NEO Event:
Fireball over Romania
January 7, 2015, 1:05:57 UTC

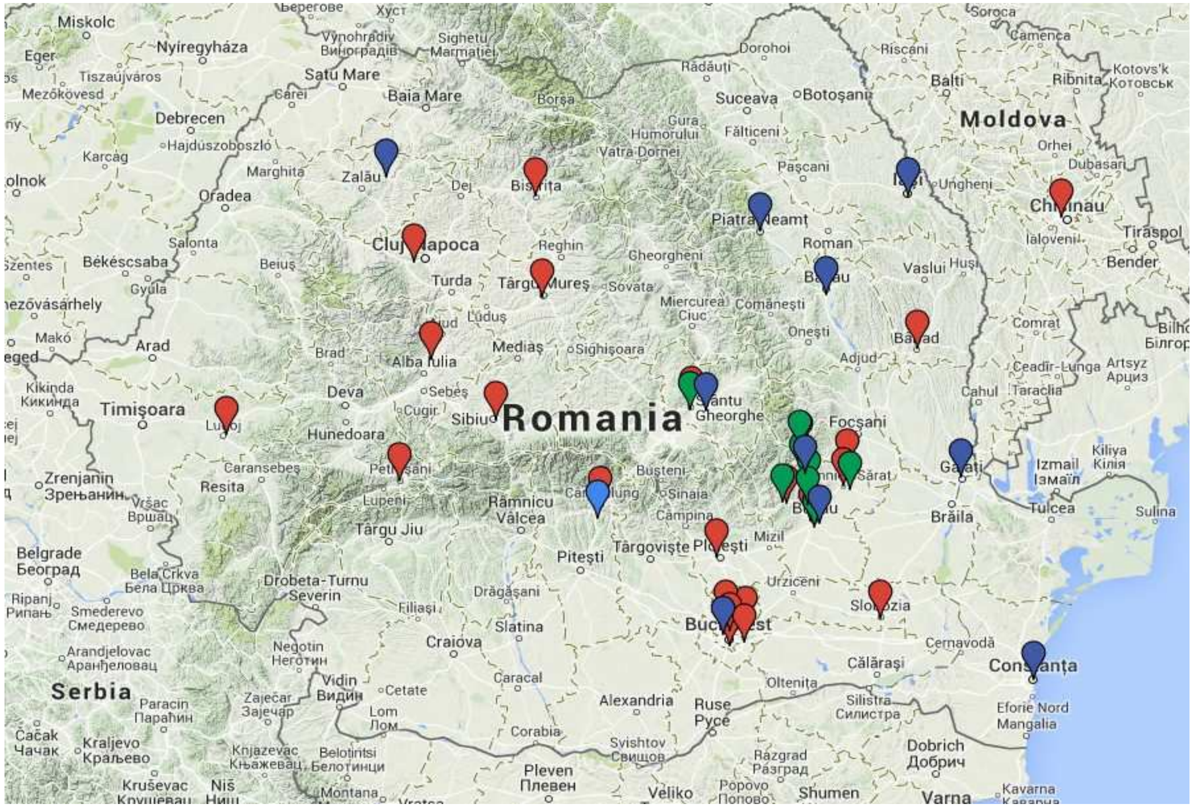
Romania, January 7, 2015, 1:05 UTC

- Trail and flash for at least 3 seconds
- Testimonials (visual observations, sound)
- Security cameras (uncalibrated for astrometry & photometry)
- Information very quickly in mass-media and virtual space (newsgroups, facebook, etc.)

Romania, January 7, 2015, 1:05 UTC

Video record frames (SW→NE)

Romania, January 7, 2015, 1:05 UTC



Non-Exhaustive list/places concerning video records(red), testimonials (blue), and sound (green) / credit R. Truta (RoViM)

Timing the flash of bolide

Search for records on Romanian National Seismic network

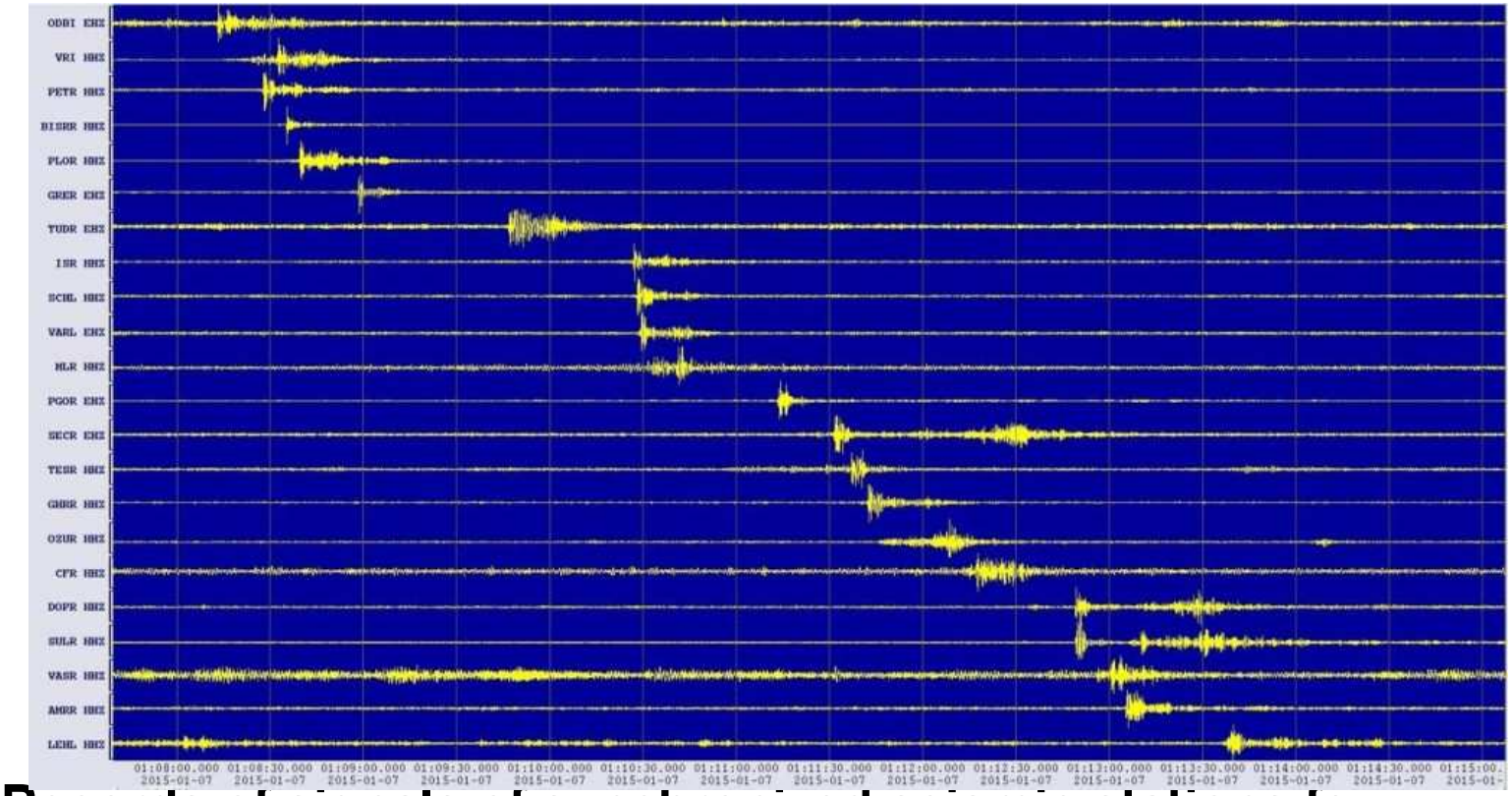
- **All these stations are synchronized, with precise GPS time**
- **One video station synchronized together with the seismic detectors**

PRECISE TIME OF FLASH:

3h05m57s (Local time)

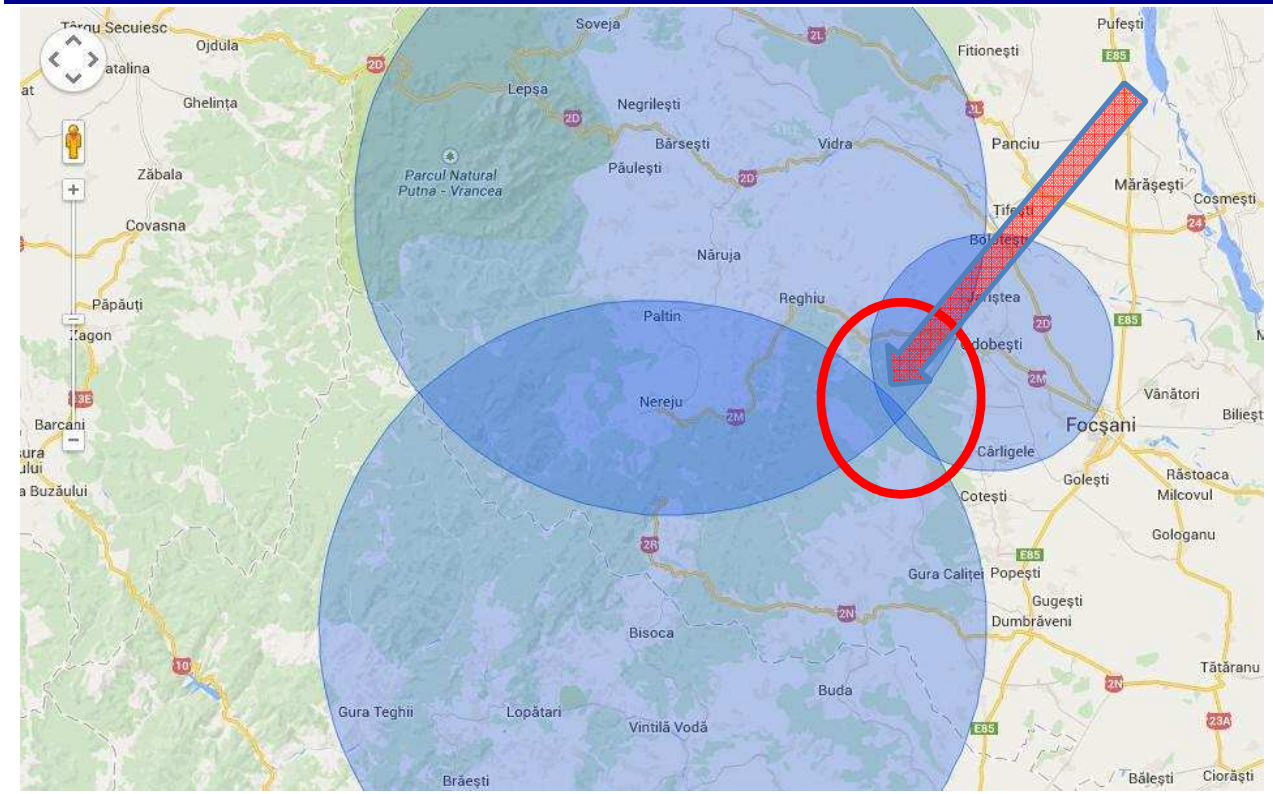
1h05m57s (Universal Time Coordinated)

Precise records on seismic stations



Records of signals of synchronized seismic stations few minutes after the flash. The disintegration of bolide and the signal recorded is function of distance / credit INFP

Triangulate the region of explosion (Odobesti vineyard region)

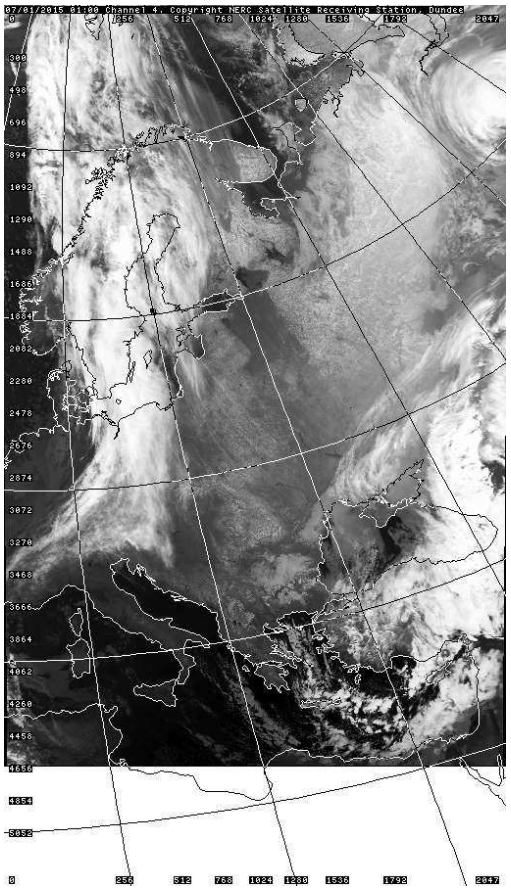


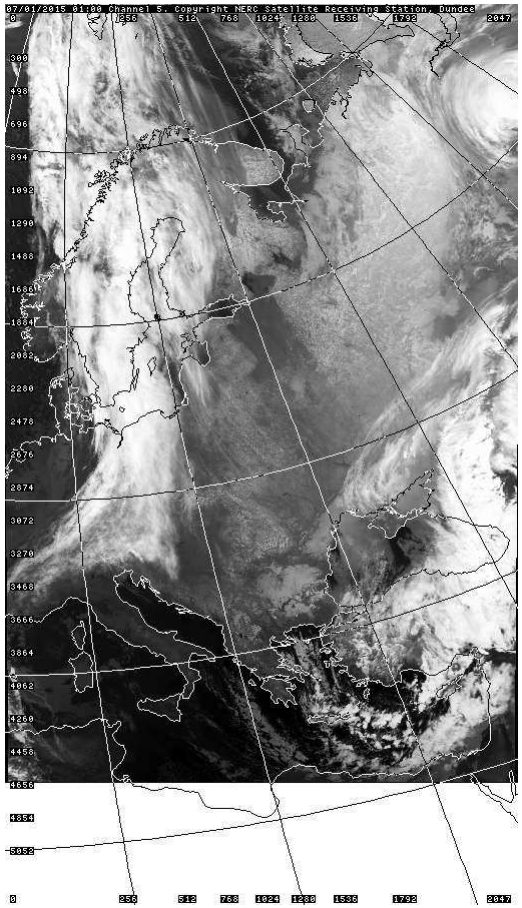
Flash light
Altitude 40±3 km

Entry velocity:
~ 18 ± 2 km/s
(assumed)

The coverage of triangulation for an explosion at 40km of altitude. Red circle contains the most probable area. **(credit D. Selaru, ISS)**

Negative results from space





Negative detection in Visible & Infrared

Mid-Infrared images (AVHRR archive)

Exp Time: 13min

How big? Mass estimation

Relation mass-visual luminosity (magnitude)

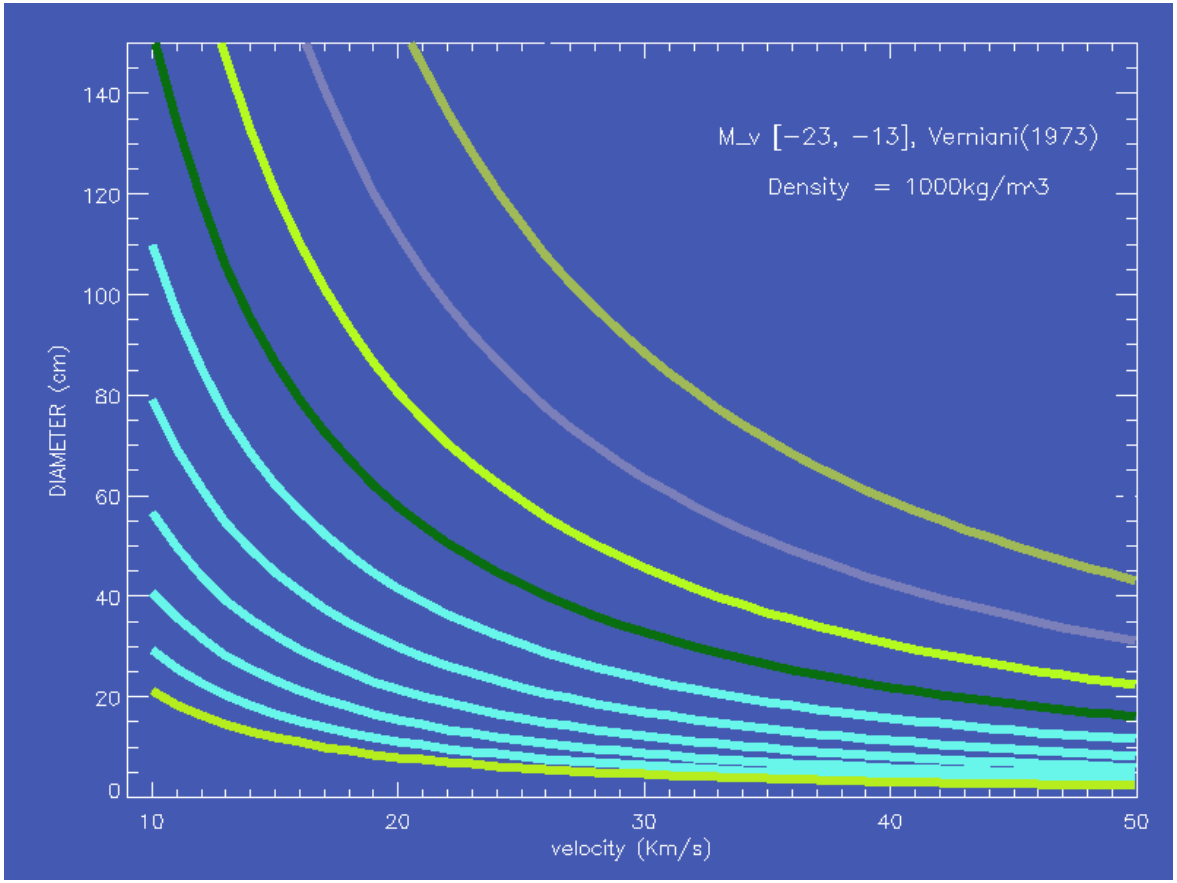
- » Verniani (1973)
- » M_V – Visual magnitude
- » V – velocity
- » *m*(g) – mass of meteoroid

This empirical low was calibrated using the Perseid meteor shower.

$$0.92 \log m(\mathrm{g}) = 24.214 - 3.91 \log V(\mathrm{cm\ s^{-1}}) - 0.4 M_V$$

Mass estimation (Verniani, 1973) work in progress

Excursions in velocity and diameter for a given density



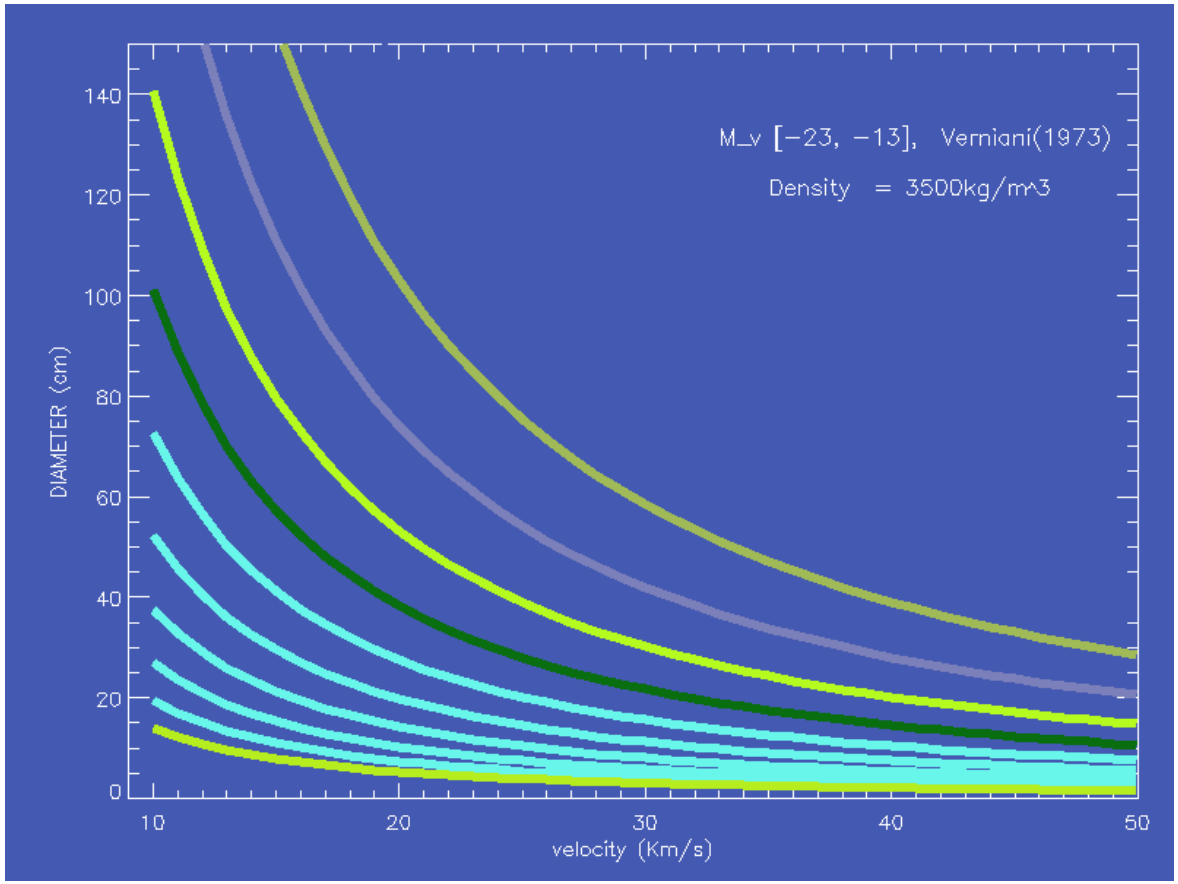
Density 1,000 kg/m^3
Diameter 2- 6 m
Velocity 20 km/s
Magnitude 20 – 23

Mass: $1{,}500^{+3{,}500}_{-500}$ kg

Credit: M. Birlan, IMCCE & AIRA

Mass estimation (in progress)

Excursions in velocity and diameter for a given density



Density 3,500 kg/m^3
Diameter 1.5 - 3.5 m
velocity 20 km/s
Magnitude 20 – 23

Mass: $2{,}400^{+2{,}500}_{-400}$ kg

Good correlation with Benesov & Kosice bolides
(Spurny et al, A&A 2014)

How big? Mass estimation

Margins: solution for covering all testimonials:

http://www.purdue.edu/impactearth/

Diameter – 6m
Density – 3,000 kg/m^3
Velocity – 35 km/s
Altitude: 39 km

Mass 325 tons

Movie

Additional Slides

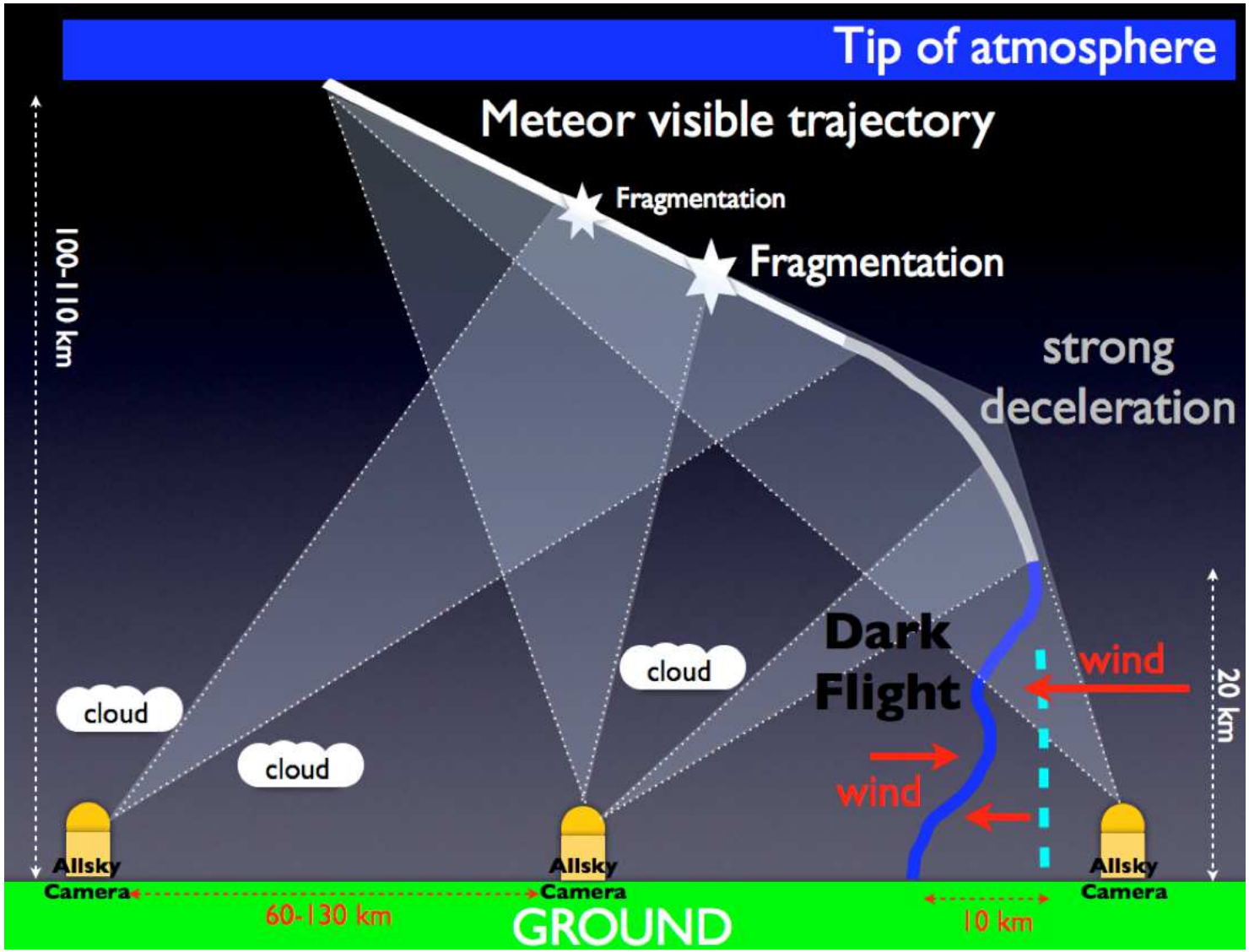
Movie

Bucharest

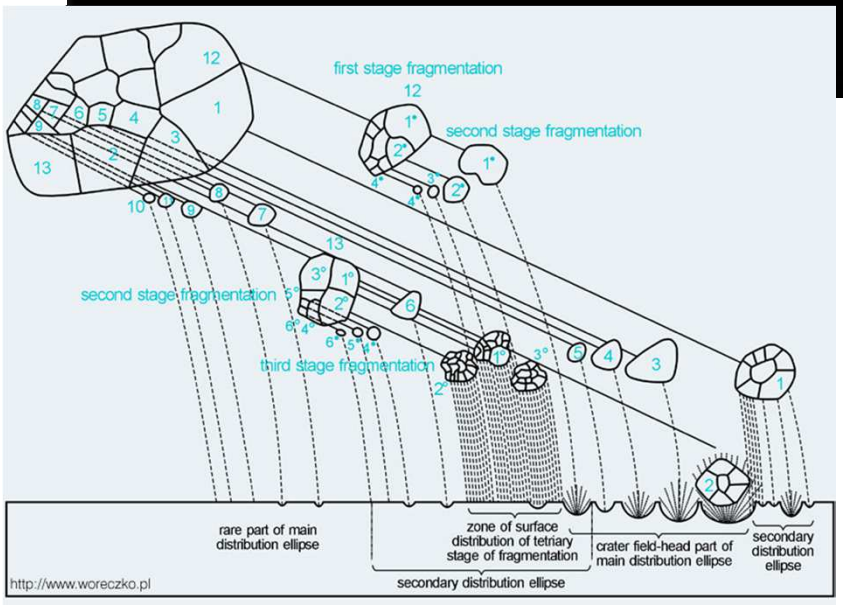
Movie

Carpathians

Split after flash



Credit: FRIPON
www.fripon.fr


first stage fragmentation
second stage fragmentation
second stage fragmentation
third stage fragmentation
rare part of main distribution ellipse
zone of surface distribution of tetriary stage of fragmentation
crater field-head part of main distribution ellipse
secondary distribution ellipse
secondary distribution ellipse
http://www.woreczko.pl

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