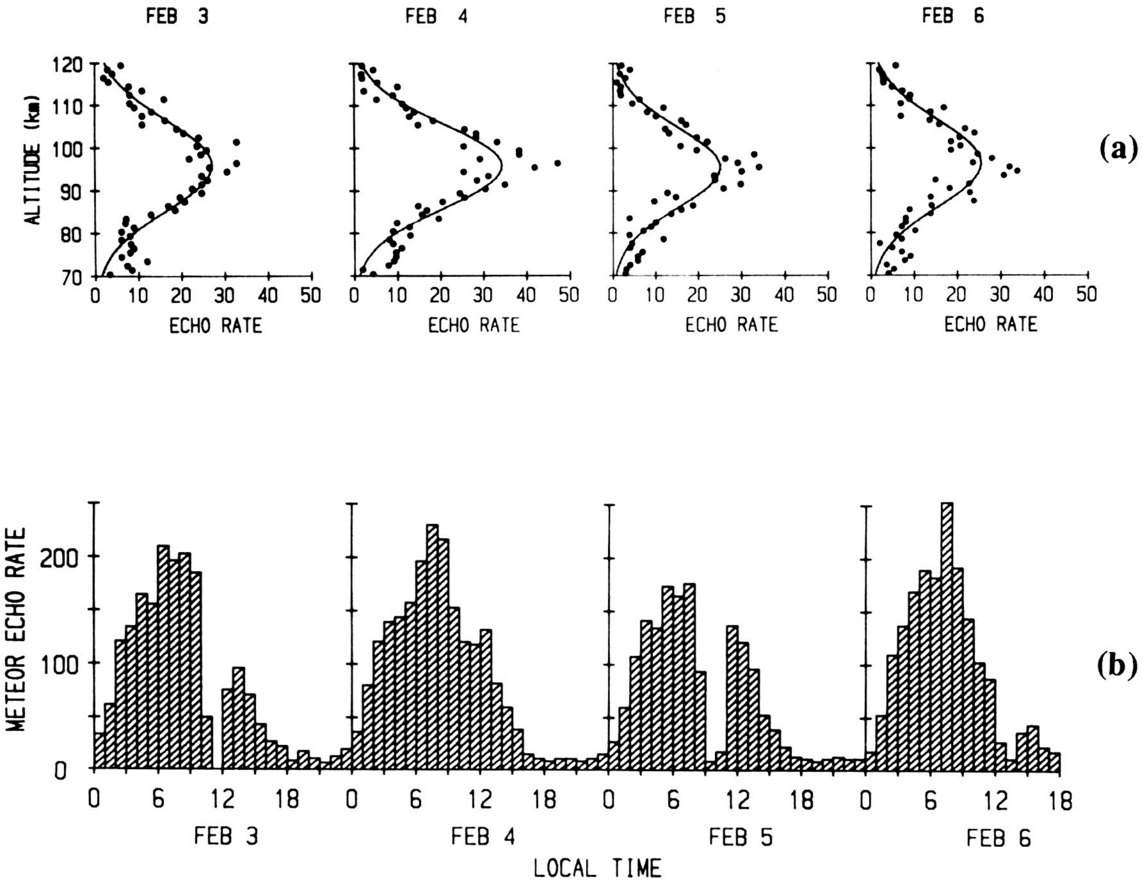


Fig. 1 (a) Meteor echo daily occurrence-frequency (per km during Feb. 1983) versus height.

(b) Meteor echo occurrence-frequency integrated over height in one hour.

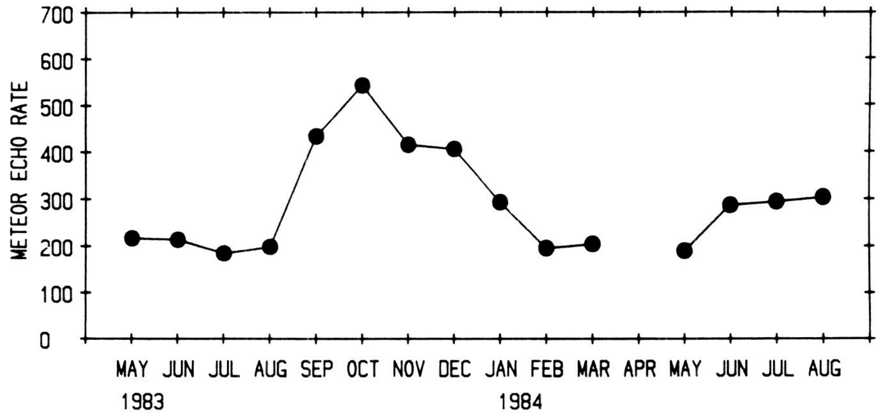


Fig. 2 Similar to Fig. 1 (b) except for monthly mean, in 1983.

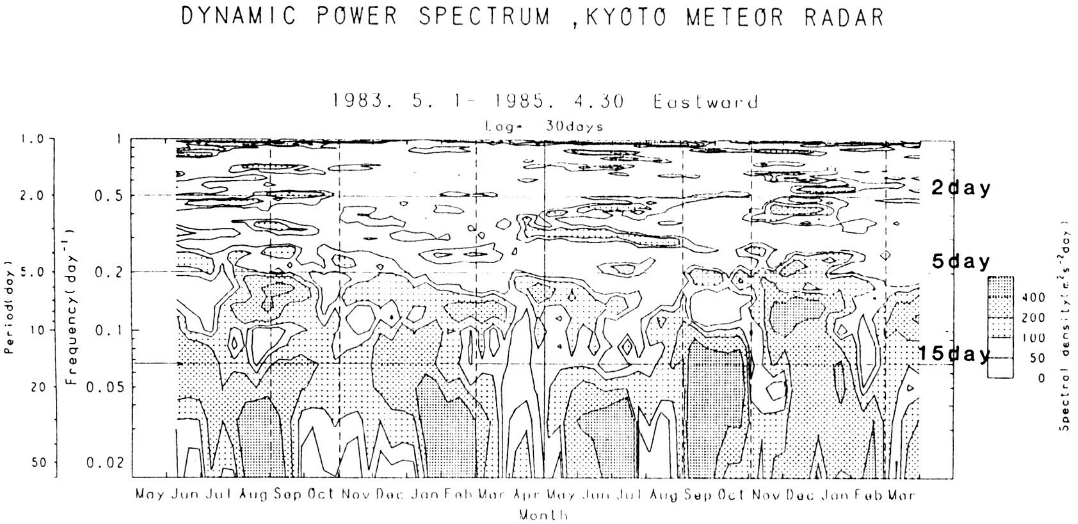
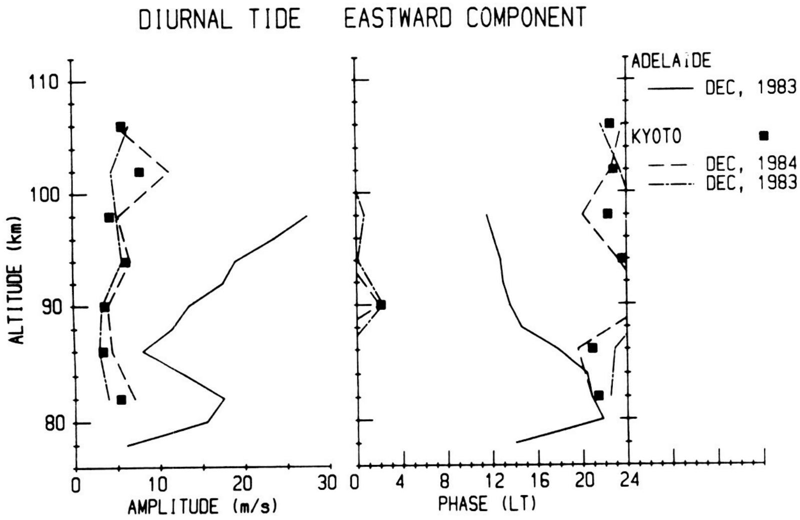
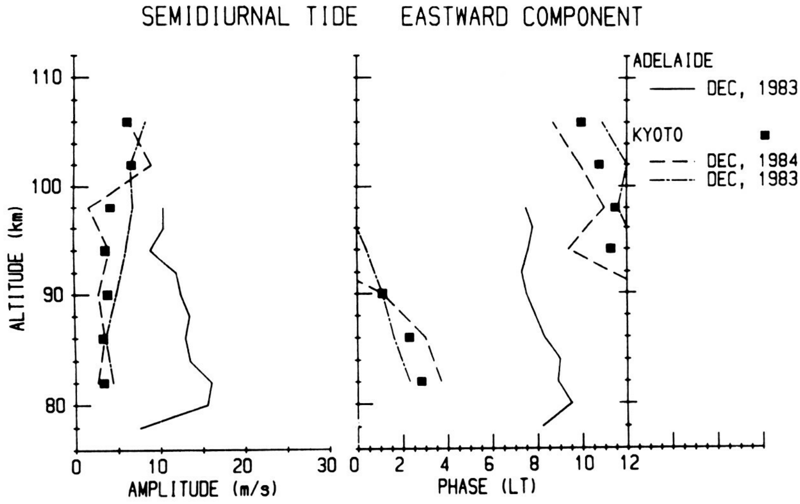


Fig. 3 Dynamic period spectrum of meteor wind in contour map.



(a)



(b)

Fig. 4 (a)Diurnal tide in Kyoto and Adelaide.
(b)Similar to Fig. 4 (a) except for semidiurnal tide.