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SHORT NOTE

THUNDERSTORM ACTIVITIES AND RELATED METEOROLOGICAL CONDITIONS IN THE NORTHWEST SUBTROPICAL PACIFIC

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We have made the first observations of oceanic thunderstorms in the Pacific during July to September 1973 and some results, such as diurnal variations on the thunderstorm activities, were already reported (Takeuti and Nagatani 1974). Again, we had a chance to take part in the cruising in the Northwest Subtropical Pacific, where is partly overlapped with the former cruising region, during February to March 1974. Using the data obtained in both cruisings, comparison of thunderstorm activities between above two seasons is made to discussed herein the relation to some meteorological conditions.

A sferics counter tuned at 3 kHz, with which the thunderstorm activities within about 100 km can be measured, was used in both cruising (Takeuti and Nagatani 1974).

The discussions are divided into two parts concerning the locations of the ship,i.e. south of 20°N, so-called Trade Wind Zone, and north of 20°N. Fig.1 indicates the locations of the ship at 3GMT for each day during both cruisings together with the sferics frequencies on daily means measured by the counter.

1). South of 20°N: During September, the daily means of sferics frequencies are between 0.1 and 2 sferics/min except for one day. During February and March, the frequencies for four days are between 0.01 and 0.1 sferics/min, being about one tenth compared with the frequencies in September, and those for the other five days are less than 0.01 sferics/min, presumably not indicating sferics but noise.

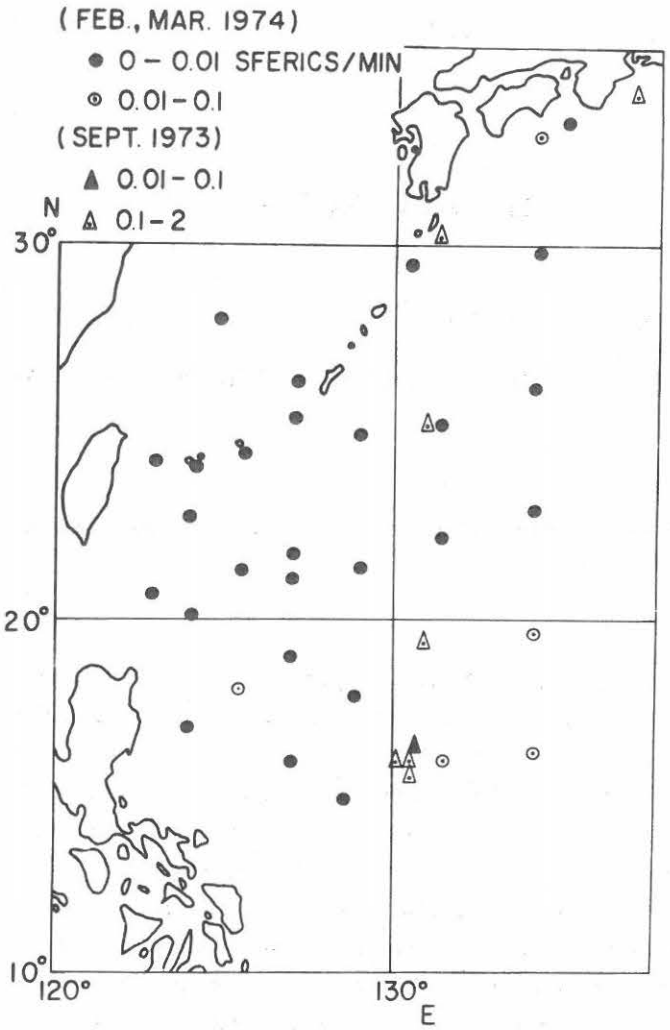

Fig.1. Locations of the ship at 3 GMT for every day are depicted by the symbols implying the daily means of sferics frequencies.

It is clear from this fact that the thunderstorm activity during February and March is very weak compared with that during September. This can reasonablly be explained by considering the location of intertropical convergence zone, which appears in this region in summer but goes away from this region to south in winter (Yoshino 1968).

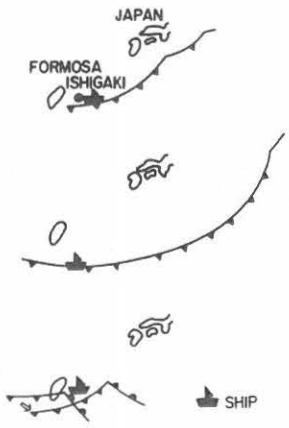

Fig.2. Locations of the cold fronts on the surfaces at 12 GMT and those of the ship. Top: 7 March 1974. Middle: 11 March 1974.Bottom: 13 and 14 March 1974. The arrow indicates the movement of the front. The ship stayed around the position indicated through both days.

2). North of 20°N: In September there existed a frontal line in this region through the cruising period and the thunderstorm activities were of the same order as that in the Trade Wind Zone.

In February and March, there existed no thunderstorm except for only one day in this region.In March, three cold fronts passed over/near the ship in the east of Formosa as shown in Fig.2, but thunderstorm was never been observed with the counter. On 7th March, the ship was by Ishigaki-Island, where is located a meteorological observatory, and a cold front passed over the ship and the island. On this day thunderstorm was not found as mentioned above and this is consistent with a vertical profile of temperature measured at the observatory, indicating the existence of a inversion zone between 850 and 700 mb, see Fig.3. It may be concluded from above discussions that the activity of cold front appeared near Formosa in this season was so weak that no thunderstorm could be accompanied.

At the coast of Japan,near Shikoku Island,on 8th February,a thunderstorm occurred after a front passed away to east as shown in Fig.4. The occurrence of the thunderstorm corresponded to a unstable period deduced from a vertical profiles of temperatures measured at Shio-no-Misaki, about 150 km east from the ship, as shown in Fig.5. This unstable condition was terminated at 600mb level indicating lower height of winter thunderstorm.

Though the measurement of sferics frequency is very simple work even for outsiders, yet the results can bring some important informations for stability of atmosphere. So, such measurements

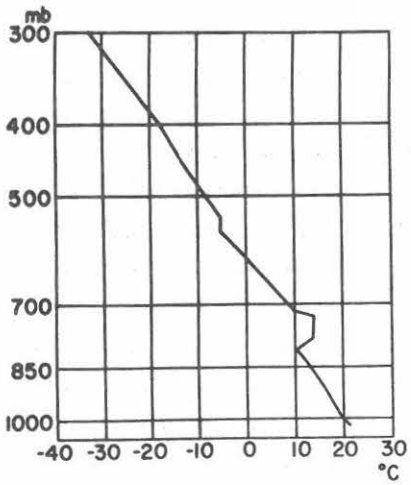

Fig.3. Vertical profile of temperature at Ishi-gaki-Island at 12 GMT on 7 March 1974.

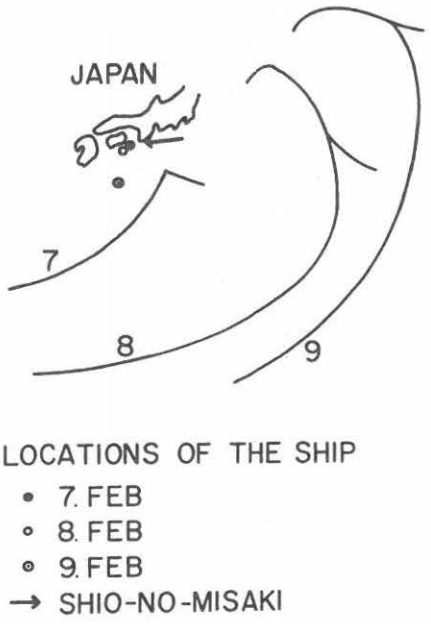

Fig.4. Locations of both the ship and front on the surface at 12GMT from 7 to 9 February 1974.

by a number of ships would be very usful to compensate meagre meteorological data on the ocean.

We are grateful to Professors Tomoda and Teramoto, Ocean Research Institute, University of Tokyo, for their kind help to this study.

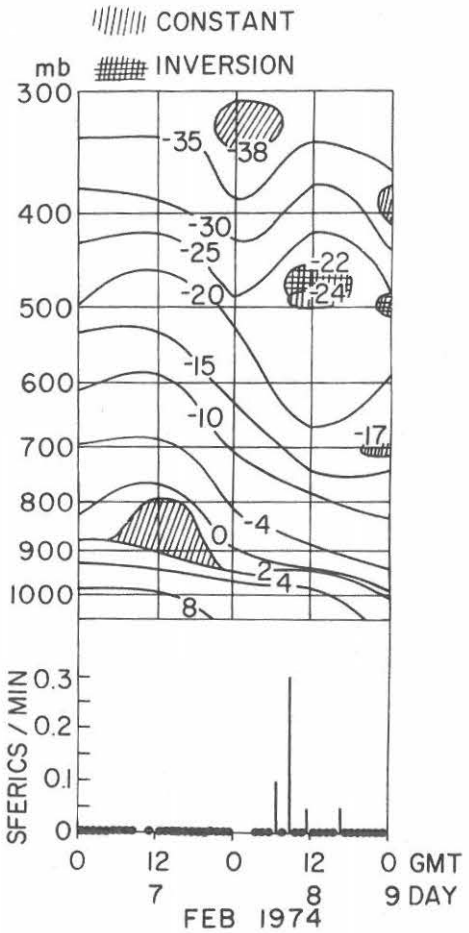

Fig.5. The sferics frequencies and vertical profiles of temperatures in ^{o}C obtained at Shio-no-Misaki on 7 and 8 February 1974.

References

Takeuti, T. and M. Nagatani; Oceanic Thunderstorms in the Tropical and Subtropical Pacific; J. Meteor. Soc. Japan, in printing.

Yoshino, M.; Climatology; Chijin-Shokan Press, 1968, in Japanese.