

# Search for meteorites and impact craters :

*François Colas – Observatoire de Paris*



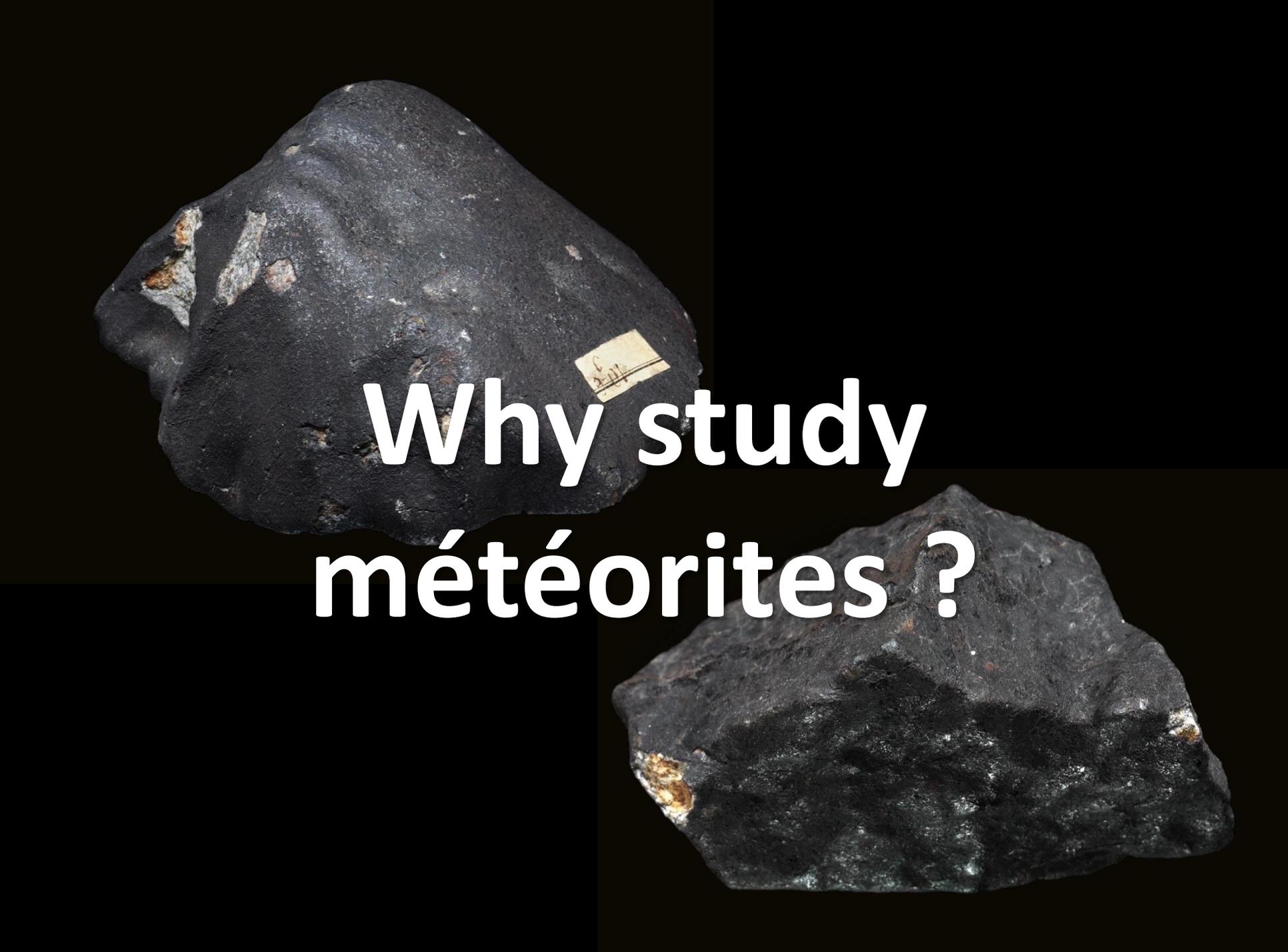
**FRIPON**  
**Vigie Ciel**

A banner for the 16th European Space Weather Week. On the left is a stylized globe with a satellite orbiting it. The text "16TH EUROPEAN SPACE WEATHER WEEK" is written in large, bold, white letters with a red outline. Below it, "18 - 22 November 2019, Liège - Belgium" is written in white. On the right is a circular logo with a red and orange gradient and a white silhouette of a person's head. At the bottom right, it says "image by Anastasia Kaufman".



**MUSÉUM**  
NATIONAL D'HISTOIRE NATURELLE





**Why study  
météorites ?**

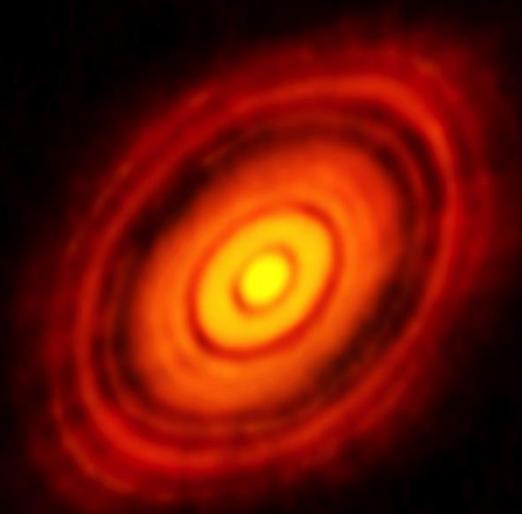
# They are space probes...

Kuiper  
Belt



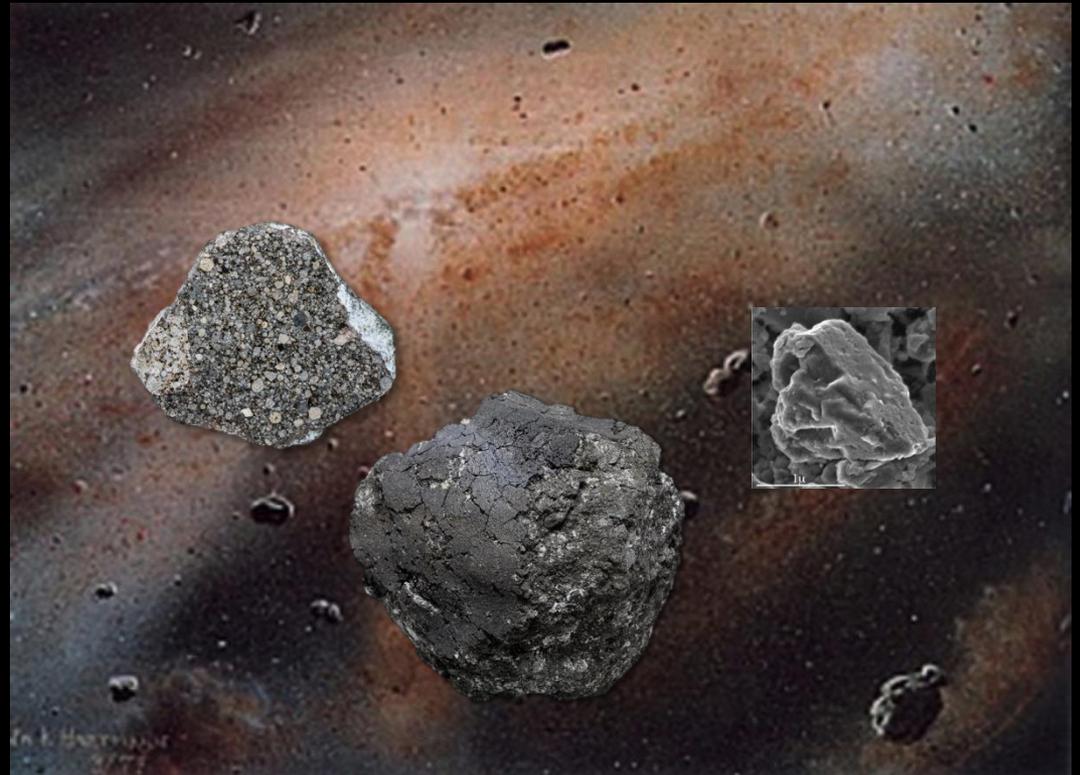
Asteroïds

# ... and time probes !



Protoplanetary disk of star HL

ALMA - ESO



*The planetary disk, 4,57 MY ago*

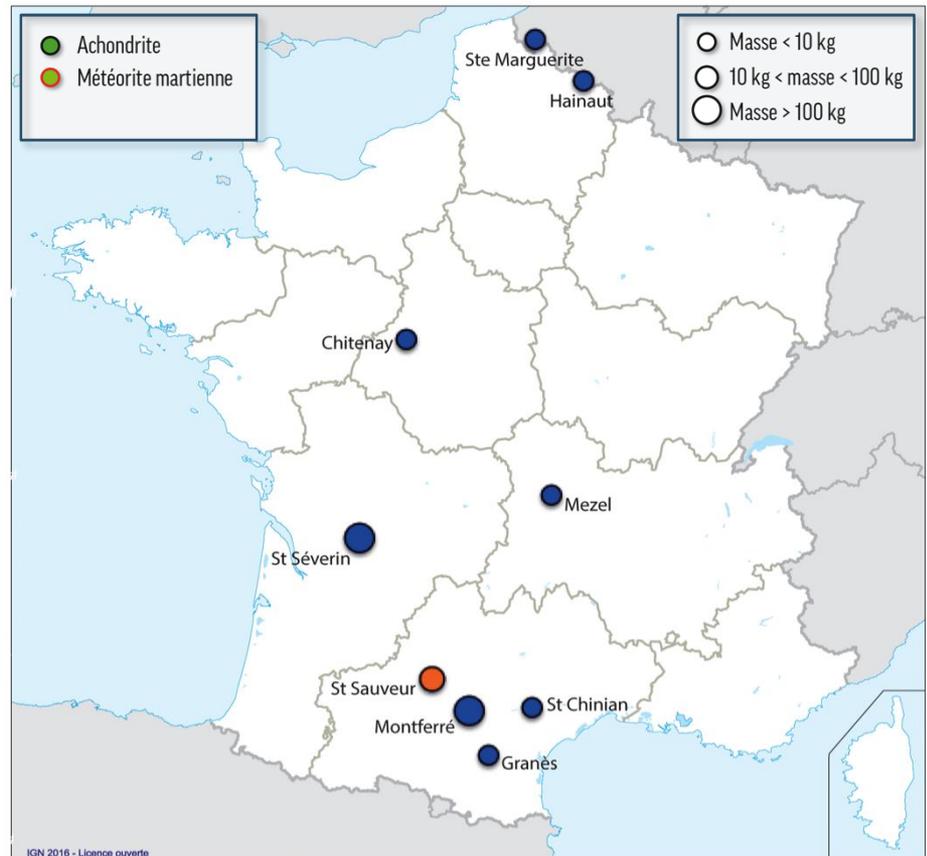
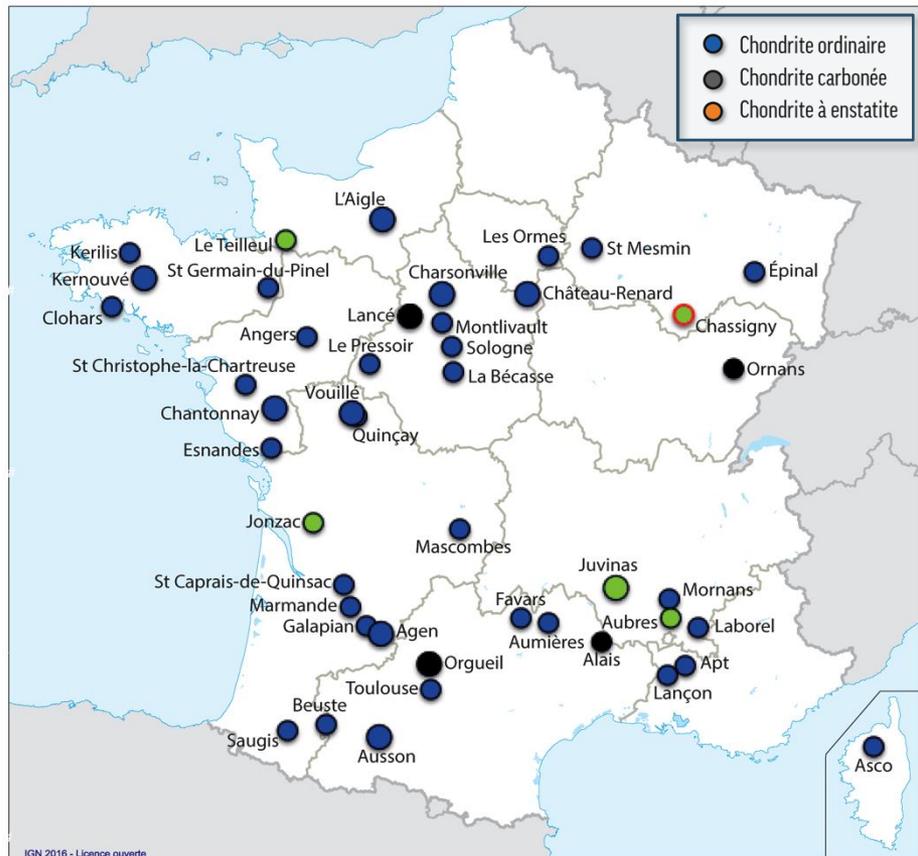
W. K. Hartmann

# FRIPON and VIGIE-CIEL to promote the recovery of fresh meteorites

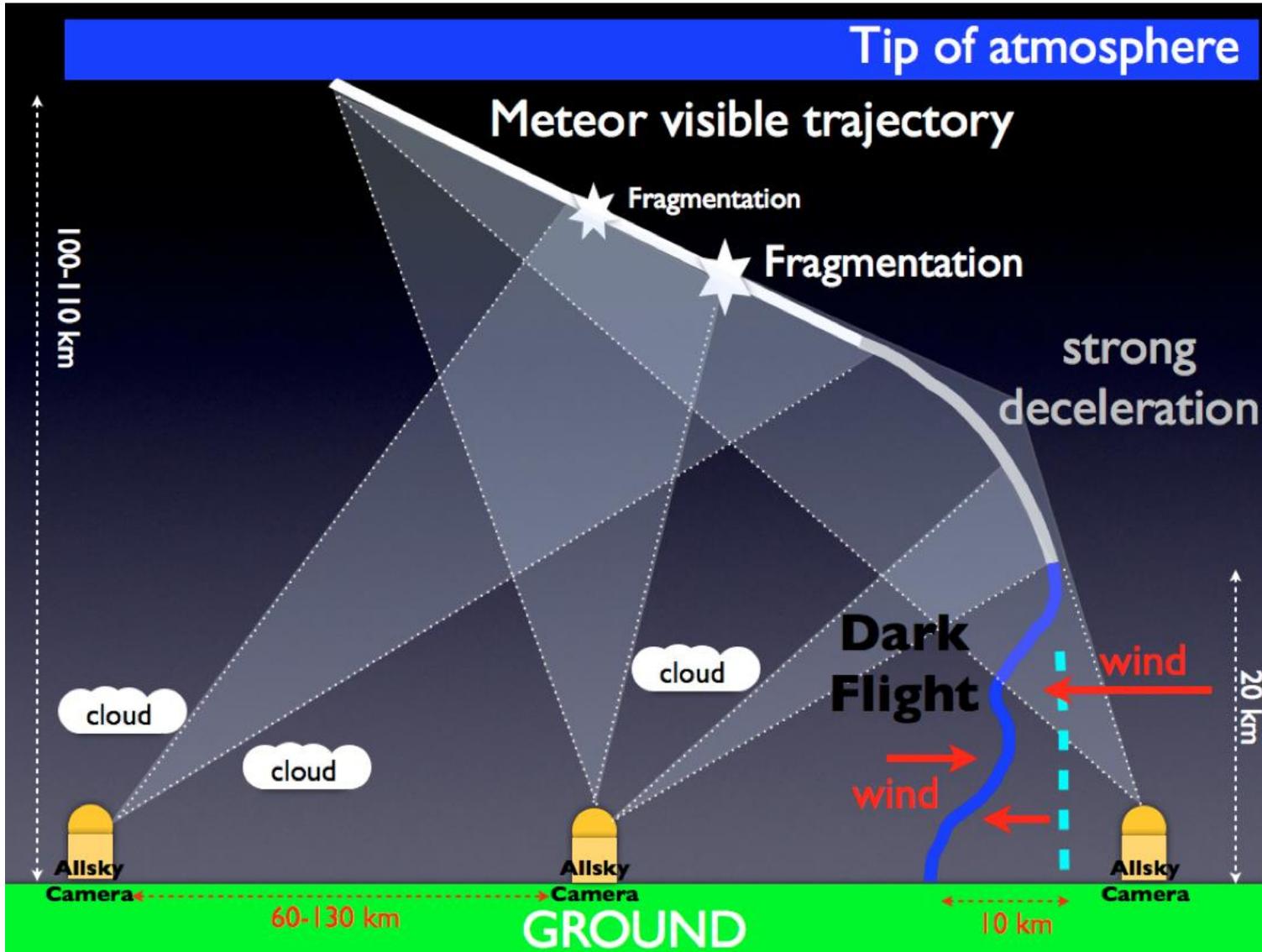
Meteorite falls recovered in France : loss of efficiency in the 20th century !

19th century : 45 meteorites.

20th century : 9 meteorites.



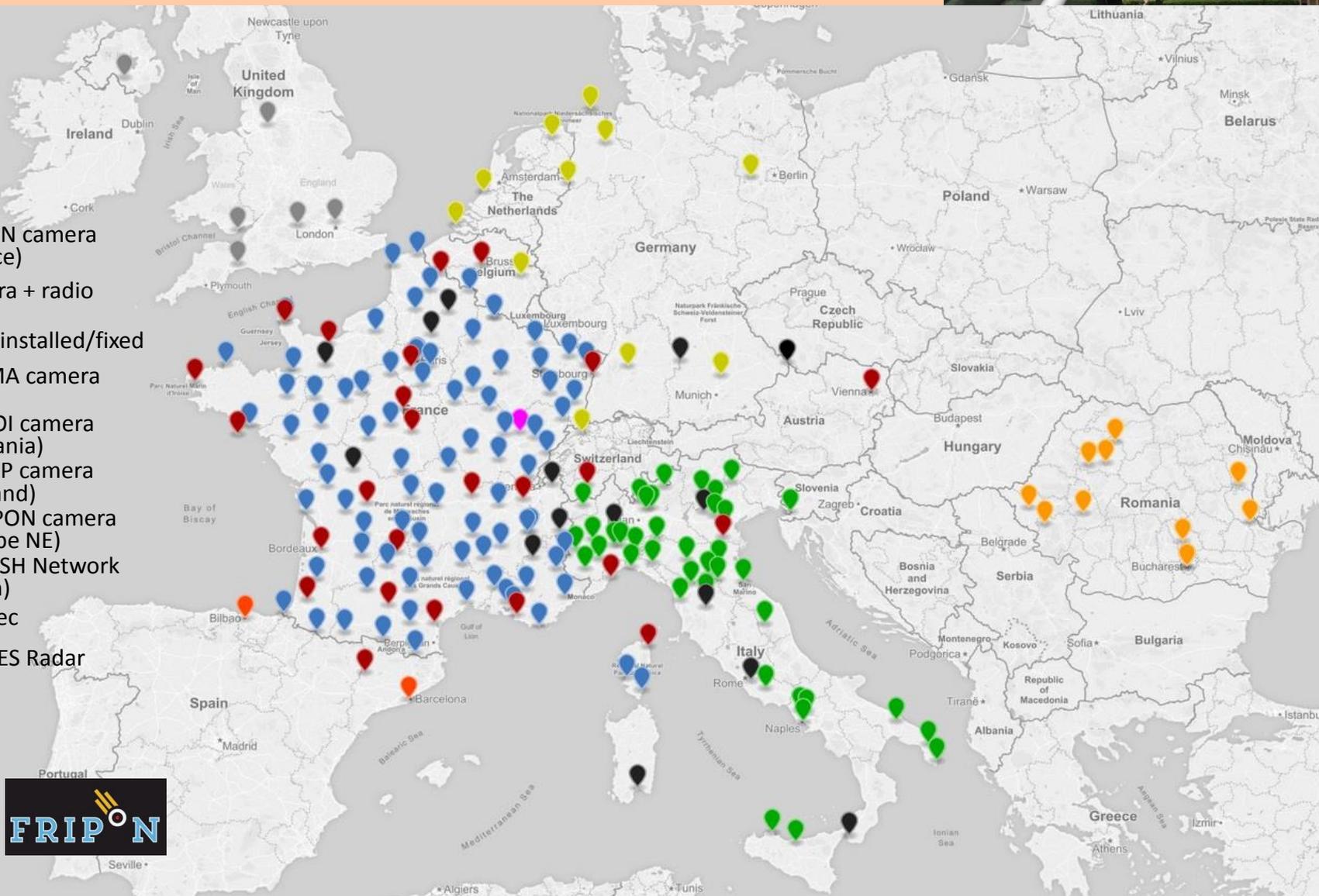
## Observations and detections



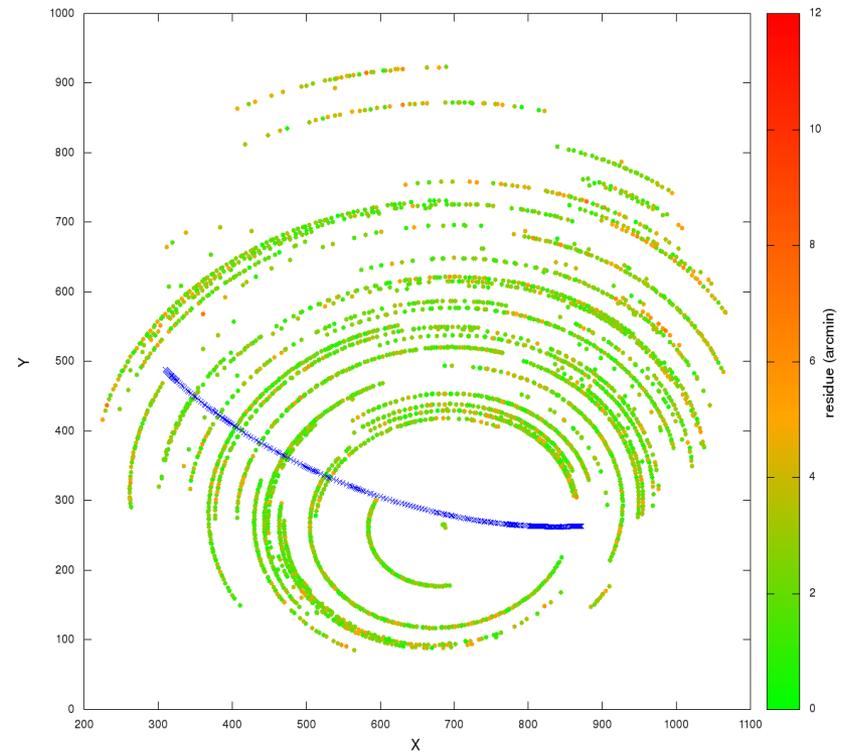
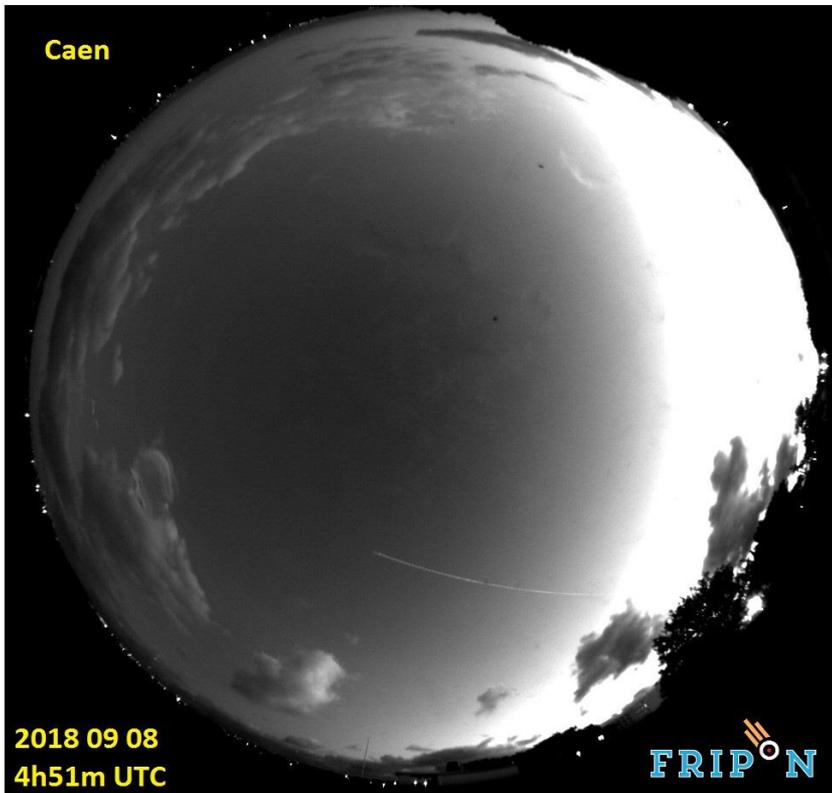


## The network in Europe

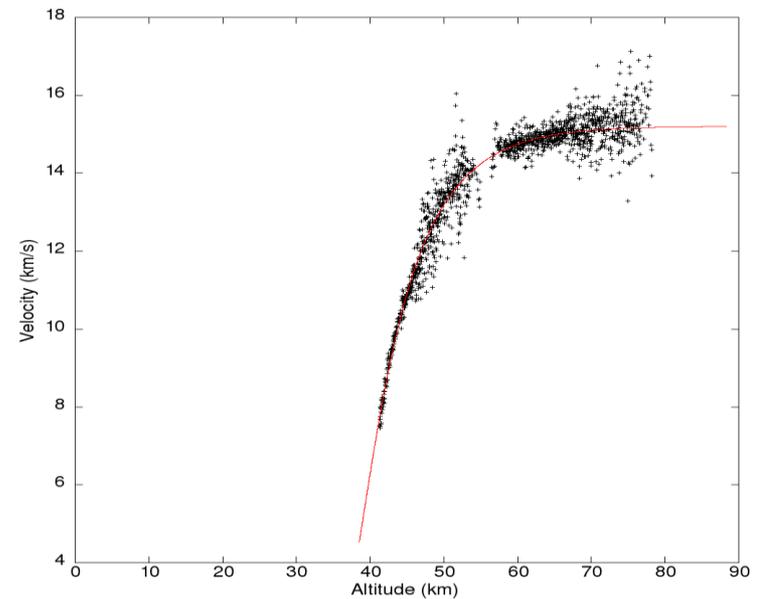
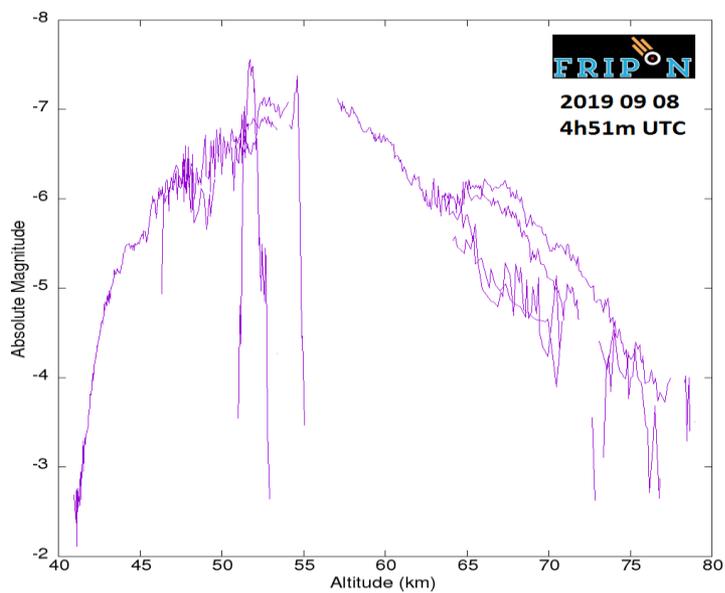
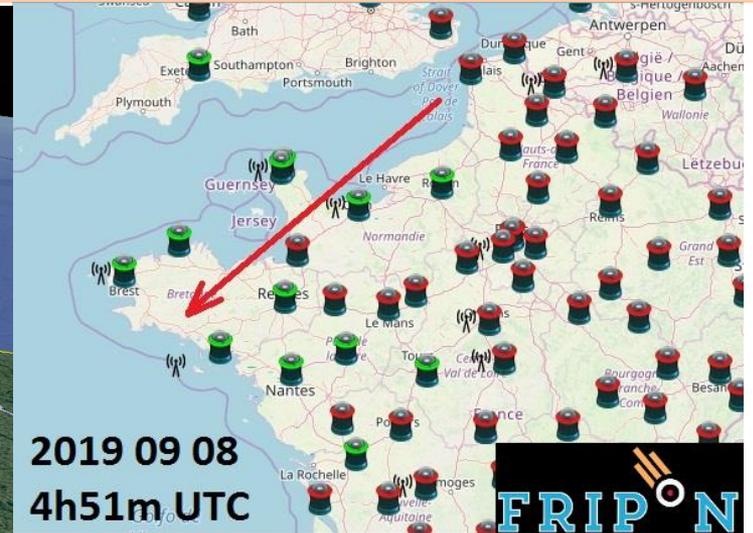
- FRIPON camera (France)
- Camera + radio
- To be installed/fixe
- PRISMA camera (Italy)
- MOROI camera (Romania)
- SCAMP camera (England)
- E-FRIPON camera (Europe NE)
- SPANISH Network (Spain)
- Québec
- GRAVES Radar



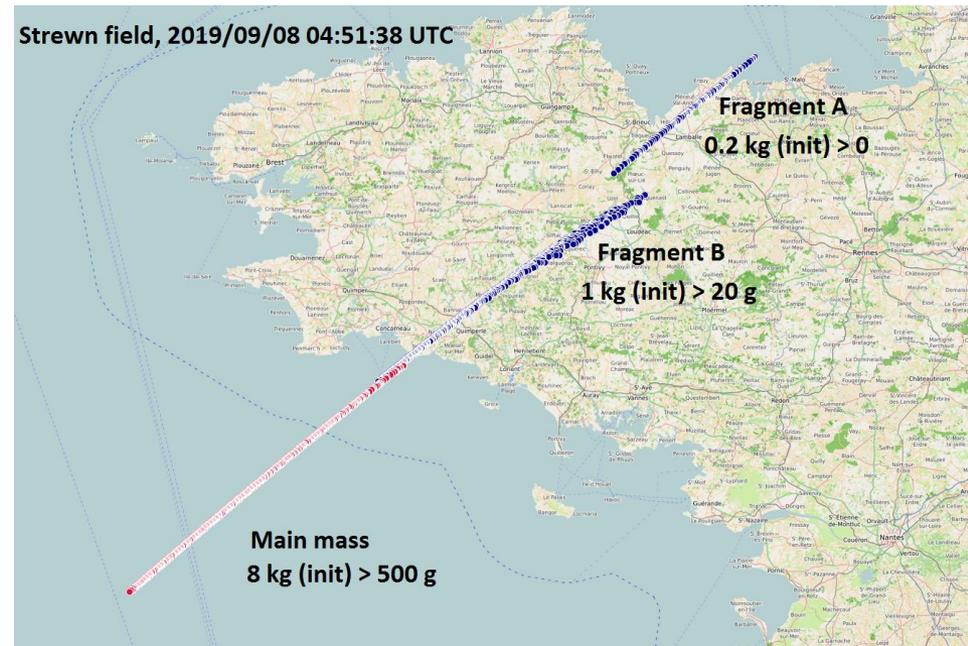
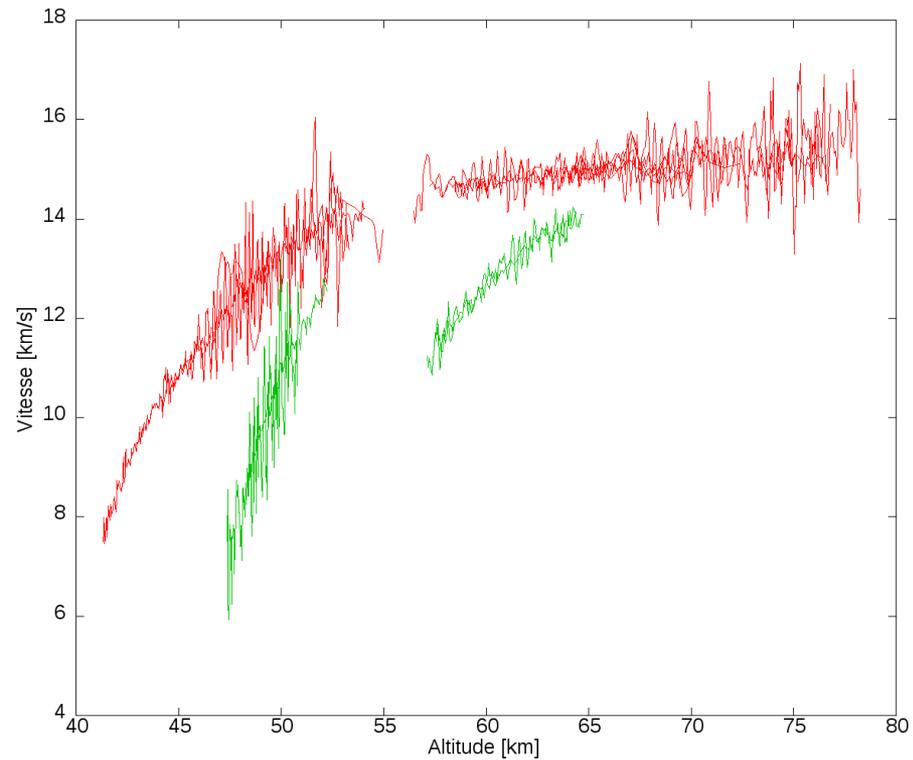
## Last big event, september 8th



## Last big event, september 8th



# Last big event, september 8th



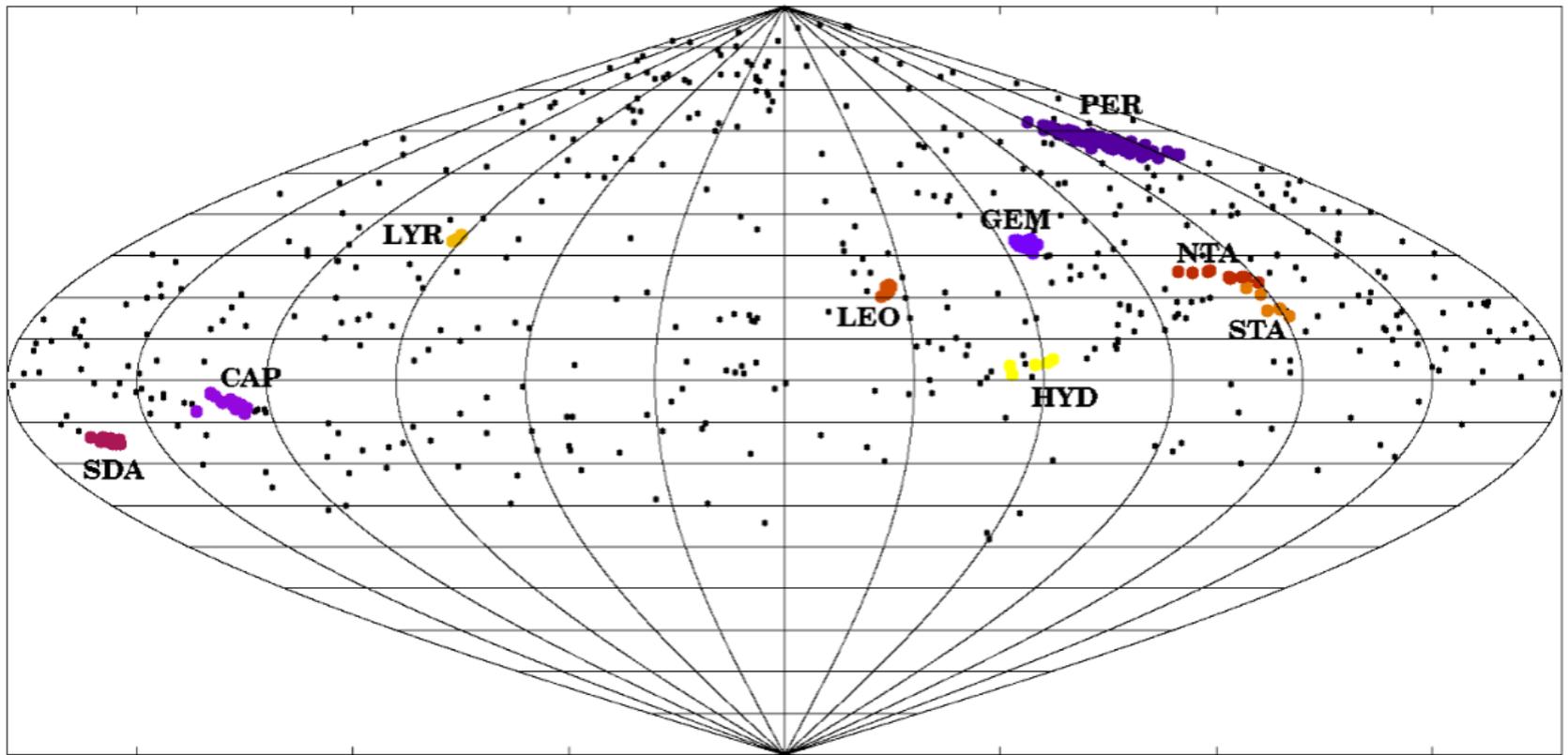
Trajectories (main mass and 2 fragments)

Dark flight and strewn field

Fripon => 1000 orbits / year

3 « big » events / year (final mass > 50 g)

Radian map of meteors detected by FRIPON in 2018 :



# Recovering météorites

Vigie iel

with

FRIP N!



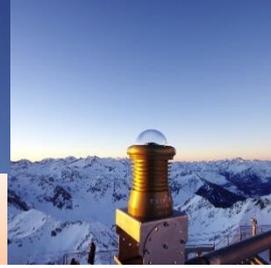
**MUSÉUM**  
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l'Observatoire *finace*  
de Paris



# The goals of VIGIE-CIEL

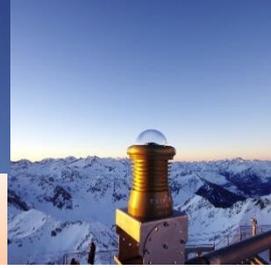
## Vigie-Ciel : citizen science program



- ⇒ Recovering freshly fallen meteorites
- ⇒ Make them be considered again as science objects (to keep/study)
- ⇒ Collect data to study the impact flow of extraterrestrial matter on Earth, involve the general public in several citizens programs (meteors, meteorites, impact craters)
- ⇒ Improve knowledge, including:
  - learn to recognize shooting stars, fireballs, meteorites and impact craters and their scientific interest
  - learn to report observations
  - and, for those who will go out in the field, learn to handle meteorites and know the legal aspects of the quest

# The goals of VIGIE-CIEL

## But also ...



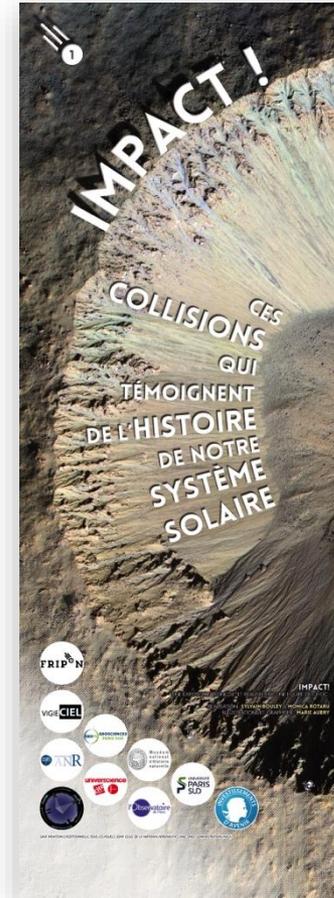
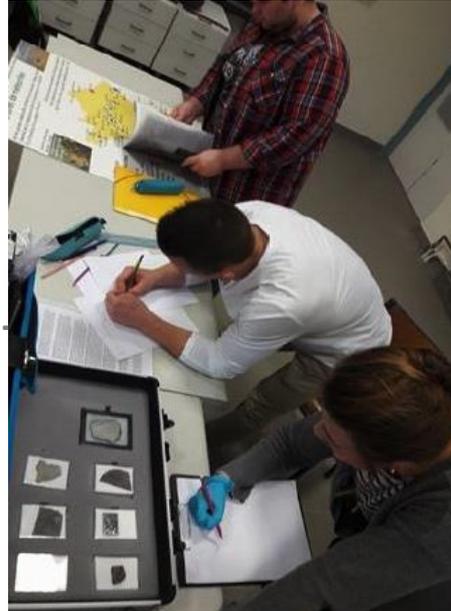
- ⇒ Build a strong human network that supports and relays the project
- ⇒ Have a wide diversity of partners
- ⇒ Promote interdisciplinarity
- ⇒ Involve various audiences in the research project to increase results
- ⇒ Facilitate communication with the general public and promote the network's visibility in the media

# VIGIE-CIEL – Tools and animations

## Educational kits

23 kits ( 4 suitcases each + educational booklet)

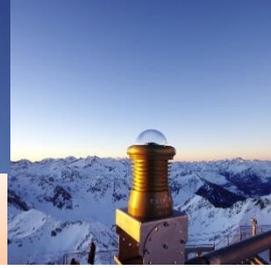
Objects: meteorites -  
impactites - terrestrial rocks -  
thin blades - card games -  
measuring equipment...



Posters to be printed

# VIGIE-CIEL : 3 PROTOCOLS

<https://www.vigie-ciel.org/>



**Fireballs**

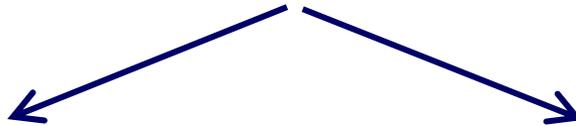


**Meteorites**



**Impact craters**

Sporadic phenomena



Transform an observation into a participation work with the AMS (American Meteoritical Society).

Mobilize and lead a community of actors likely to mobilize an operational local community in a short period of time.



Collaborative analysis of topographic images of the Earth to identify potential impact structures

# 1/ Fireballs

<https://vigie-ciel.imo.net/members/imo/>



[Report a Fireball](#)

[Events](#)

[Reports](#)

[Statistics](#)

[English](#) ▾



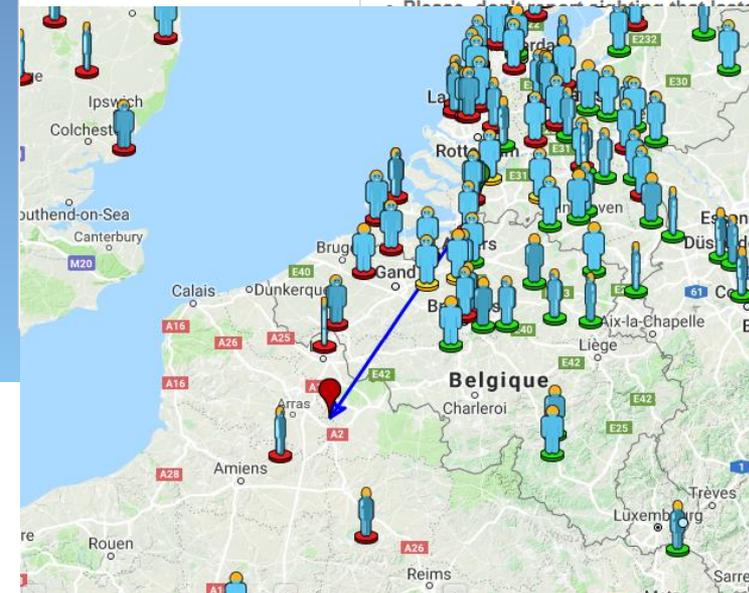
## Report a Fireball: it's fun and easy!

You saw something bright and fast? Like a huge shooting star? Report it: it may be a fireball.

We are going to ask you to fill an interactive form that is intended to be easy to fill out for anyone. Please, be as precise as you can. Your report is important, it alerts us to potentially scientifically significant events that occur, and contributes to the general database of knowledge about meteors. You will have the opportunity to give us all the details about your sighting experience at the end of the form.

Please do not report sightings that lasted **more than 30 seconds**: the vast majority of fireballs are only visible for few seconds. Seeing a fireball is extremely rare and often an once in a lifetime event. Do not report objects or lights crossing the sky going by 2 or 3: a fireball looks like a big shooting star.

click the Help links or try the [simplified version](#) of the form.

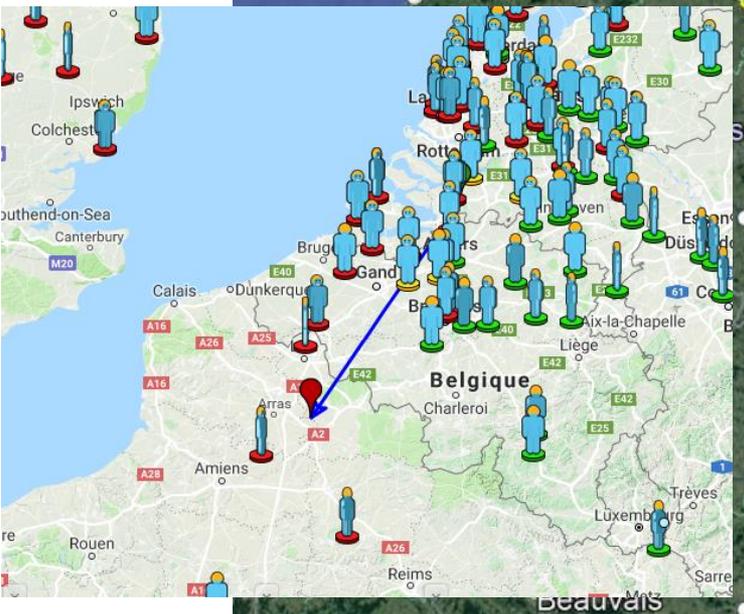


**OUVERT**

# Bolide 10 octobre 2018 à 21h17m TU



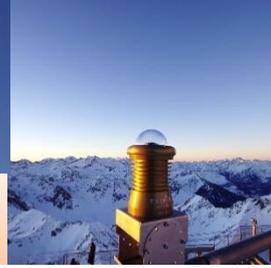
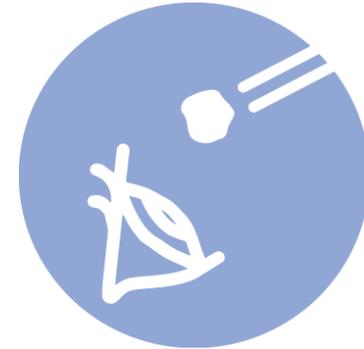
Vu par CAMS



# 1/ Fireballs

## Goals of Vigie-Ciel

- ⇒ Alert in case of an important event
- ⇒ Communicate with witnesses to explain the phenomenon
- ⇒ Characterize the fireball in addition to the cameras (color, sound...)
- ⇒ Mobilize the general public around the event



Plusieurs témoins du côté de l'Italie, n'hésitez ps à témoigner sur [vigie-ciel.imo.net](http://vigie-ciel.imo.net) pour aider à mieux caractériser le bolide ; on n'a rien du côté des caméras FRIPON, il faisait encore jour.



**Vigie-Ciel Signalez un bolide : c'est facile et amu...**  
Vous avez vu quelque chose de brillant et rapide dans le ciel ? Comme une très grosse étoile filante ? Partagez votre observation avec nous : c'est peut-être [vigie-ciel.imo.net](http://vigie-ciel.imo.net)

1 4 4

**Julien DRUET**  
@AstroGloomy

En réponse à @AsmaStein @VigieCiel  
**c'est fait à l'instant**

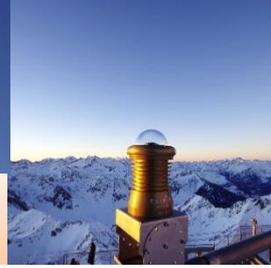
11:56 - 24 oct. 2018

3 J'aime

3

# 2/ Meteorite search

Fripon and Vigie-Ciel



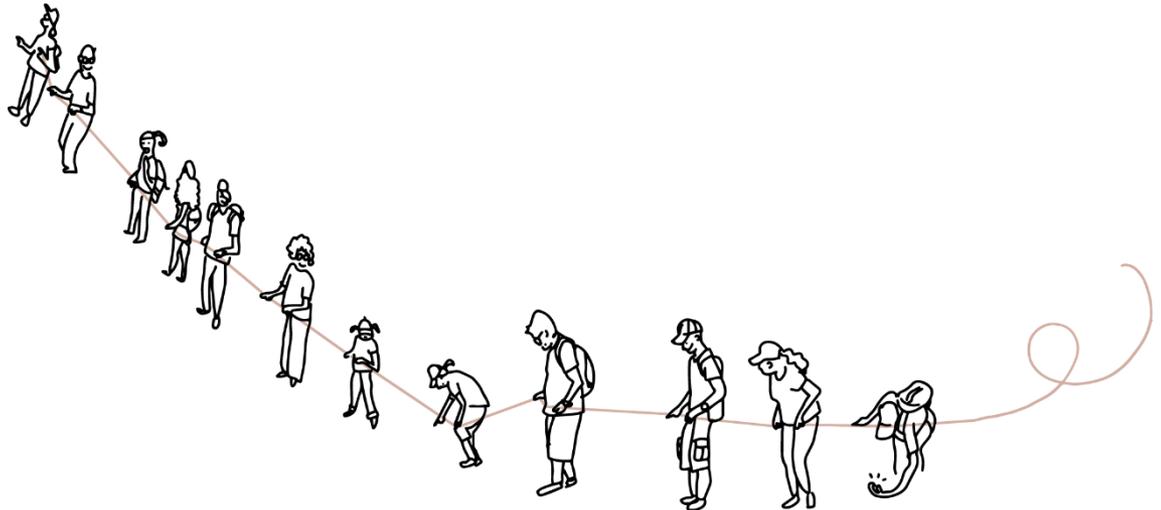
**Where are we ?**

**=> 3 test searches**

**=> A guide to good practices being developed based on initial experiences**

**=>Ongoing legislative work**

**=>Detection network and functional calculation procedure**

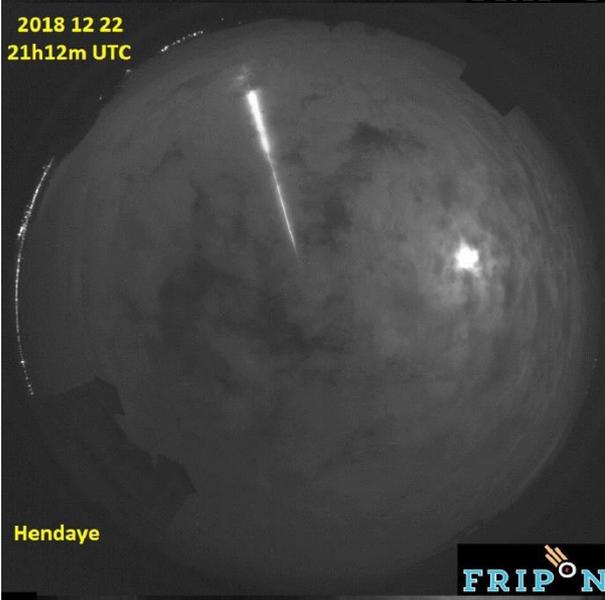
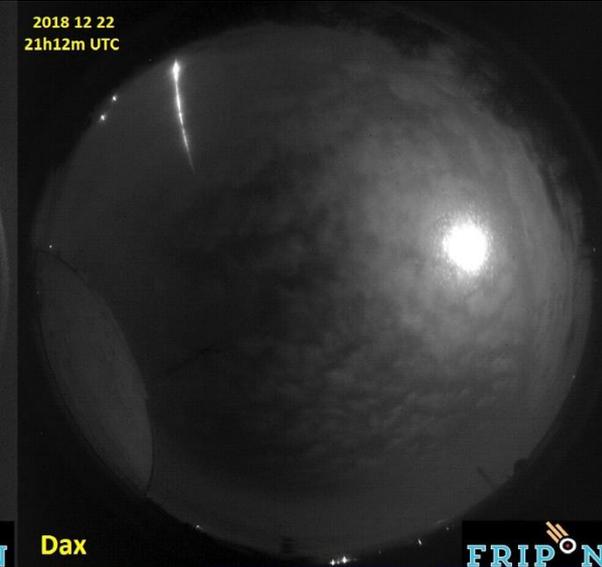
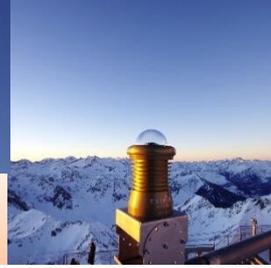


# 2/ Meteorite search

2018 december 22nd fall

21h12m TU

FRIP  N



# 2/ Meteorite search

## Flyer for public

¿CÓMO SABER  
SI HAS  
ENCONTRADO  
UN METEORITO?



Muchos testigos vieron un bólido (gran estrella fugaz) en el cielo del País Vasco y Navarra el 22 de diciembre de 2018.



El fenómeno luminoso

¿ Piensas que podrías ayudar a encontrar el meteorito que causó este fenómeno luminoso ?  
Sí, los cálculos indican que... i habría caído en La Rioja !



Mapa de testimonios



Si se encuentra en esta región, nuestros equipos pueden contactarlo para buscarlo.

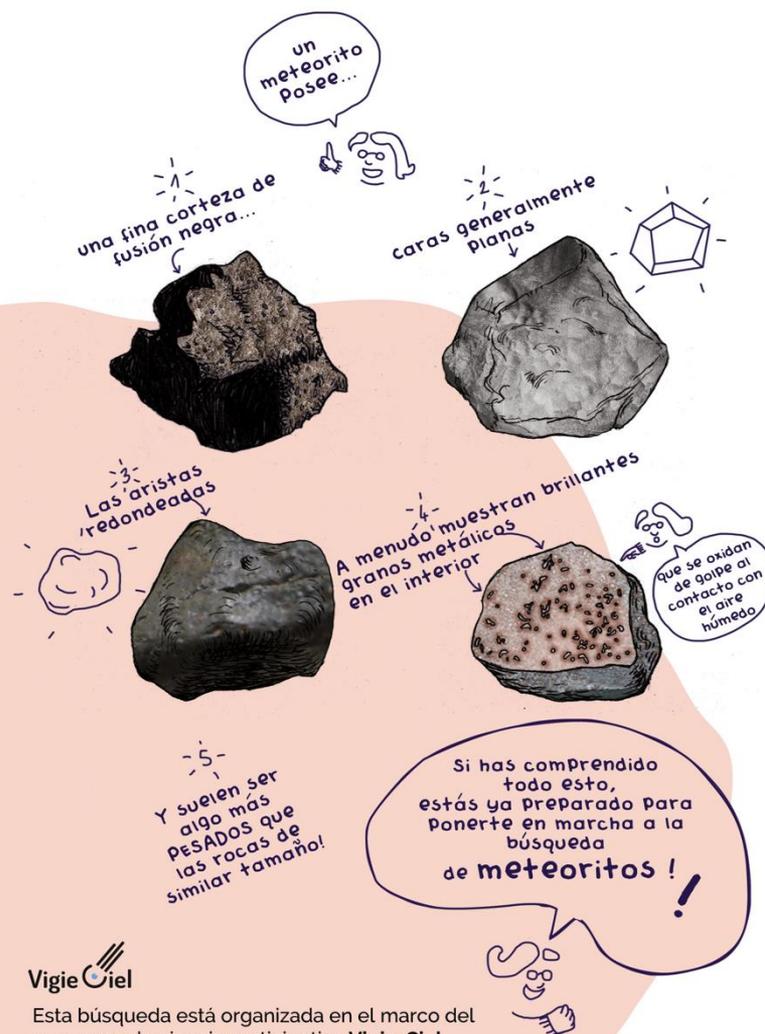
Si ha encontrado una roca que parece un meteorito, contáctenos.

contacto

Instituto de Ciencias del Espacio (CSIC) - Red SPMN,  
Josep Trigo Rodríguez : trigo@ice.csic.es / www.spmn.uji.es o  
Vigie-Ciel en Facebook /vigie-ciel.org



Vigie Ciel FRIP N

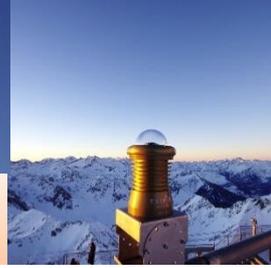


Vigie Ciel

Esta búsqueda está organizada en el marco del programa de ciencia participativa **Vigie-Ciel** con la cooperación de la **Red SPMN**.

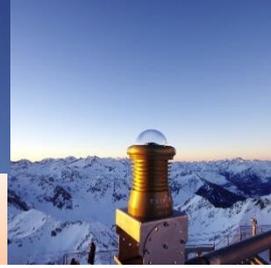
## 2/ Meteorite search

Search with local people (Logroño and Saragossa universities)



# 3/ Identification of impact craters

<http://www.vigie-crateres.org/>



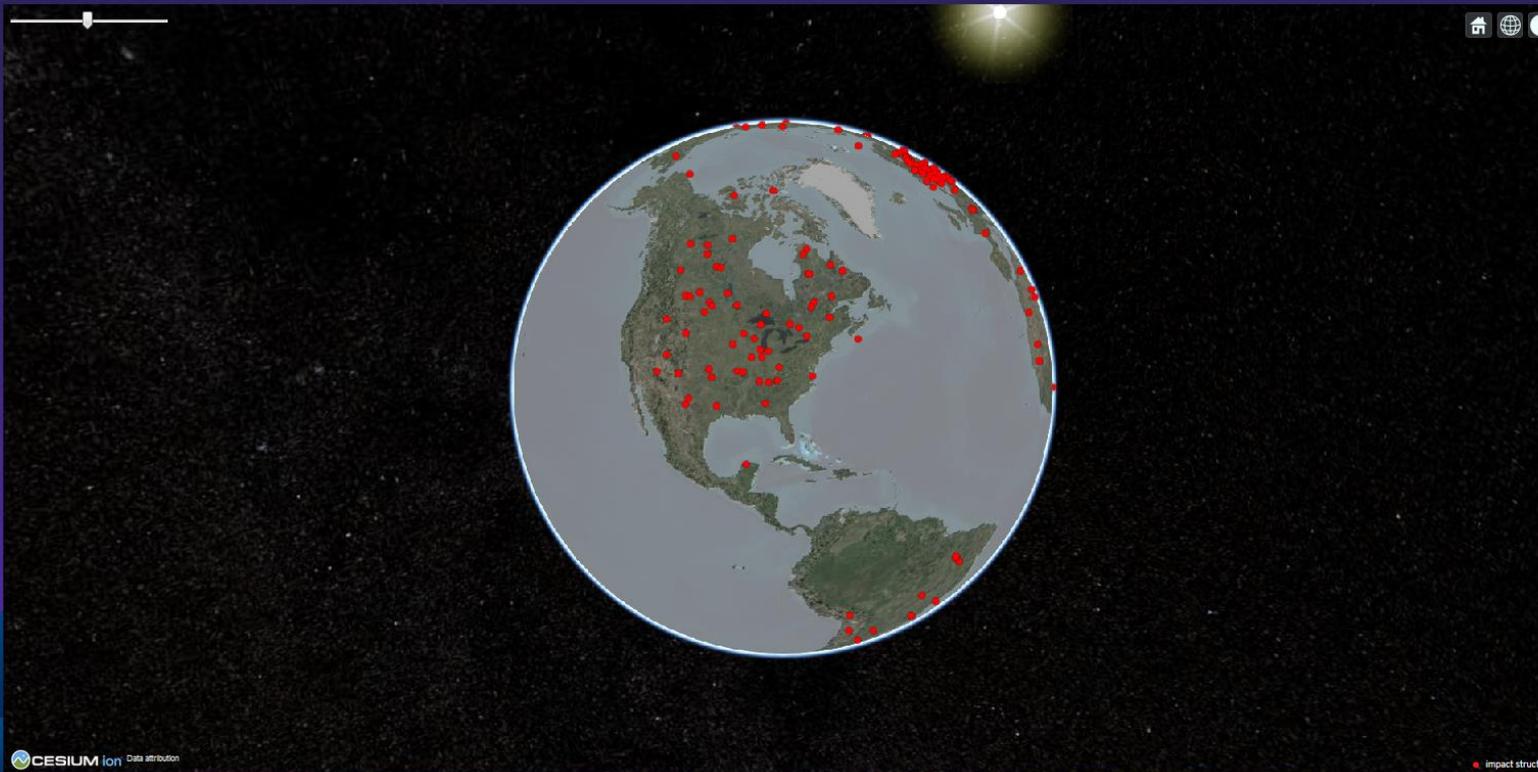
## Vigie Cratère

WHAT IS VIGIE-CRATÈRE?

LOOK FOR NEW IMPACT STRUCTURES

LEARN MORE ABOUT CRATERS

CONTACT US



CESIUM Ion Data attribution

Impact structure

Discover potential impact structures by exploring and zooming in on the virtual globe

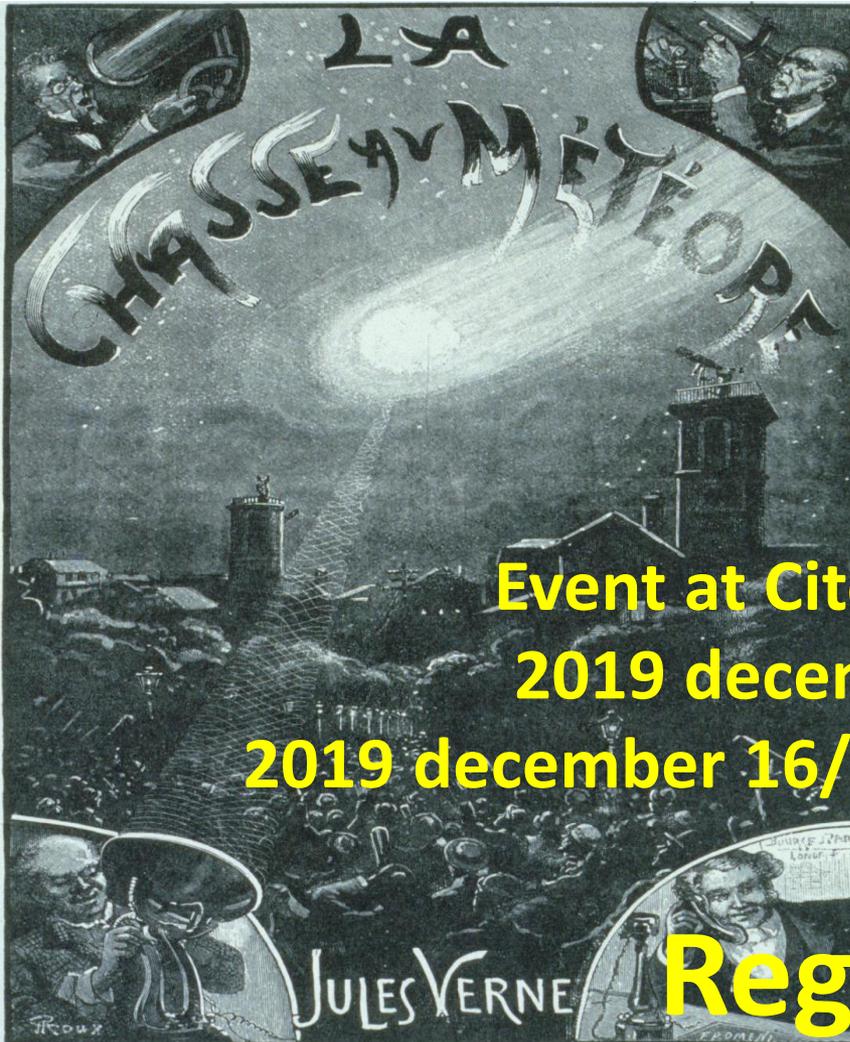
TODAY

18/11/2019

1323 detected structures  
1% explored area

Votes

2018 02 24  
0h11m UTC



Event at Cité des Sciences (PARIS)

2019 december 14/15 for public

2019 december 16/17 FRIPON-VigieCiel networks

**Register Now**

*[Asma.steinhausser@mnhn.fr](mailto:Asma.steinhausser@mnhn.fr)*

Vigie  Ciel

FRIPON 

Vigie  Cratère

<https://www.vigie-ciel.org/>

<http://www.vigie-cratere.org/>