

## MU radar head echo observations of the 2012 October Draconid outburst

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We present October Draconid meteor head echo observations with the Shigaraki middle and upper atmosphere (MU) radar in Japan. Prominent activity of 2012 October Draconids occurred between 16:20 UT and 17:40 UT on October 8. Around the peak time (13-20 h UT), the MU radar recorded 51 Draconid head echoes with precise orbit determinations. The weighted mean geocentric radiant during this time interval was  $\alpha = 262.5 \pm 0.5$  in right ascension,  $\delta = +55.8 \pm 0.3$  declination (degree, epoch J2000.0) with the weighted mean geocentric velocity of  $20.6 \pm 0.3 \text{ km s}^{-1}$ , which are in good agreement with model predictions. Although the models predicted no strong visually detectable activity, our head echo observations showed that the peak activity in 2012 was higher than that of the previous outburst in 2011. Based on the distribution of radar cross section (RCS) for the Draconid meteor head echo, the outburst in 2012 was due to meteoroids with lower masses (fainter meteors) than that in 2011.

Keywords: meteor shower, radar observation, head echo