The FRIPON network
(Fireball Recovery and Interplanetary Observation Network)

F. COLAS
B. ZANDA
S. BOULEY
J. VAUBAILLON
P. VERNAZZA
J. GATTACCECA
M. BIRLAN
C. MARMO
Y. AUDUREAU
M.K. KWONG

And the FRIPON team

Solar System

Orgueil, 1864

IMC - GIRON 2014
Connexion asteroid / meteorites

Geology

Iron
Pallasite
Achondrite

Astronomy

Orbit inclination (°)

Heliocentric distance (AU)

Hungaria  Main belt  Cybele  Hilda
Inner  Mid  Outer

Trojan
2008 TC3

Good dynamic data for the first time
We know only a few meteorites orbits.
Dynamic studies need data (700 000 astéroïds!!)

- Families are the result of impacts

Diagram semi axis/ excentricity
The discovery of exo planet change our view on The solar system formation
Study asteroids / meteorites = study all the solar system
The same problem viewed from two different points!

2012 DA14 La Sagra (Spain)  15 Feb 2013

Tchelyabinsk (Russia)  15 Feb 2013 ...
Impacts seen over France

XIXᵉʳᵉ siècle : 45 météorites
XXᵉʳᵉ siècle : 9 météorites
Bolide detection

Fish eye detector, also to compute orbits
Bolide march 7 2014  FRIPON – Pic du Midi

“J.M. Trigo (SPMN)
GRAVES RADAR

Fig: 3. Illustration of the principle of the GRAVES radar

143 MHz
Head echo as seen by GRAVES

Moreover, object like Chelyabinsk of 2014 RC (Tonight!!!) can be observed
Orbit and trajectory

100 fish eye cameras and 25 radio receptors
Fireball September 7th 4h56 UTC
Le réseau FRIPON

100 stations avec caméras

24 pôles régionaux

→ Laboratoires Astro/Sciences de la Terre/Université

75 pôle locaux

→ Observatoires amateurs, musées et sites naturels, CCSTI, Etablissements scolaires, Planétariums

IMCCE / Observatoire de Paris

→ Détermination des trajectoires/Expertise technique

LMCM / MNHN

→ Recherche des météorites/Science participative

GEOPS / OSUPS:

→ Gestion des données et du réseau humain

CEREGE - LAM / OSU Pytheas

→ Caractérisation des météorites/Régions source
Science with FRIPON

Orbits

→ Determination of hundreds of orbits (with or without meteorites on the ground) and source regions
→ Determination of parent bodies (comets / asteroids)
→ Spectral spectral type meteorite / asteroid-type connection
→ Atmosphere Interaction / meteoroid - fragmentation

Meteorites

→ Characterization of the meteorite by the MNHN and providing samples to partner teams
→ Determination of the transfer time to the Earth (Exposure to cosmic rays)
Study of Oxygen isotopes (parent bodies)
→ Paleomagnetism of meteorites - primitive magnetic field in the solar system
Origin of rare meteorites (CO CM / Comets?)
FRIPON Facts

Hardware

→ Digital camera (Mega pixel) 30fps
→ Alimentation Power Over Ethernet (one cable, 50 m)
→ 0.015 ms exposure time => daytime observation
→ Passive cooling
→ PC, fanless i3 / i5

Software

→ Open source
→ Driver for many cameras (genicam, …)
→ Orbit computation
→ Strewnfield determination

Network

→ Top - Down
→ Density / area
→ Amateurs at every level (soft, observations...) 
→ Number, variety and geographical distribution of participants