Meteoroid Flux Profiles from the IMO Video Meteor Network

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1. Introduction

The video network of the International Meteor Organisation (IMO) consists of >80 narrow-angle video cameras, which are capable of detecting meteors in visible light down to a mean limiting magnitude of $+3.0 \pm 0.8^{\mathrm{m}}$ (with reference stars detected down to $+4.0\ \pm 0.9^{\mathrm{m}}$).

All stations are operated using the MetRec meteor detection software. MetRec initially focused on collecting astrometric and photometric measurements, but two years ago it also started providing limiting magnitudes and hence flux estimates (Molau 2011).

Recently, we implemented a system to collect the flux measurements automatically via a web application. This allows the meteor activity in the optical domain to be monitored in near real-time.

2. Real-time flux reporting

Observing stations can report fluxes every minute by sending a short text message to a web service API. The message must include the number of meteors per shower and the associated 'Effective Collection Area' (ECA), which is given in units $[\mathrm{km}^2 \cdot \mathrm{h}]$ and includes a correction for the difference between the actual and the nominal limiting magnitude ($+6.5^{\mathrm{m}}$).


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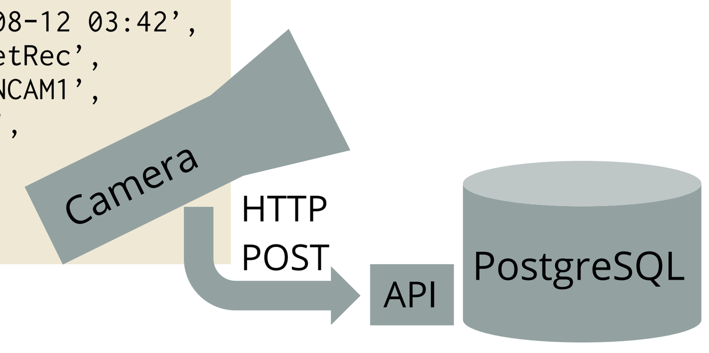
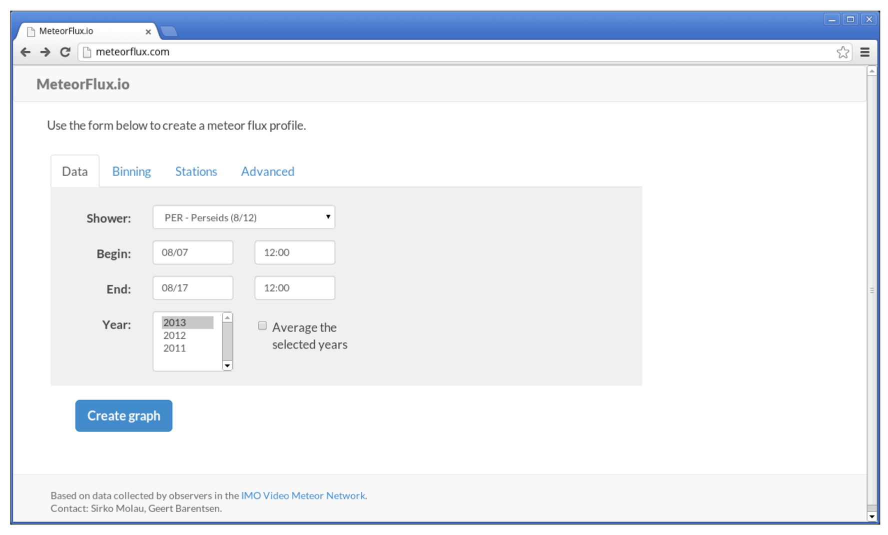


3. Visualisation

A Python web application allows activity profiles to be extracted from the database of flux messages, which contains 53 million records at present. Graphs can be generated using configurable binning parameters.



www.meteorflux.io

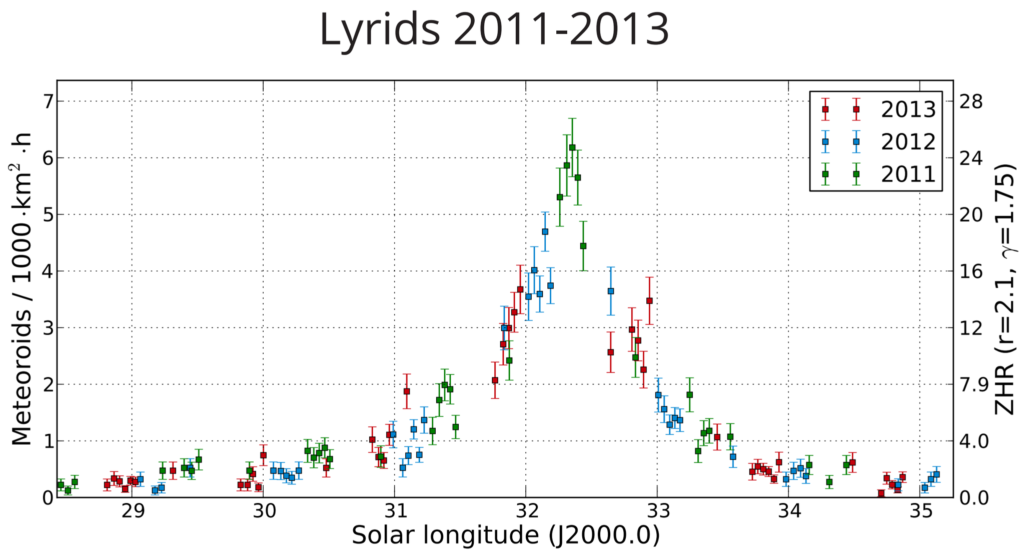
4. Results

The figures below show examples of flux profiles which were generated using the web application. Different visualisation parameters were chosen for each shower to highlight different aspects of both the dataset and the meteoroid streams.

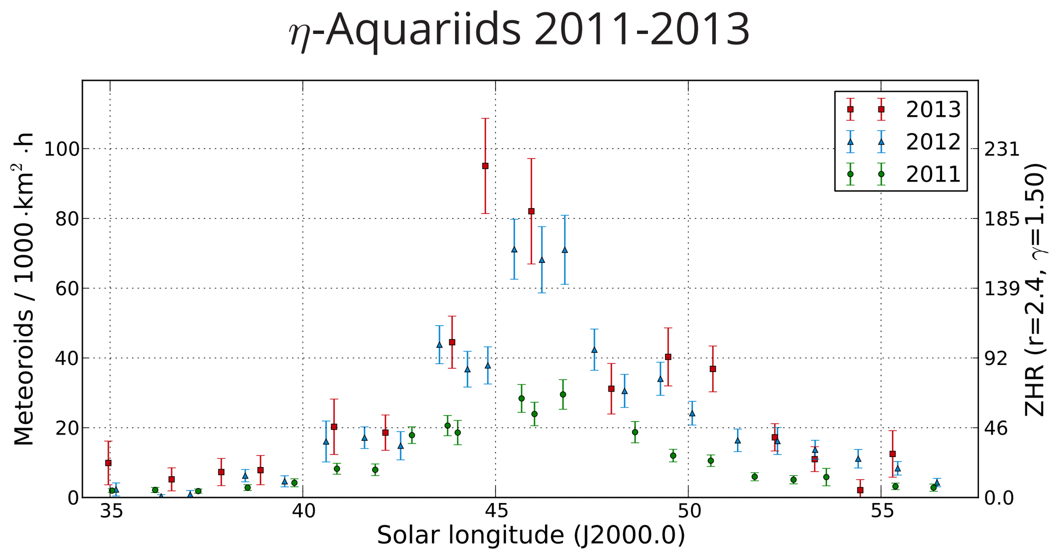
The flux values shown refer to the number of meteoroids causing meteors brighter than magnitude $+6.5$. They are computed by MetRec as described in (Molau & Barentsen 2012) and depend on the assumption of a nominal population index.

The error bars are derived in a Bayesian fashion as explained in (Barentsen, Arlt & Fröhlich 2011). The figures also show ZHR estimates, which are converted from the flux values using the relationship established by (Koschack & Rendtel 1990).

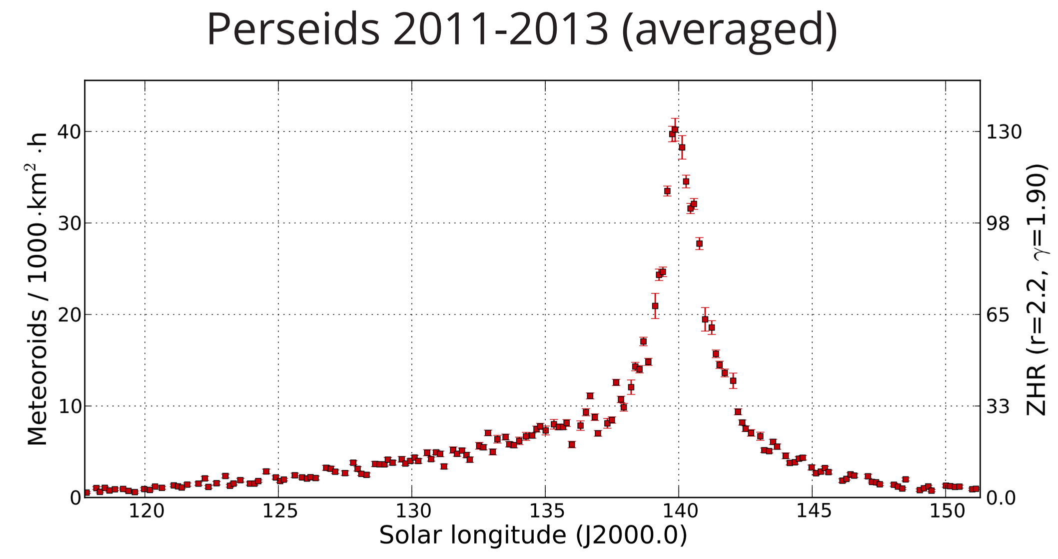
Lyrids 2011-2013



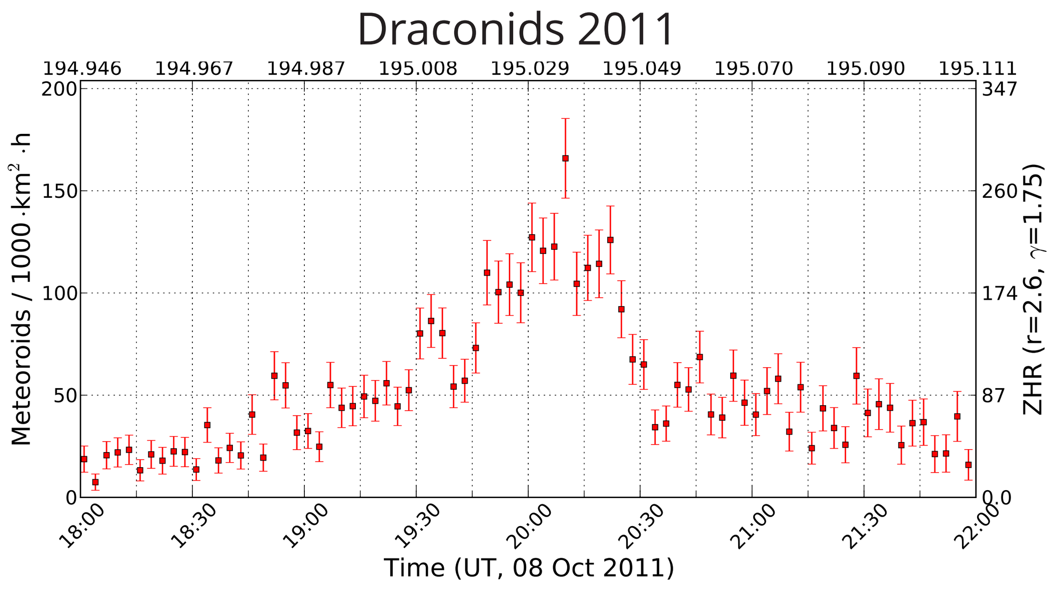
η-Aquariids 2011-2013



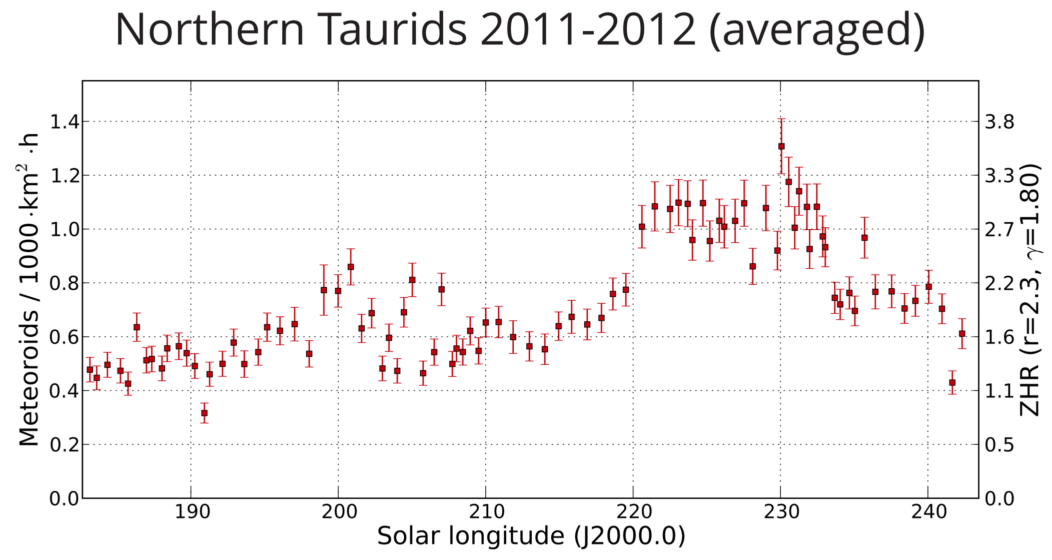
Perseids 2011-2013 (averaged)



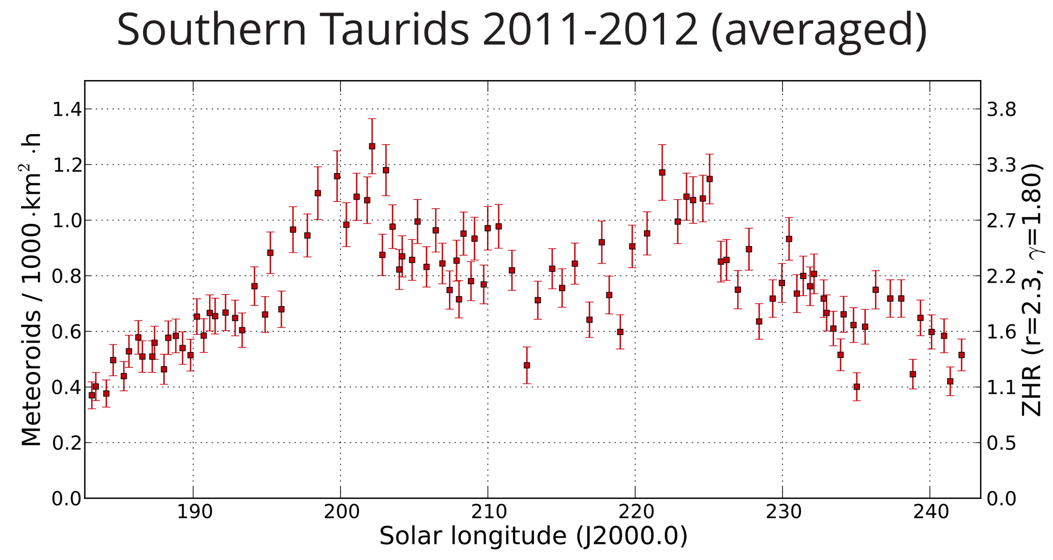
Draconids 2011



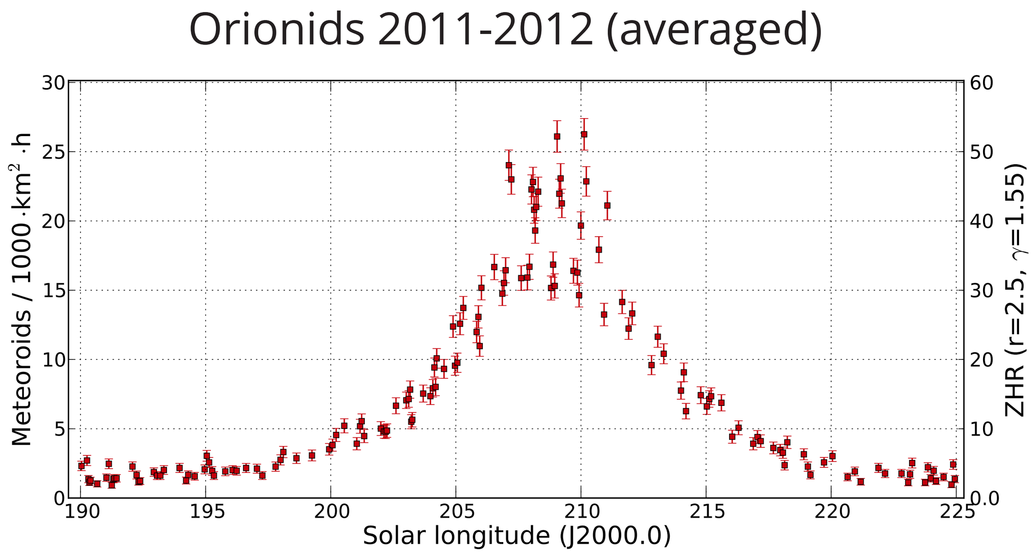
Northern Taurids 2011-2012 (averaged)



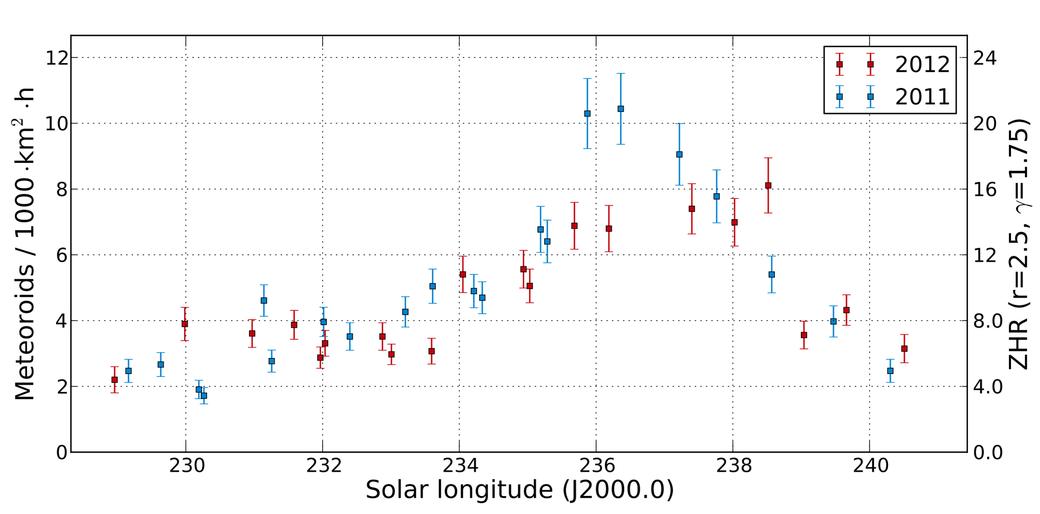
Southern Taurids 2011-2012 (averaged)



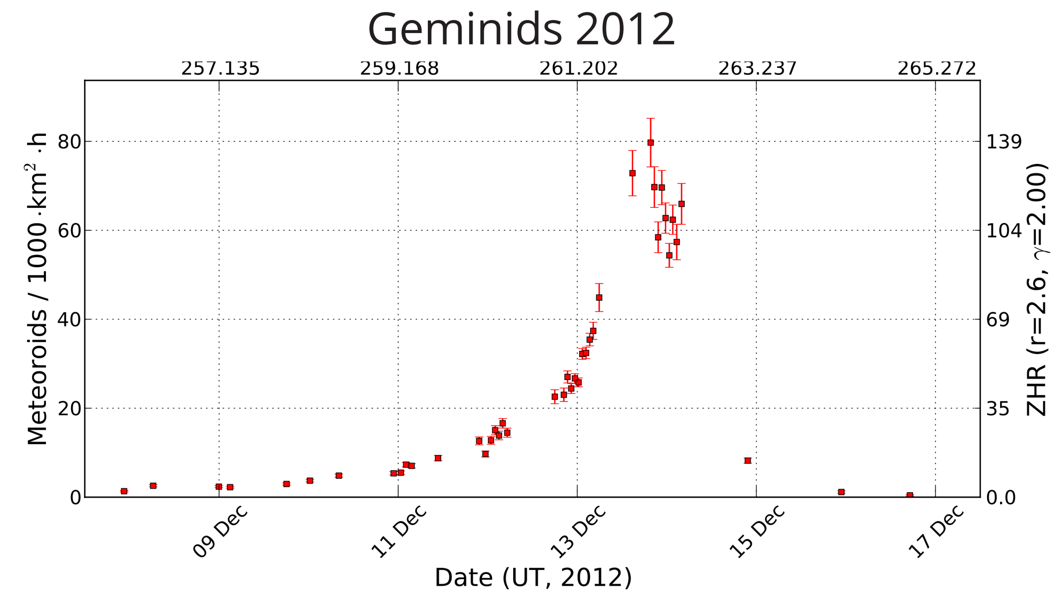
Orionids 2011-2012 (averaged)



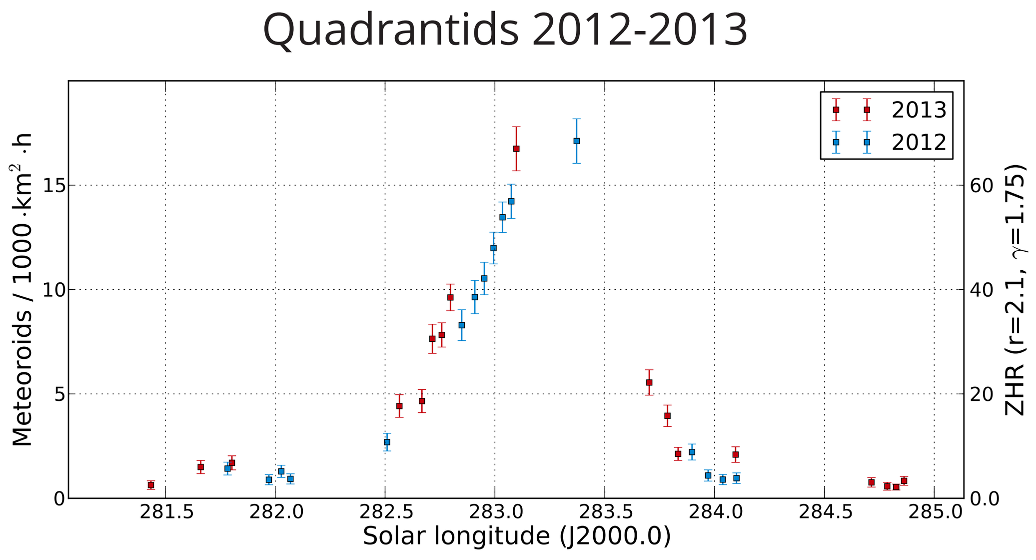
Leonids 2011-2012



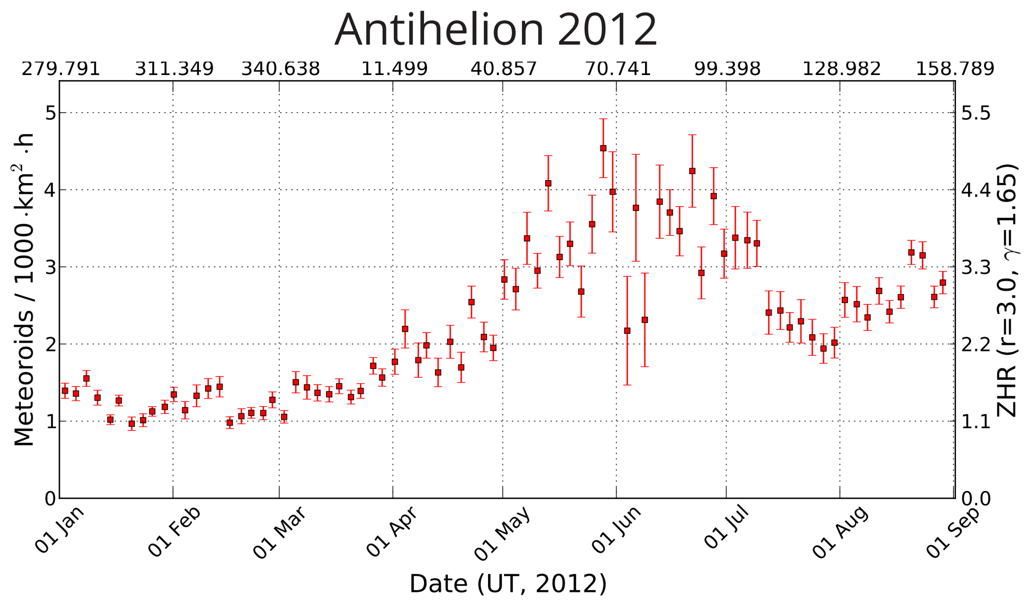
Geminids 2012



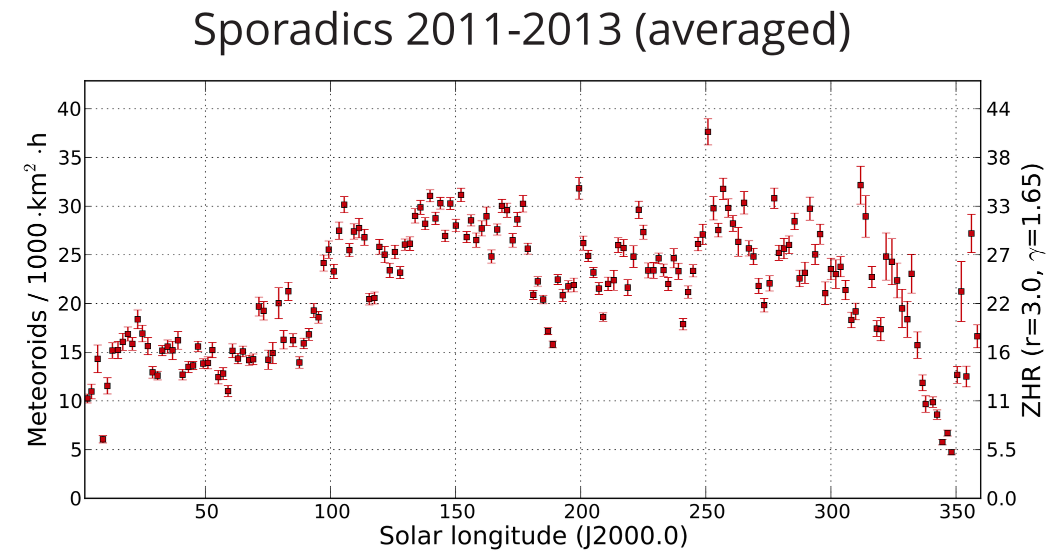
Quadrantids 2012-2013



Antihelion 2012



Sporadics 2011-2013 (averaged)



5. Conclusions, future & source code

Our software provides the much-needed capability to monitor the activity of meteoroid streams in the ~faint optical domain, down to a typical depth of +3 to +4$^{\mathrm{m}}$.

In future work, we aim to improve the analyses by including mass index estimates and visual observations.

The web application can be used to support other observing networks as well. The source code is available under a permissive MIT license at:

https://github.com/barentsen/meteor-flux

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References

Barentsen G., Arlt R., Fröhlich H. (2011). WGN 39, 126-130.

Koschack R., Rendtel J. (1990). WGN 18, 119-140.

Molau S. (2011). Proceedings IMC 2010, Armagh.

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