

# Why Meteors Rock

## An analysis of radio meteor detection

Charles Powell

Exeter Mathematics School

30<sup>th</sup> March, 2017

Charles Powell

Introduction

What is a meteor?

Meteor showers

Radio meteor  
detection

Antenna variation

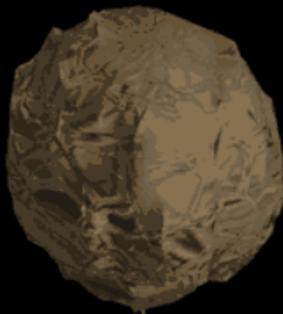
Spatial variation

Diurnal shift

Temporal variation

Zenithal hourly  
rate

Image analysis



# Meteoroid

Credit: *Wikipedia*

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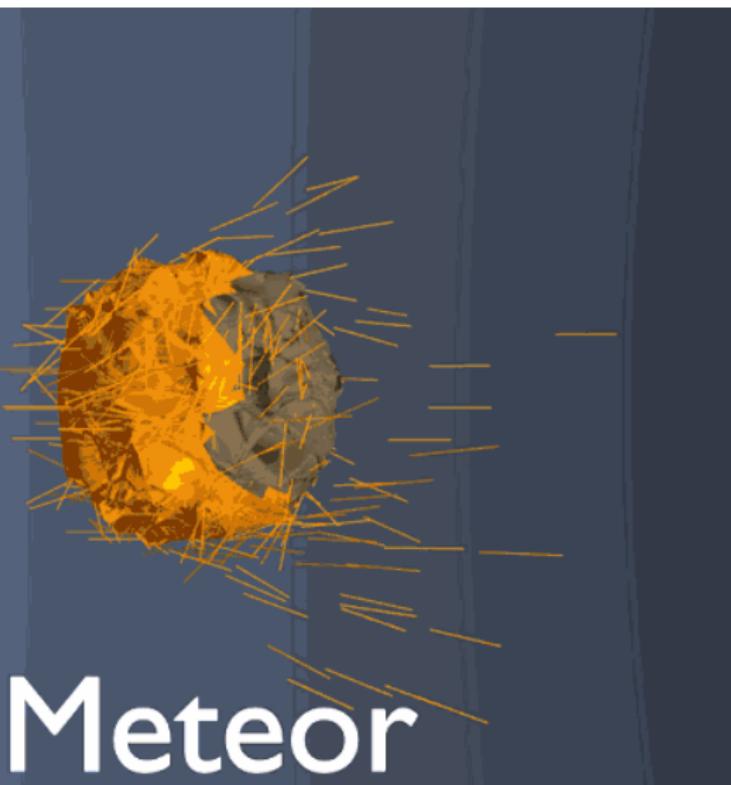
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Credit: Wikipedia

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# Meteorite

Credit: Wikipedia

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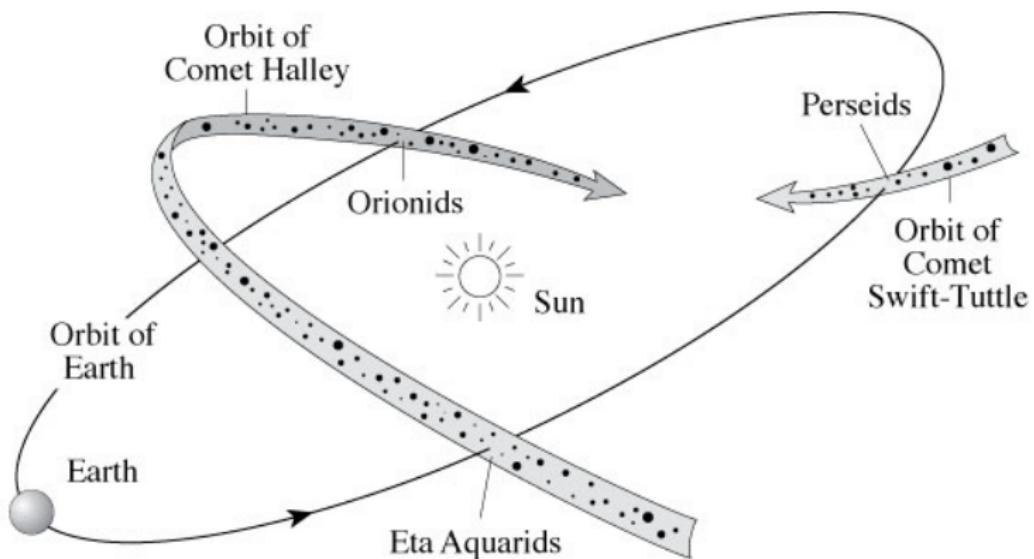
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Credit: *nasa.gov*

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Credit: NASA's Cosmos ([ase.tufts.edu](http://ase.tufts.edu))

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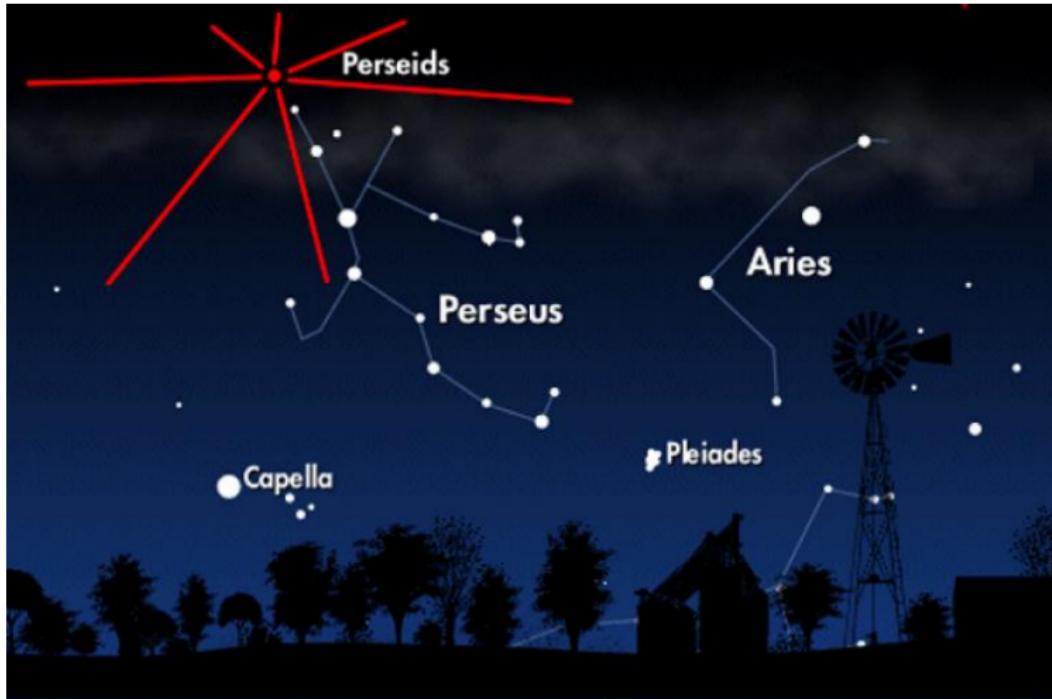
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Diurnal shift

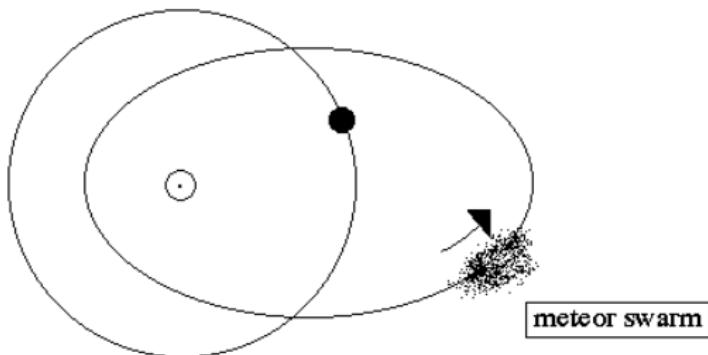
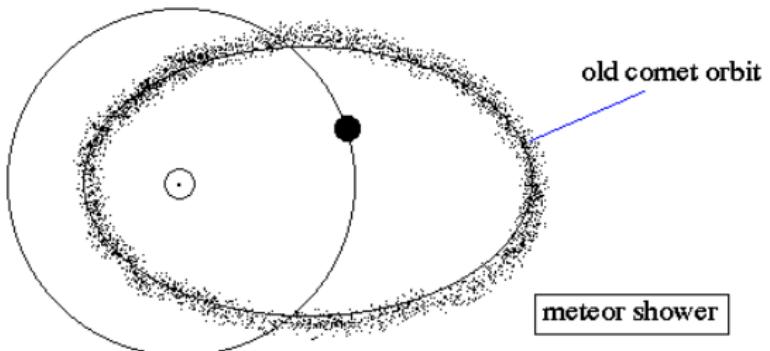
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Credit: NASA



Credit: Oregon University

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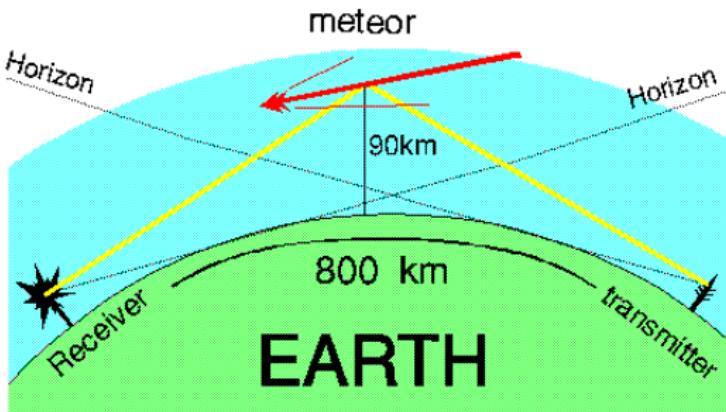
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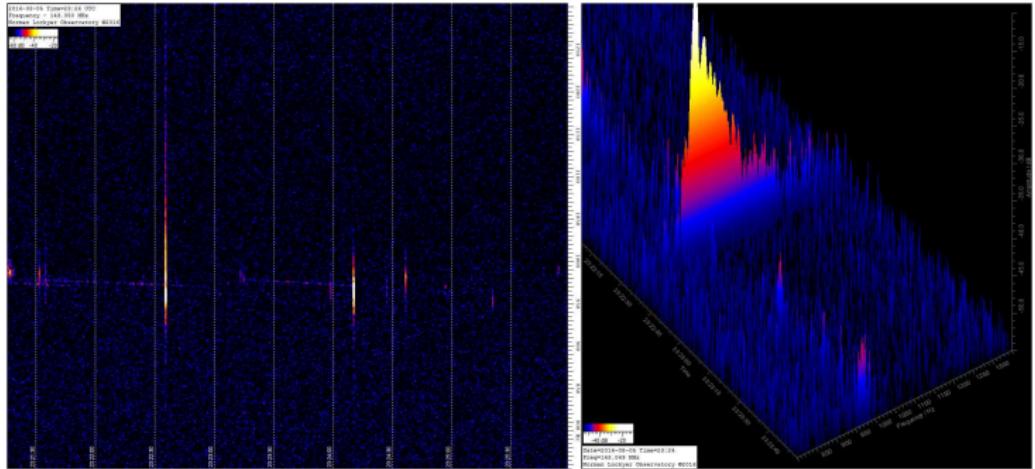
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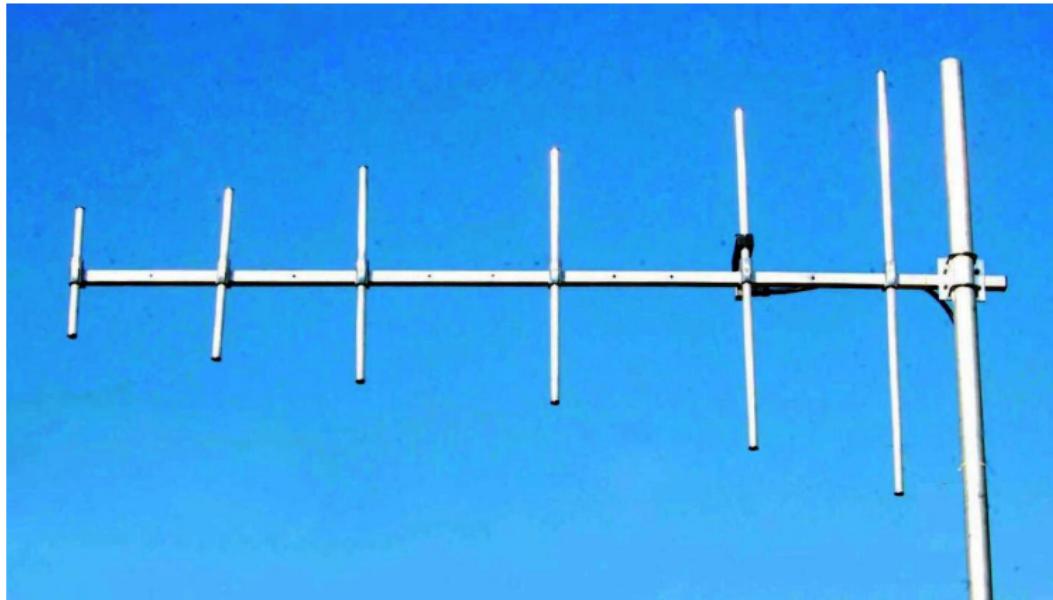
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Credit: *Sky Scan*



Credit: *Lockyer Technology Centre, NLO*



Credit: RF & A

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## Radio meteor detection

## Antenna variation

## Spatial variation

## Diurnal shift

### Temporal variation

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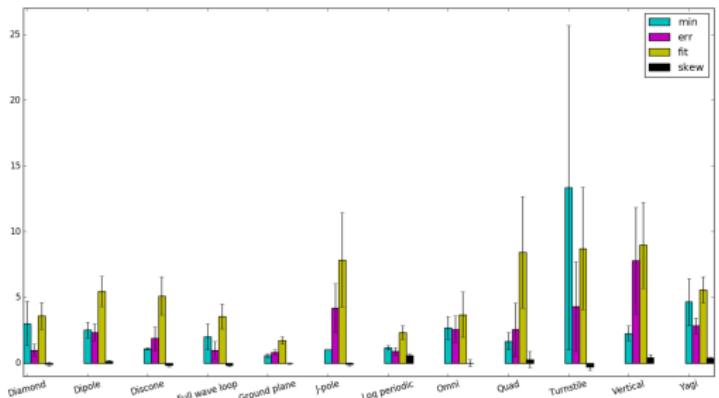
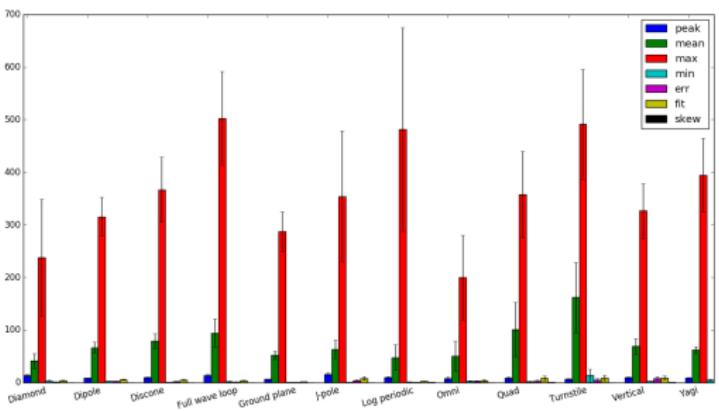
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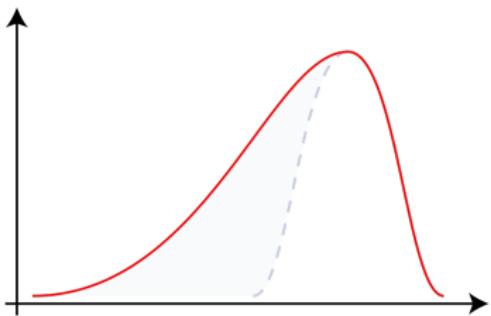
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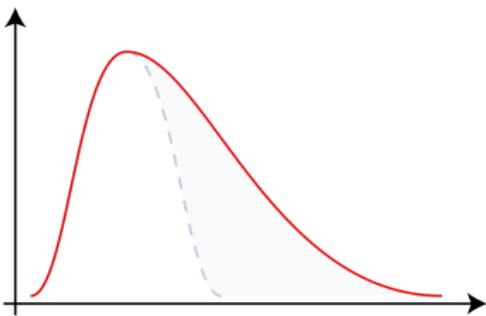
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Credit: *Pixabay*

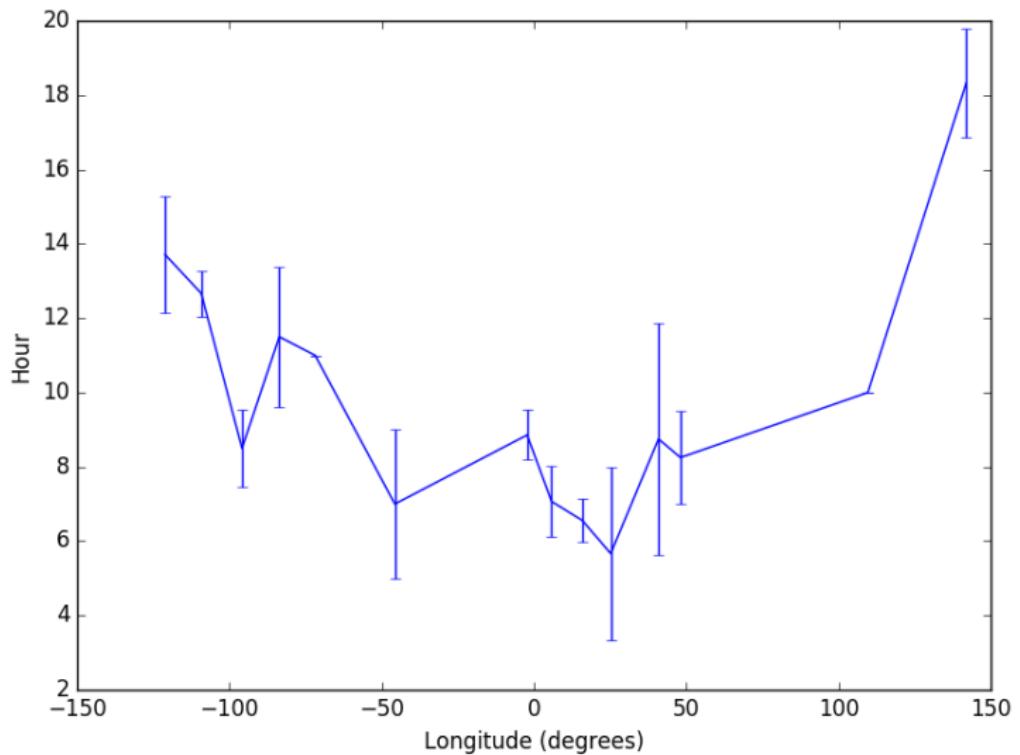
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Negative Skew



Positive Skew

Credit: *Wikipedia*

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## Meteor showers

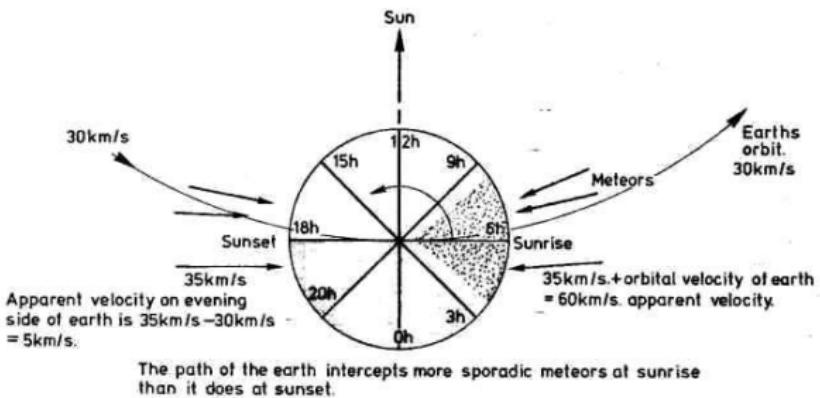
## Radio meteor detection

## Antenna variation

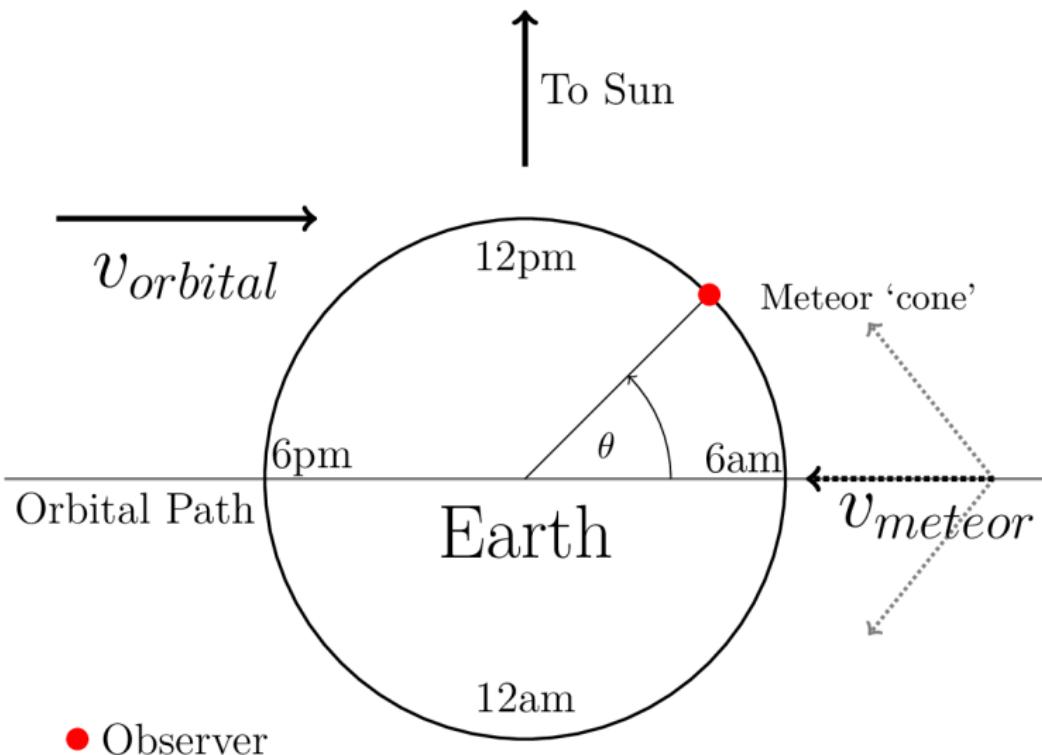
## Spatial variation

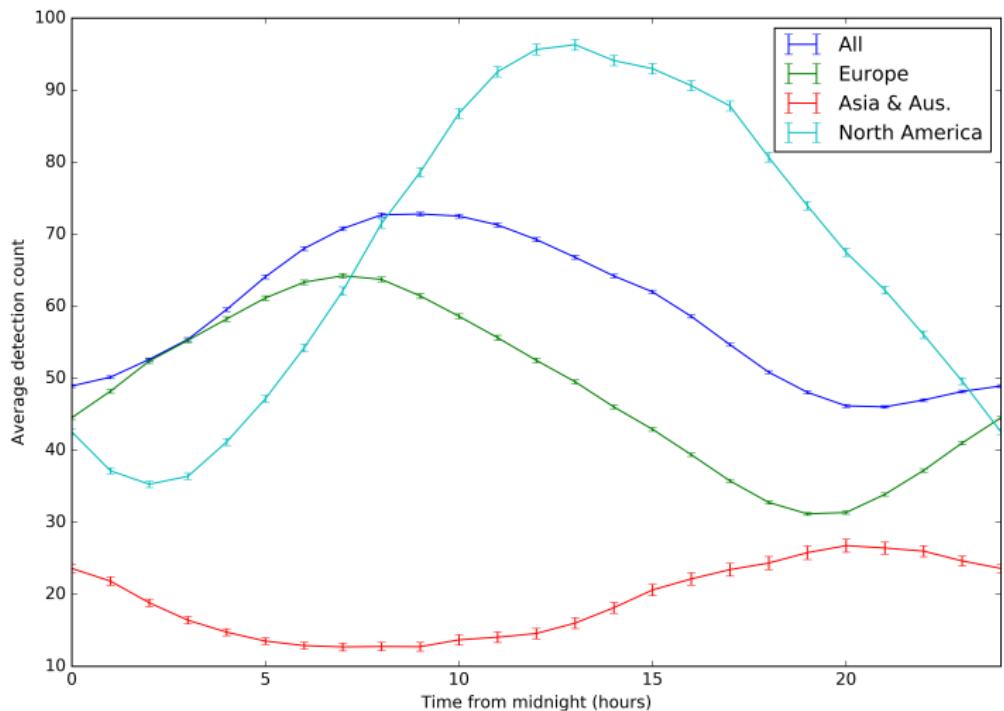
## Diurnal shift

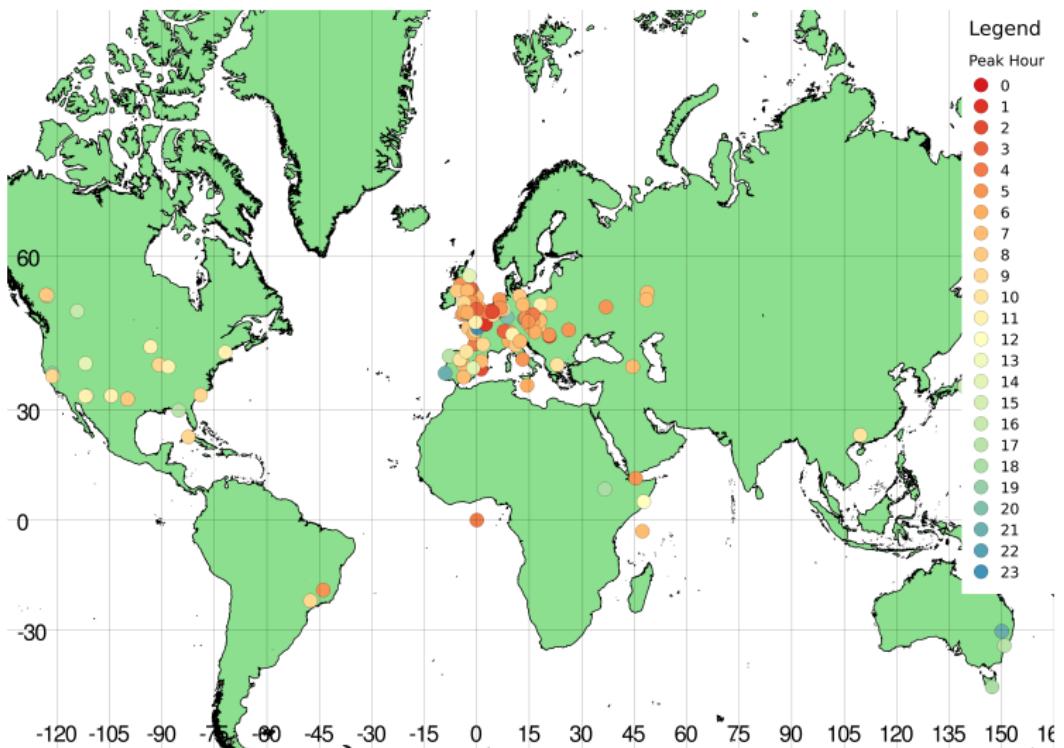
## Temporal variation

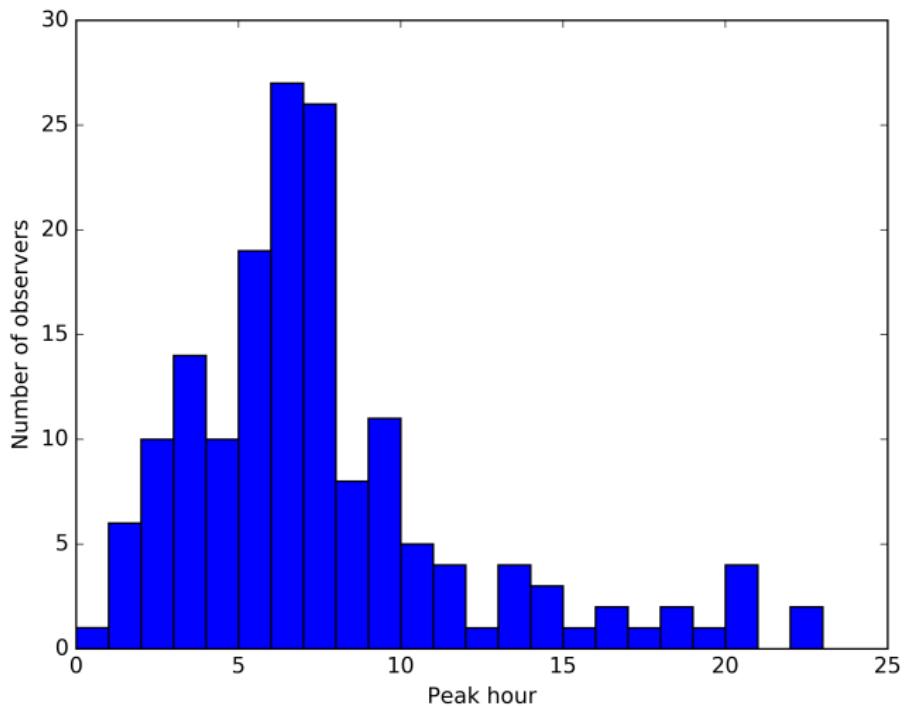


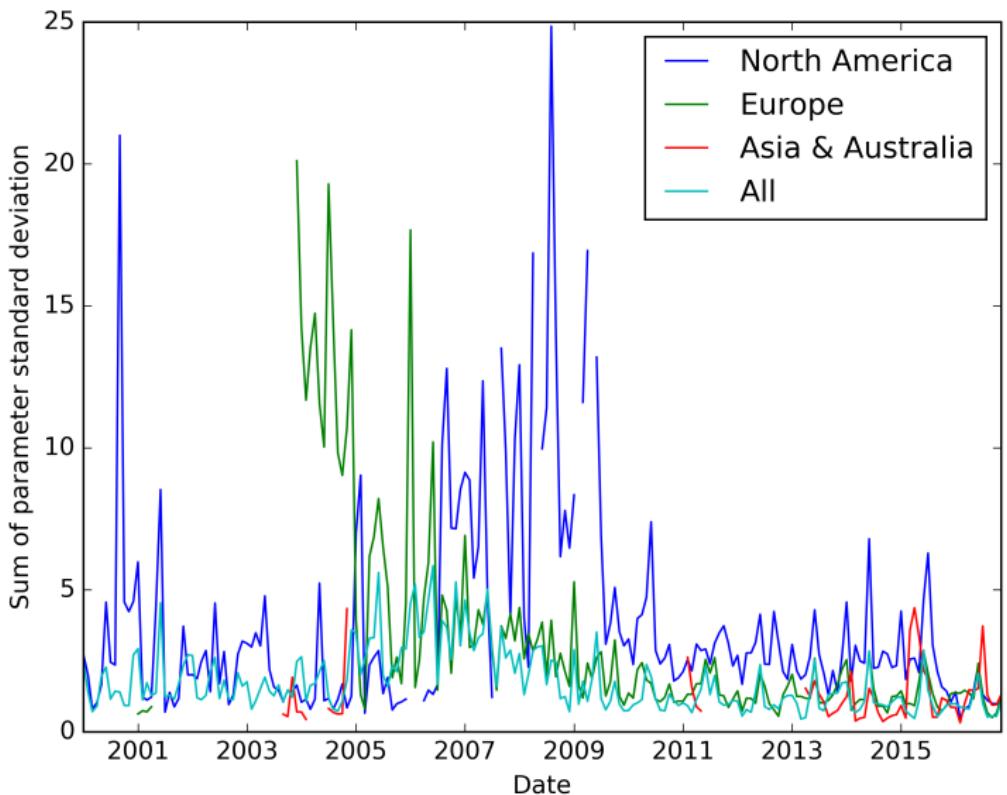
Credit: *British Astronomical Association*

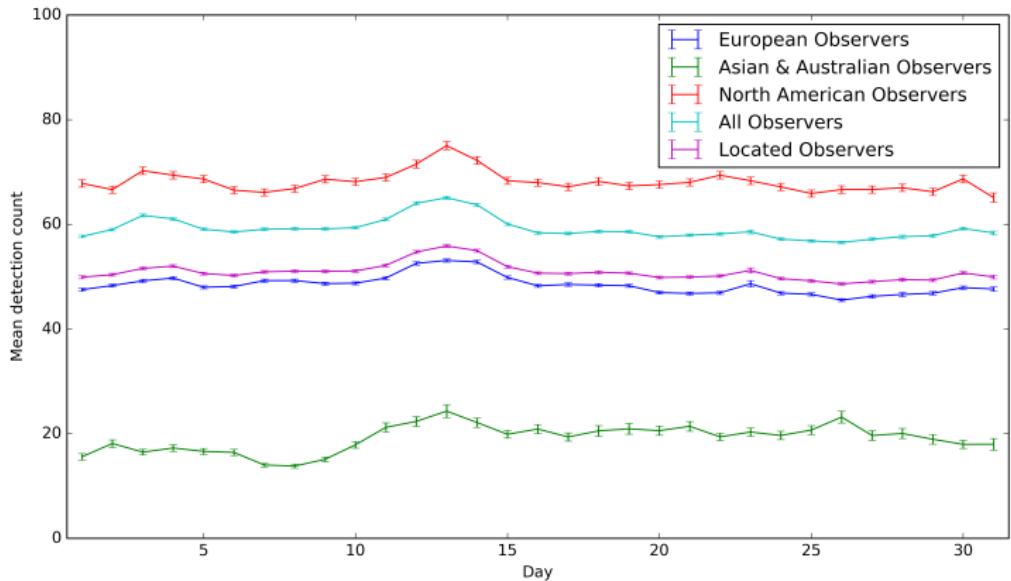
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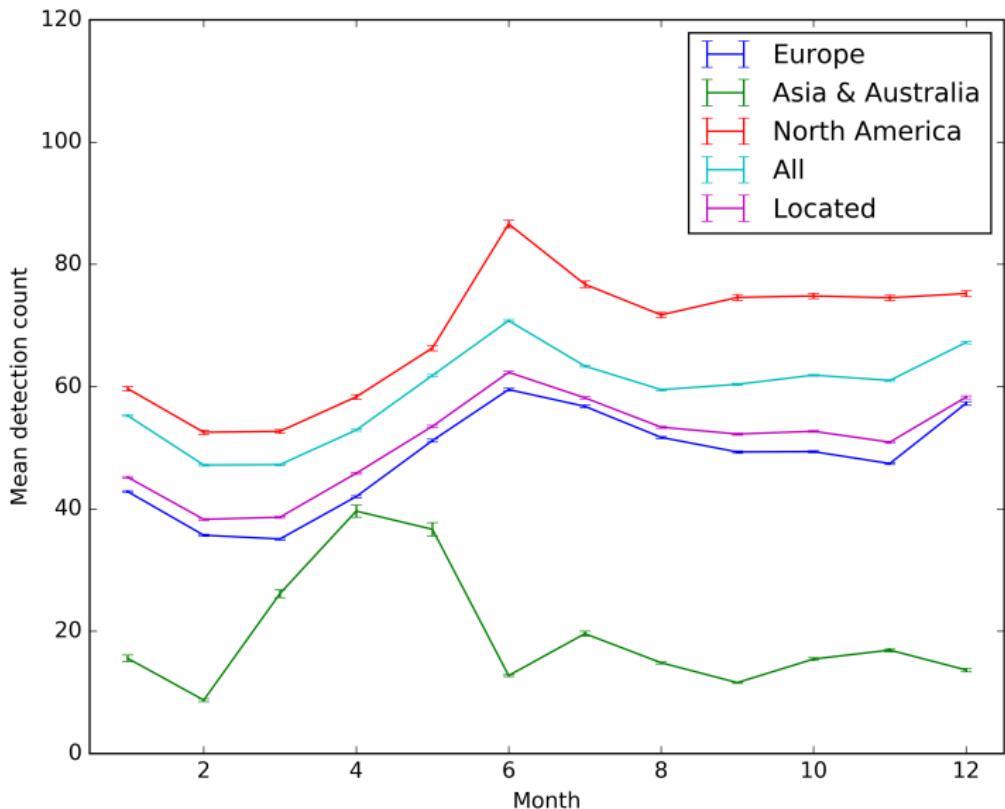
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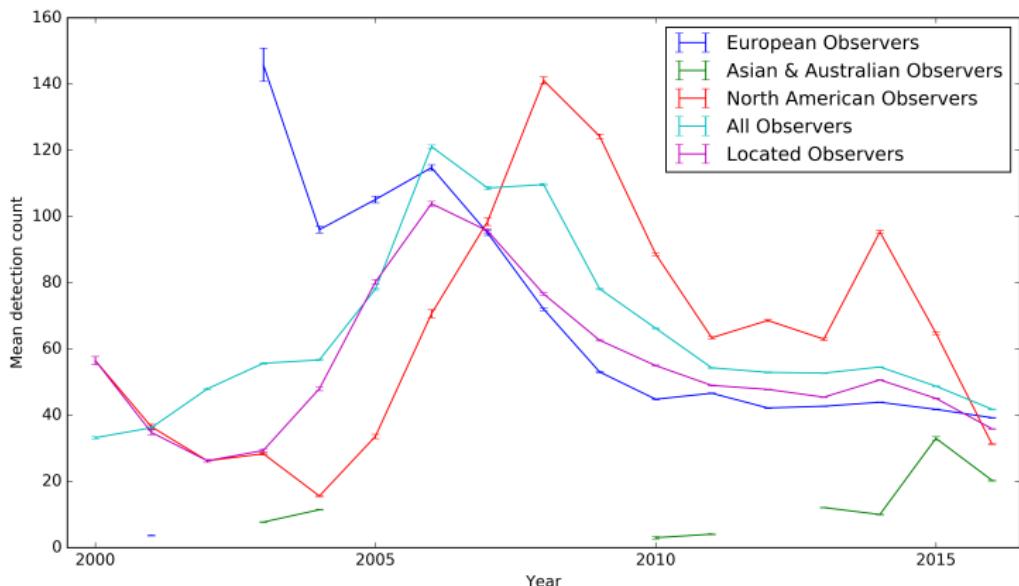
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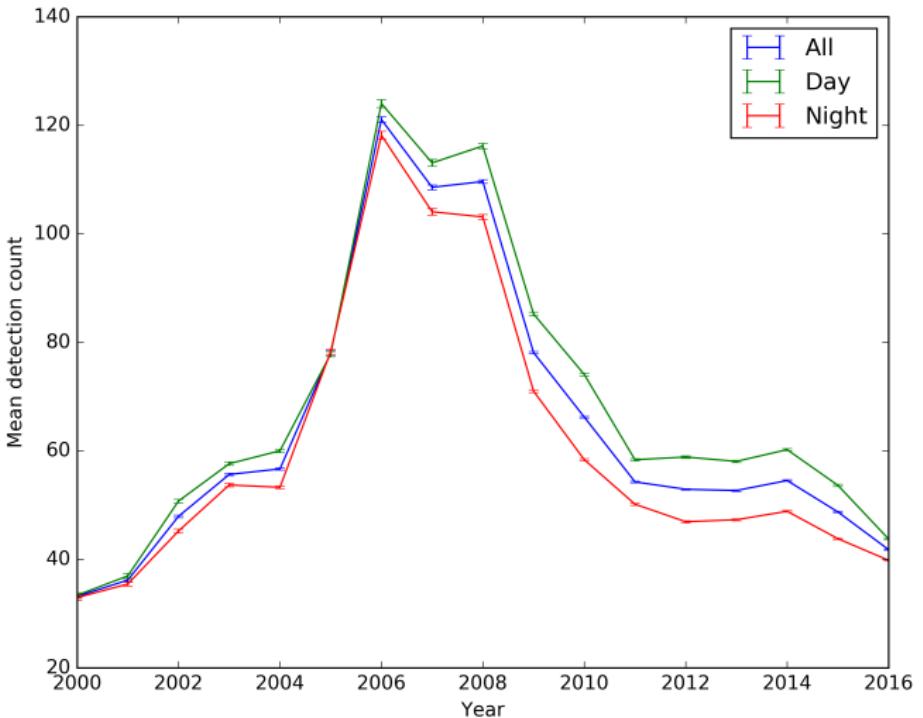
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$$ZHR = \frac{\overline{HR} \cdot F \cdot r^{6.5-m}}{\sin(h)}$$

$\overline{HR}$  = number of detected meteors in an hour

$F$  = correction for % of sky obstructed

$r$  = population index

$m$  = limiting magnitude

$h$  = angular radiant height

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$$ZHR = \frac{N - r}{\left(\frac{1}{2} + \frac{h}{2\pi}\right)} \cdot F \cdot M$$

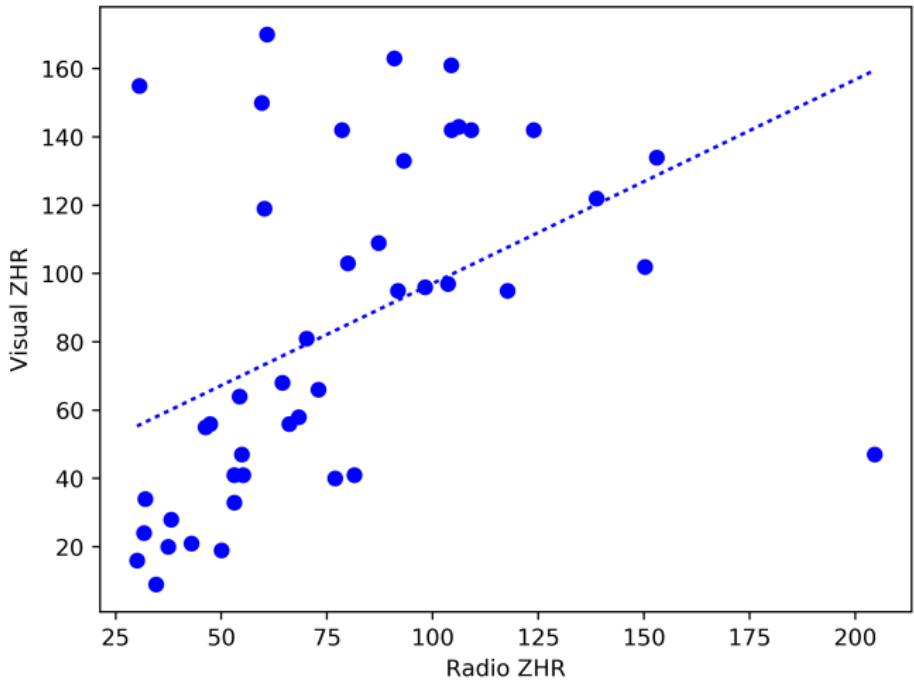
$h$  = angular radiant height

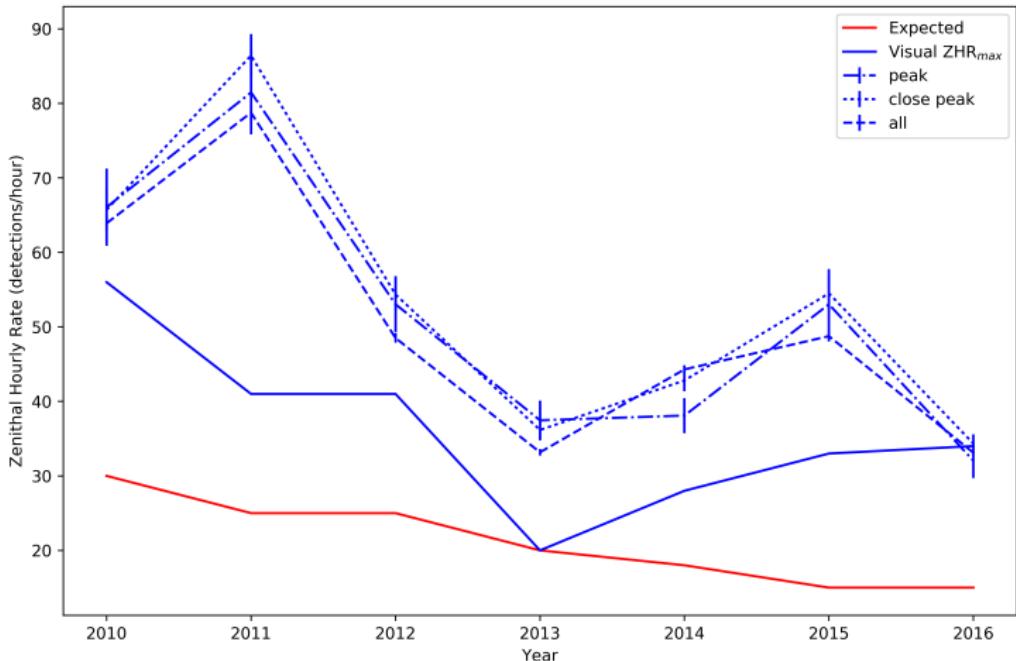
$N$  = number of detected meteors in an hour

$r$  = background hourly detection rate

$F$  = correction for % of sky obstructed

$M$  = correction for limiting magnitude

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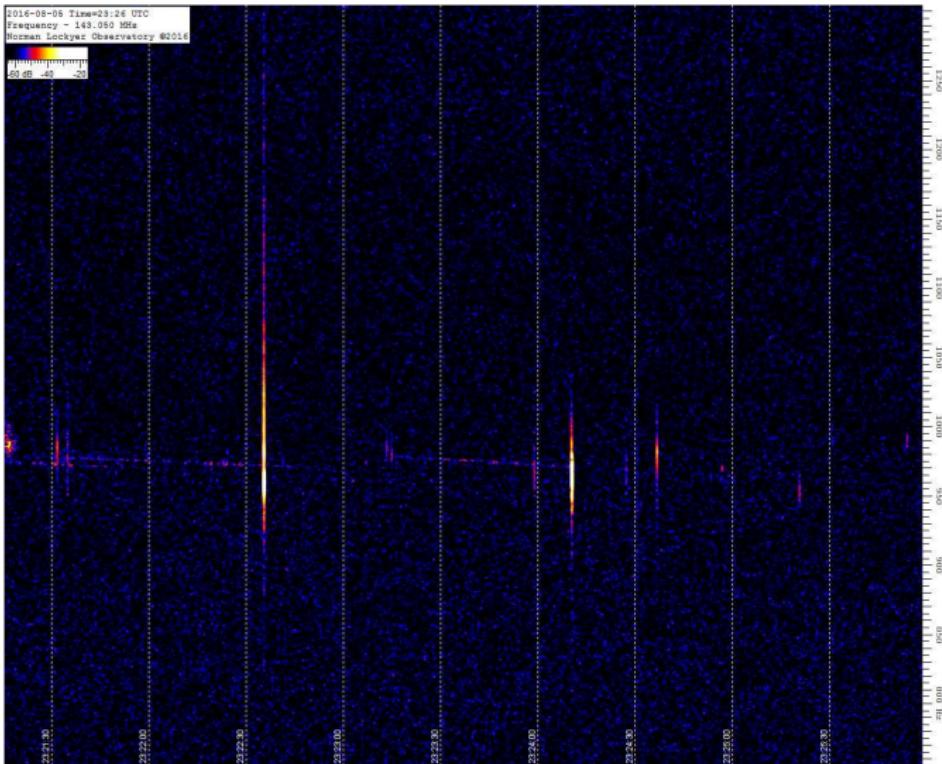
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