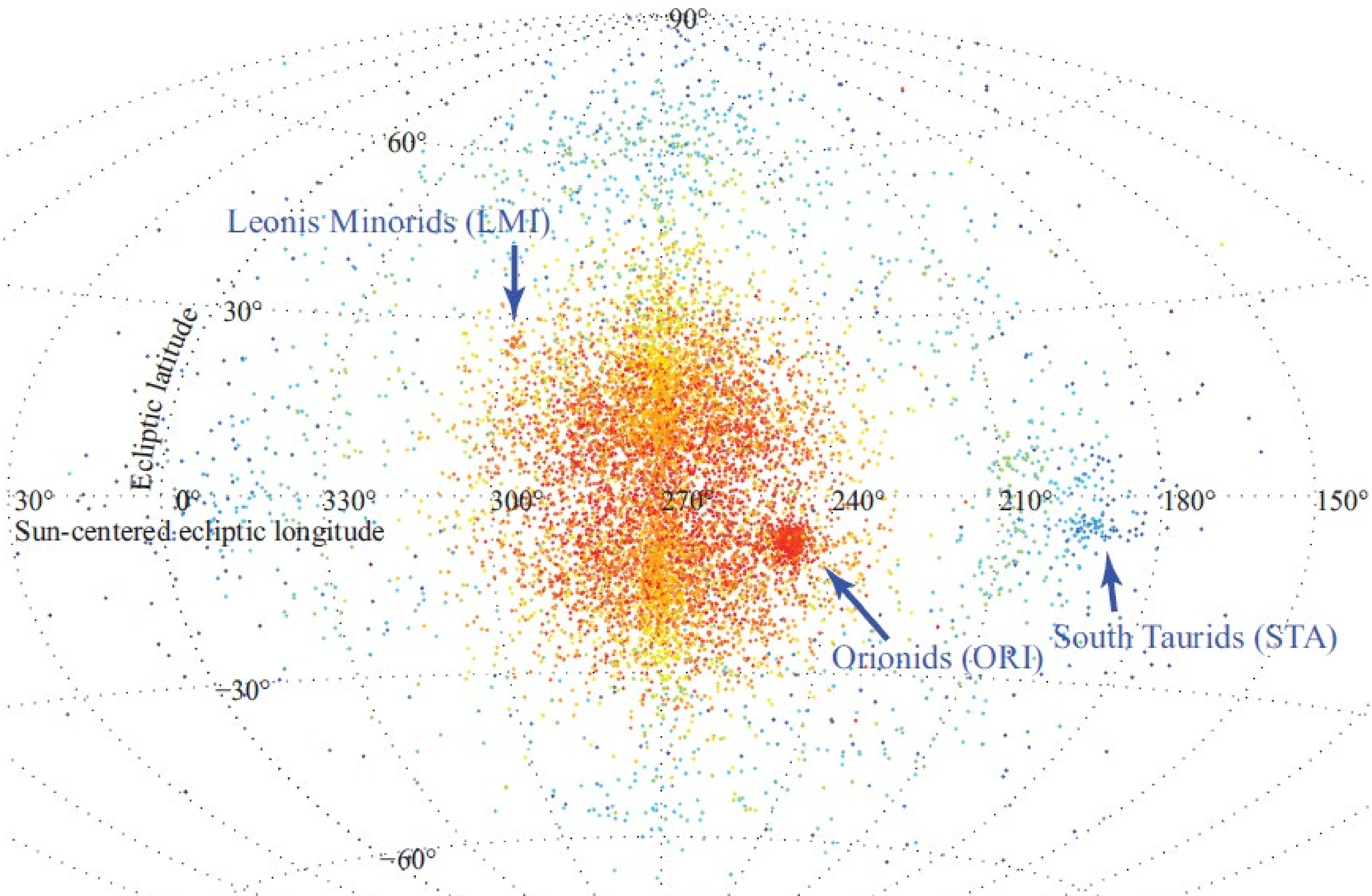
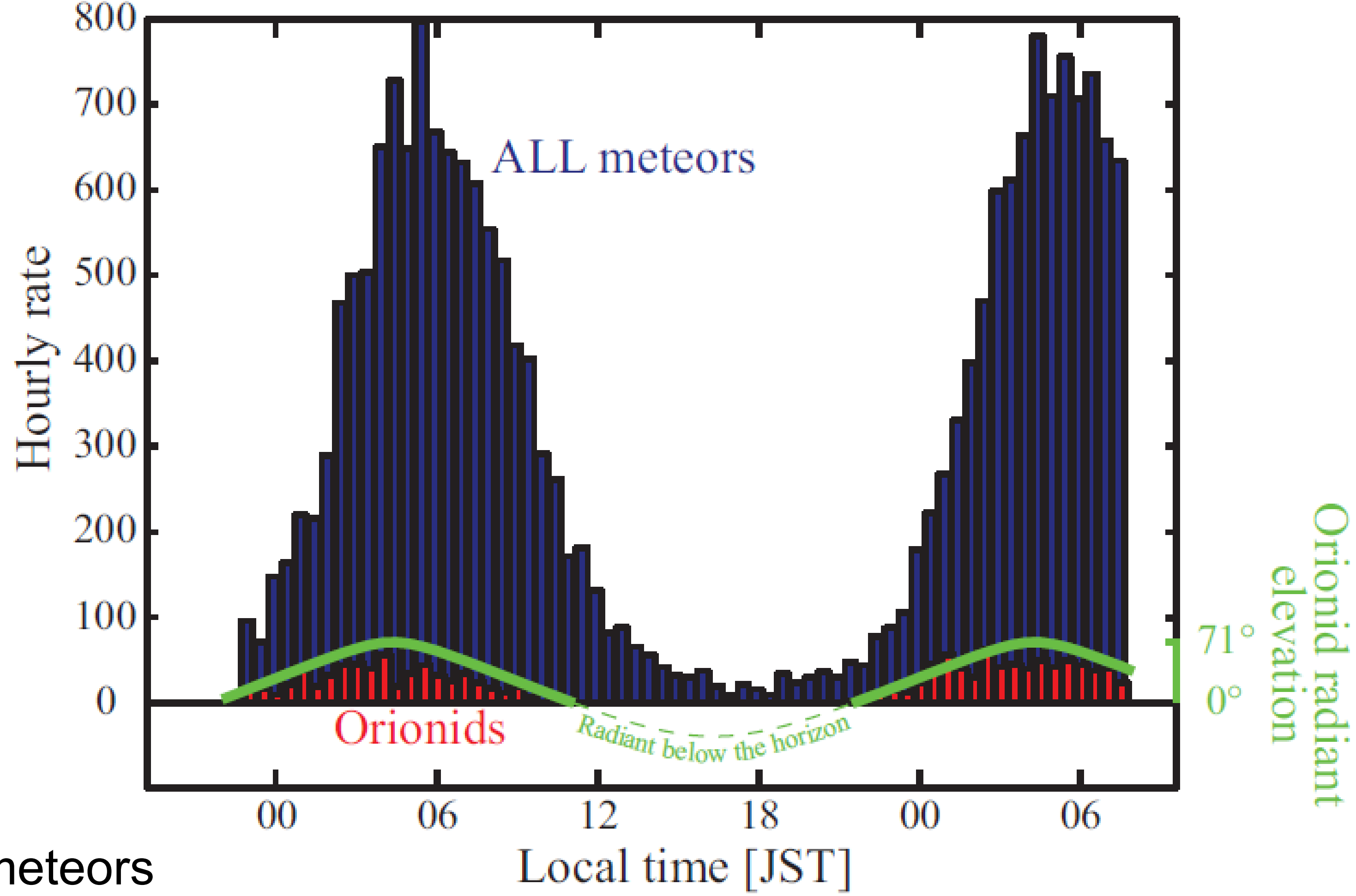
33 hours of MU data October 19-21, 2009



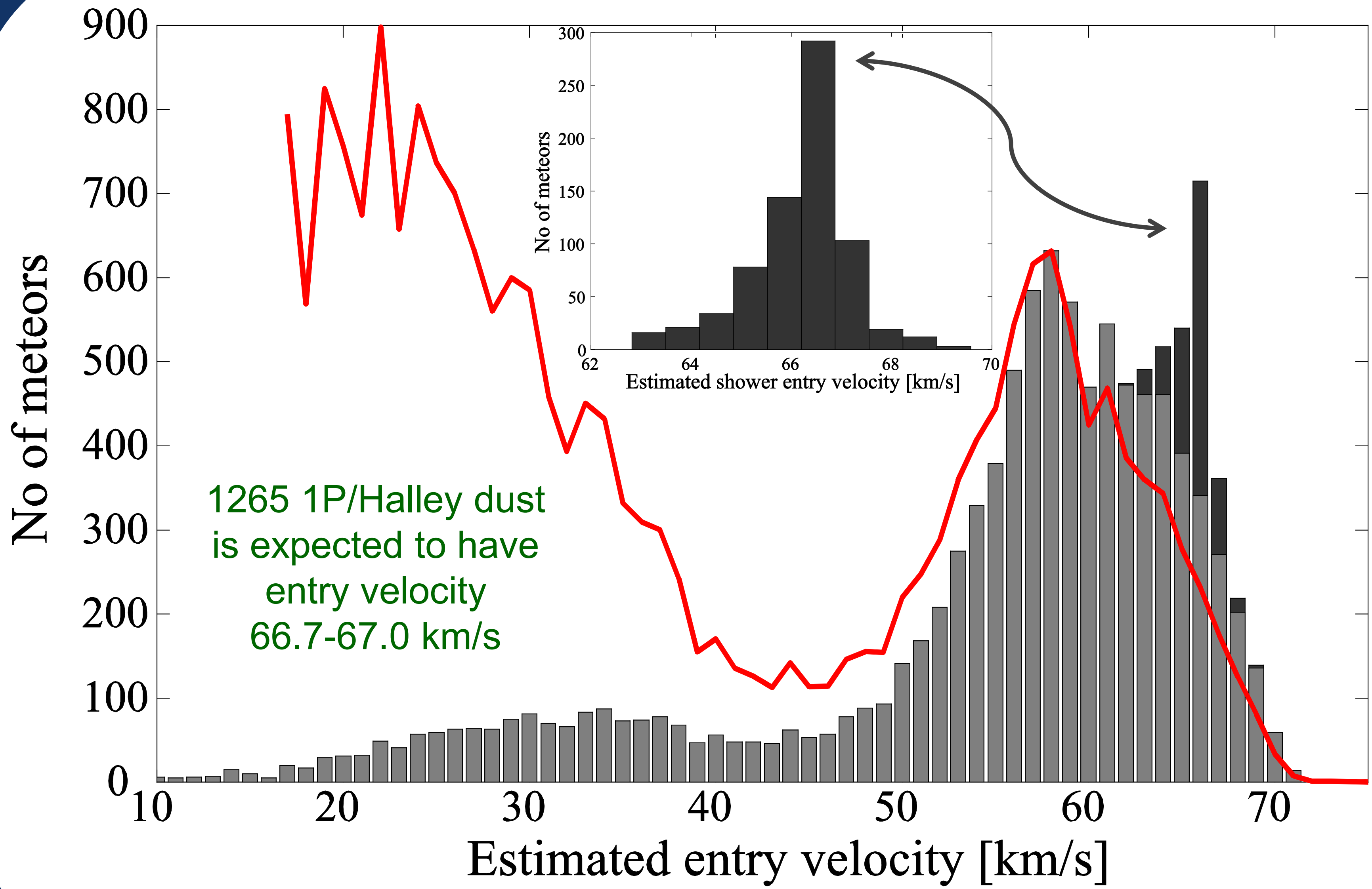
Kero, J., Szasz, C., Nakamura, T., Meisel, D. D., Ueda, M., Fujiwara, Y., Terasawa, T., Miyamoto, H., and Nishimura, K. (2011). First results from the 2009-2010 MU radar head echo observation programme for sporadic and shower meteors: the Orionids 2009. *MNRAS, 416:2550–2559.*

33 hours of MU data October 19-21, 2009

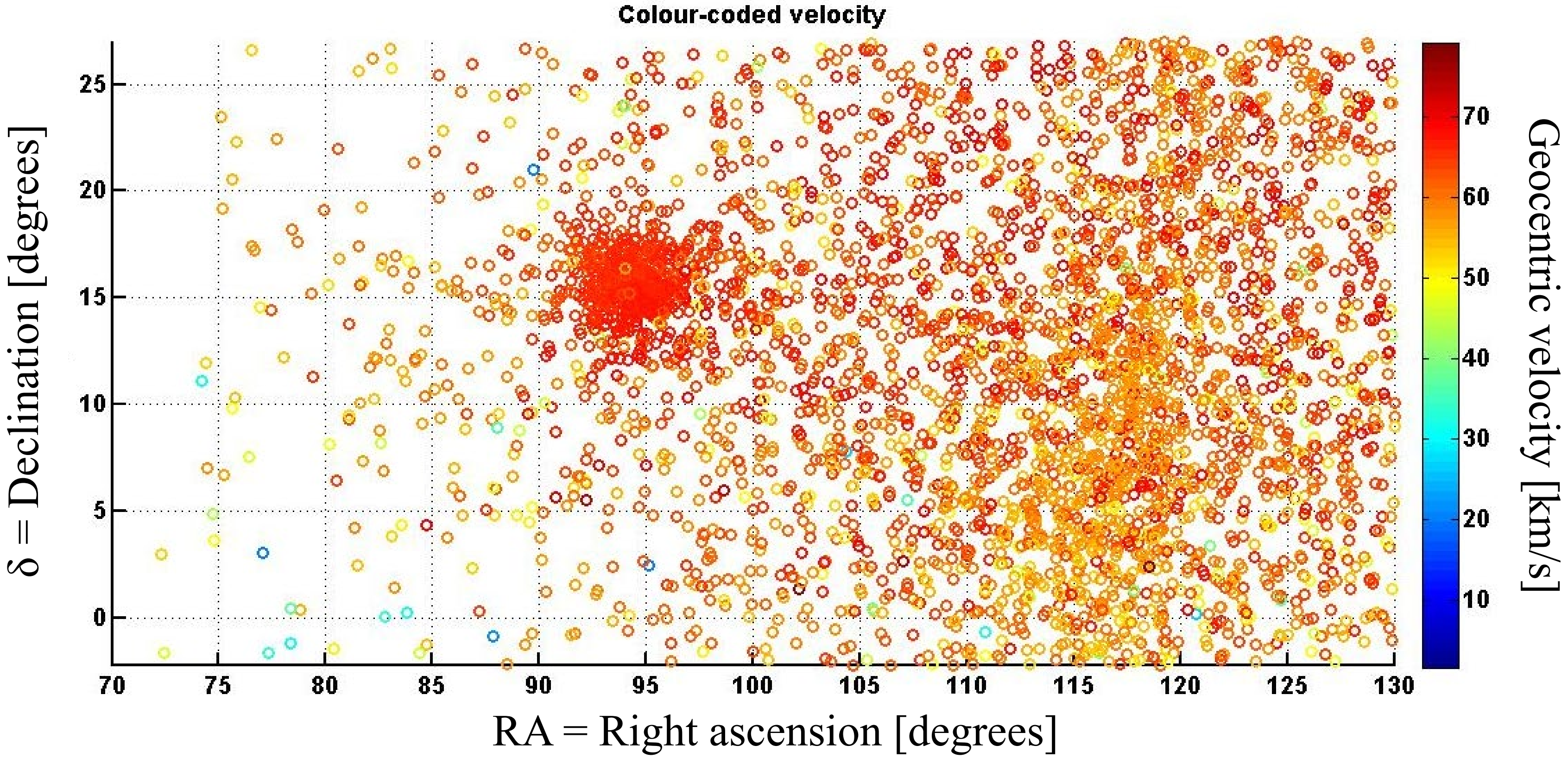


>10000 meteors
of which
> 600 Orionids

33 hours of MU data October 19-21, 2009



33 hours of MU data October 19-21, 2009



Orionids ejected from comet 1P/Halley in 1265:
RA=94.6°, **δ**=-15.4°

33 hours of MU data October 19-21, 2009

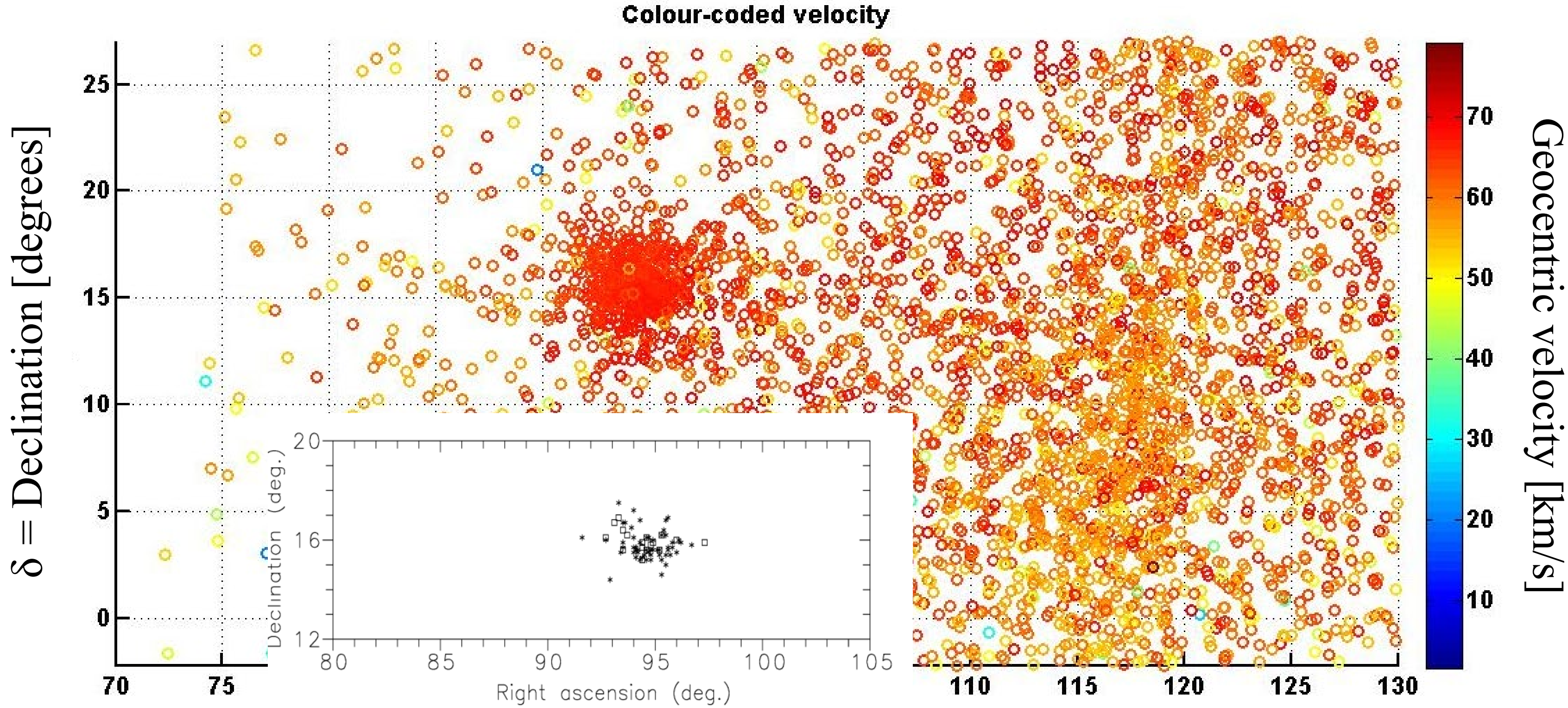
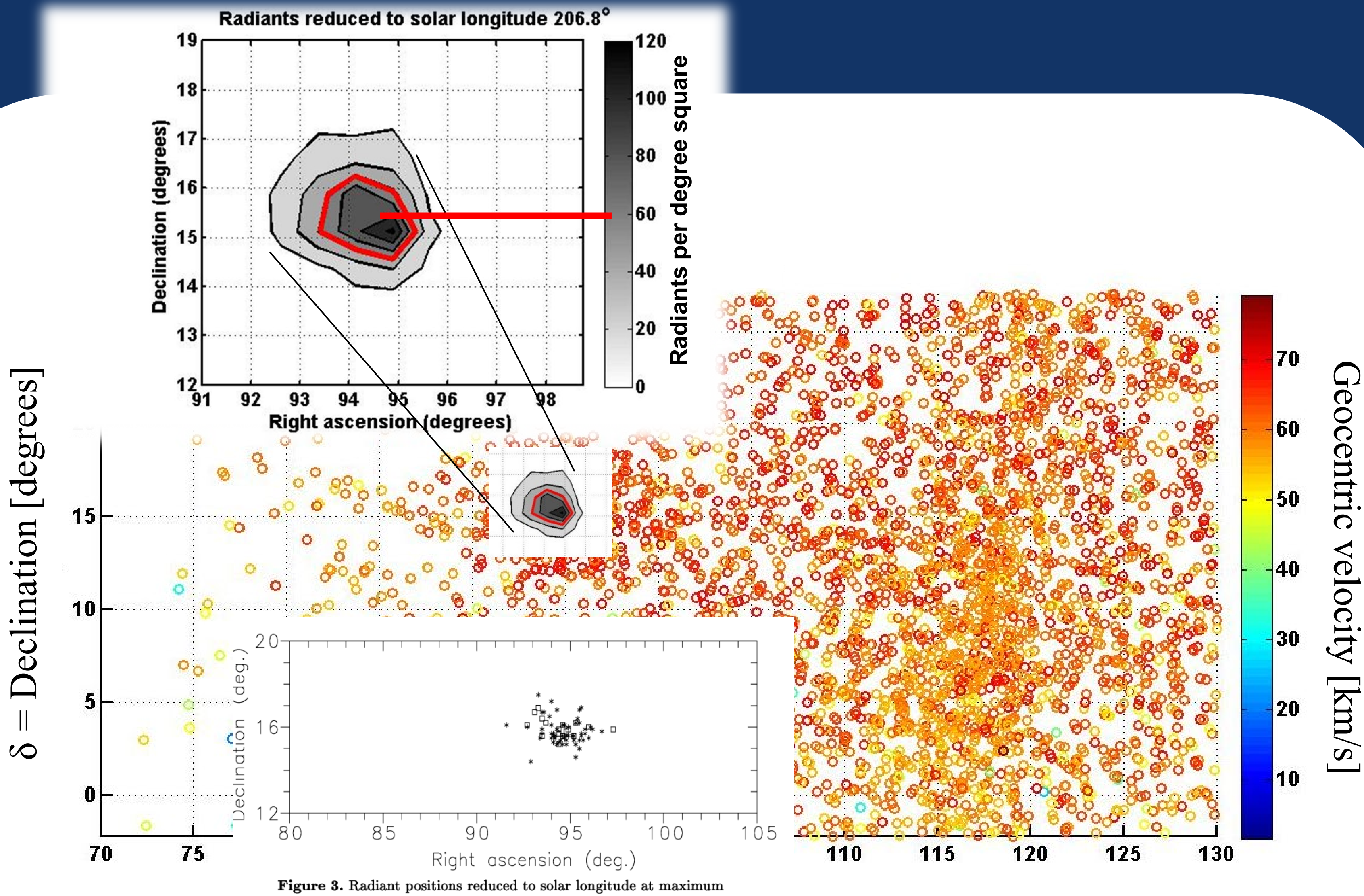


Figure 3. Radiant positions reduced to solar longitude at maximum

Comparison with the 60 best photographic and 17 video Orionoids of the IAU Meteor Data Center
(Lindblad and Porubcan, CAOSP 29, p 77, 1999)



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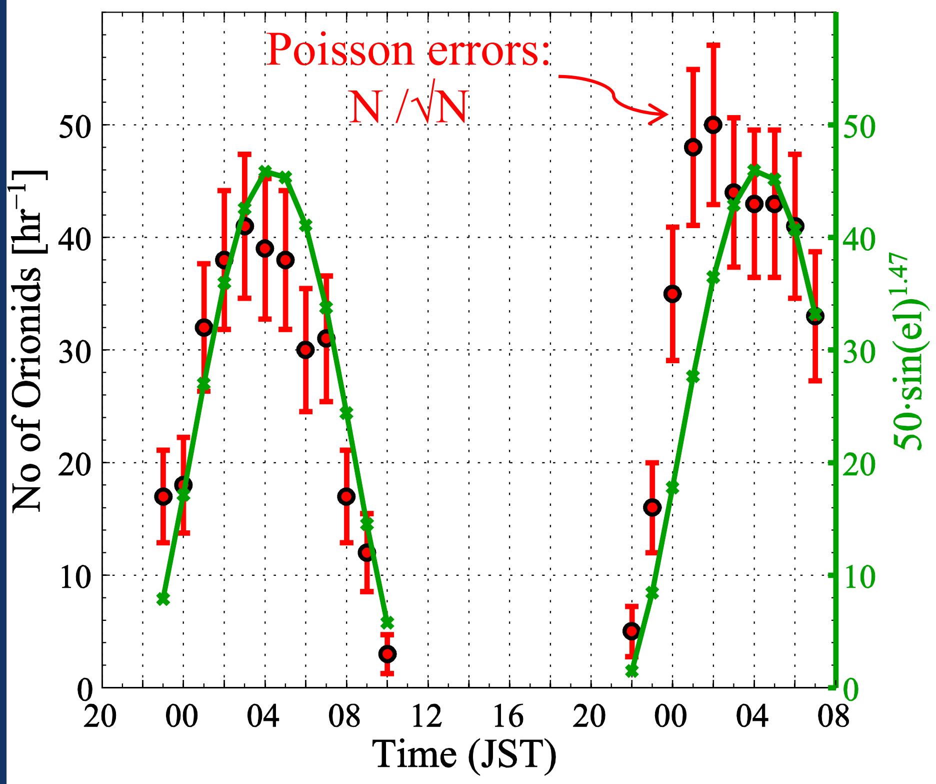
33 hours of MU data October 19-21, 2009

Count rate:



33 hours of MU data October 19-21, 2009

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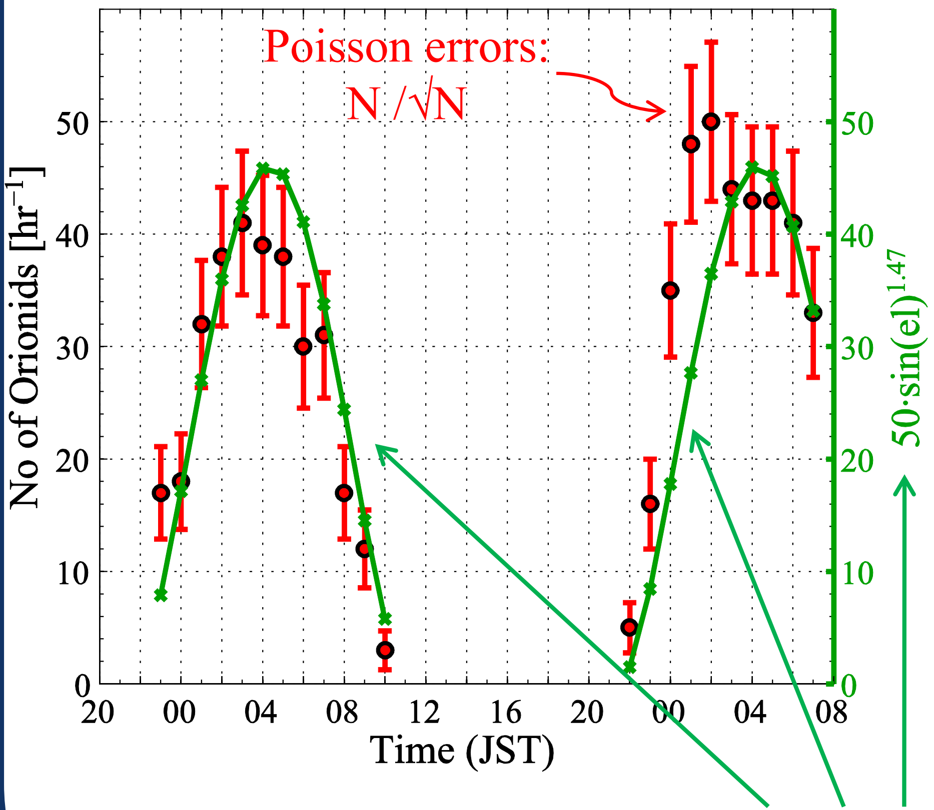

Count rate dependence of radiant elevation agree well with visual observations, e.g.,

- Zvolankova (1983): Dependence of the observed rate of meteors on the Zenith distance of the radiant
- Jenniskens (1994): Meteor stream activity I. The annual streams

33 hours of MU data October 19-21, 2009

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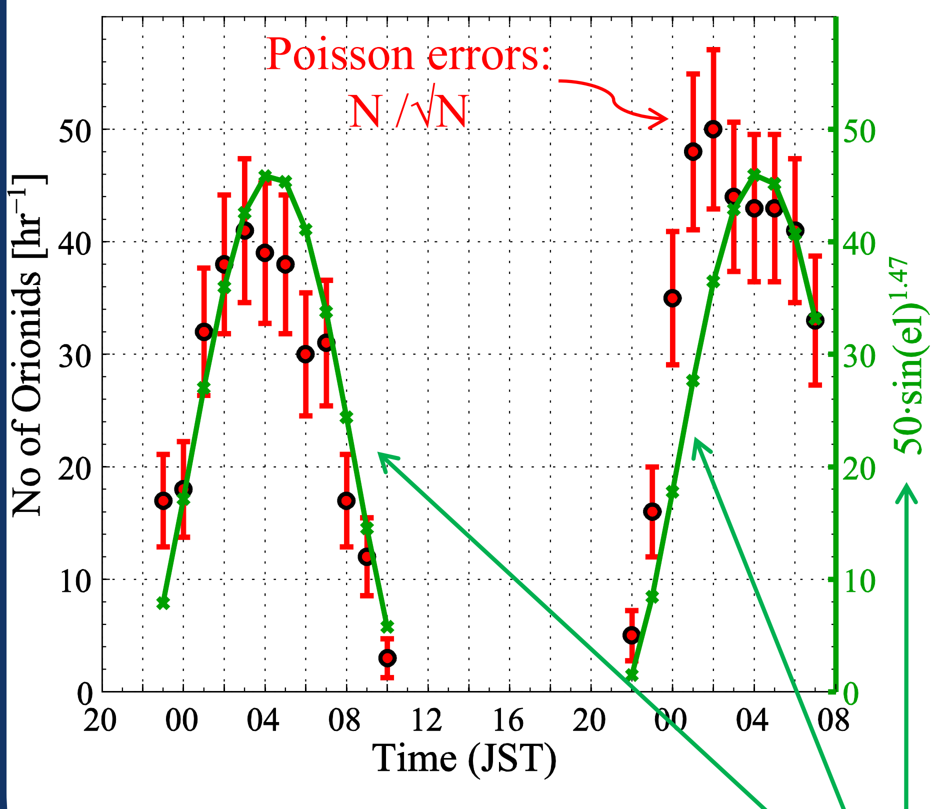
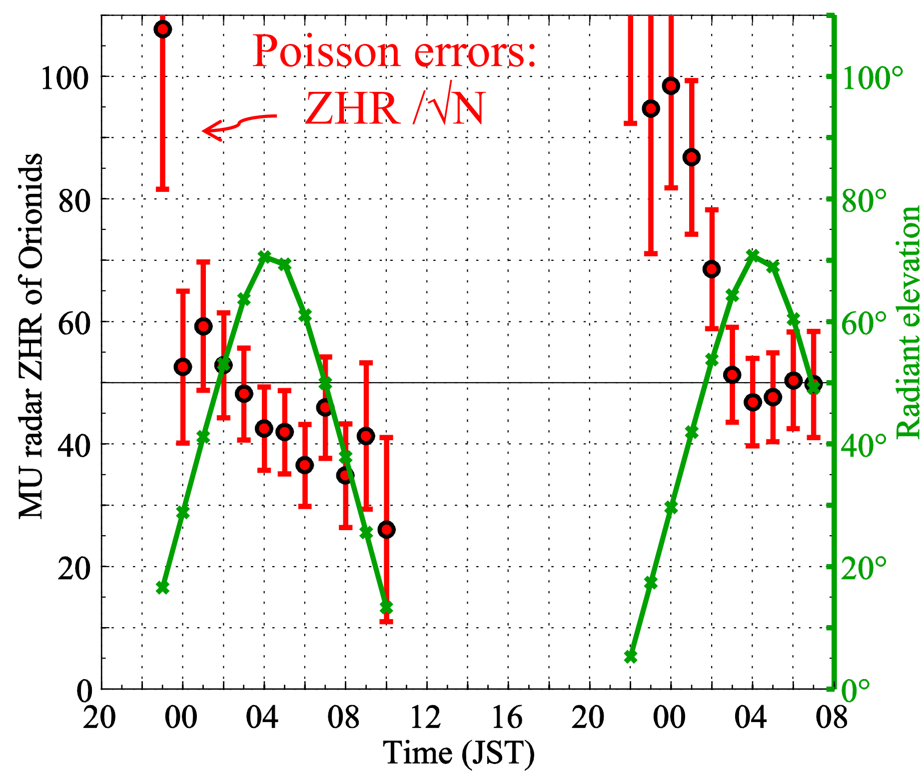


MU radar ZHR:



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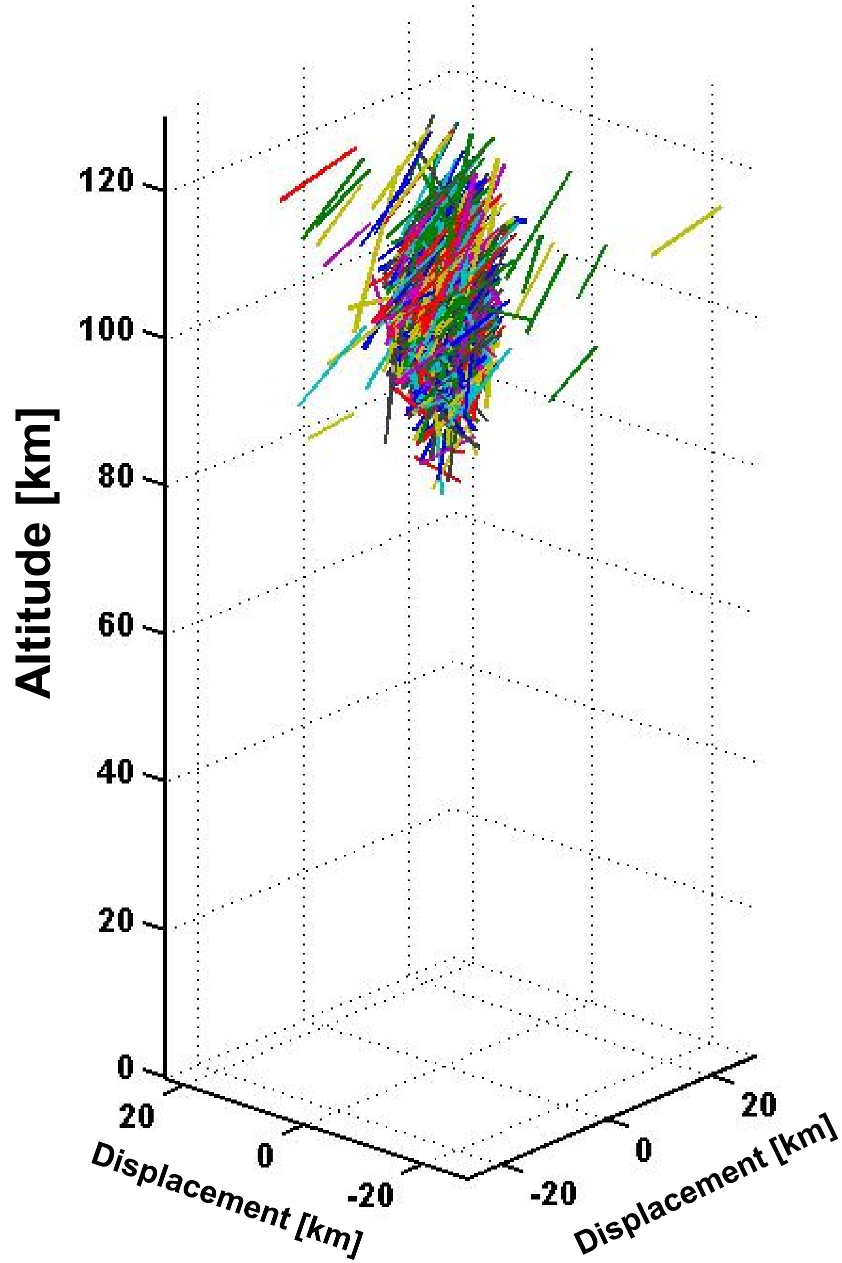
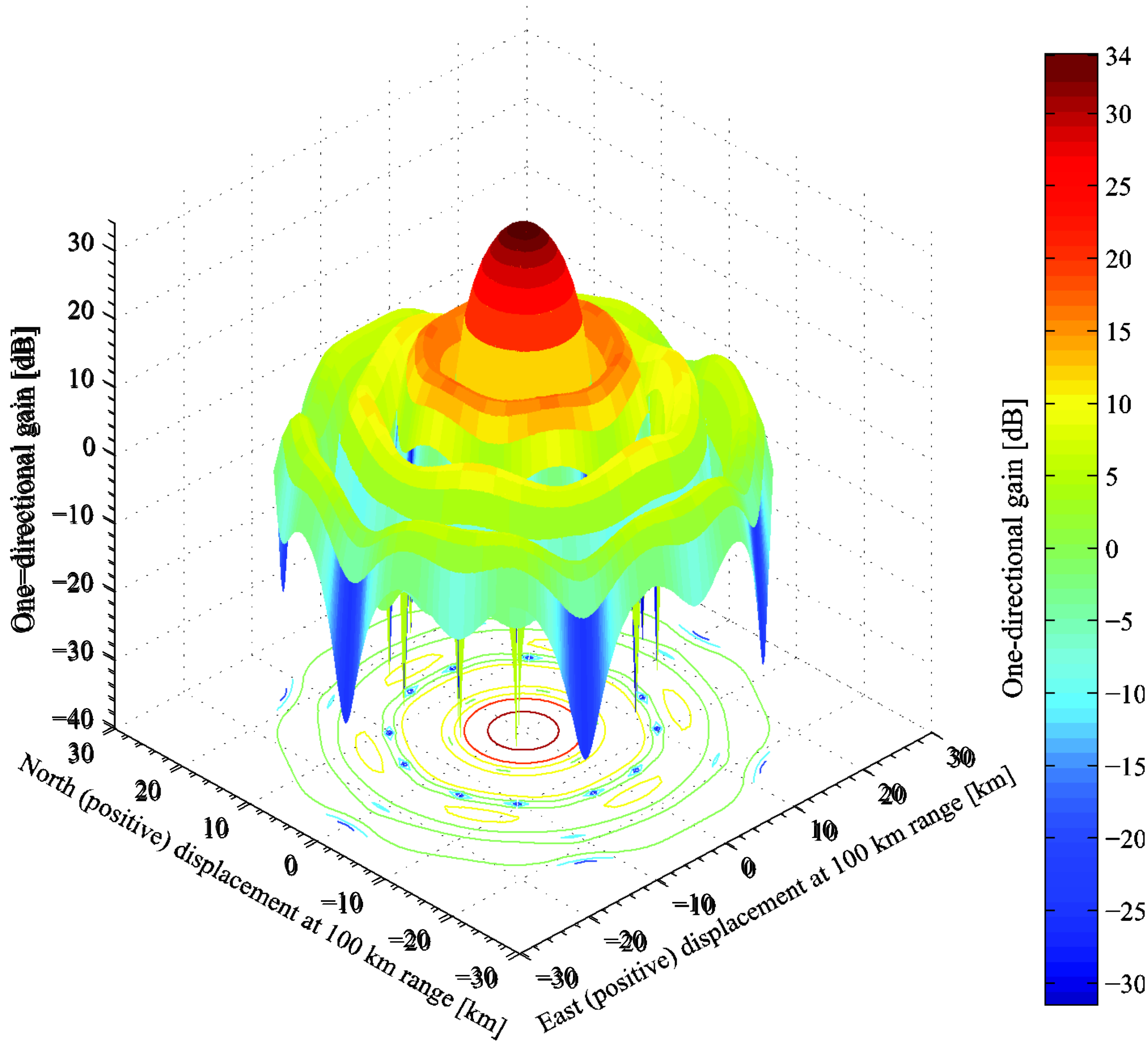
Estimating MU radar collection area

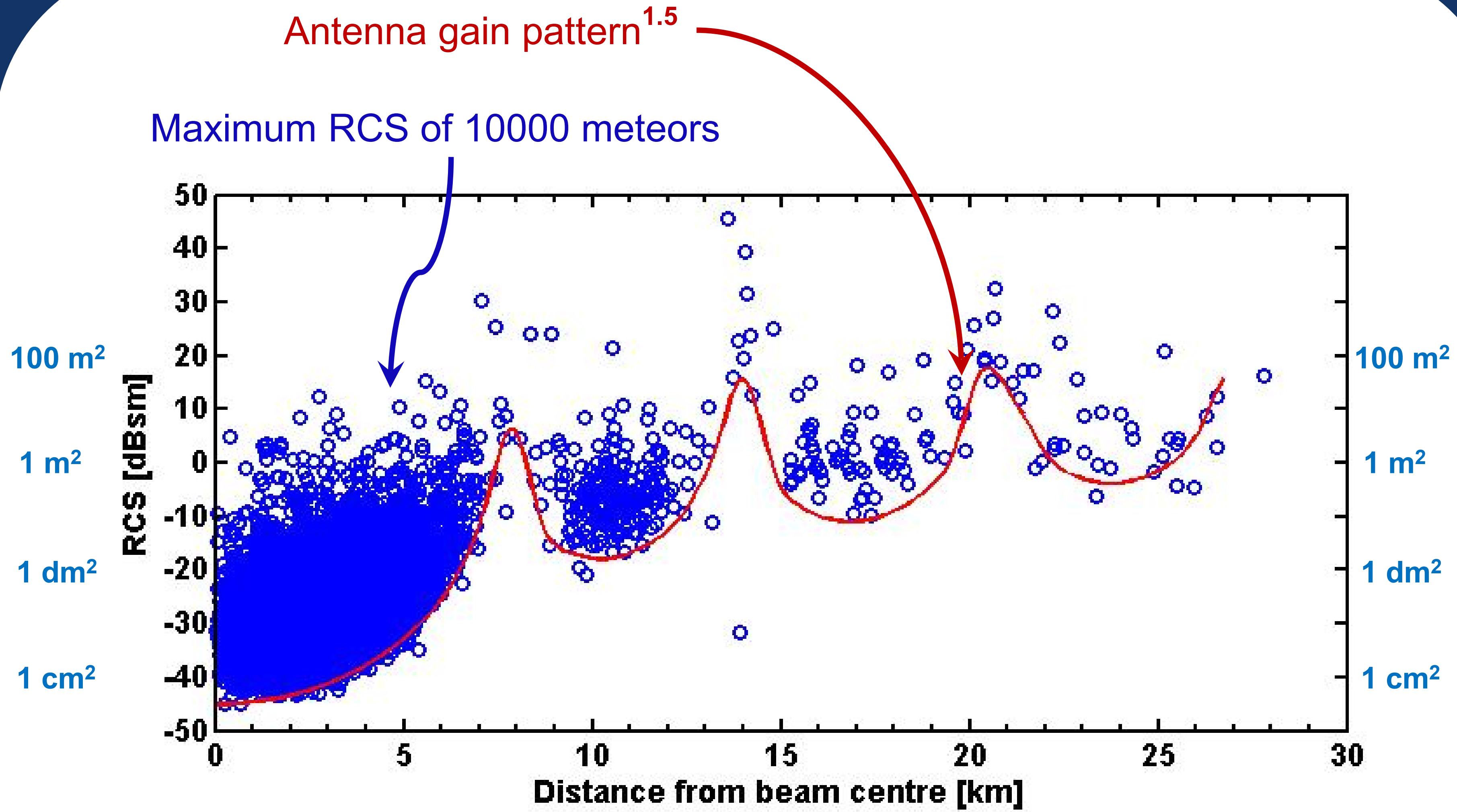


Distribution of 1000 meteors

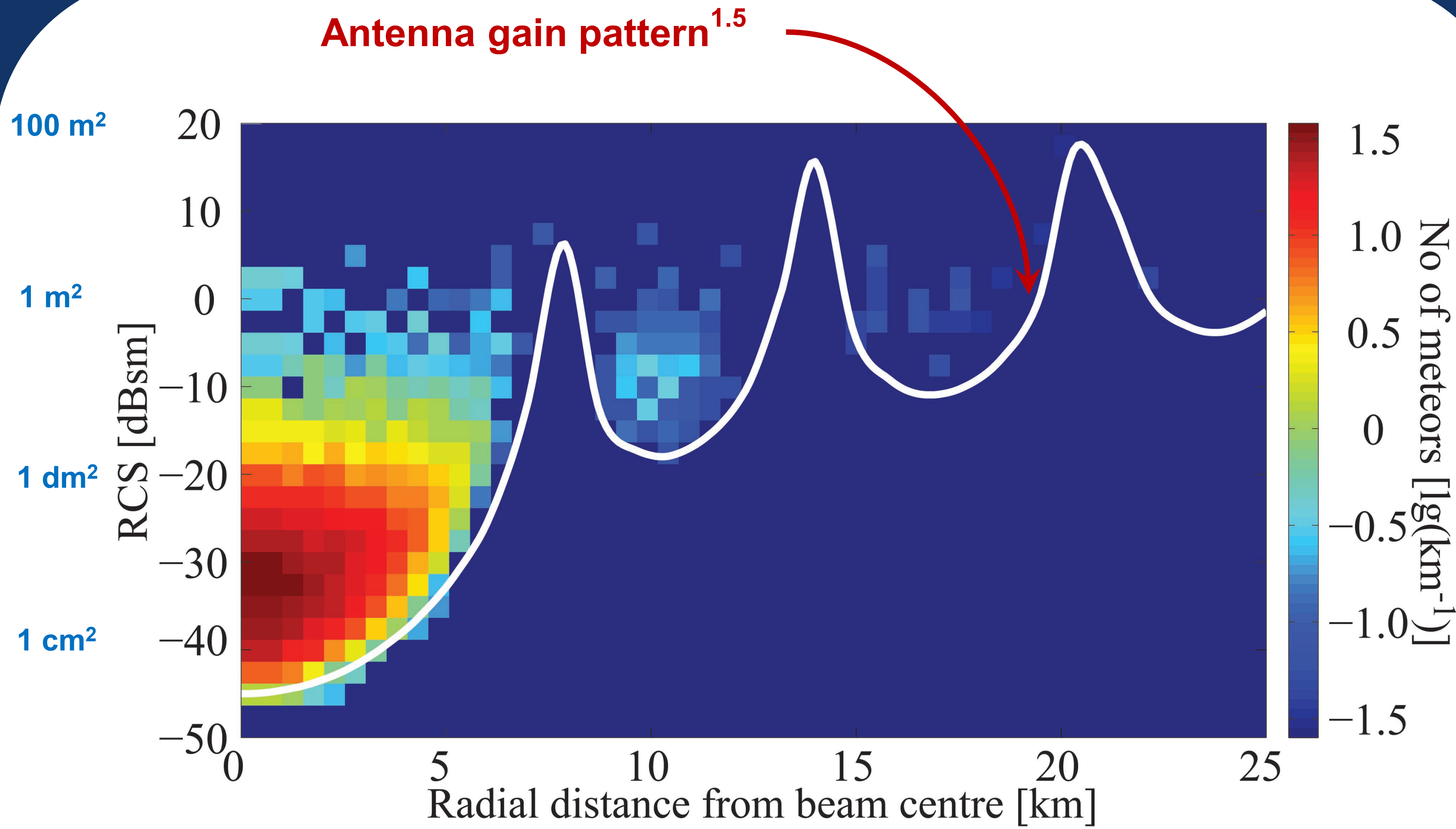
MU radar antenna gain pattern



Estimating MU radar collection area



No of meteors normalized by beam area



MU radar collection area

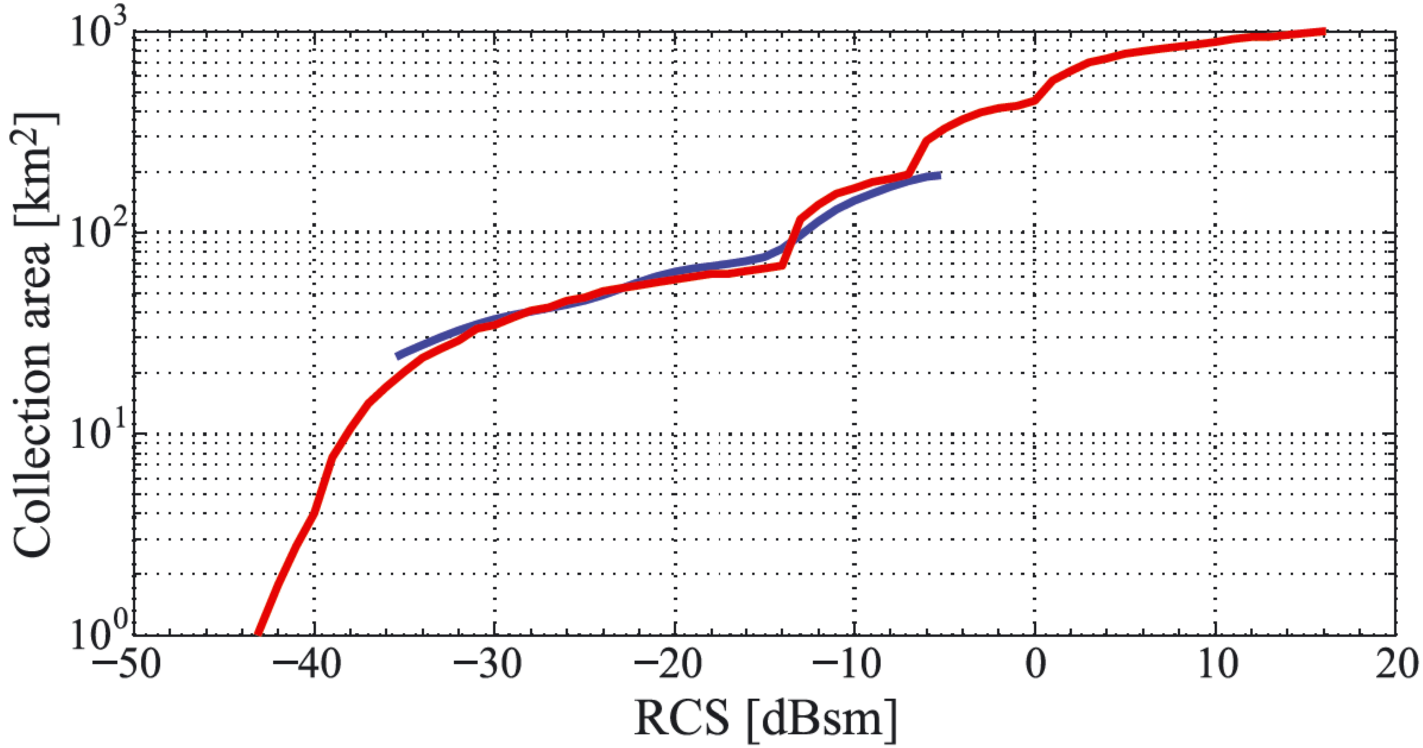
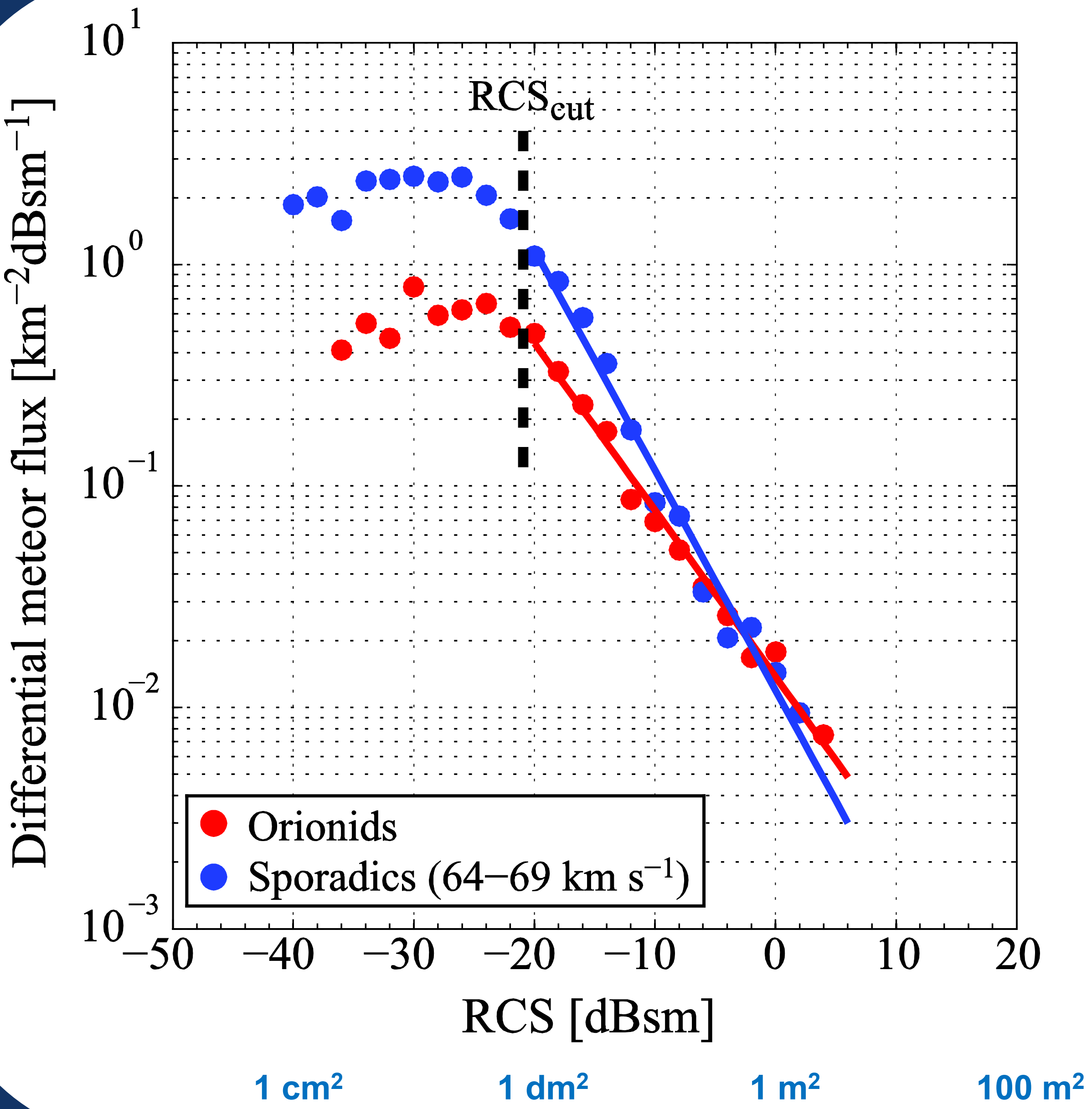


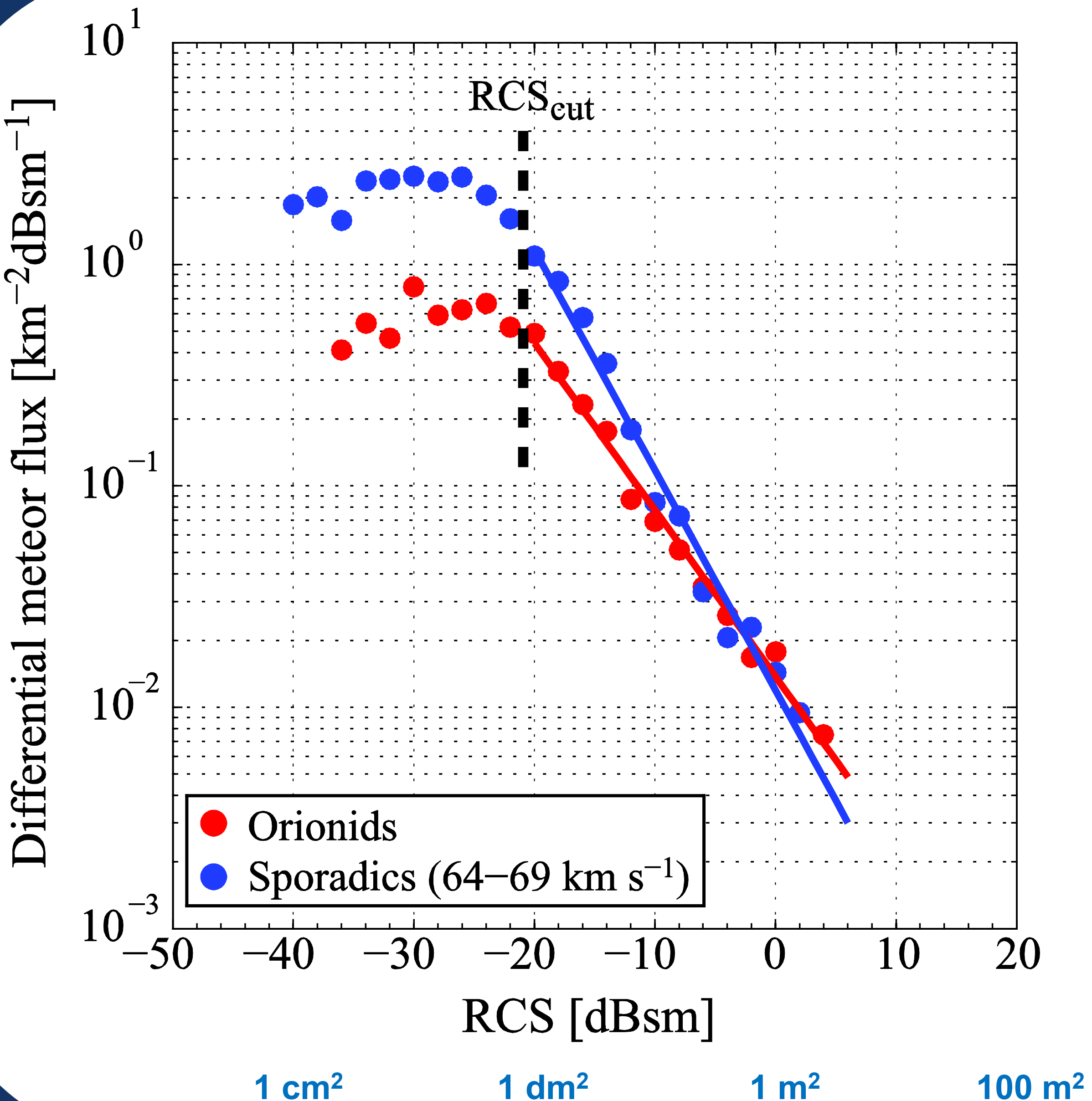
Figure 7. Estimated meteor collection area as a function of meteor radar cross-section (RCS). The blue curve is calculated using a probability of detection approach and assuming a uniform flux of meteors as a function of distance from the bore axis. The red curve is based on an integration of the antenna radiation pattern.

Differential MU meteor flux



The ratio of the differential RCS distributions is 1.32 ± 0.11

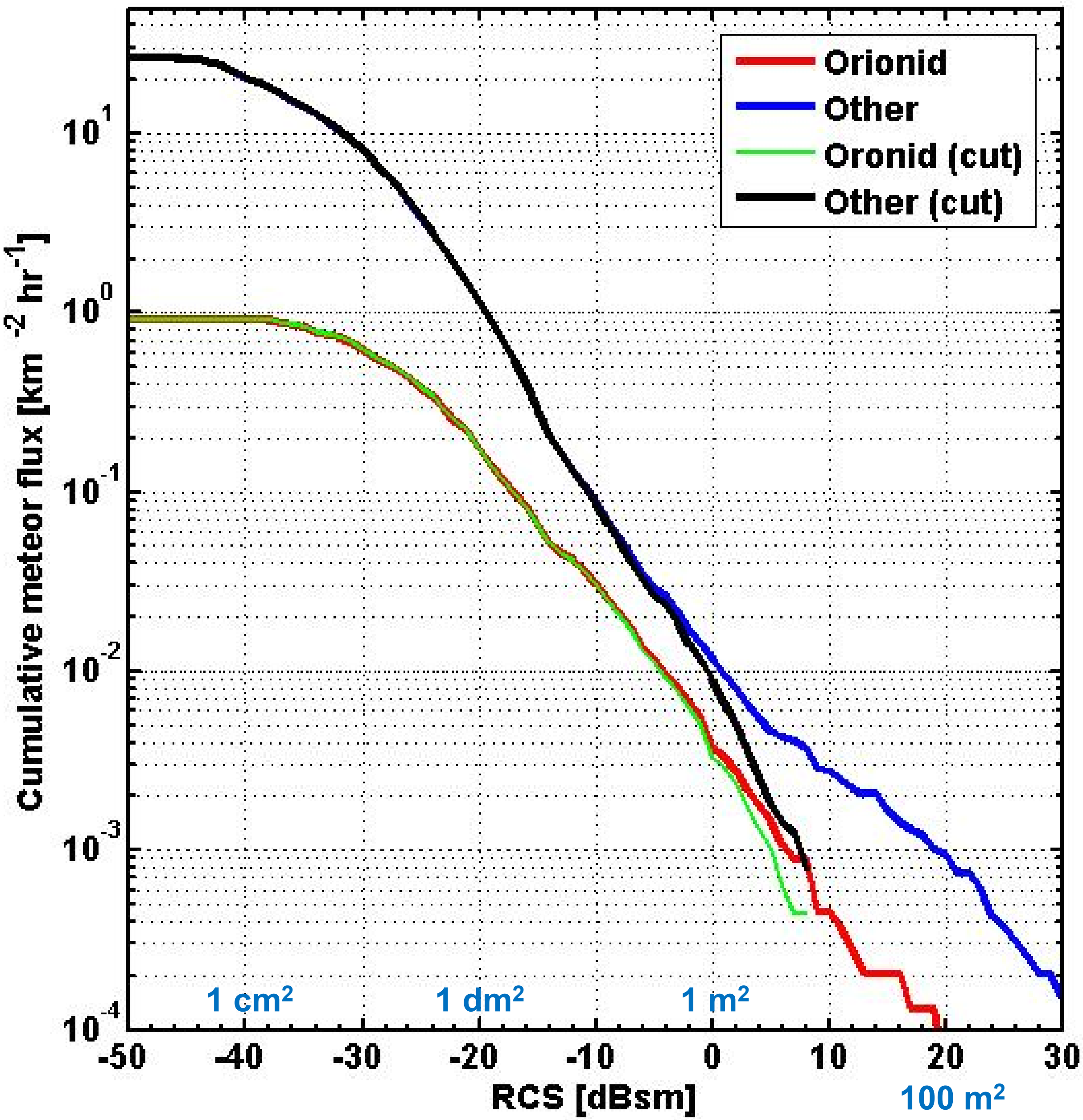
Differential MU meteor flux



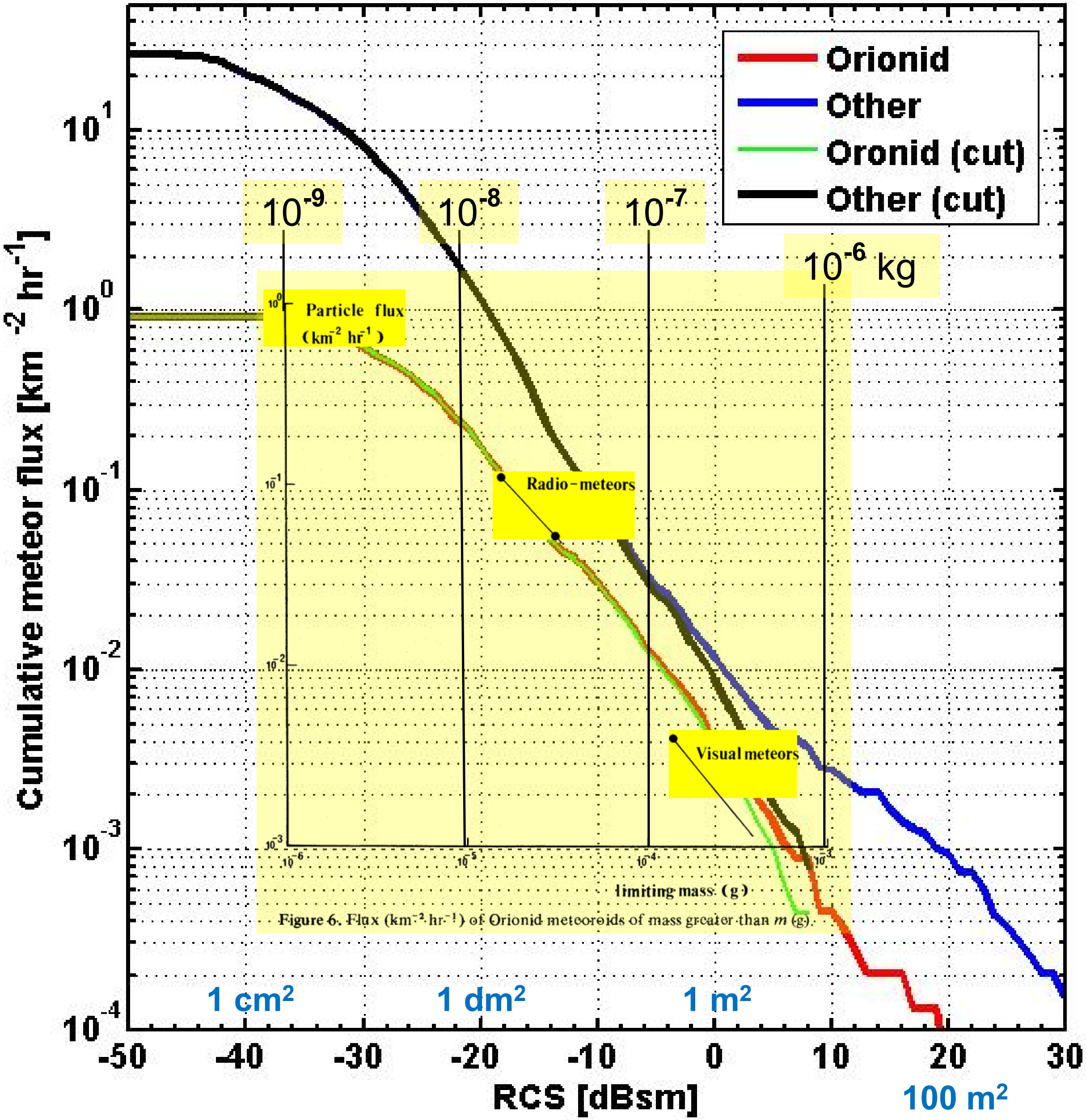
The ratio of the differential RCS distributions is 1.32 ± 0.11

If the RCS mass dependence of Orionids and other meteoroids is the same, the ratio of the mass distribution indices is also 1.32 ± 0.11

Cumulative MU meteor flux

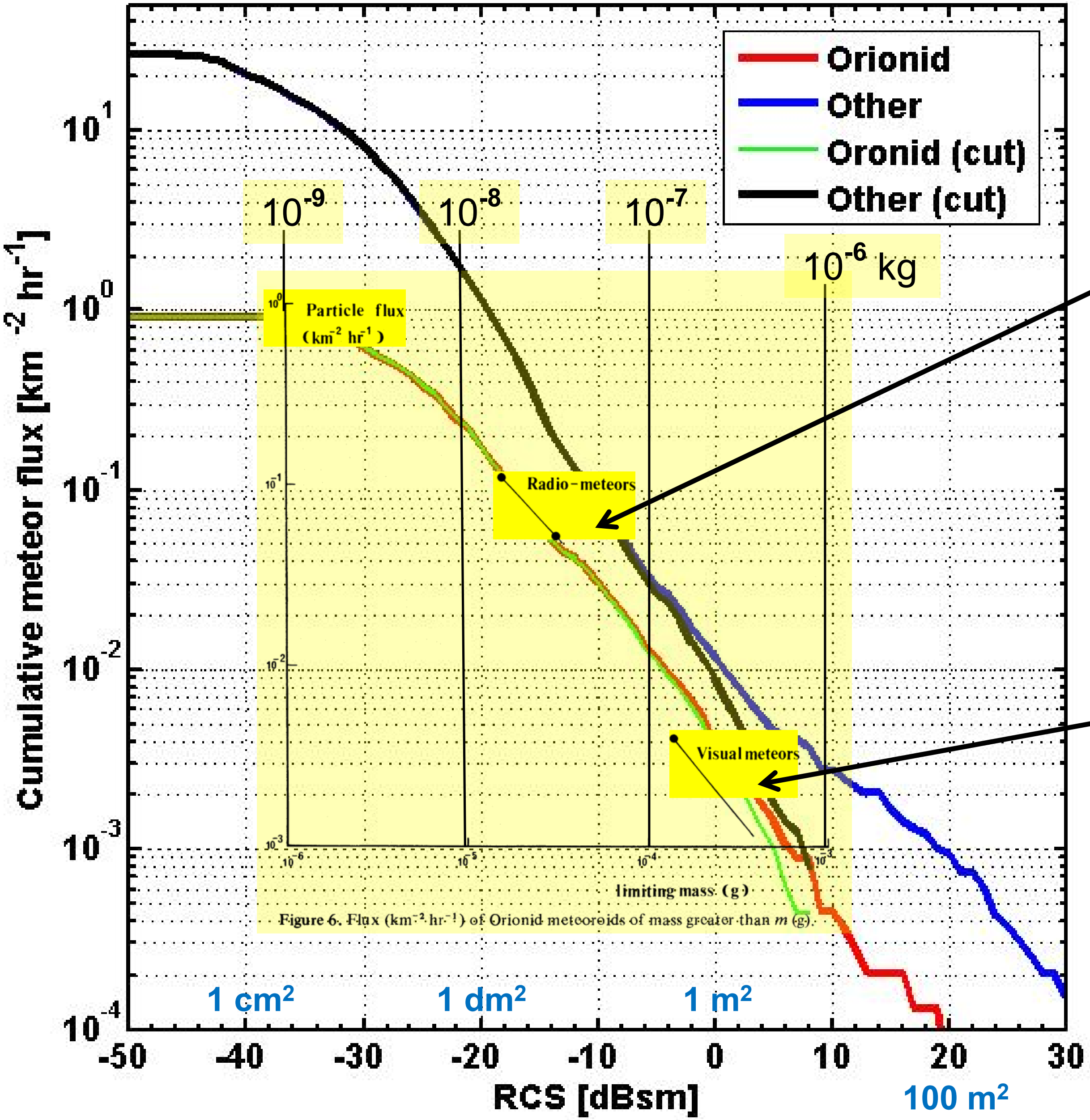


Comparison with meteor trail and visual obs.



Adapted from: Jones (1983), MNRAS

Comparison with meteor trail and visual obs.



Jones radio meteor count rate was multiplied by 35 to take into account altitude cutoff.

Visual meteor rate was ZHR=22

Conclusions from the Orionid observations

- \> 600 of 10,000 meteors were Orionids
- The Orionid detection rate reached $50 \pm 7\ h^{-1}$
- The detection rate was consistent with the radiant altitude exponent of 1.47 derived for visual meteors by Zvolankova (1983)
- The resulting ZHR_{MU} was $50 \pm 7\ h^{-1}$ except during Oct. 20 22:00 JST to Oct. 21 02:00 JST when it was enhanced by a factor of 2 ± 0.4
- The estimated MU collection area varies from about 1 to 1,000 km^2 within the RCS span of the detected meteors
- The zenithal equivalent cumulative flux of Orionids is $\approx 1\ km^{-2}h^{-1}$ while the sporadic flux peaked at $\approx 30\ km^{-2}h^{-1}$