

# CAMS COVERAGE FOR BRAMS METEOR ECHOS

- Introduction
- Geometrics & density of the network
  - Current situation
  - Wish list for the near future

# CAMS COVERAGE FOR BRAMS METEOR ECHOS INTRODUCTION

## About CAMS

- Professional project (NASA)
- Started October 2010 (California - U.S.A.)
  - BeNeLux network 14 March 2012
- CAMS networks: Arizona Lowell Observatory, Florida, Maryland, New Zealand, UAE

# CAMS COVERAGE FOR BRAMS METEOR ECHOS

## INTRODUCTION

### Main goal of CAMS

- Sample meteor orbits ( $\sim -2$  to  $+5$  Mv range)
- 3D-map of dust distribution based on meteor orbits
- Locate dust trails in the solar system
- Match dust trails with parent bodies

### Optional

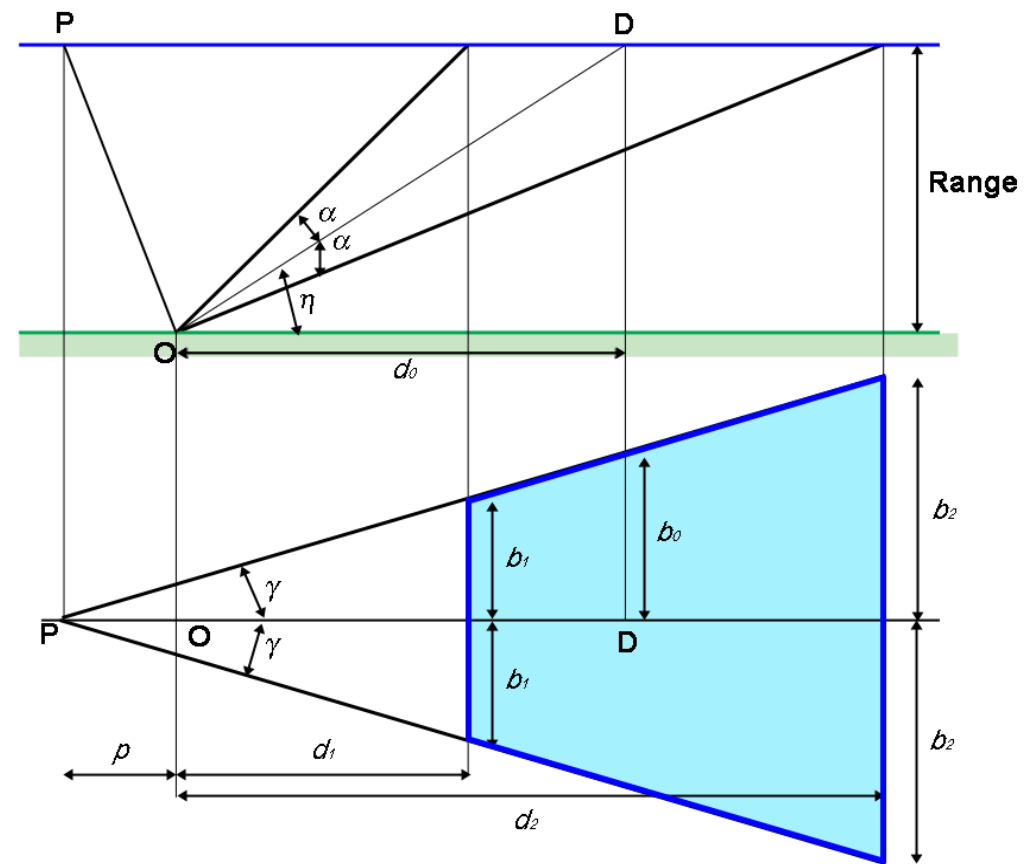
- Trajectories in the atmosphere (Useful for BRAMS)
- Light curves (Useful for BRAMS)

### Not used for :

- Statistical radiant from single station meteors
- Activity profiles based on video hourly rates

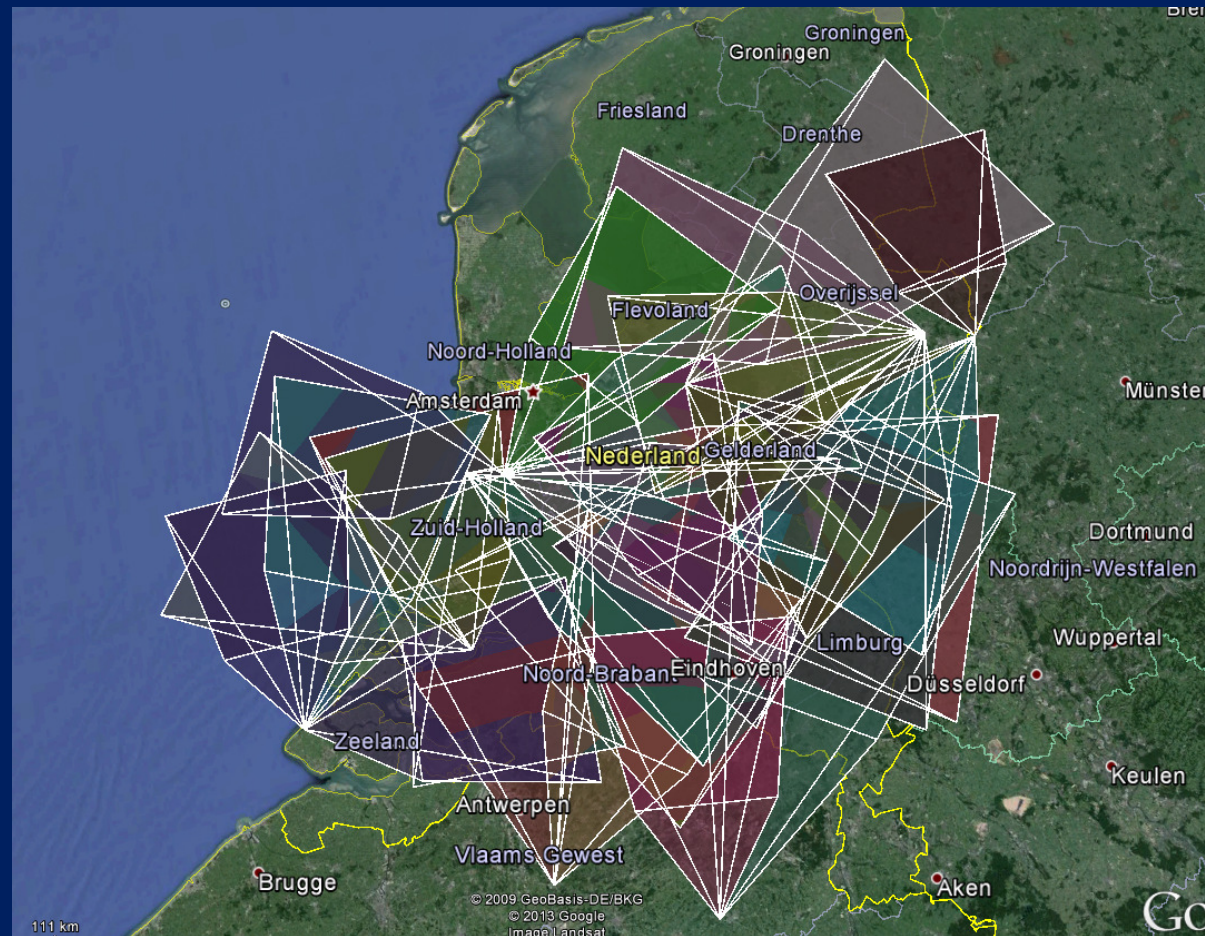
# CAMS COVERAGE FOR BRAMS METEOR ECHOS INTRODUCTION

CAMS standard: Watec-902H2 with 1.2/12mm ( $22^\circ \times 30^\circ$ )



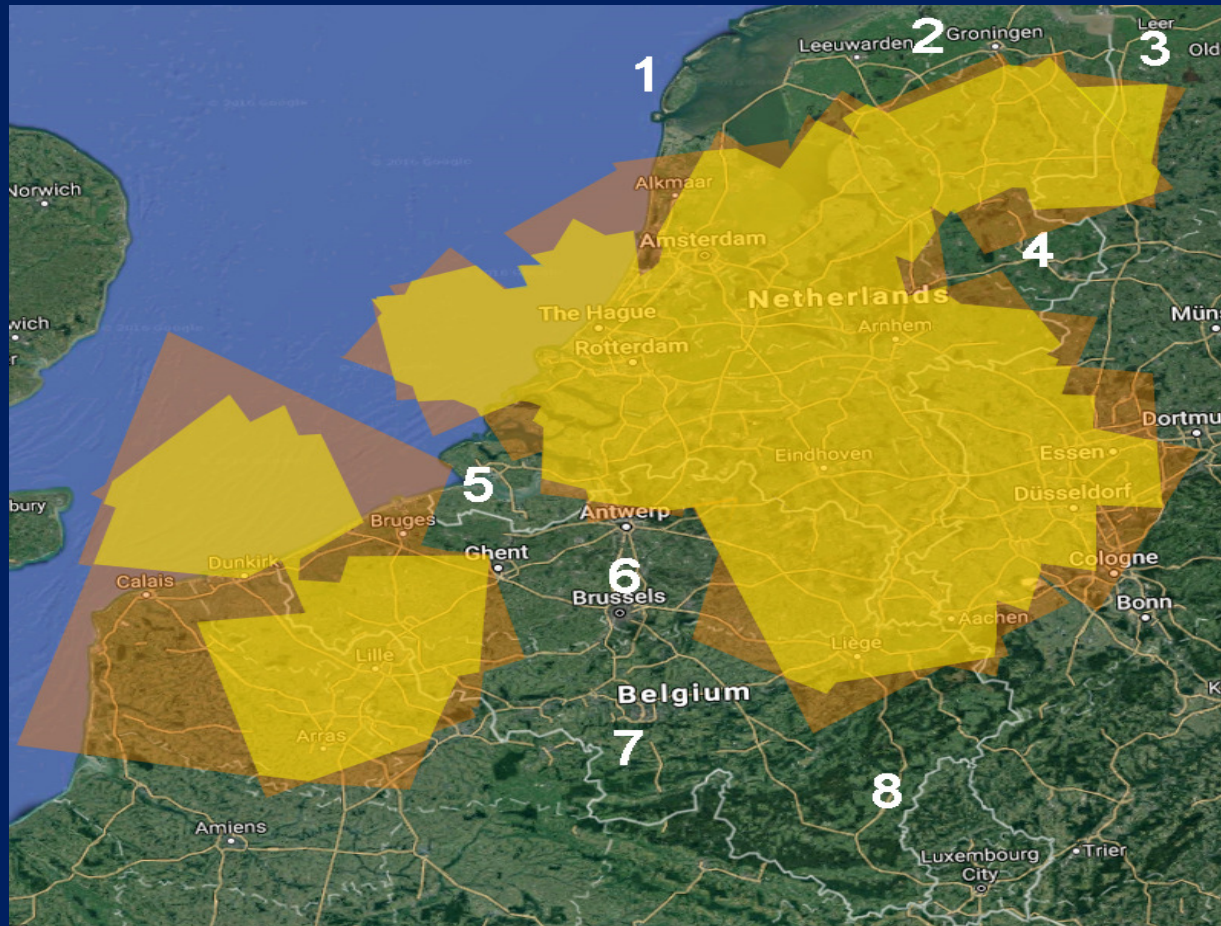
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Status November 2013: CAMS for BRAMS ?



# CAMS COVERAGE FOR BRAMS METEOR ECHOS INTRODUCTION

Situation 2016: still poor coverage for BRAMS!



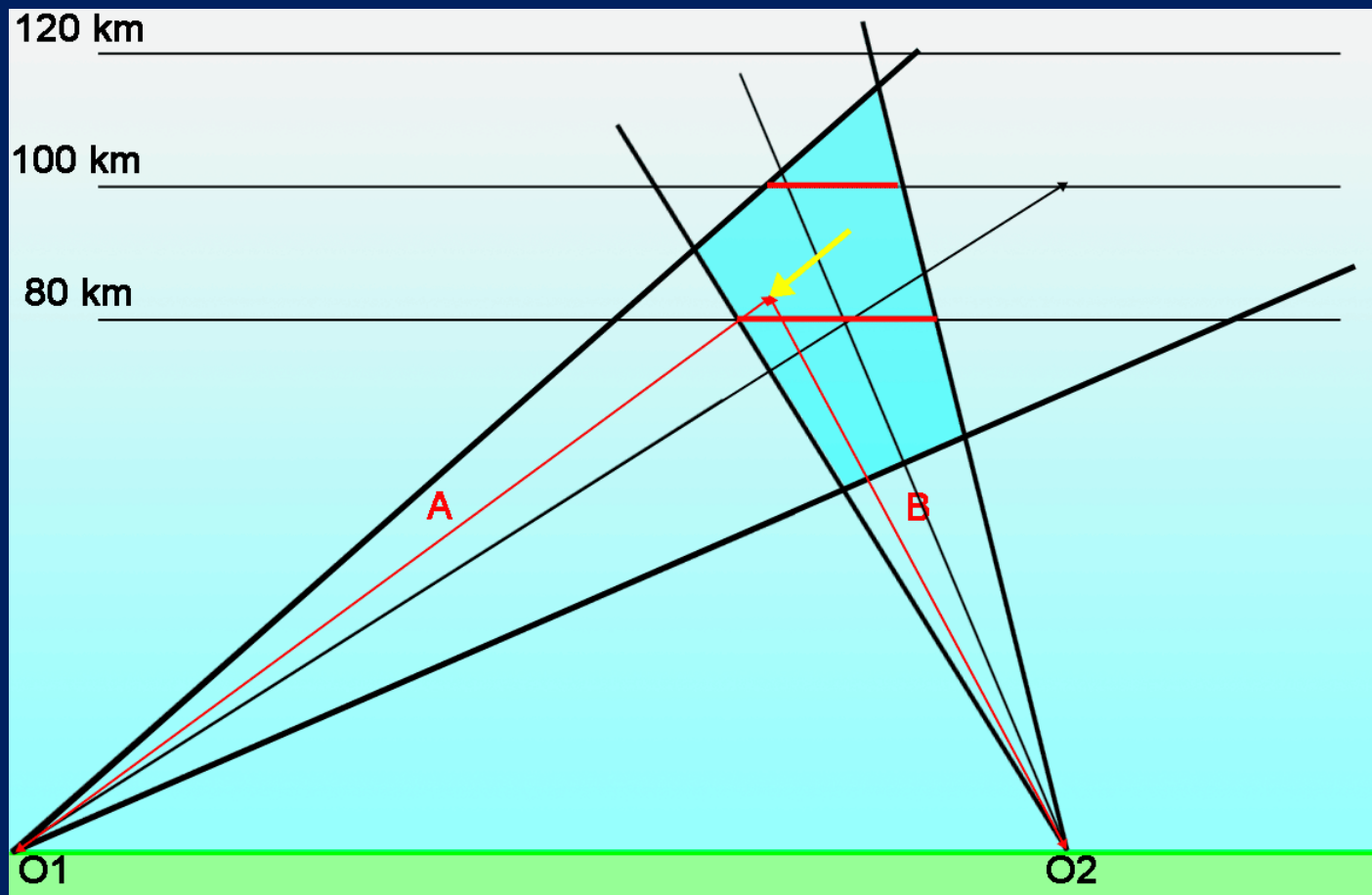
# CAMS COVERAGE FOR BRAMS METEOR ECHOS INTRODUCTION

## Priorities defined for 2017

- Determining the optimal geometry
- Optimizing the camera directions
- Completing coverage of BeNeLux
- Keeping processing pipeline under control

# CAMS COVERAGE FOR BRAMS METEOR ECHOS GEOMETRY & DENSITY OF THE NETWORK

Geometry – Angle of convergence – Extinction

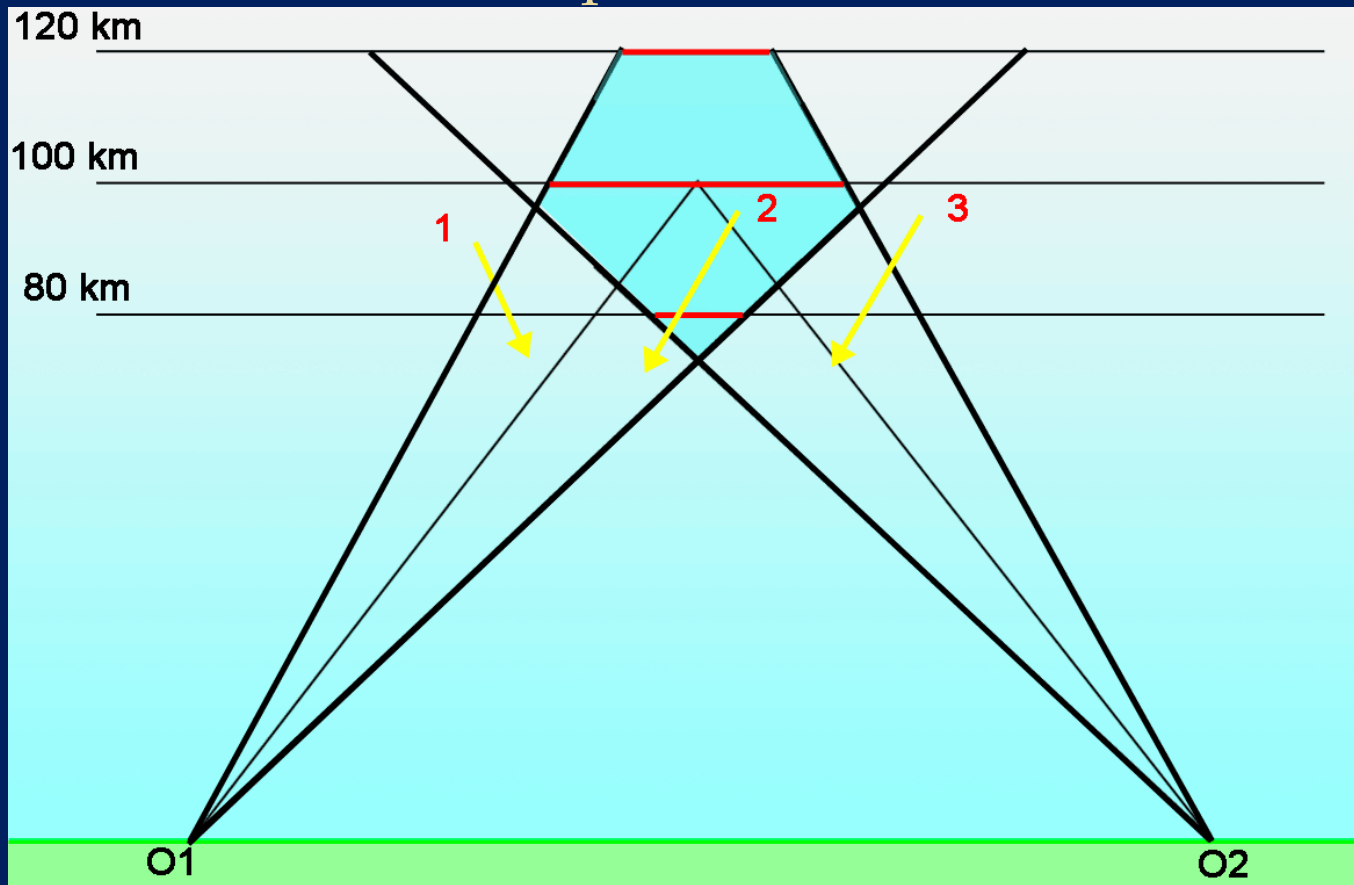




# CAMS COVERAGE FOR BRAMS METEOR ECHOS GEOMETRY & DENSITY OF THE NETWORK

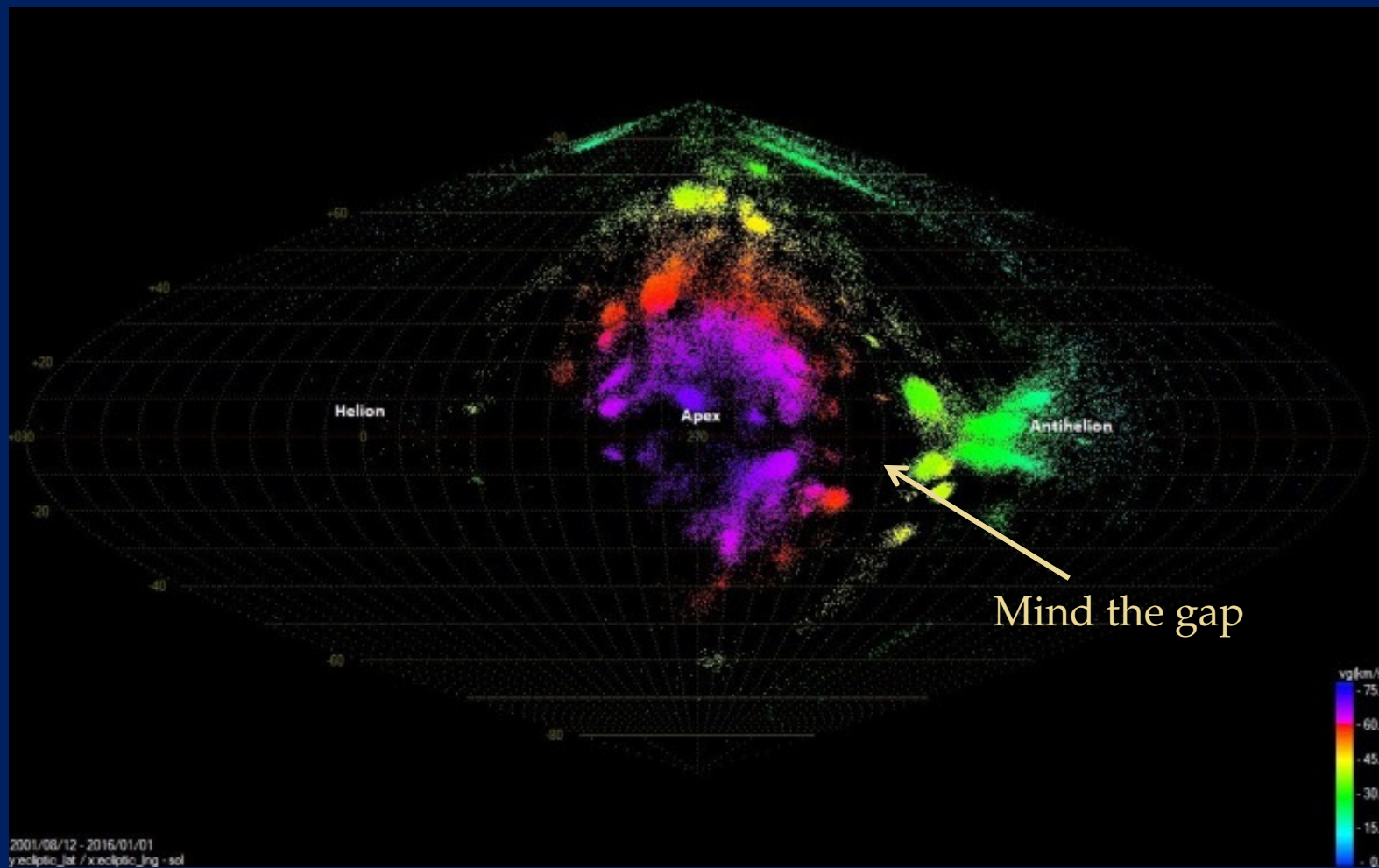
Optimizing overlap at 100, 90 or 80 km?

Do we cover all possible meteor sources?



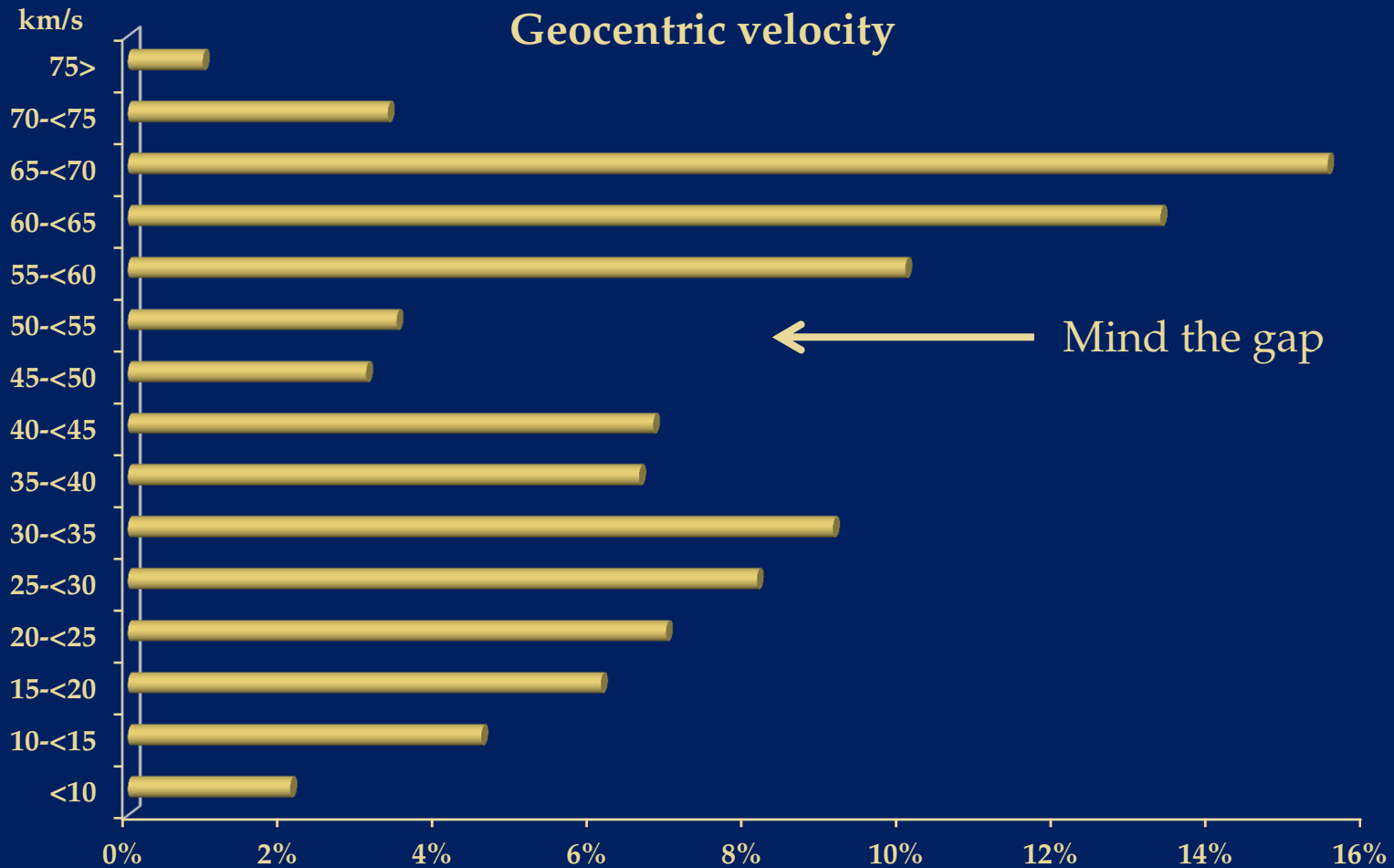
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Dust from long periodic comets and asteroid sources



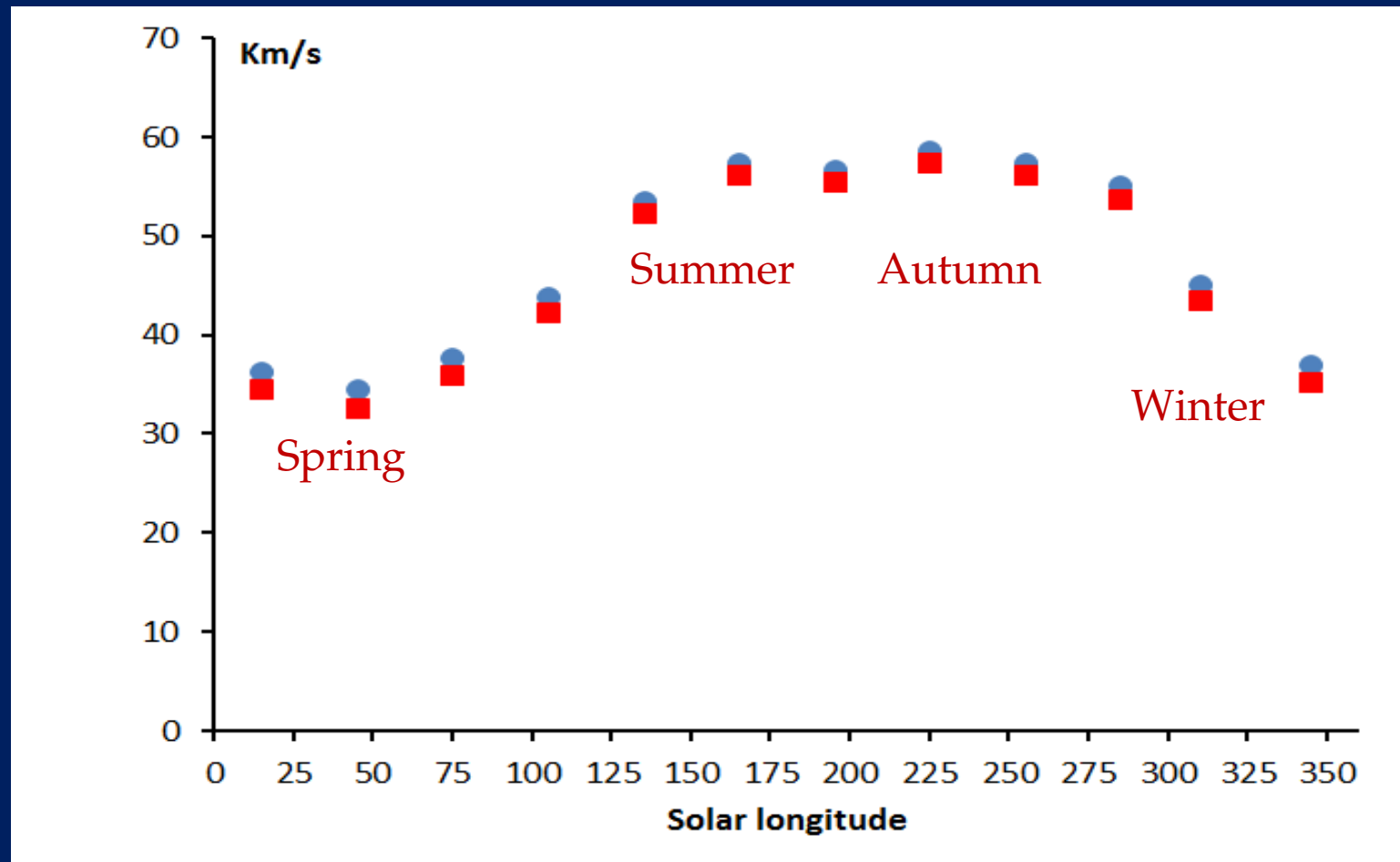
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## Geocentric velocity distribution of CAMS meteors



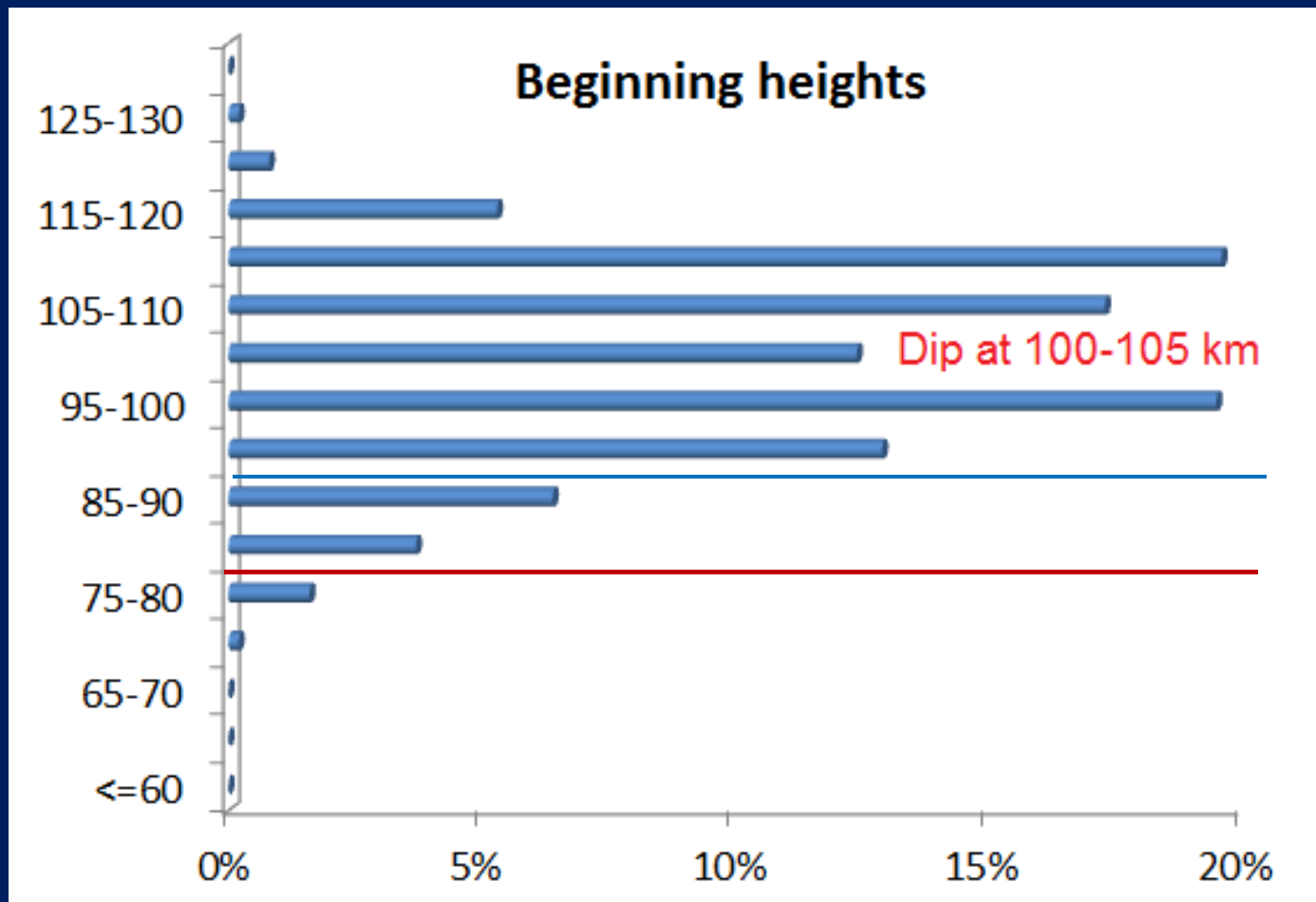
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## Annual variation in meteor velocities



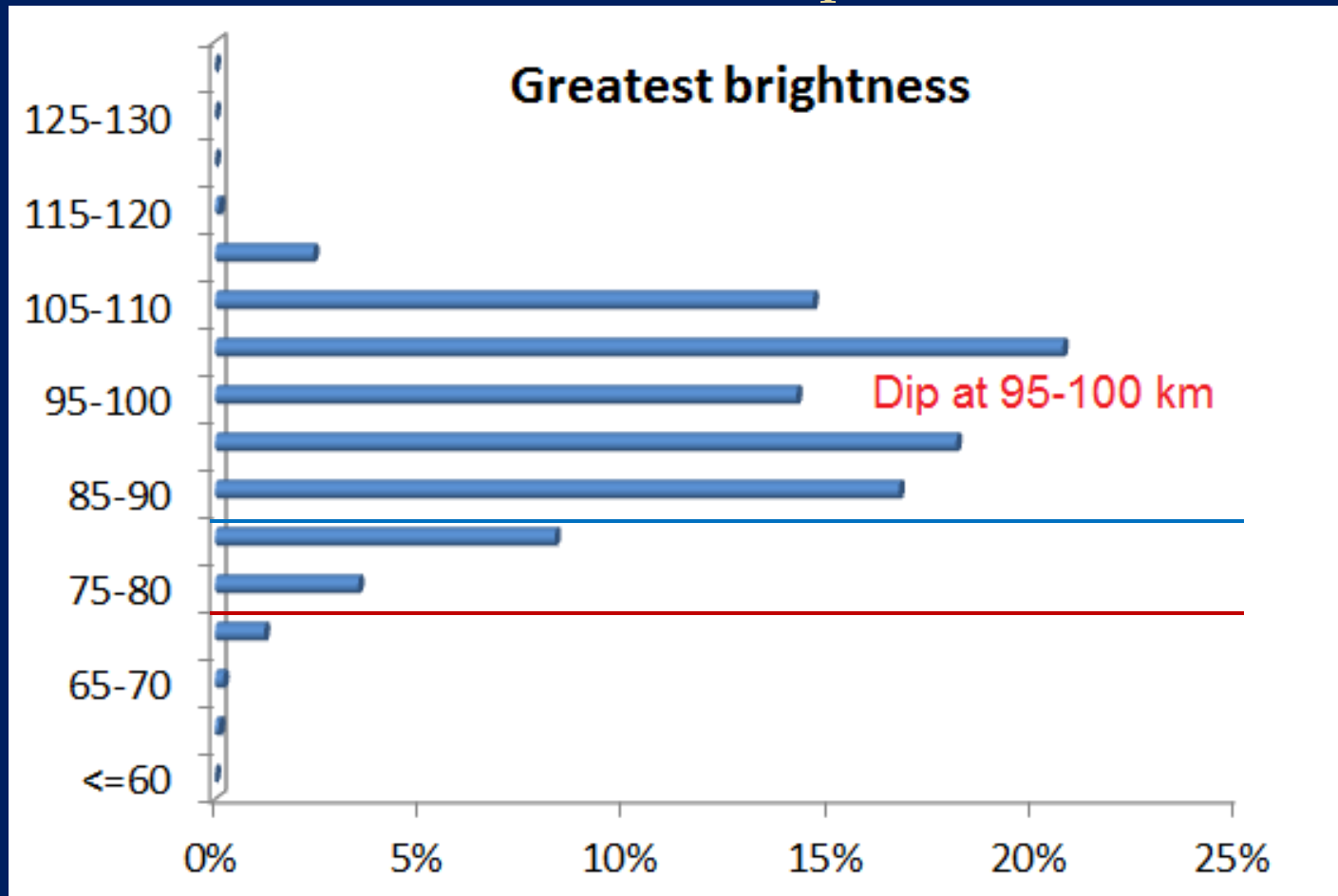
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Ablation heights depend on the entrance velocity



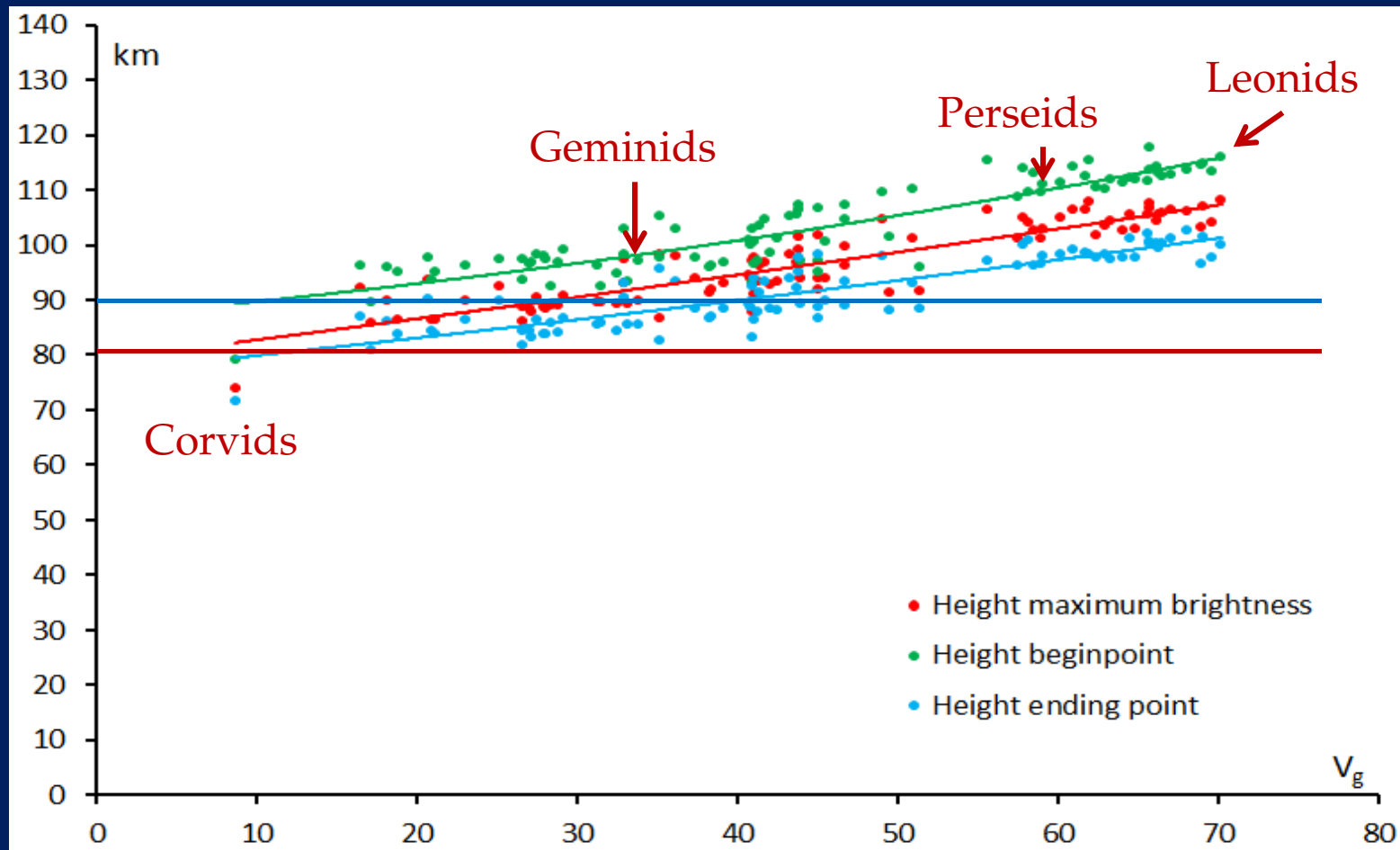
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At which elevation should we optimize our network?



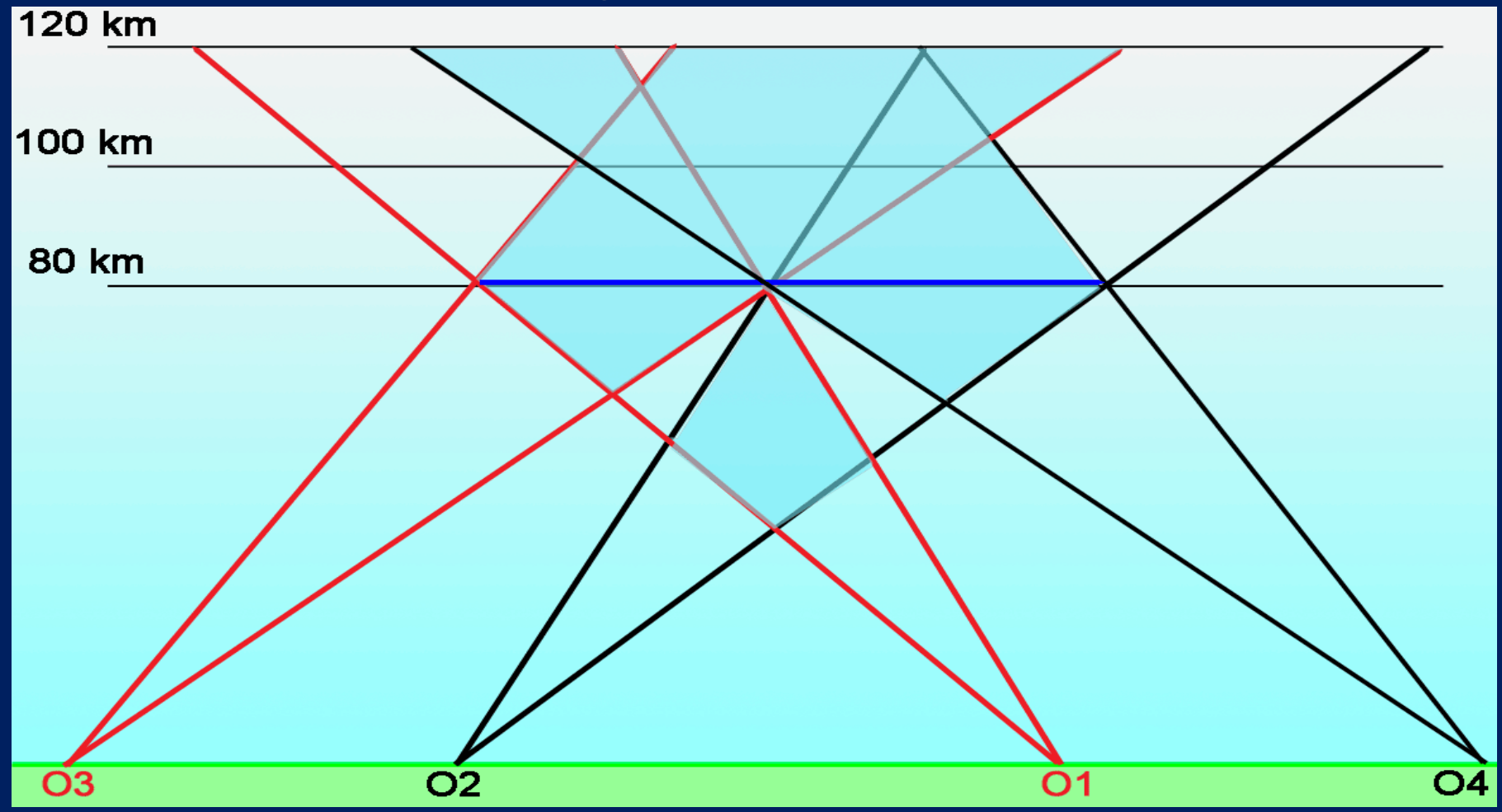
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Typical heights for 112 meteor showers



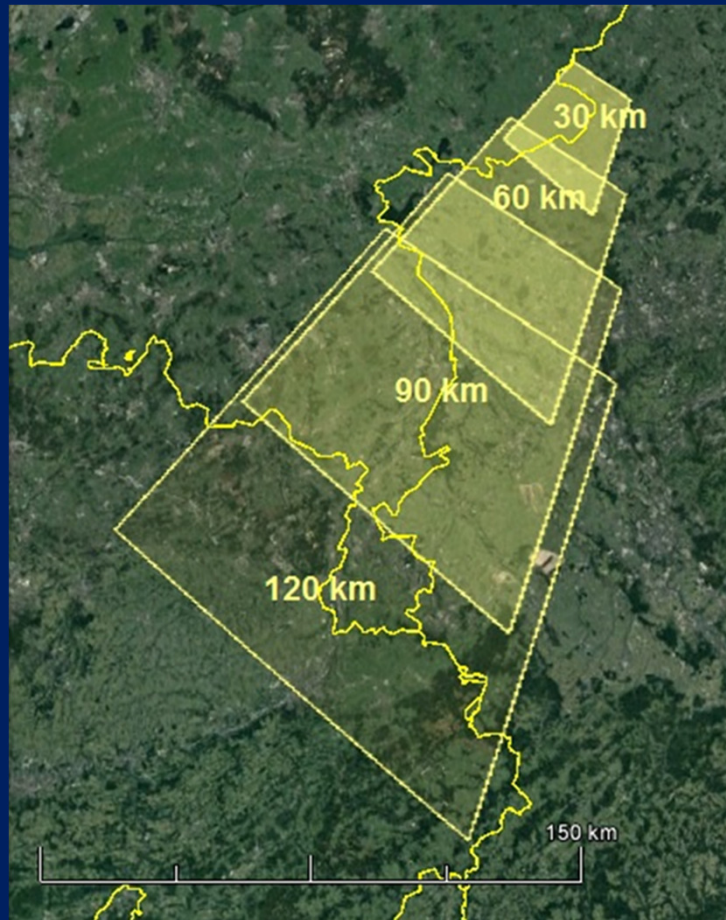
# CAMS COVERAGE FOR BRAMS METEOR ECHOS GEOMETRY & DENSITY OF THE NETWORK

Ablation heights favor the 80 km level





# CAMS COVERAGE FOR BRAMS METEOR ECHOS GEOMETRY & DENSITY OF THE NETWORK



**CAMS California ~36000 km<sup>2</sup>**

- California: 3 sites & 60 cameras

**CAMS BeNeLux ~90000 km<sup>2</sup>**

- Belgium: 8 sites & 26 cameras
- Germany: 3 sites & 13 cameras
- Netherlands: 10 sites & 51 cameras

**Optimizing at 80 km level  
Requires extra cameras!**

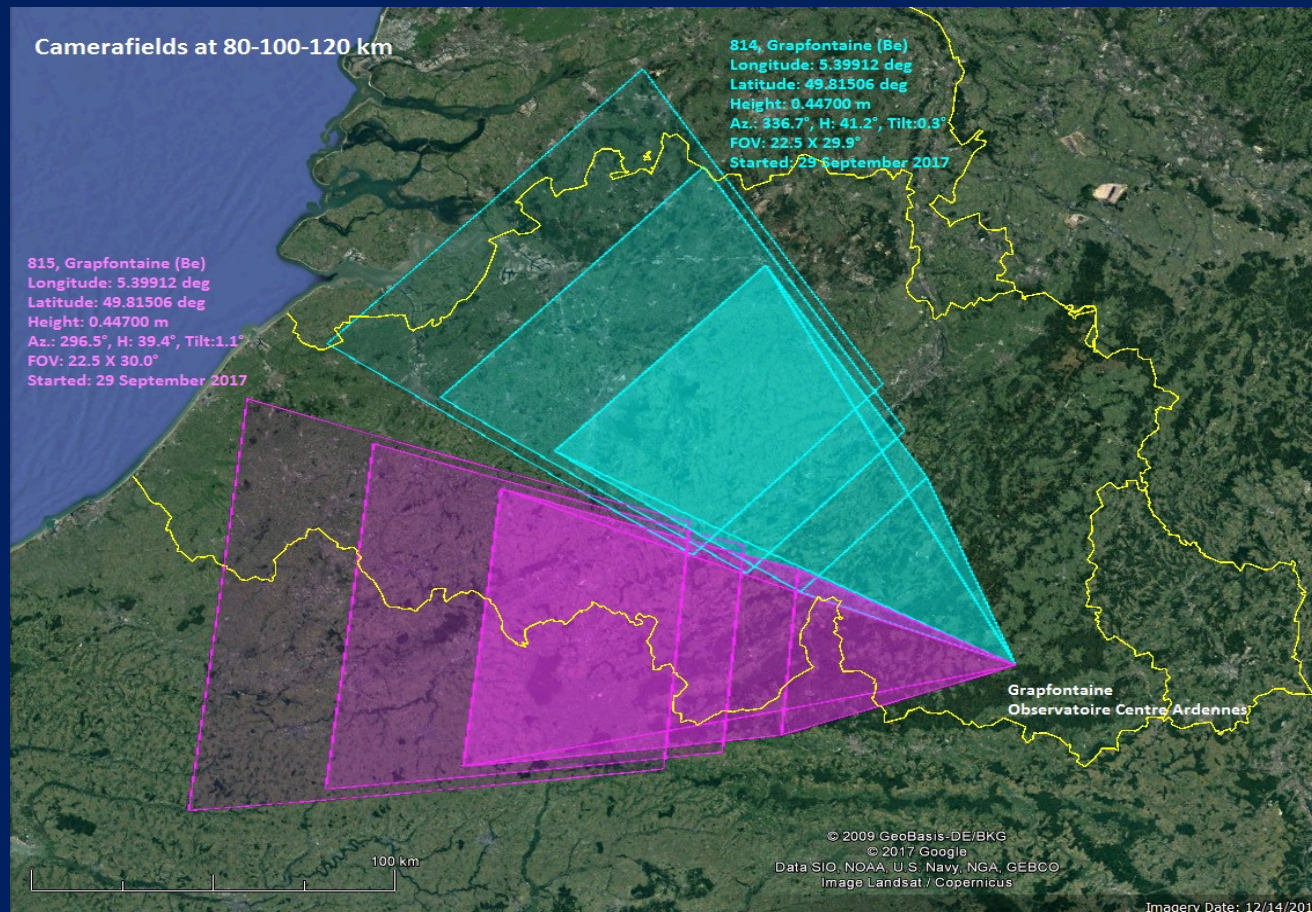
# CAMS COVERAGE FOR BRAMS METEOR ECHOS CURRENT SITUATION

## Installing CAMS at OCA (Grapfontaine)



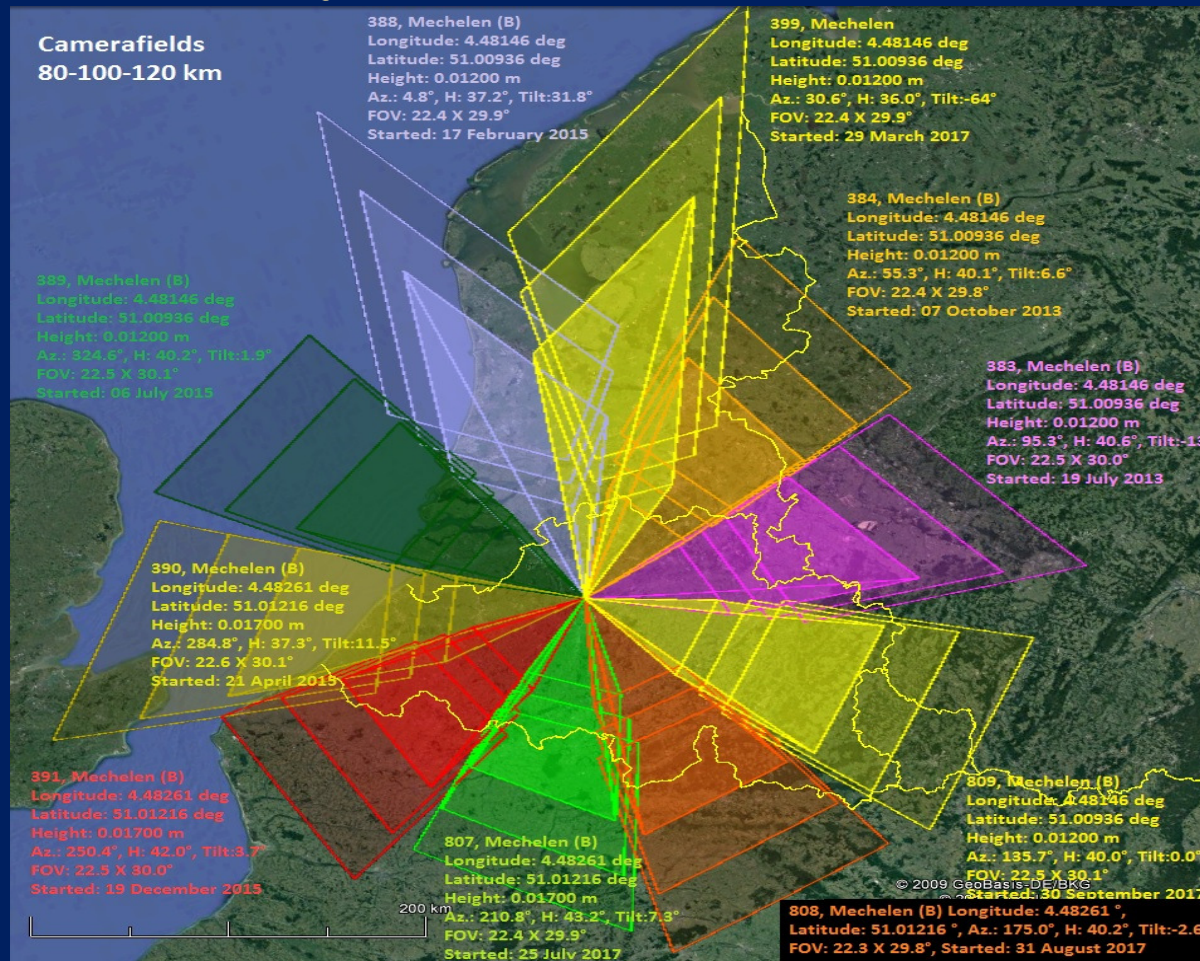
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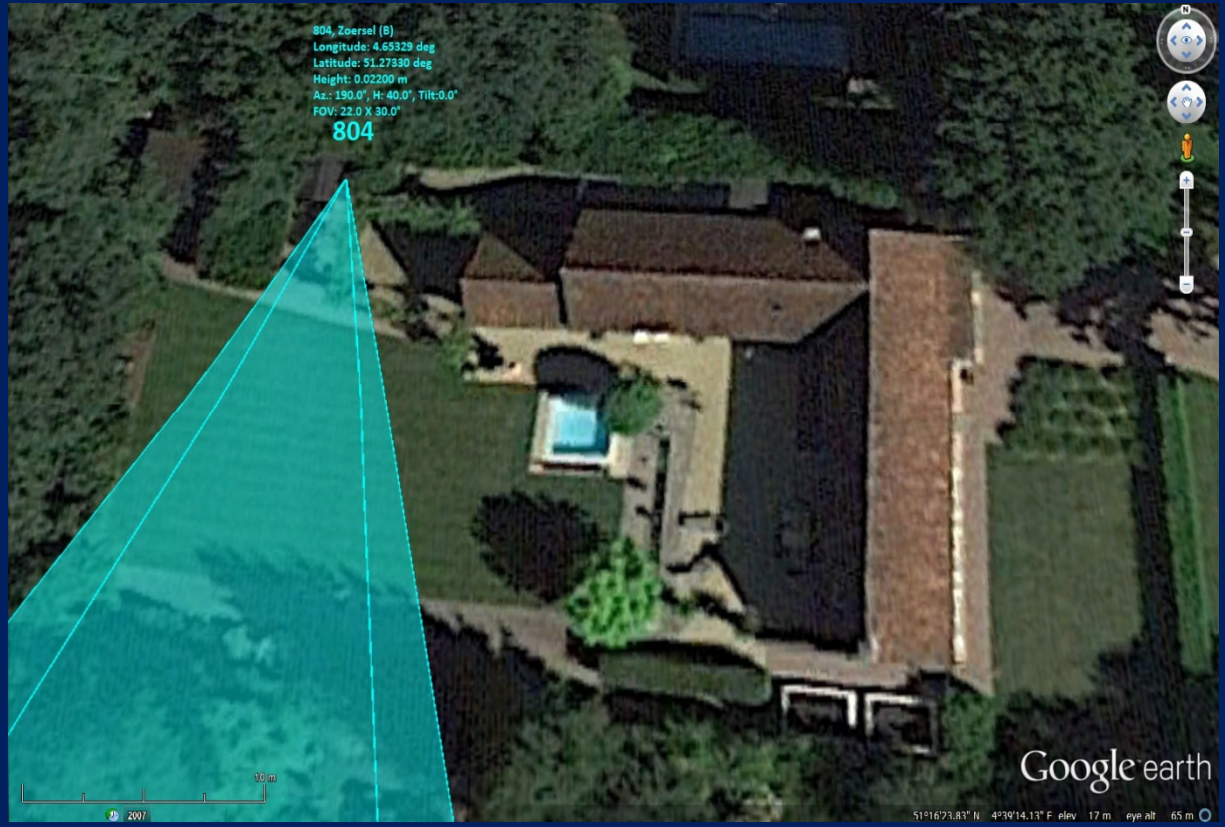
# CAMS COVERAGE FOR BRAMS METEOR ECHOS CURRENT SITUATION

## Currently 10 cameras in Mechelen

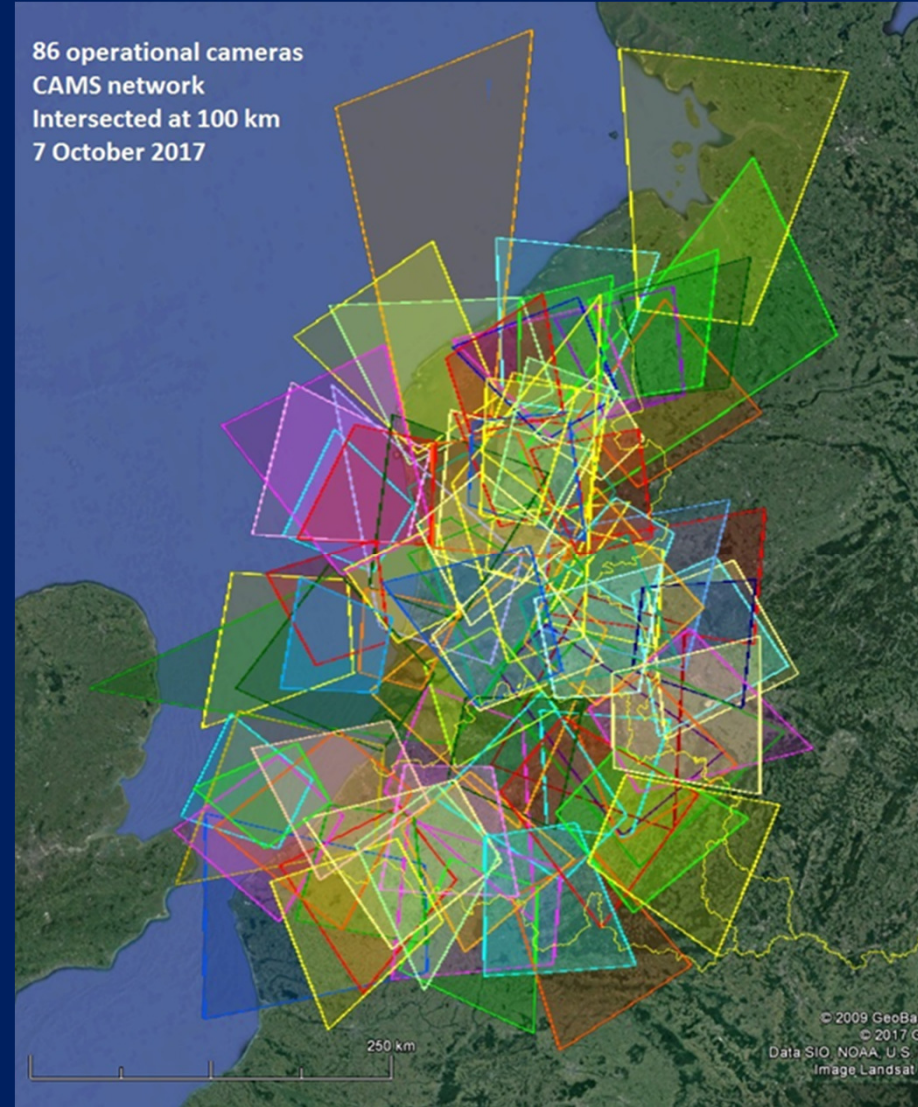


# CAMS COVERAGE FOR BRAMS METEOR ECHOS CURRENT SITUATION

## CAMS 397-398-804-805-806 In Zoersel, Belgium

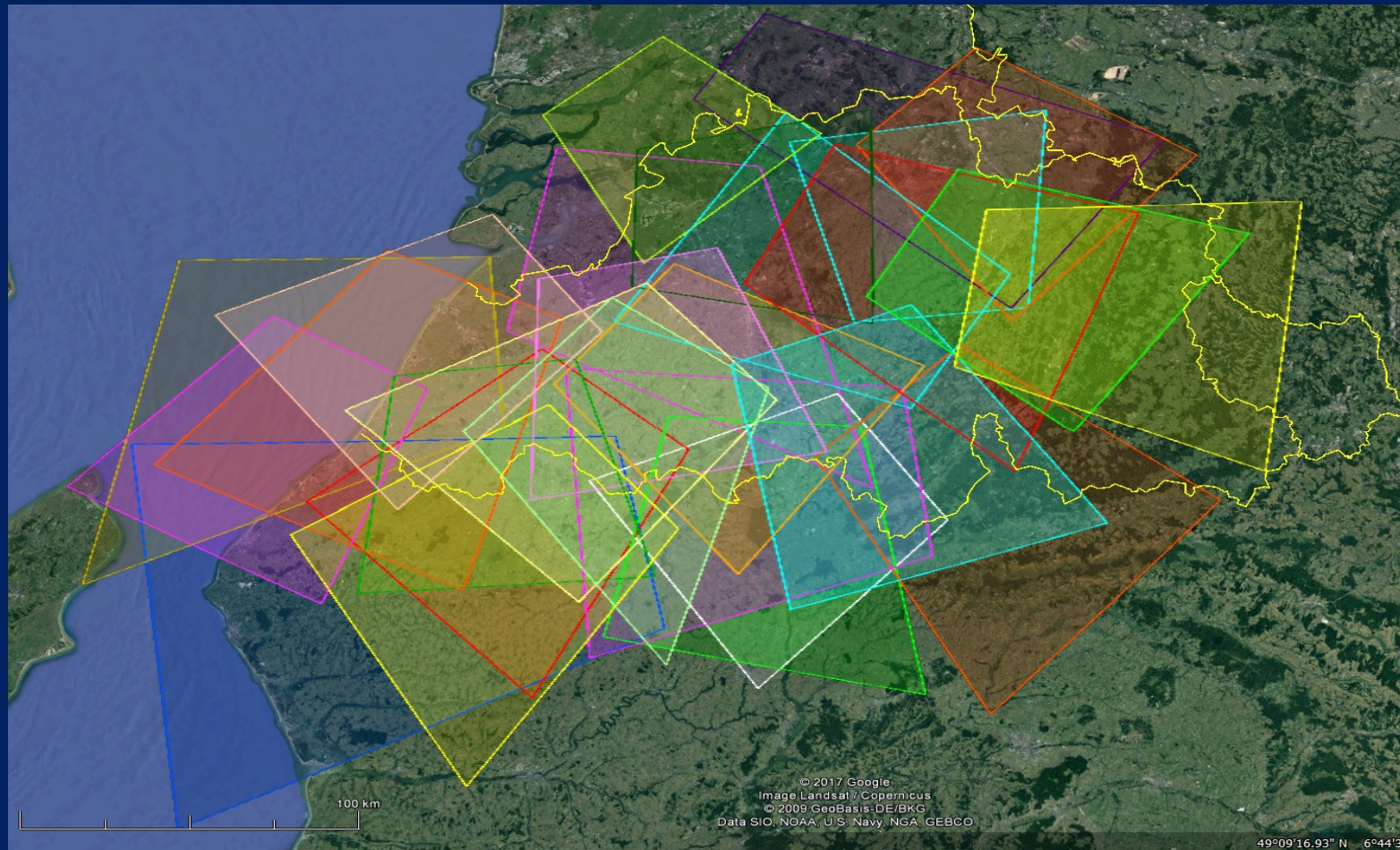


# CAMS COVERAGE FOR BRAMS METEOR ECHOS CURRENT SITUATION



# CAMS COVERAGE FOR BRAMS METEOR ECHOS CURRENT SITUATION

Coverage Belgium (at 100 km)



# CAMS COVERAGE FOR BRAMS METEOR ECHOS

## CURRENT SITUATION

CAMS BeNeLux = team work by 20 volunteers  
 Self-financing guarantees strong commitment

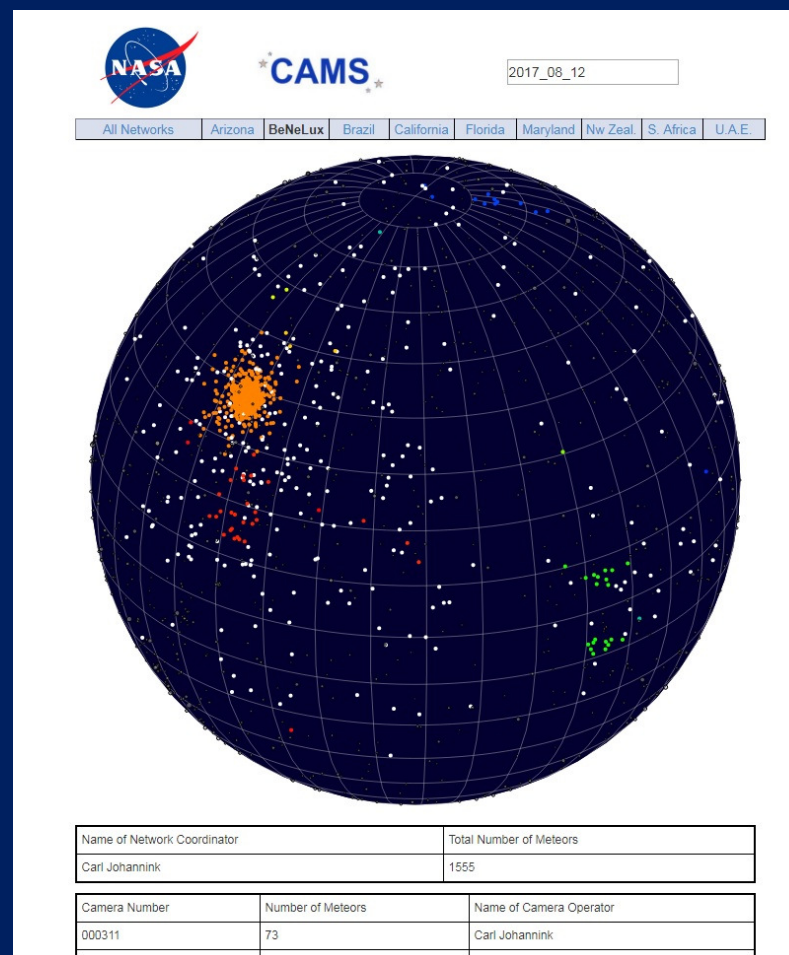
Year	Number of orbits collected	Maximum number of operational cameras	Number of CAMS stations	Number of nights with successful recorded orbits
2012	1079	8	6	101
2013	5684	26	13	198
2014	11288	37	14	269
2015	17259	49	15	294
2016	25187	58	21	309
2017	28605	90	22	256
<b>Totals</b>	<b>89102</b>			<b>1427</b>



# CAMS coverage for BRAMS Meteor Echos

## Wish list for the near future

- New version CAMS 2.2
- New CAMS Manual
- More AutoCAMS
- New Online tool  
(<http://cams.seti.org/FDL>)
- Attention to work load!
- More technical assistance  
(equipment, software,...)



# CAMS COVERAGE FOR BRAMS METEOR ECHOS WISH LIST FOR THE NEAR FUTURE

## Specific for BRAMS

Create a dataset of all CAMS-BRAMS common events

### Can the network still be improved?

- More cameras necessary, especially in Belgium
- Extra sites at strategic positions near border of network
  - Volunteer hosts for remote CAMS stations

# CAMS COVERAGE FOR BRAMS METEOR ECHOS

Thank you!

Any questions?