Study of the Quadrantids 2016 using BRAMS data

H. Lamy[1], Cis Verbeeck[2], S. Calders[1], A. Martinez Picar[2], C. Tetard[1], E. Gamby[1]

[1] Royal Belgian Institute for Space Aeronomy, Avenue Circulaire 3, 1180 Brussels, Belgium
[2] Royal Observatory of Belgium, Avenue Circulaire 3, 1180 Brussels, Belgium

BRAMS (Belgian RAdio Meteor Stations) is a radio forward scatter system located in Belgium with one dedicated transmitter located in Dourbes, and about 30 receiving stations spread out over the Belgian territory. The transmitter emits towards the zenith a circularly polarized continuous wave at 49.97 MHz with a power of 150 watts. At each receiving station, data are recorded continuously as audio WAV files of 5 minutes duration. WAV files and corresponding spectrograms can be accessed via the "BRAMS viewer" at http://brams.aeronomie.be/brams_viewer.

We present here the analysis of the Quadrantids 2016 using BRAMS data. A careful manual count of meteor echoes was done using an online tool which allows the user to draw rectangles around meteor echoes in spectrograms. Manual counts were performed between 1st January at 0:00 UT and 7th January at 23:59 UT for a total of 2016 spectrograms. This period covers the Quadrantids as well as enough "quiet" periods before and after the peak in order to estimate statistically the values of the background.

First we test several automatic detection algorithms of meteor echoes using only the raw audio signal or the spectrogram. Detection rates as well as false positive and false negative rates are provided with also a distinction between underdense and overdense meteor echoes.

Then we attempt to compute the mass index of the Quadrantids meteor shower. For that the cumulative number of meteor echoes vs the maximum amplitude of the meteor echoes is computed. On this graph the two slopes related to underdense and overdense meteor echoes depend on the mass index s. The mass index is estimated in a robust way using the Maximum Likelihood Estimator. We discuss the strategy to adopt when the meteor echoes overlap with bright plane echoes or the direct signal coming from the beacon as this can modify the maximum amplitude of the meteor echo.

Finally, we compare the results of this analysis with meteor echoes obtained at two different receiving stations. These stations do not see the same meteor echoes all the time due to different geometry transmitter-receiver as well as different distances to the transmitter. Still we expect to obtain the same mass index s.