# RESULTS OF FOWARD-SCATTER RADIO ECHO OBSERVATIONS IN 2000

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## ABSTRACT

We had been performing a forward scatter radio observation of meteor since 1996. The transmitting station was at Fukui (Japan), and the frequency is 53.750MHz and the power is 50W. The receiving station is Osaka (Japan) and base line has 160km distance and NE-SW direction. 504,588 meteor echoes have been observed from January to December 2000. Total of radio observation was 8,238 hours. We made the activities of these showers clear :Quadrantids(January), Daytime showers(June),δAquarids(July), Perseids(August), Leonids(November), Geminids(December) and Ursids(December).

Moreover, We reported the daily variation of mean meteor rates and the annual variation of mean meteor rates.

## 1. INTRODUCTION

It is possible to continue the Ham-band Radio Observation (HRO) for one year [1]. In the result was 725 echoes per day which used HRO method in 1997. That software was used FFTDSP (M. W.Cook, MS-DOS version) in 1997. And Kazuhiko Ohkawa made new spectral display software (HROFFT) in 1999. By using this highly spectral display software (HROFFT), the number of meteor echoes increased twice. For this research, it observed using this HROFFT software. In the past, there is the mean annual variation by forward scatter radio observation. However, there are few the appearances as hourly rate(HR) 3. And there are few appearances of the mean daily variation as HR=30 [2]. We did study using observation data of mean appearance number of HR=61.

## 2. RADIO OBSERVATION SYSTEM in 2000

Forward scatter radio observation system in 2000 year
transmitting station . JA9YDB Sabae-shi, Fukui
(136.18°E, +35.93°N)
manager : Kimio Maegawa
transmitter : ICOM, IC-706
antenna : 2 element / crossed Yagi aim to Zenith
frequency : 53.750MHz , CW , power:50W
Receiving station :Habikino-shi, Osaka (135.64 ° E, +34.53°N)
observer : Masayoshi Ueda
receiver : ICOM, IC-706MK II G
antenna : 2element Yagi (DIAMOND, A502HB) aim to Zenith
Computer : NEC, VALUESTAR-VU45L (Windows98)
Software : HROFFT (sound spectral display and storage software)

## 3. RESULTS

(1) The annual variation of mean meteor rates

Figs 1-4 are the numbers of meteor echoes in every hour. The number of mean appearances of meteor for every month of 2000 had the most in June. This is based on prolonged activity of daytime showers. March had the least appearances. The curve of the numbers of appearances, such as a peak, is well alike in 1997 years 2000 (Fig. 5). The mean every month appearances between 4:00-9:59 LT of for every month were counted, (a). The mean every month appearances between 15:00-20:59 LT of for every month were computed, too. (b). Consequently, (a) shows the peak in June but (b) has gentle peak between August and September (Fig. 6).

The mean every month appearances between 15:00-20:59 of for every month was computed, too. (b).

Consequently, (a) became the peak in June. But, (b) became the peaks in August and September(Fig. 6).

(2) The daily variation of mean meteor rates

In 2000 the maximum number of appearances for every hour became at 5hr and 6hr LT and the minimum number of appearances were at around 17hr, 18hr LT(Fig. 8). This phenomenon is by apex revolution of the earth.

(3) Appearance of overdense echo

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Fig. 7 showed the number of long echoes (more than 20 seconds) per hour. Long echoes appeared on Quadrantids(January), Perseids(August), and Leonids (November)time.

(4) Activity of a meteor shower

Fig. 9-14 showed the activity of meteor showers.

## REFERENCES

1. Maegawa K.,WGN, the Journal of the IMO, 27:1, 64-72, 1999.

2. McKinley D. W. R., Meteor Science and Engineering, McGRAW-HILL, New York, 1961, 114.

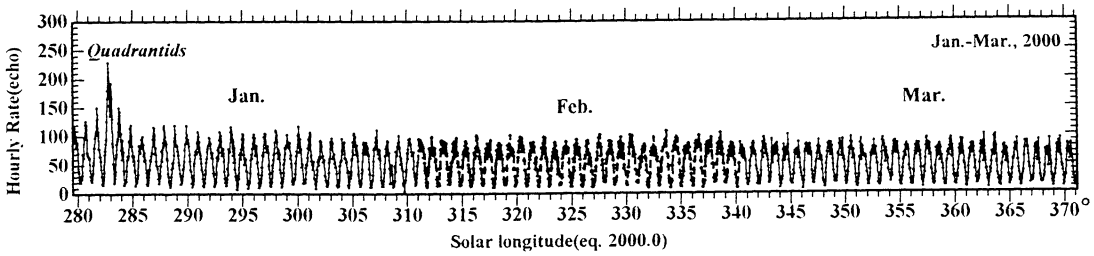


Figure 1 Raw hourly radio meteor echo counts during the period Jan. to Mar., 2000.

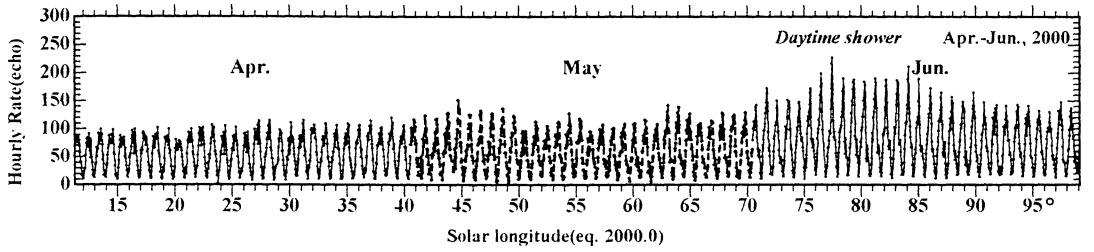


Figure 2 Raw hourly radio meteor echo counts during the period Apr. to Jun., 2000.

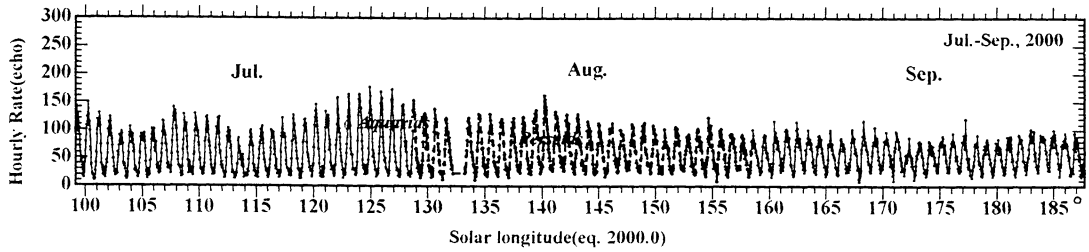


Figure 3 Raw hourly radio meteor echo counts during the period Jul. to Sep., 2000.

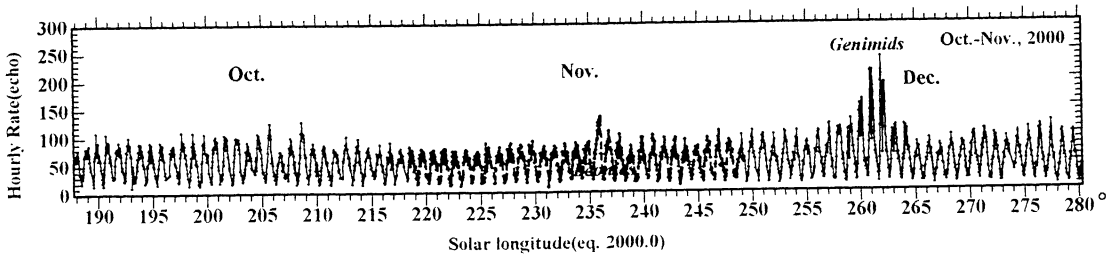


Figure 4 Raw hourly radio meteor echo counts during the period Oct. to Dec., 2000.

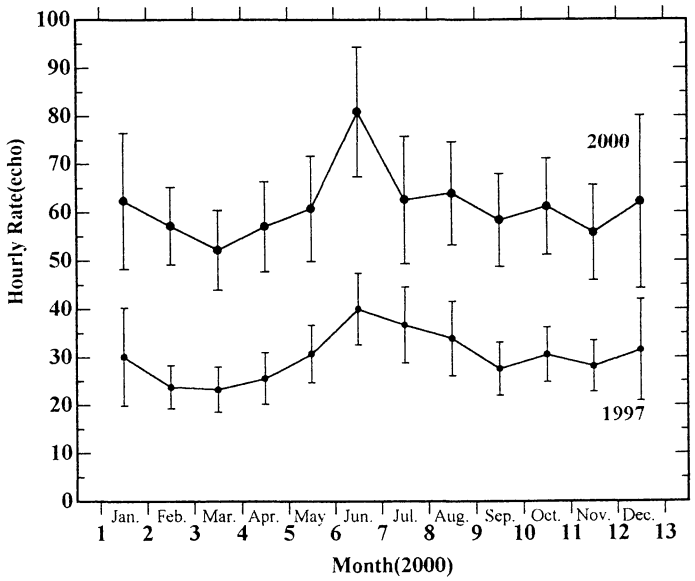


Figure 5 The annual variation of meteor rates (2000).
Forward scatter radio-echo observations.
Frequency : 53.750MHz, CW

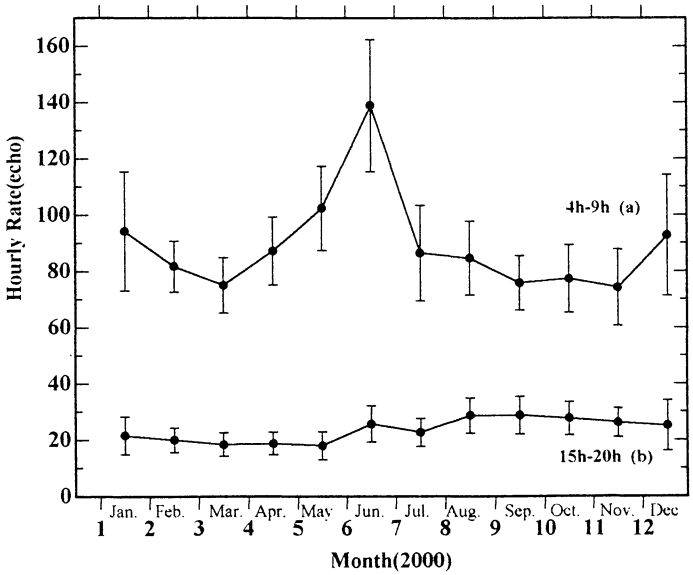


Figure 6 The annual variation of meteor rates (2000).
Forward scatter radio-echo observations.
The mean every month appearances between 4:00-9:59 LT of for every month were counted. (a).
The mean every month appearances between 15:00-20:59 LT of for every month were computed. (b).

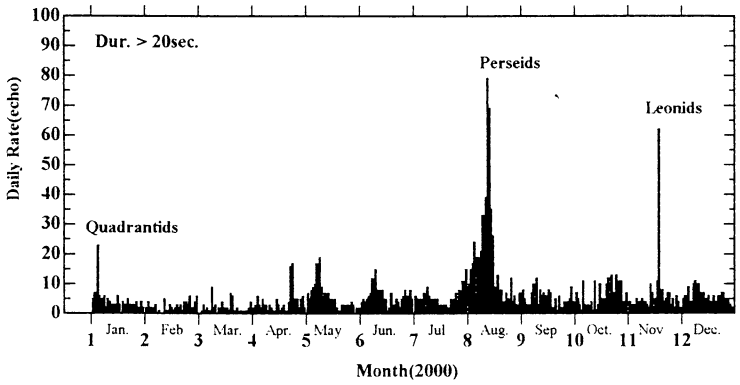


Figure 7 The annual variation of meteor daily rates. Number of meteor echoes more than 20 seconds duration. Forward scatter radio-echo observations.

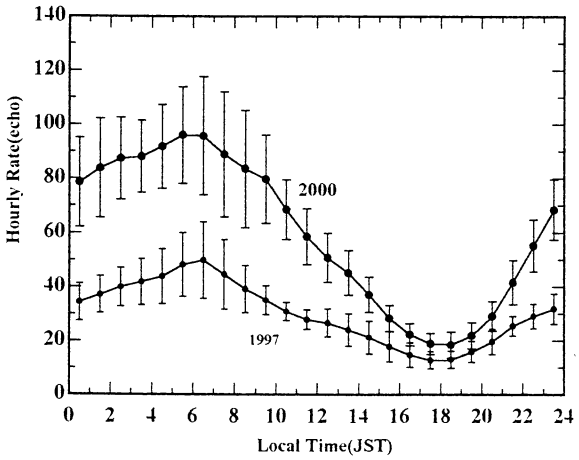


Figure 8 The mean daily variation of meteor rates (Jan.-Dec. 2000). Forward scatter radio-echo observations. Frequency : 53.750MHz, CW

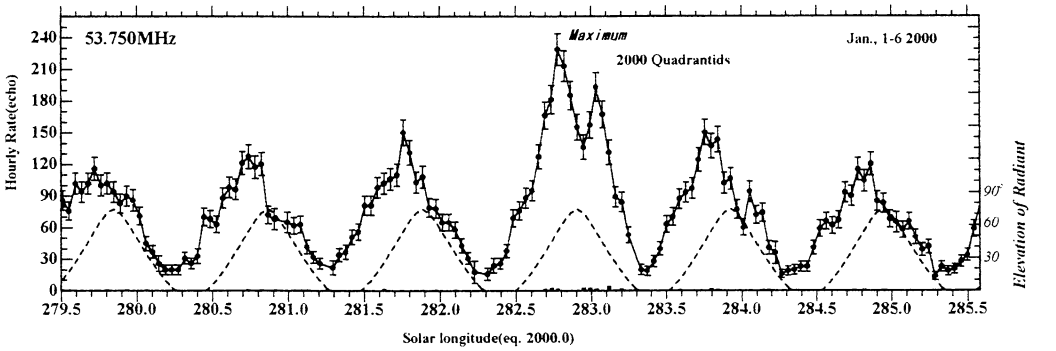


Figure 9 Raw hourly radio meteor echo counts during the period Jan. 1 to 6, 2000. Max. of 2000 Quadrantids: Jan. 3, 2000 at 20:30 UT, $\lambda$ =282.78° (J2000.0)

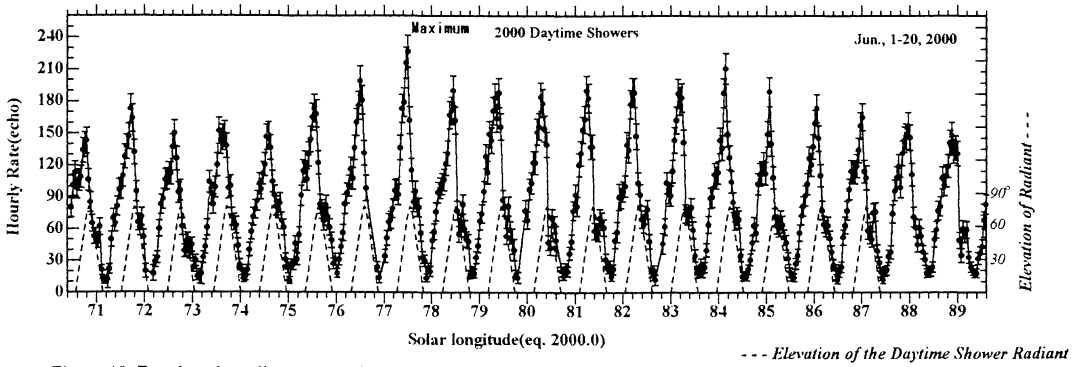


Figure 10 Raw hourly radio meteor echo counts during the period Jun. 1 to 20, 2000.
Max. of 2000 Daytime showers: Jun.7 to 15, 2000, $\lambda$ =76° - 85° (J2000.0)

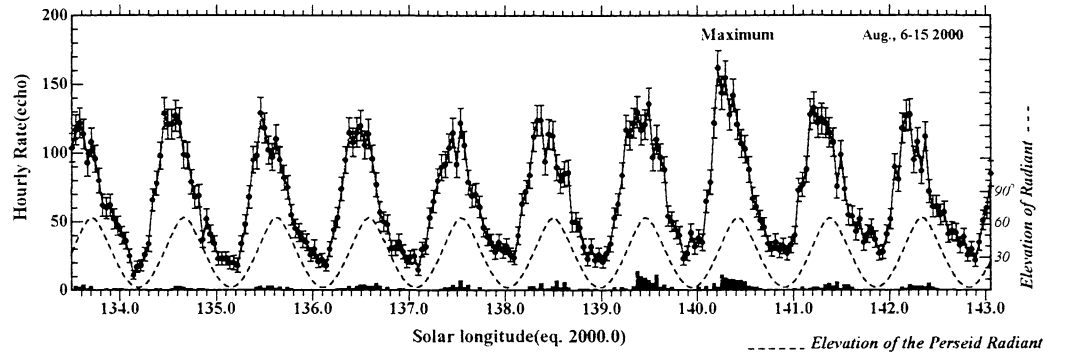


Figure 11 Raw hourly radio meteor echo counts during the period Aug. 6 to 15, 2000.
Max. of 2000 Perseids: Aug. 12, 2000, UT, $\lambda$ =140.25° (J2000.0)

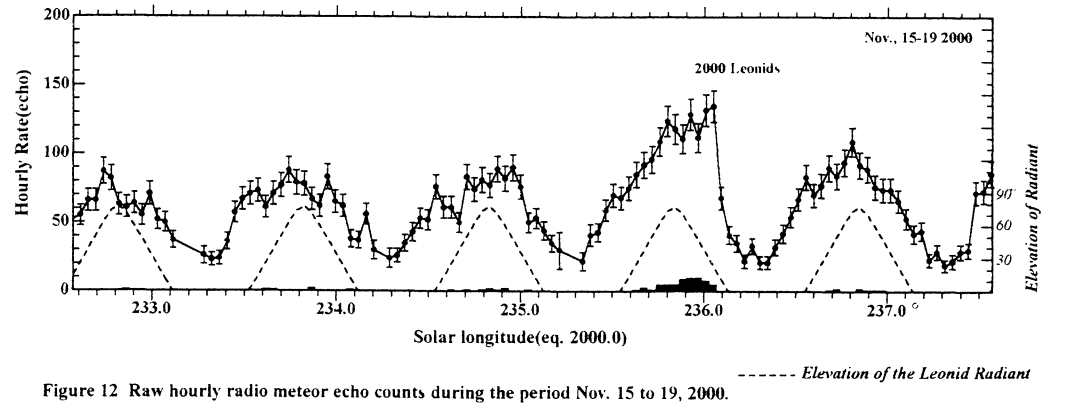


Figure 12 Raw hourly radio meteor echo counts during the period Nov. 15 to 19, 2000.

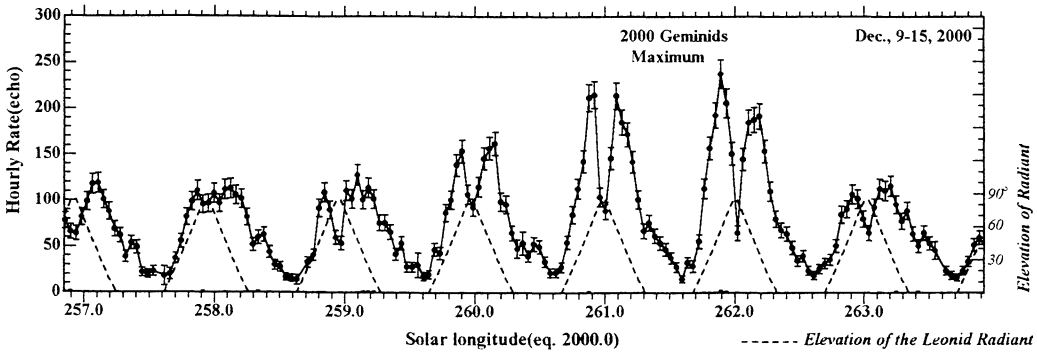


Figure 13 Raw hourly radio meteor echo counts during the period Dec. 9 to 15, 2000.
Max. of 2000 Geminids : Dec. 12-13, 2000, UT, $\lambda$ =261° -262° (J2000.0)

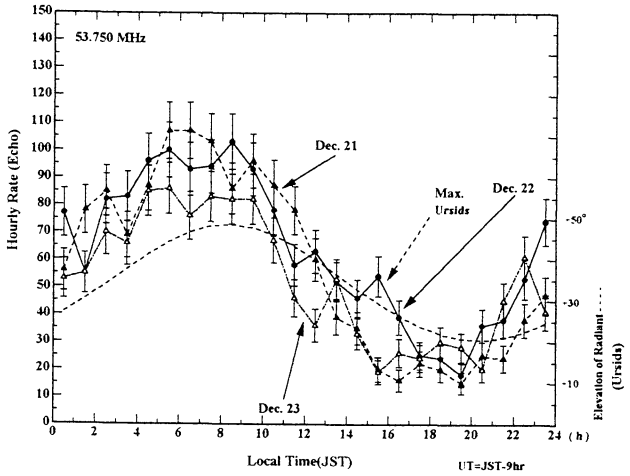


Figure 14 Ursids was observed by our forward scatter radio observations.
Max. of 2000 Ursids : Dec. 22, 2000 at 14hr, 15hr, 16hr LT, $\lambda$ =270.7° (J2000.0)