

La science des météores

Séminaire LTE

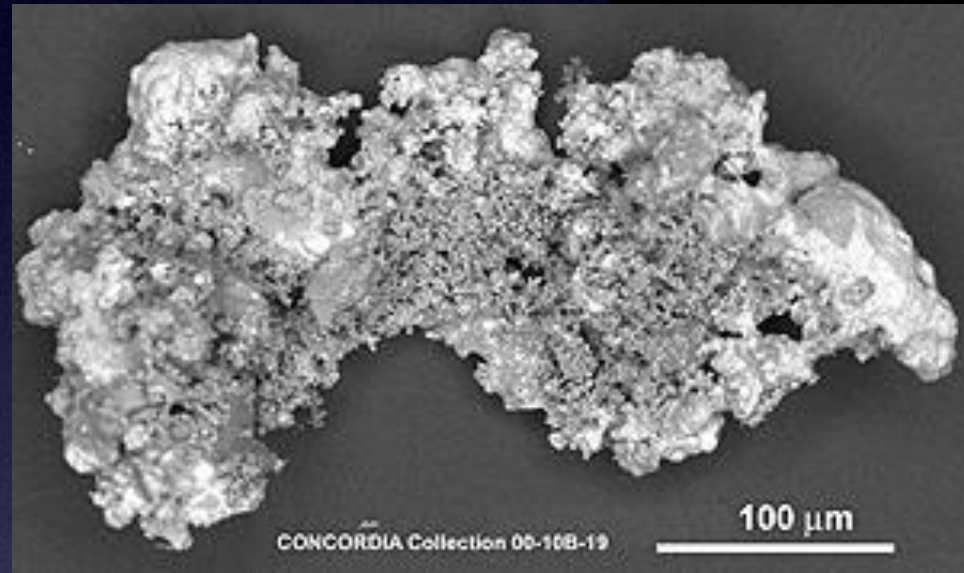
Jérémie Vaubaillon, François Colas

Outline

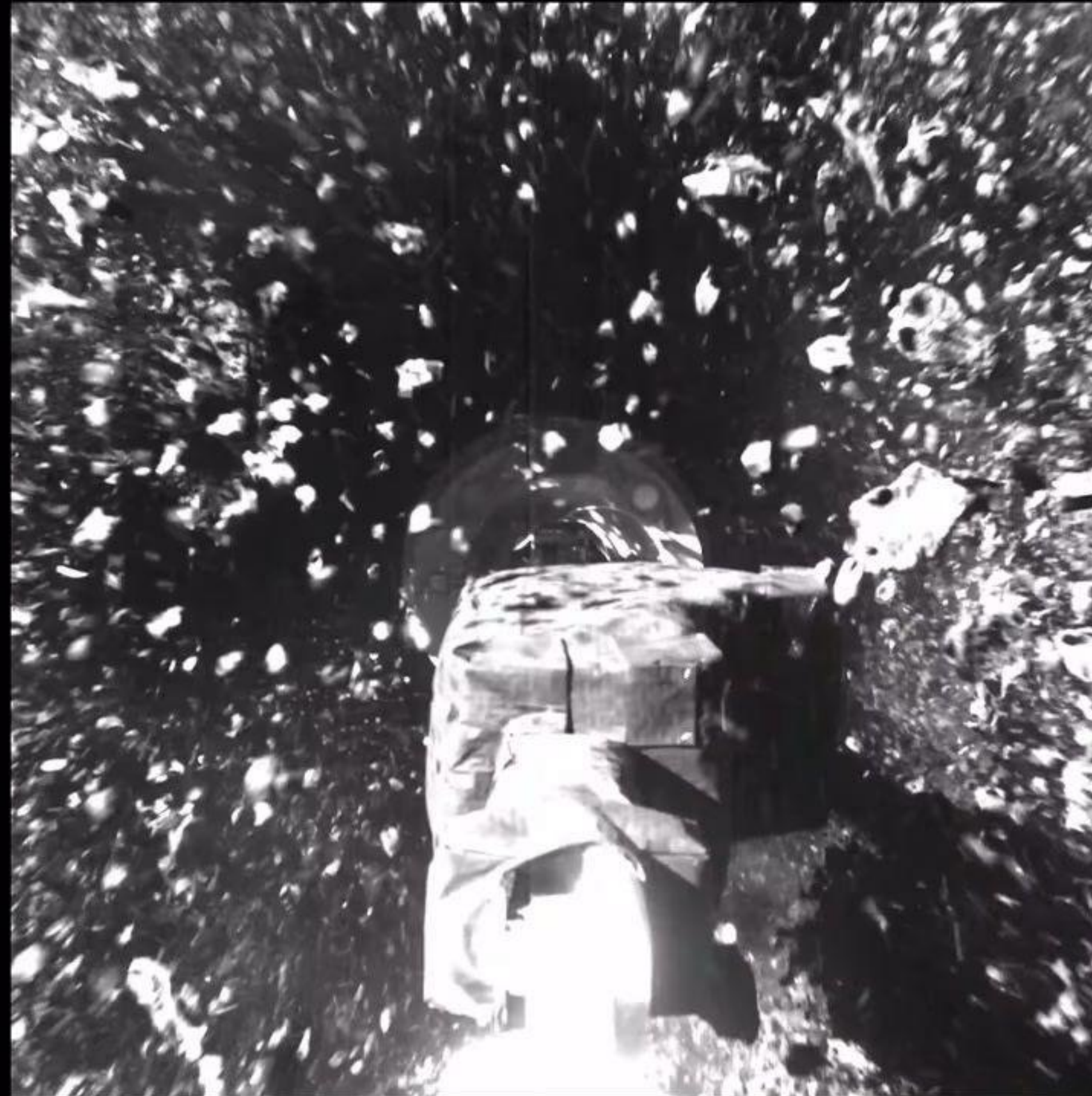
- Introduction to meteors
- Observation of meteors
- The FRIPON project

1. Introduction to meteors

Meteoroids



Micrometeorite collected at Concordia,
Antarctica, CSNSM IN2P3-CNRS



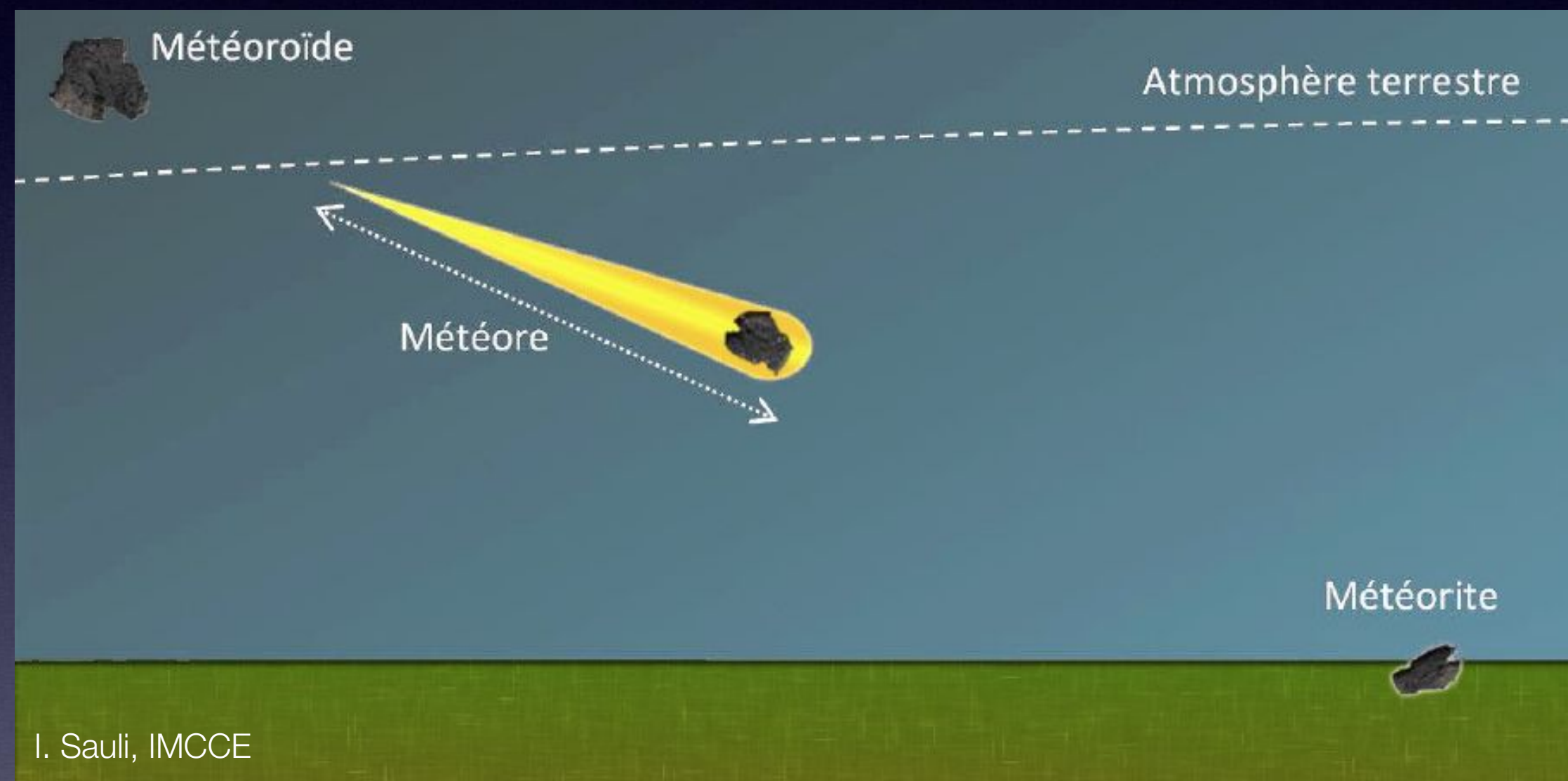
Osiris-Rex TAG, 2020, NASA/Goddard/University of Arizona (NASA)



J. Toth, Modra Obs, Slovakia

Imagery from
OSIRIS-REx SamCam

Meteors



Perseid 2008

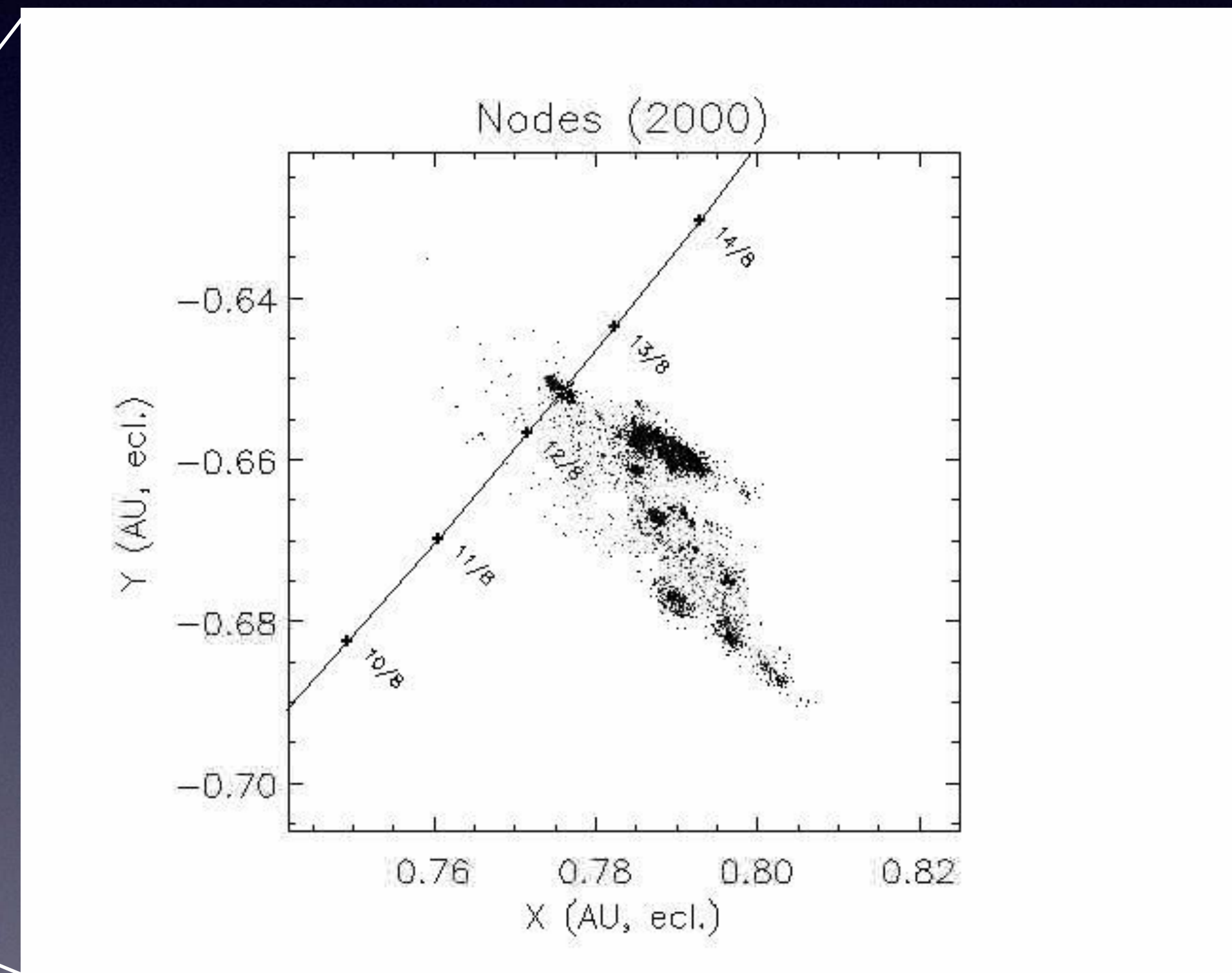
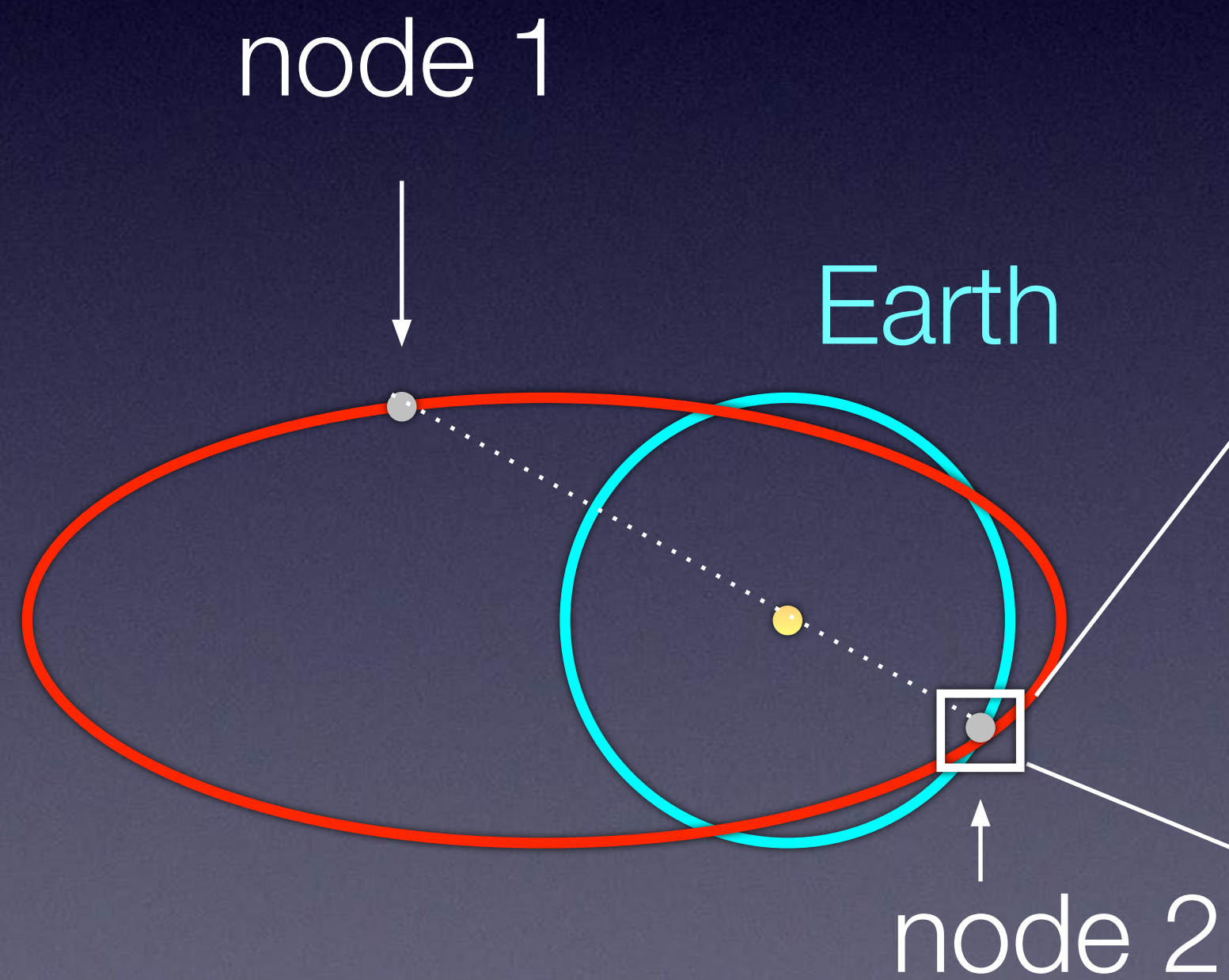
In-lab meteor

Frame number : 000000

Pts : 00:00:00,000

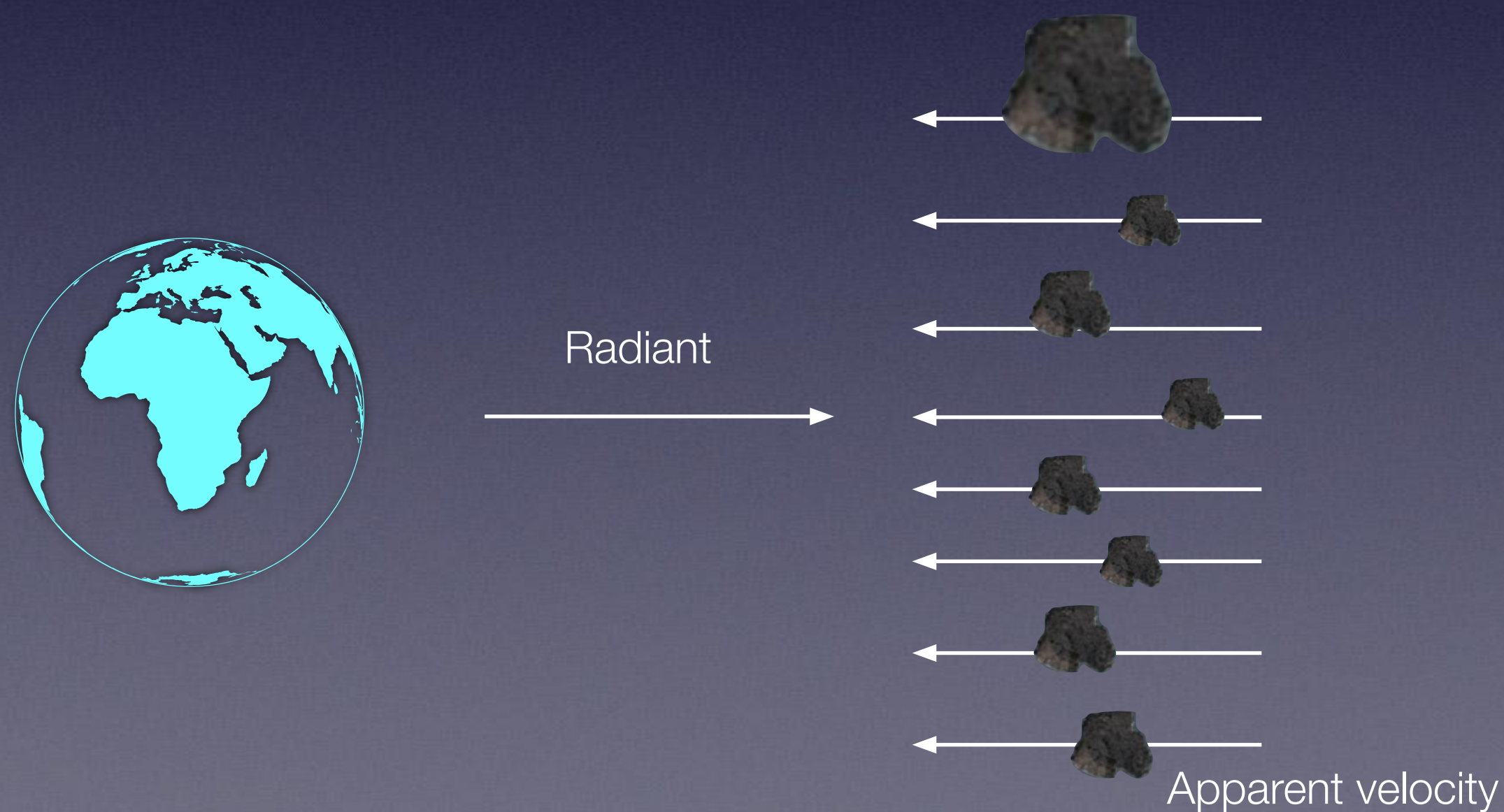
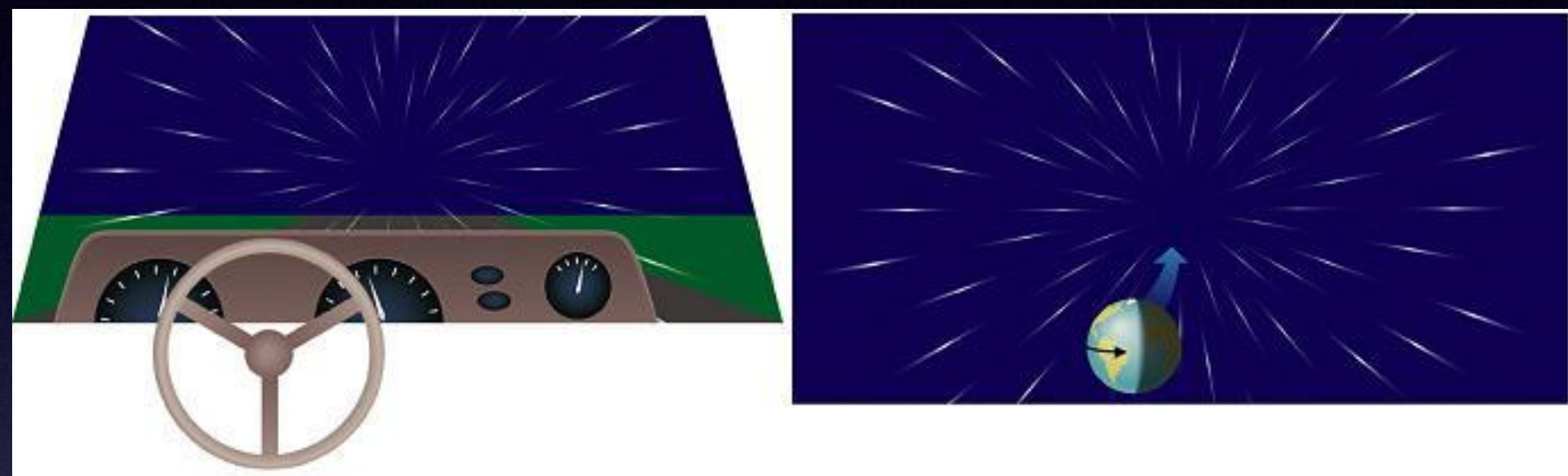
Murchison (CM2)
Hefdig, IRS, U. Stuttgart, Germany

Principle of a meteor shower



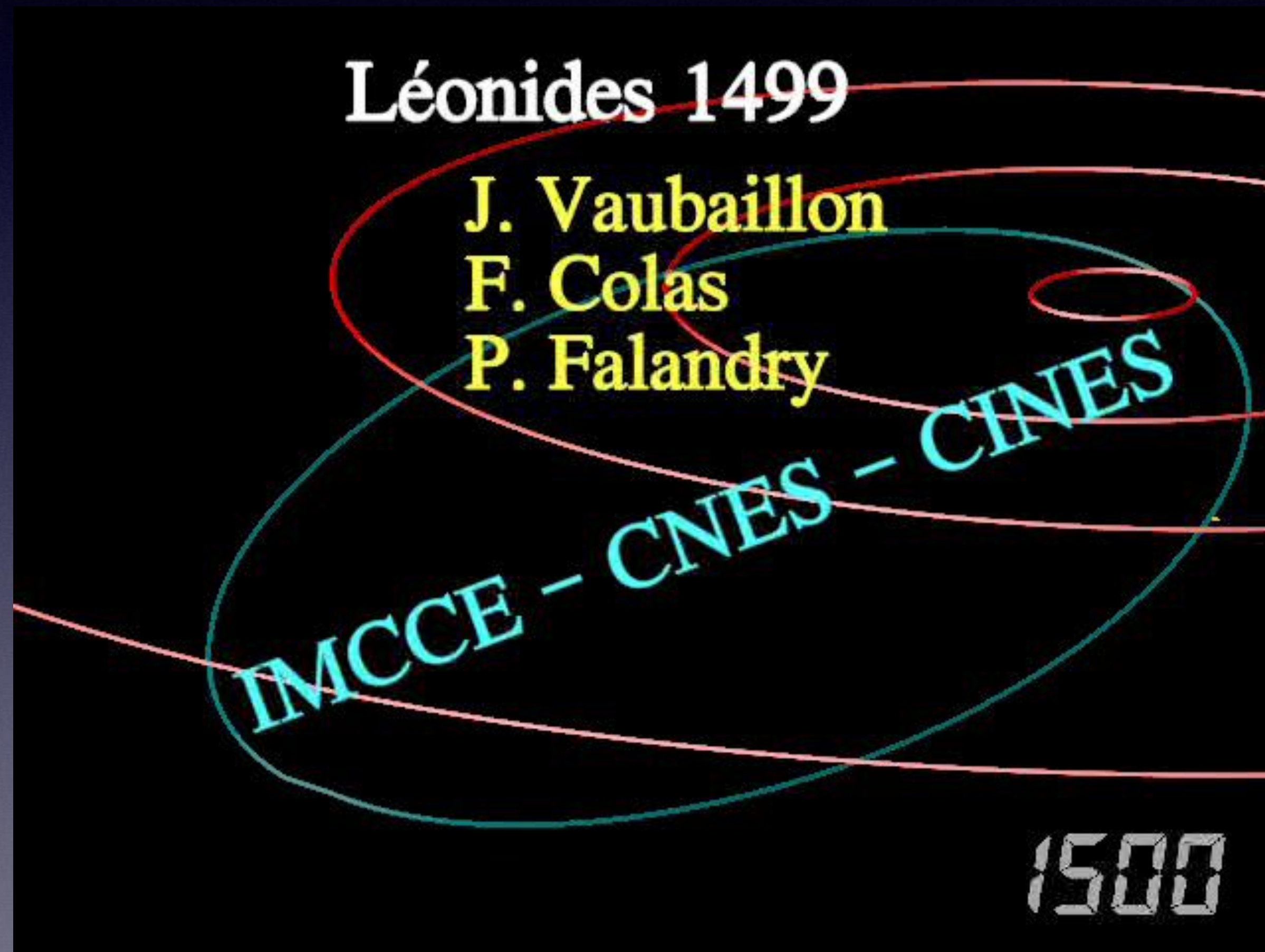
Perseids

Meteoroid stream and Meteor showers

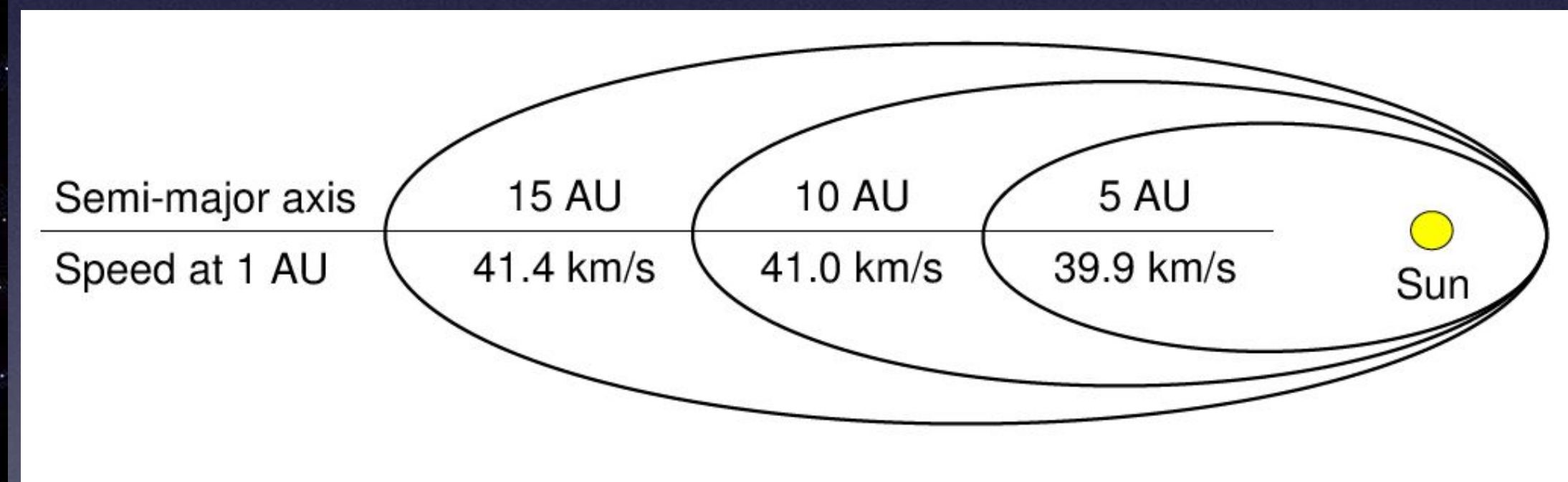
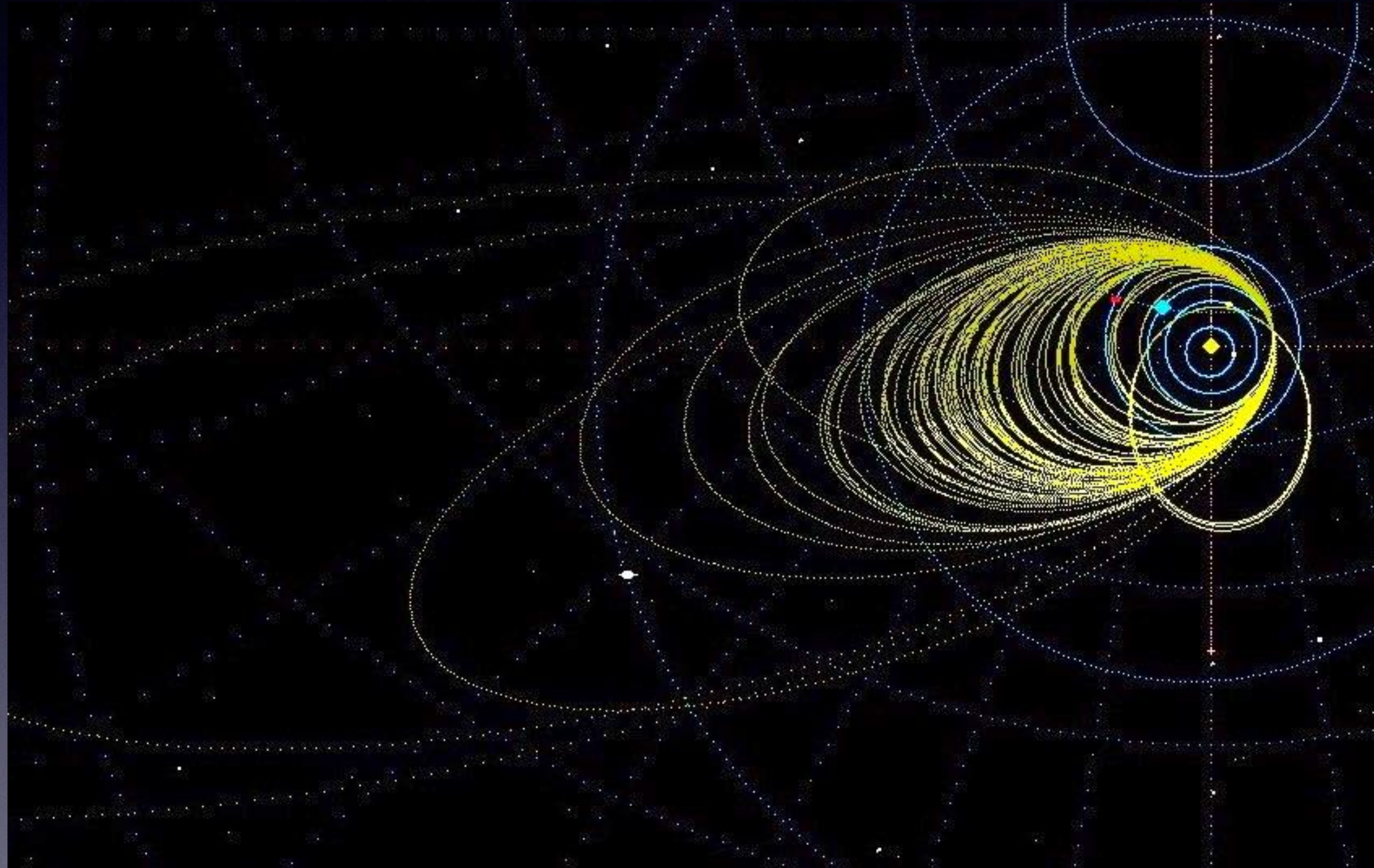


Yong Beom Jeon (2001 Leonids)

Prediction of meteor showers



The challenge of meteoroid orbit measurement

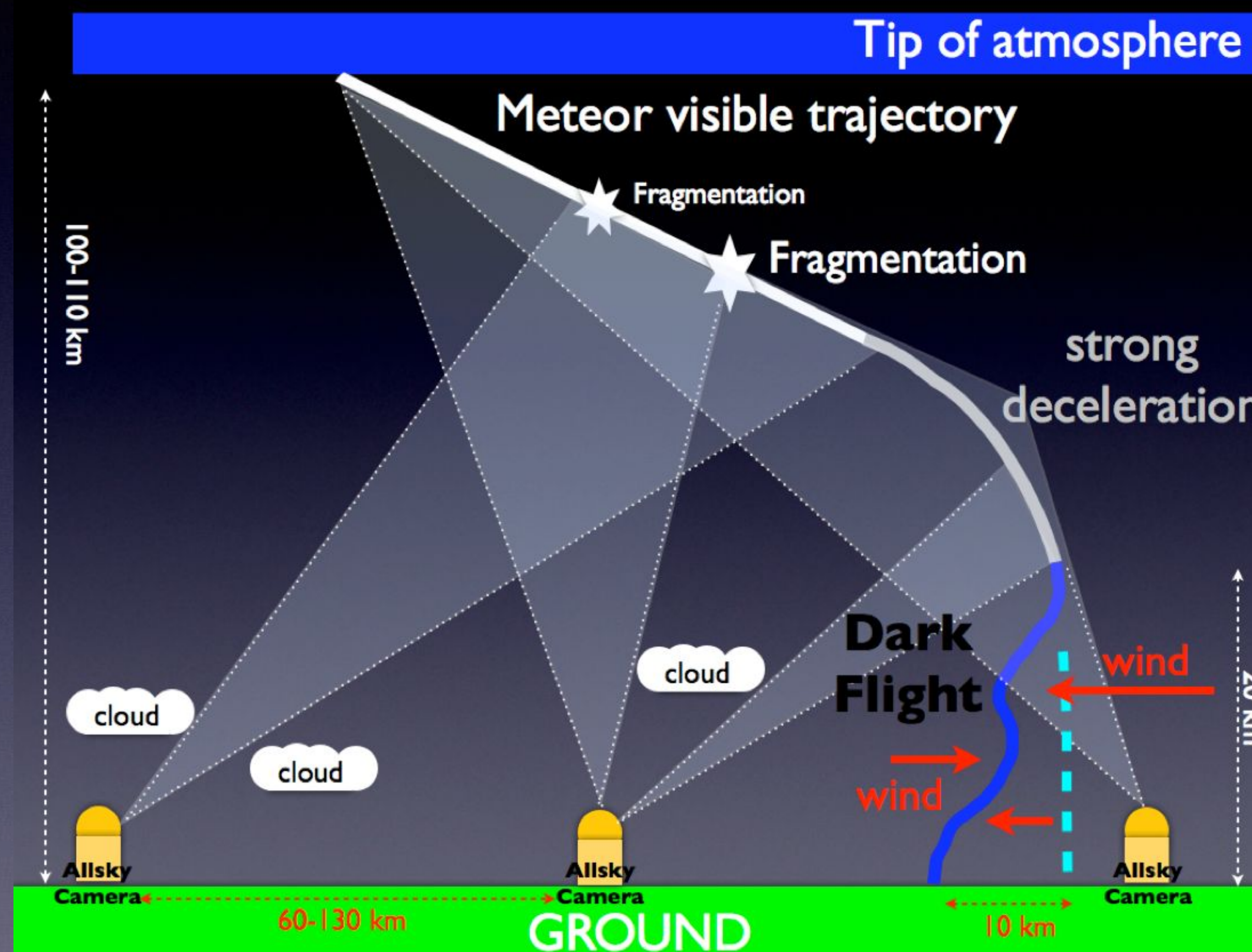


from Barentsen 2009

A. Leroy, DRA2011 Data acquired and process with UFOCapture suite

2. Observation of meteors

Principle: triangulation



FRIPON
Vigie-ciel

What do we learn from meteor observations?

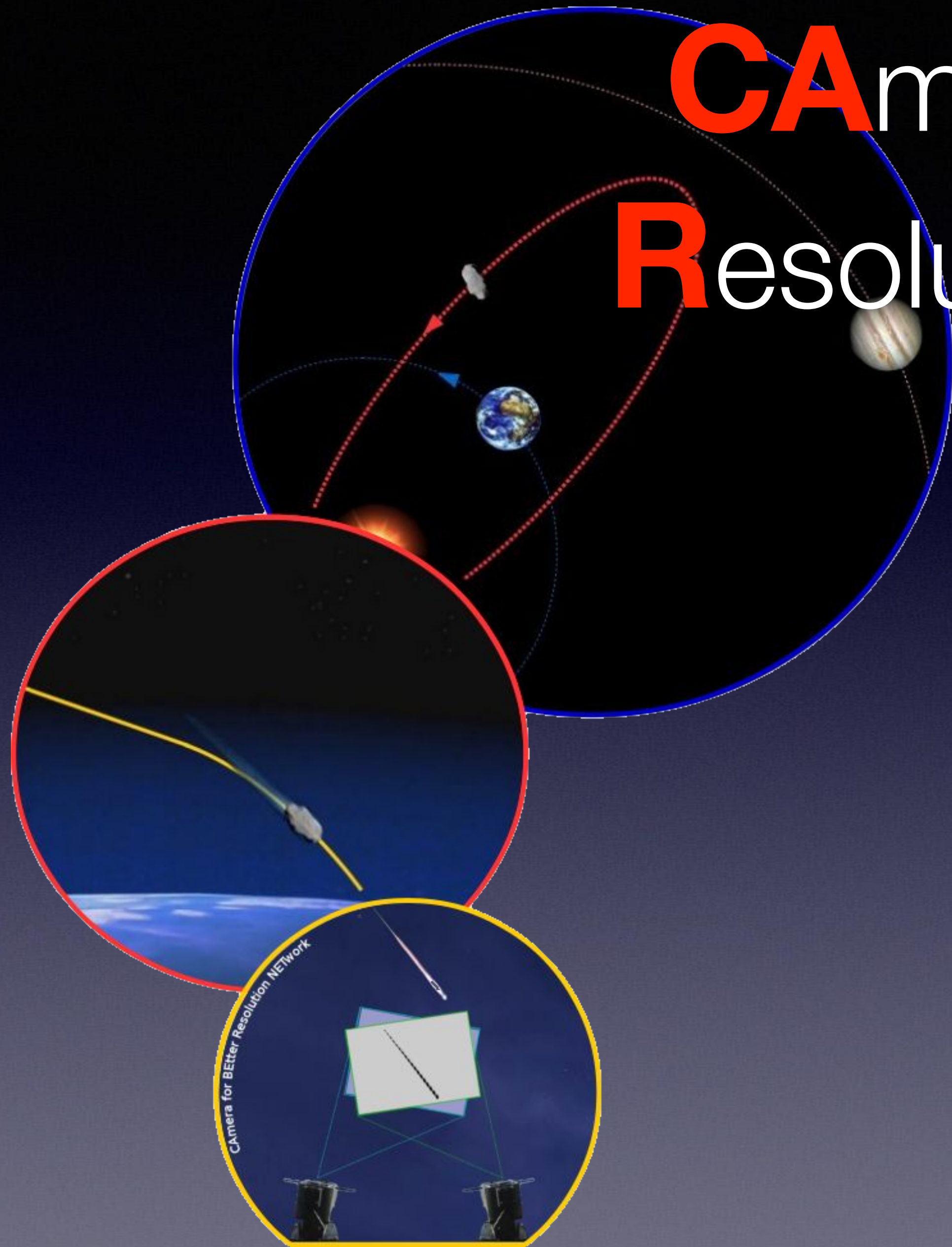
- **Number** Measures of meteors ZHR = $f(t)$

- **Orbit**
- Dispersion of **orbits**
- Light curve + **trajectory**
- Spectrum

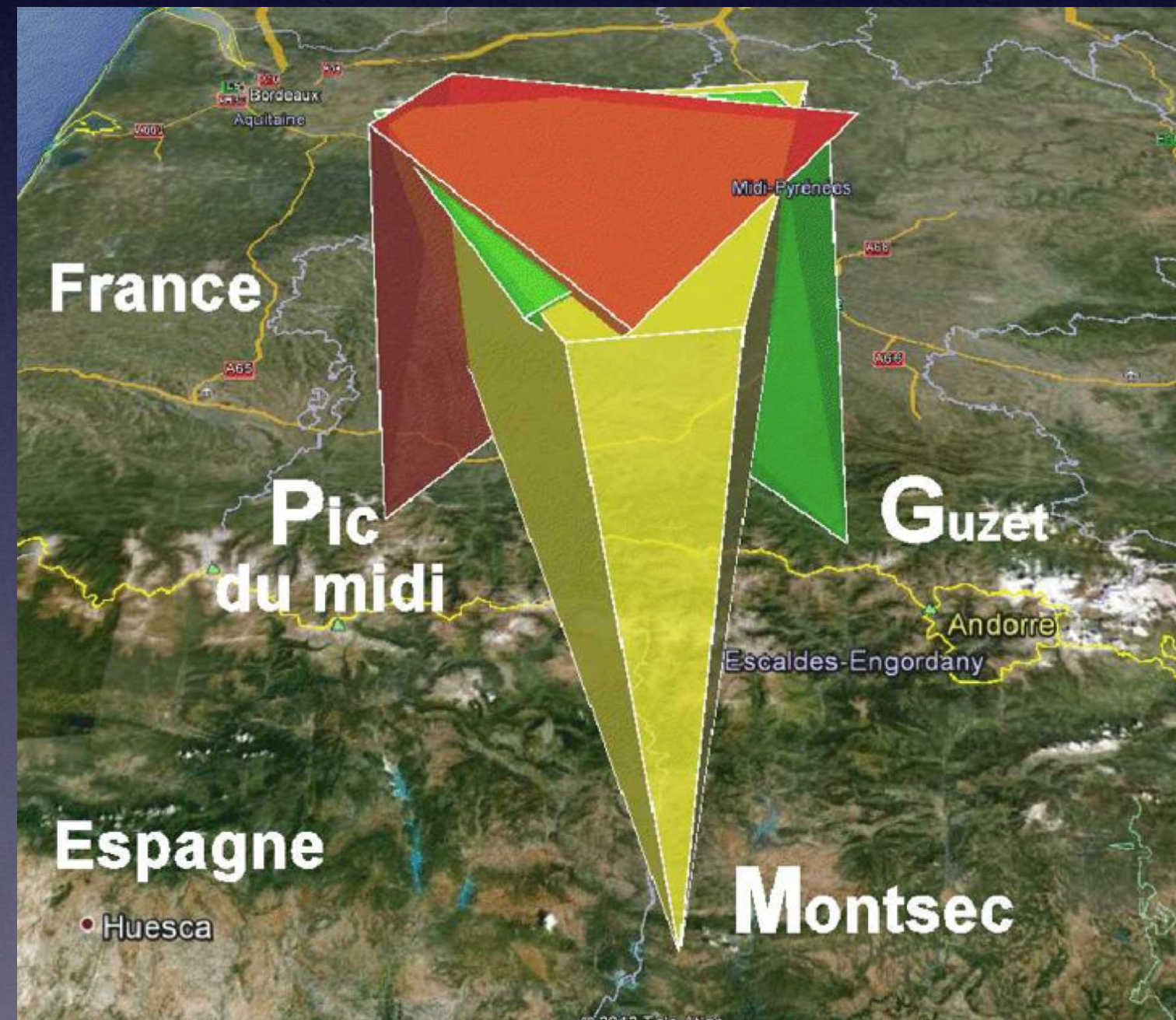
Deduce

- SFD+flux ; Presence + position of stream in Solar System ; nature+activity of the parent body ; collision **lifetime**
- Parent body + origin
- Age, lifetime expectancy
- Tensile strength
- Main atomic composition

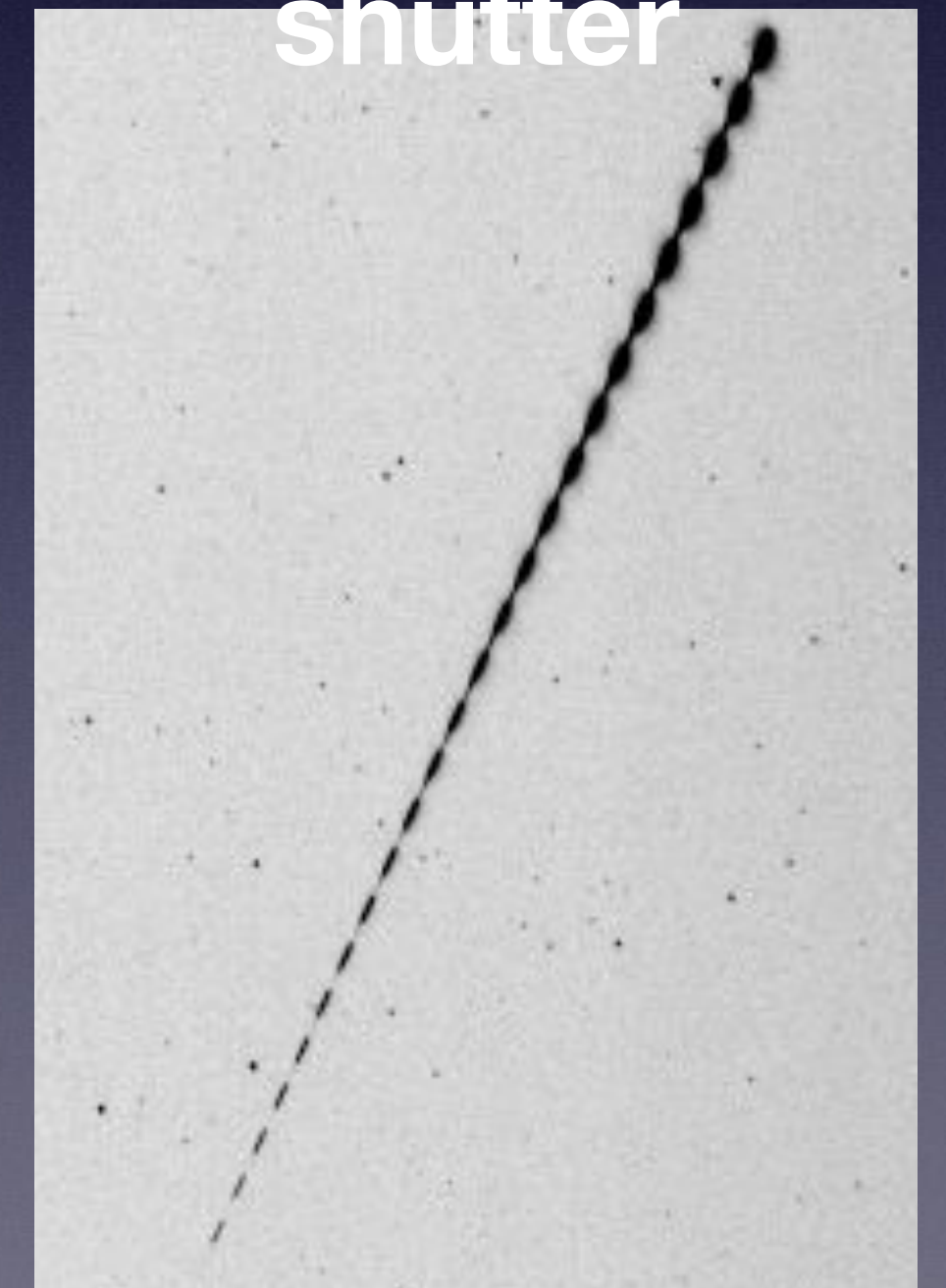
CAmera for BEtter Resolution NETwork



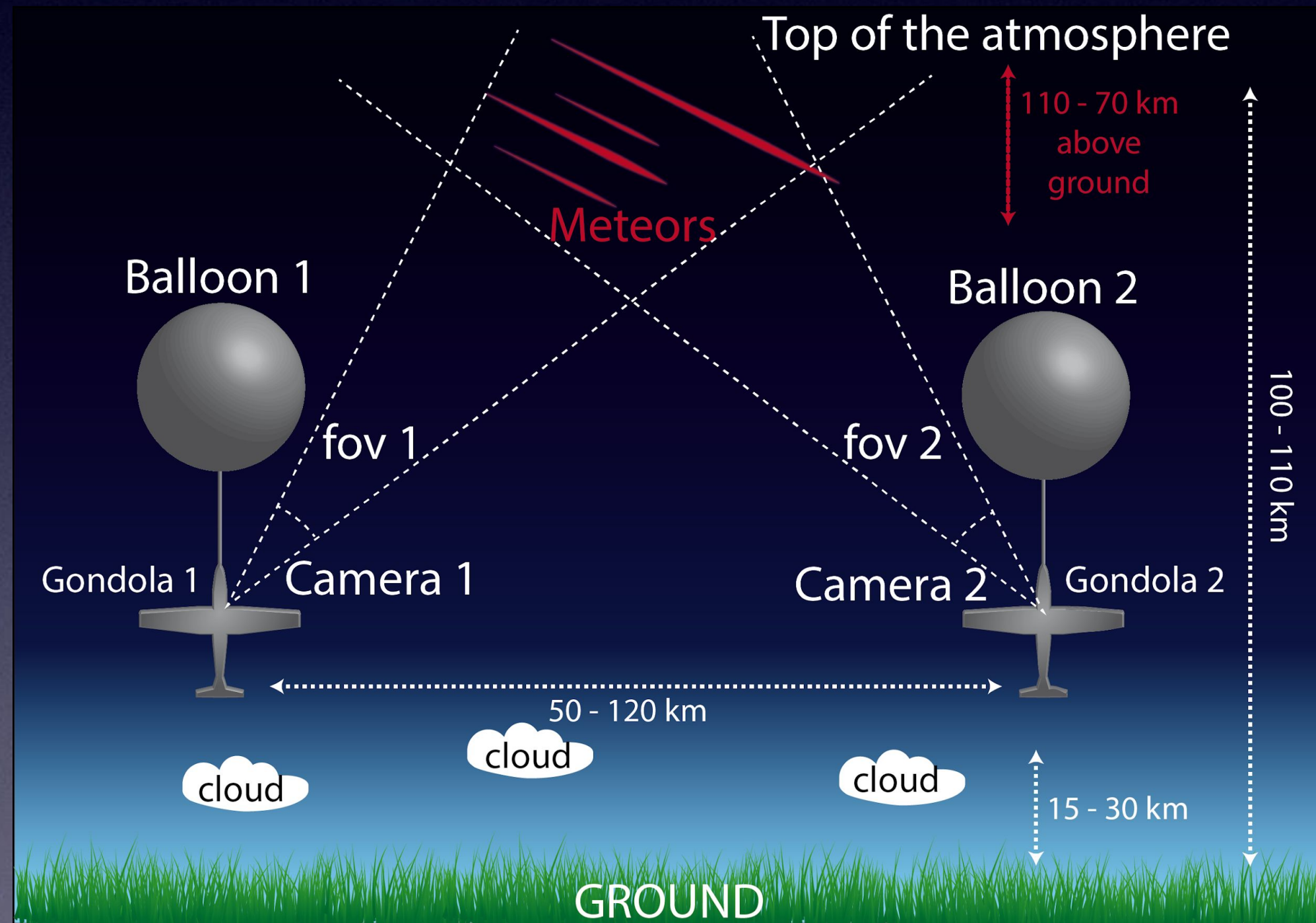
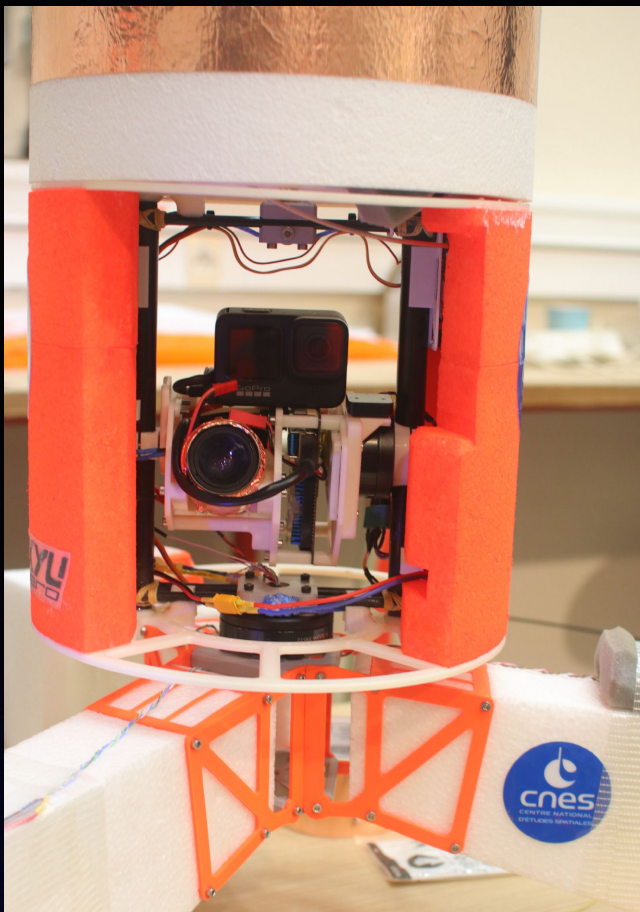
Auriane Egal (2014-2017)



3 stations
40x27 deg²
1 pixel=36''
100 Hz
shutter



Airborne observations



MALBEC project



tau-Herculids 2022

Meteor cluster

- τ -Herculides 2022

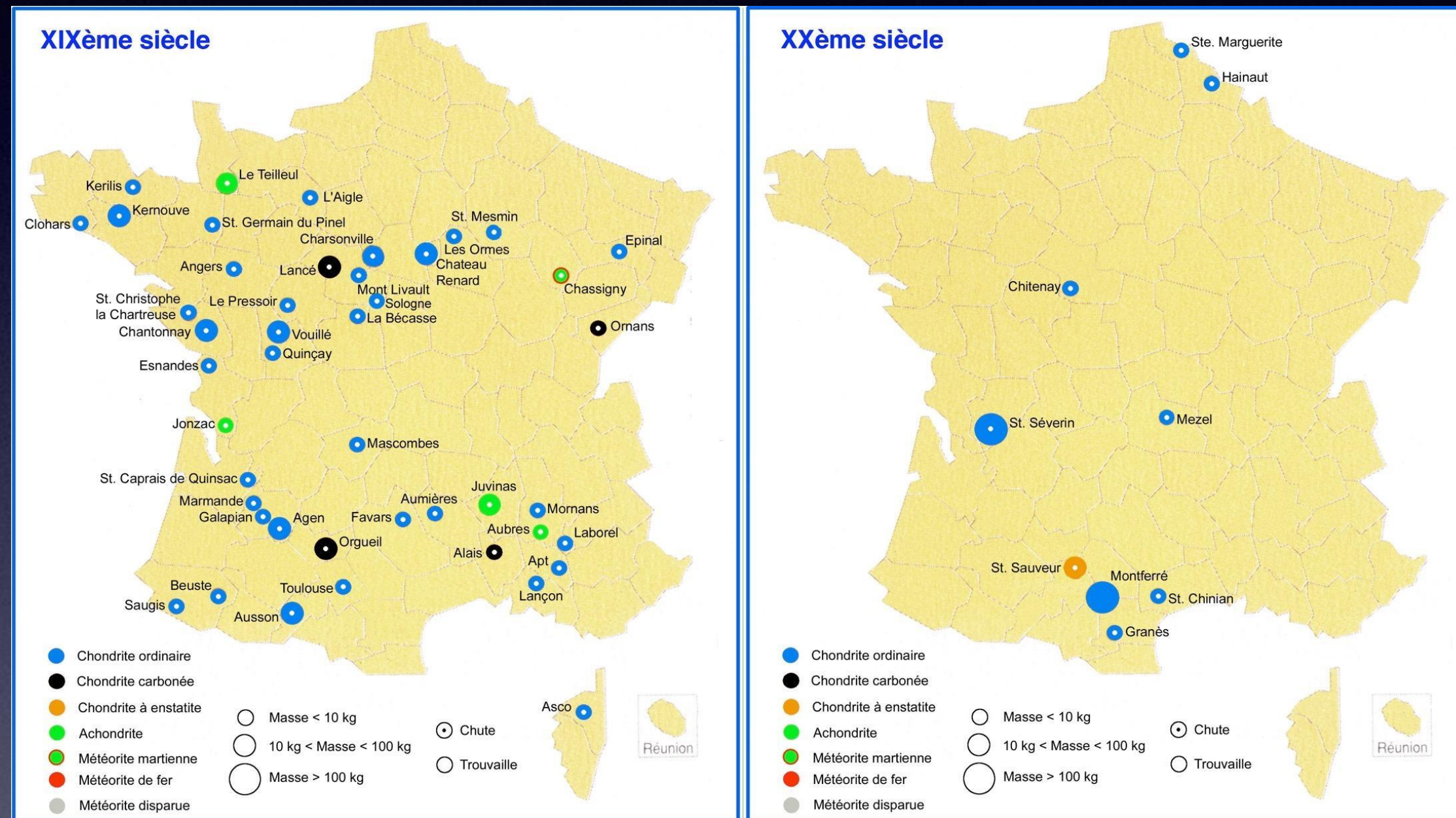
A. Cassagne, LIP6



3. The FRIPON project

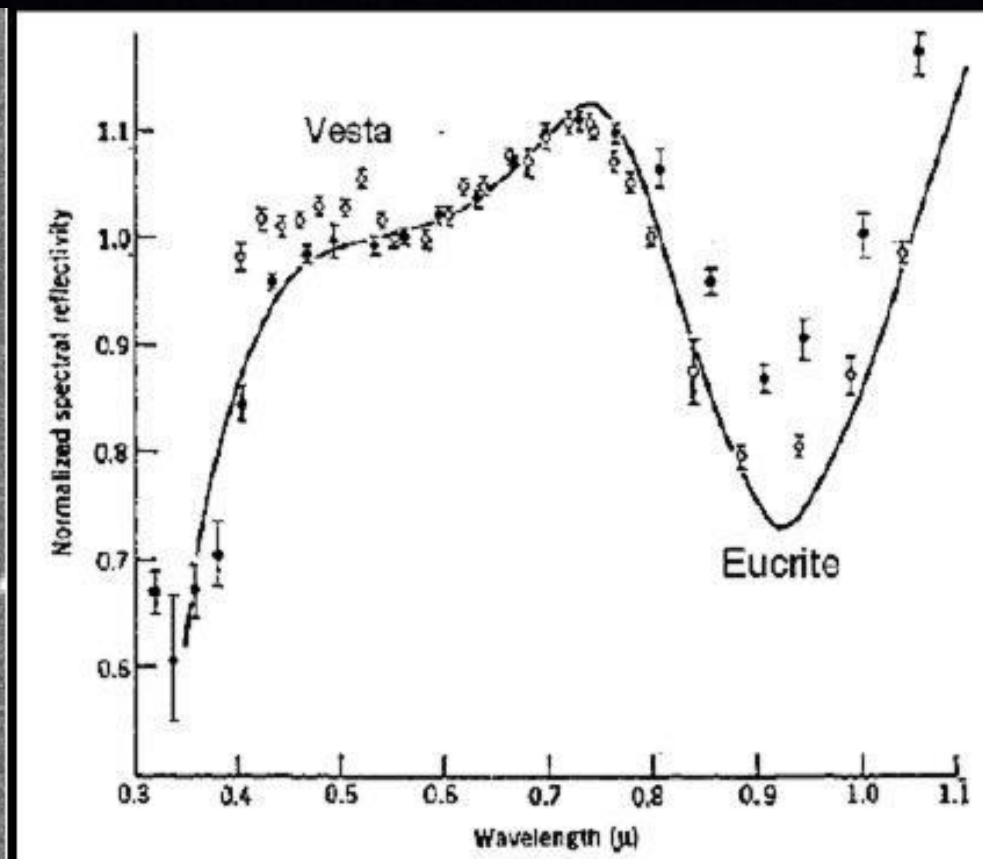
Why does it matter?

B. Zanda, MNHN



One object observed from different points of view

comets,
asteroid
astronomy



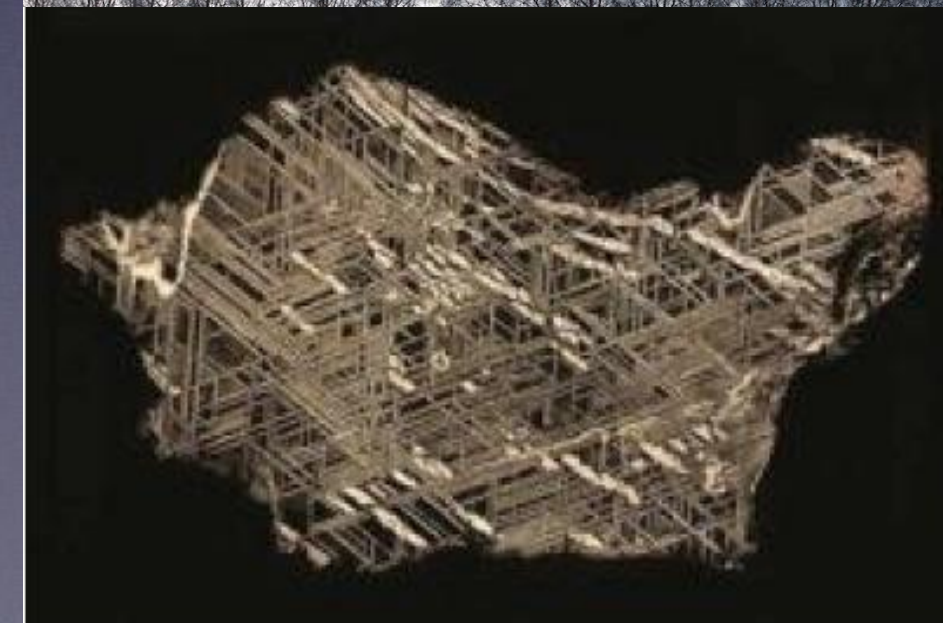
Telescope
space
probe

meteors
atmosphere



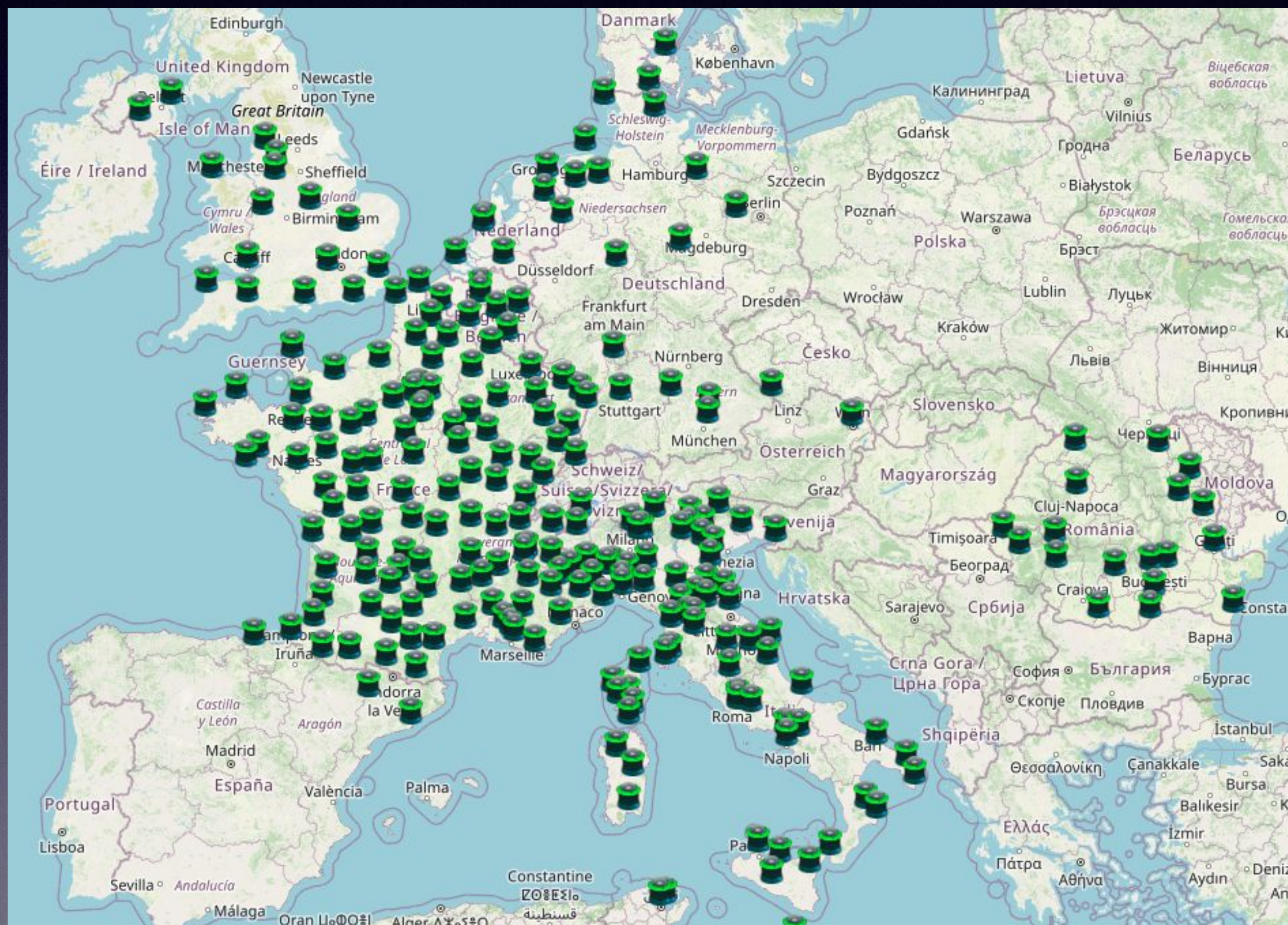
Wide field
camera

meteorite
geology



microscope

FRIPON 2024





Meteorite fall

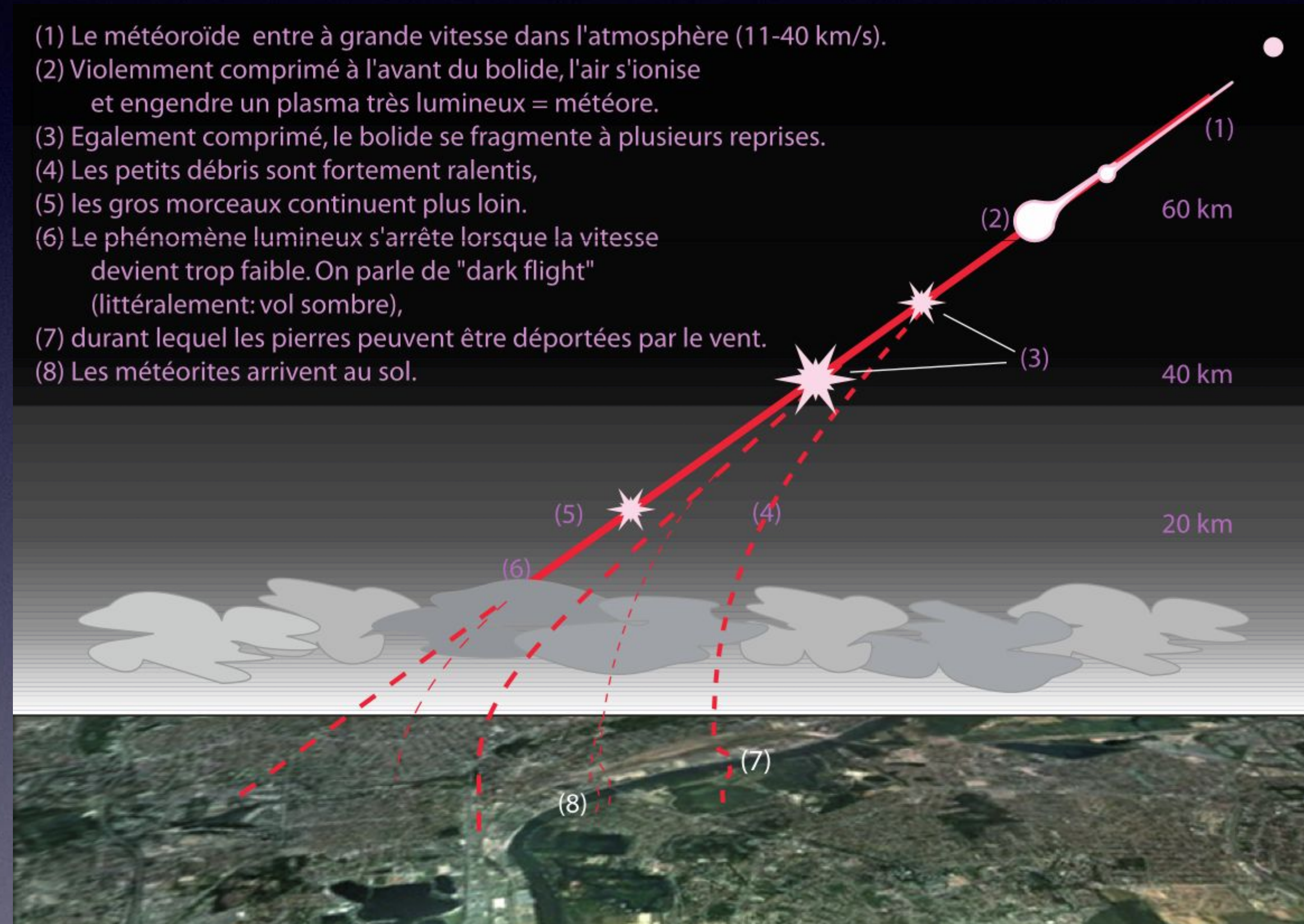
Asteroid : 2023 CX1
Meteorite : St-Pierre-le-Viger

crédit : Titus K

https://vigie-ciel.imo.net/members/imo_view/event/2023/937

Strewn field

- (1) Le météoroïde entre à grande vitesse dans l'atmosphère (11-40 km/s).
- (2) violemment comprimé à l'avant du bolide, l'air s'ionise et engendre un plasma très lumineux = météore.
- (3) également comprimé, le bolide se fragmente à plusieurs reprises.
- (4) Les petits débris sont fortement ralentis,
- (5) les gros morceaux continuent plus loin.
- (6) Le phénomène lumineux s'arrête lorsque la vitesse devient trop faible. On parle de "dark flight" (littéralement: vol sombre),
- (7) durant lequel les pierres peuvent être déportées par le vent.
- (8) Les météorites arrivent au sol.



FRIPON
Vigie-ciel

St-Pierre-le-Viger meteorite



S. Bouley, Vigie-ciel

