Radio observation of meteors at the Slovak Central Observatory in Hurbanovo

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From 4 November 2014, we started registration of meteors using radio waves at the Slovak Central Observatory in Hurbanovo. Our system records meteoric echoes from the TV transmitter Lviv 49.739583 MHz (N49.8480° E24.0369°, Ukraine), using a 4-element Yagi antenna with horizontal polarization (elevation of 0° and azimuth of 60°), receiver ICOM R-75 in the CW mode, and a computer with registration using HROFFT v1.0.0f.
Received data were statistically processed and compared with shower activity. Not all of the echoes have meteoric origin, but are caused also by ionospheric Es layer. Registrations are also disturbed by lightning.

1 Introduction

Reflections of radio waves from meteor trails were recorded and registered in the period from 1 December 2014 to 1 August 2015 at the Hurbanovo Observatory. The main objective of the experiment was to record continuously meteor radio echoes at our observatory.

2 Description of the equipment

A horizontally polarized 4-element Yagi antenna operating at 50 MHz was used. The antenna is oriented towards the azimuth of 60 ° with an elevation of 0°. Given the relatively small height of the antenna, the conductive ground effect cannot be neglected and the beam peak of the antenna has an elevation of about 15°. The analog television transmitter Lviv at 49.739583 MHz (N49.8480° E24.0369°, Ukraine) was used as a source of electromagnetic waves. Since it is a television transmitter, one can assume a circular emission characteristic of the transmitter in the horizontal plane. An ICOM-R75 communication receiver was used to detect radio waves. It was tuned to the frequency of 49.73970 MHz in CW demodulation mode. The difference in frequencies between the transmitter and the receiver ensured a low-frequency output in the range between 880 Hz and 940 Hz. A computer fitted with a Linux operational system and the program HROFFT version 1.0.0f was used to register echoes.

3 Data processing

Data obtained by continuous registration from 1 December 2014 to 31 July 2015 were recorded by the HROFFT software. These data were converted to RMOB format using HROFFTtoRMOB software. RMOB data were displayed by the software as a two-dimensional chart shown at the lowest part of *Figure 1*. Days are displayed on the horizontal axis and time on the vertical axis. The number of recorded echoes at 10 dB of audio output is displayed as a gray-scale map. These data were not corrected for any interference. One-day average data are displayed at the central part of *Figure 1*. The top part of *Figure 1* shows the shower activity (Rendtel, 2014), with a declination higher than -20 deg. The period of the shower activity is shown as a triangle. The first of each triangle's vertices is placed at the start of the shower's activity, second at the maximum and the third at the end of the activity. The maximum height corresponds to a shower ZHR or high rate for Arietids respectively.

The data set shows that showers with a higher ZHR and longer activity period are registered well, but weak or short showers are not so clear.

There is a 7-day periodicity of the signal visible during the period from 15 January to 15 February. This periodicity has an origin in interference and corresponds with human activity. To decrease these disturbances we lowered the frequency range in HROFFT from 1 March 2015.

Disturbances caused by ionospheric Es layer and lightning occurred during the summer period.

4 Conclusion

On bases of the data we obtained, it is possible to use this equipment to monitor the shower activity during longer periods. To monitor the activity of weak showers it would be necessary to eliminate echoes caused by sporadic meteors and by any artificial sources.

References

Rendtel J., editor (2014). *Meteor Shower Workbook* 2014. IMO.

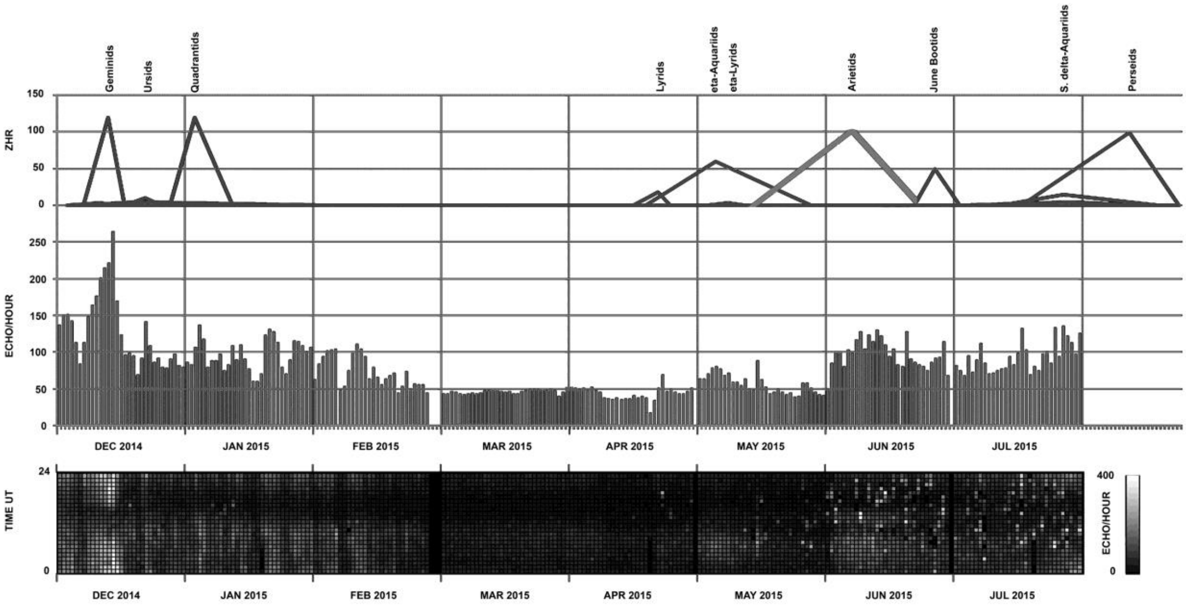

Figure 1 – Echo rates and shower activity.

The author, *Peter Dolinský (middle)*, during the poster session (Photo by *Axel Haas*).