

FRIPON network



Jean-L. RAULT

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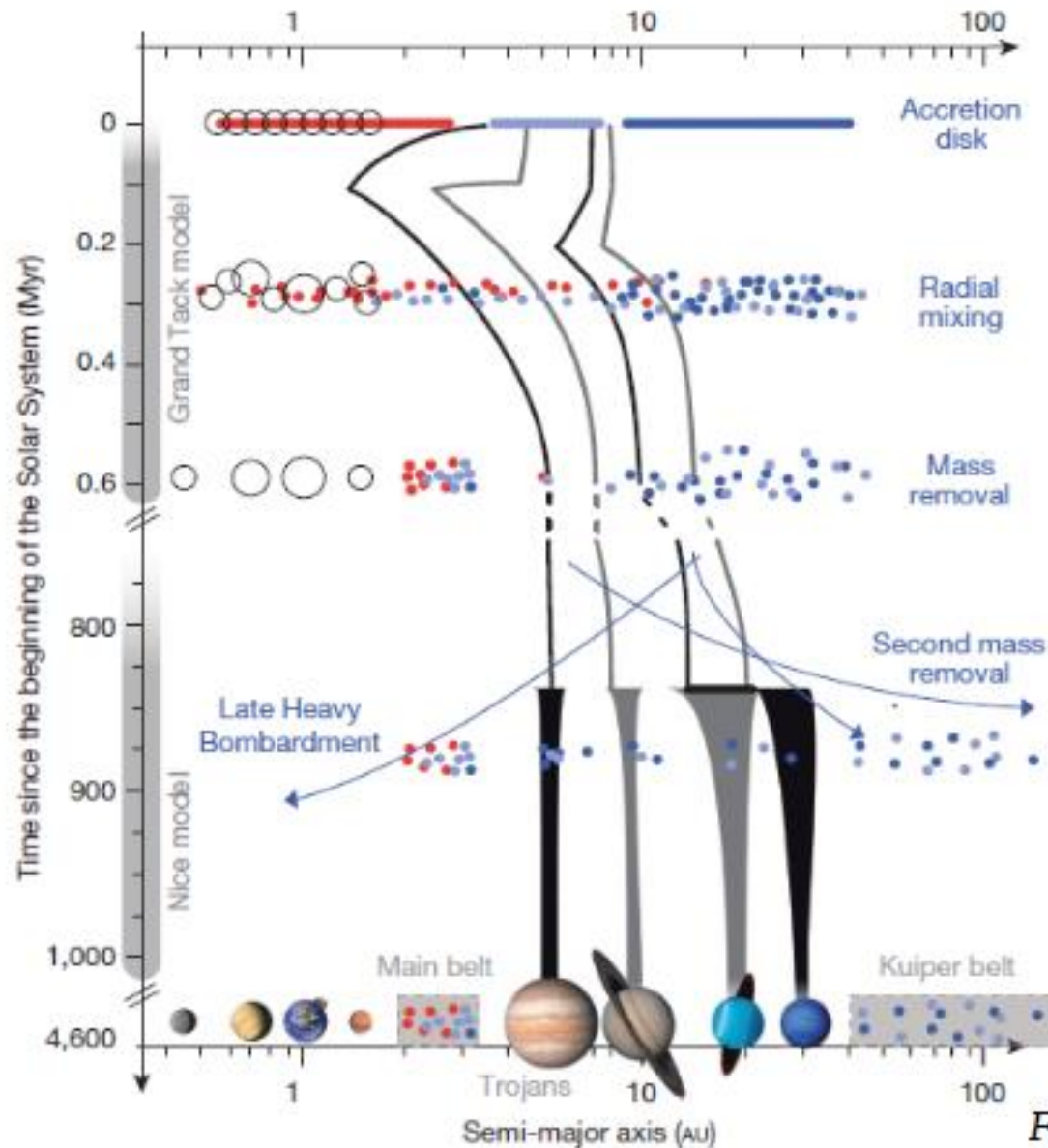


Mira, Grimbergen, 5 april 2014



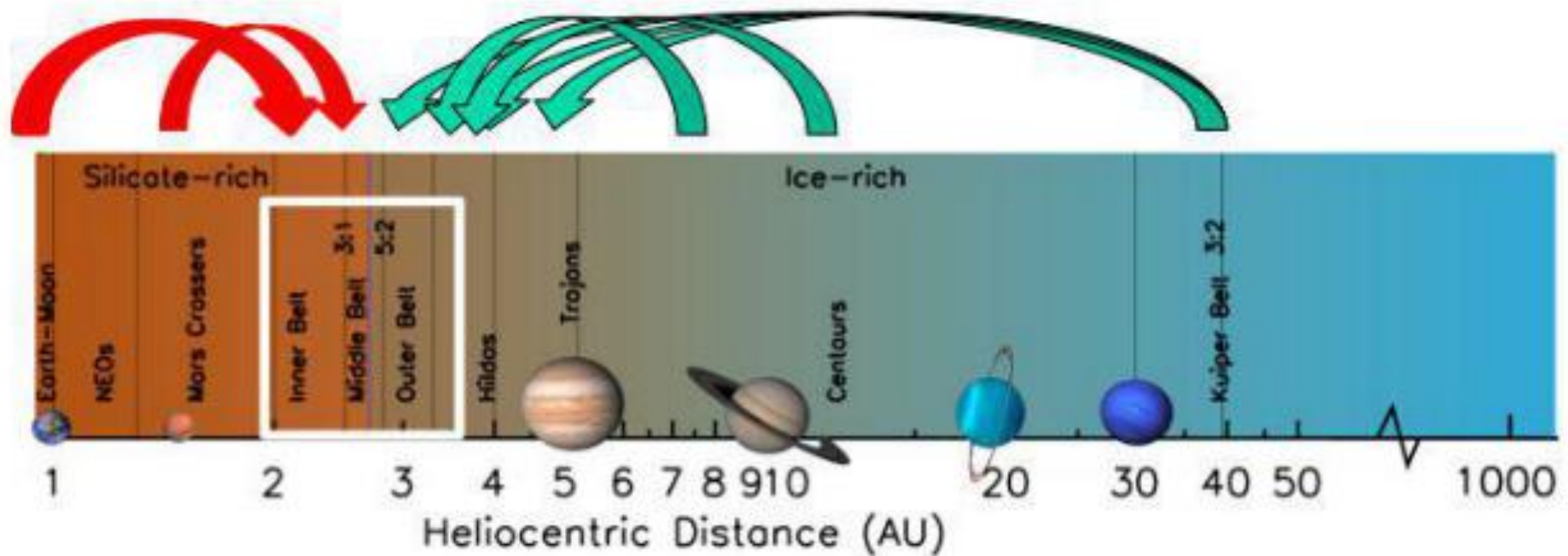
<http://ceres.geol.u-psud.fr/fripon/?lang=en>

Where do the meteorites come from ?



F. DeMeo, B. Carry

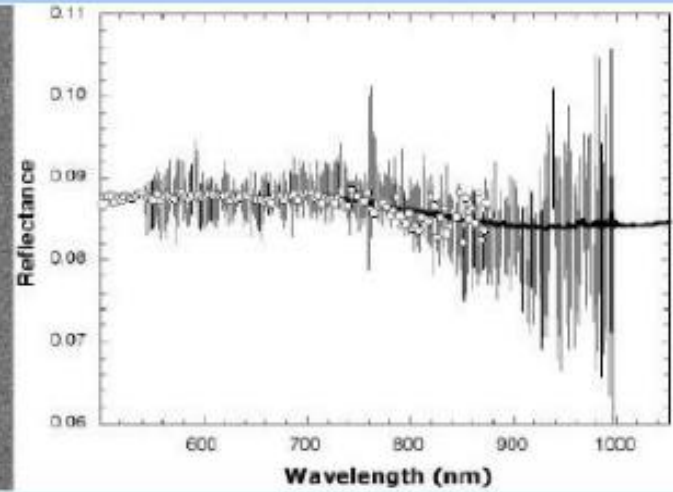
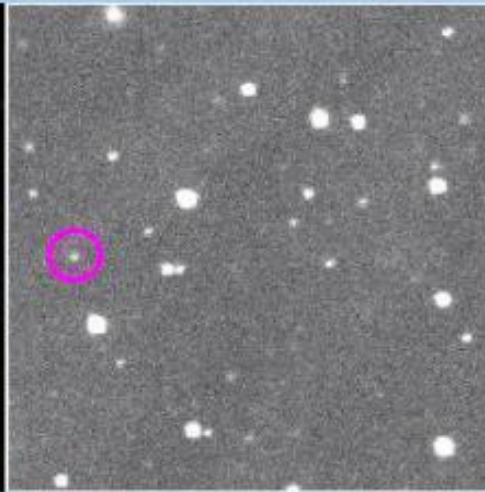
Sampling the main belt means sampling the full solar system



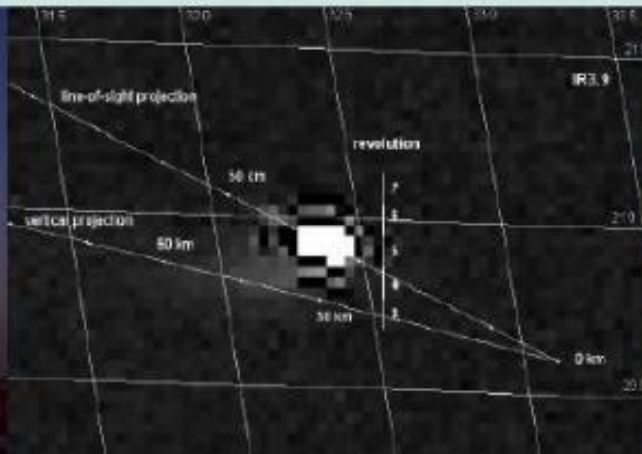
F. DeMeo

A school case ...

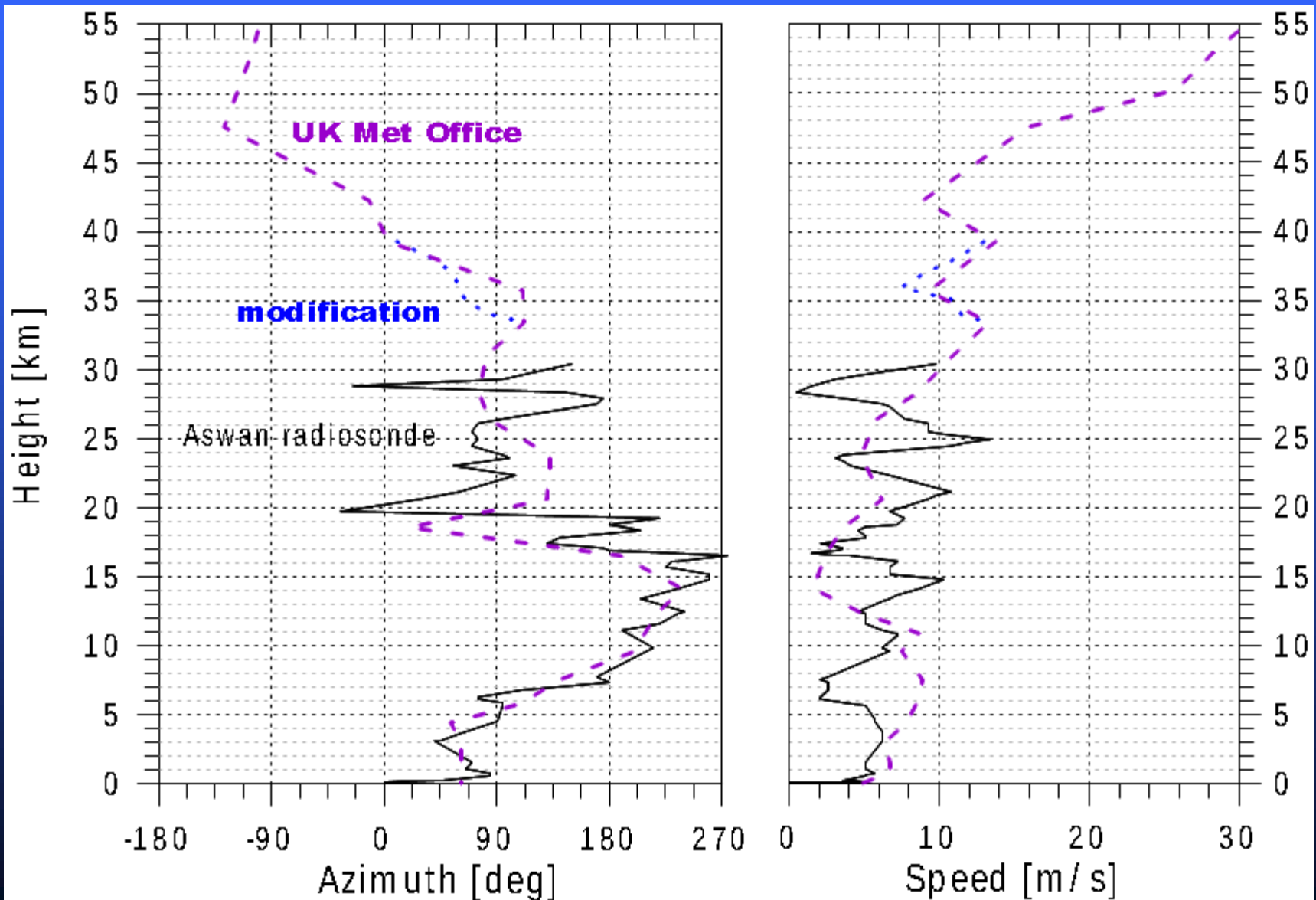
2008 TC3



Almahata Sitta



Accurate wind profiles are mandatory to assess the dark flight





XIXème siècle

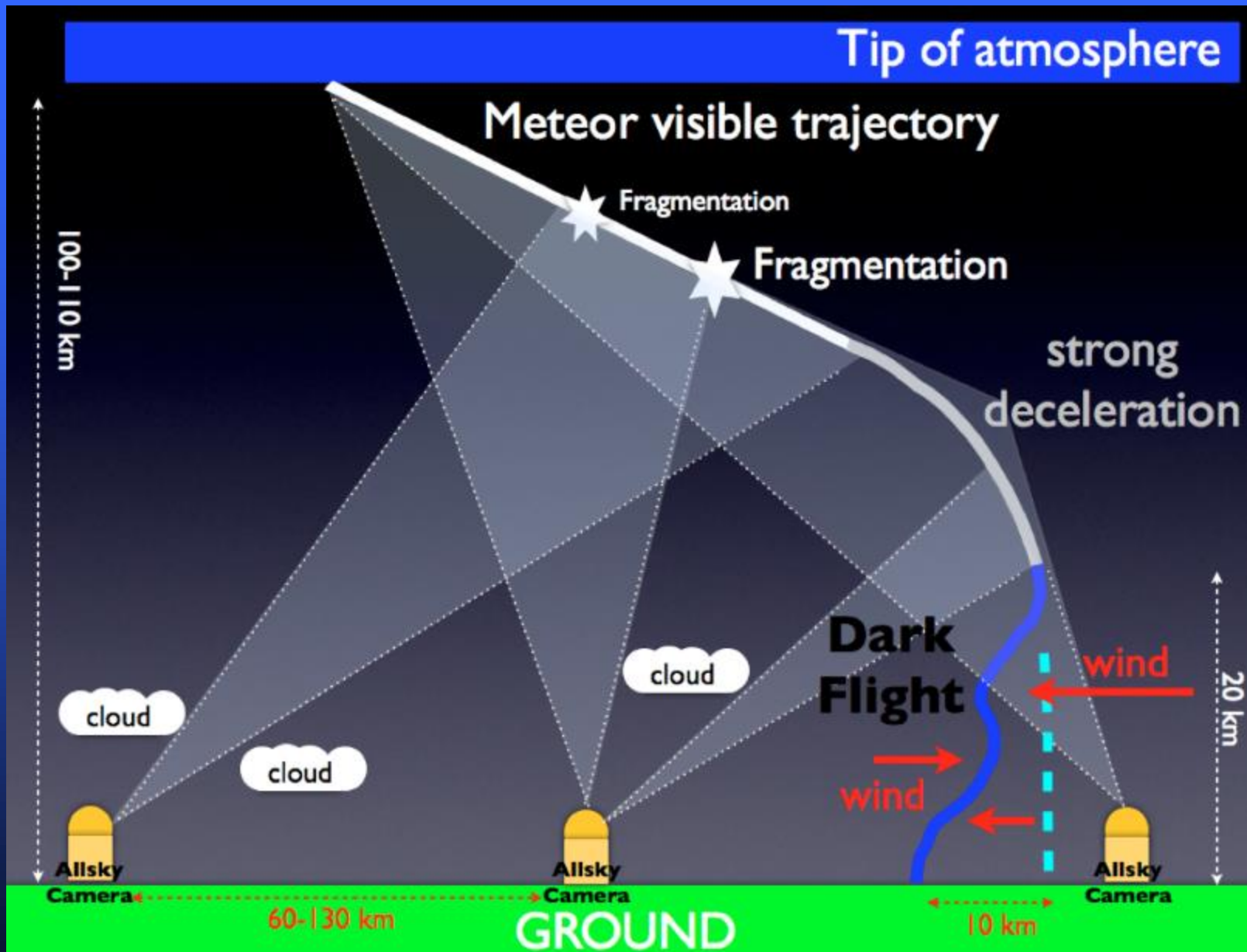


XXème siècle

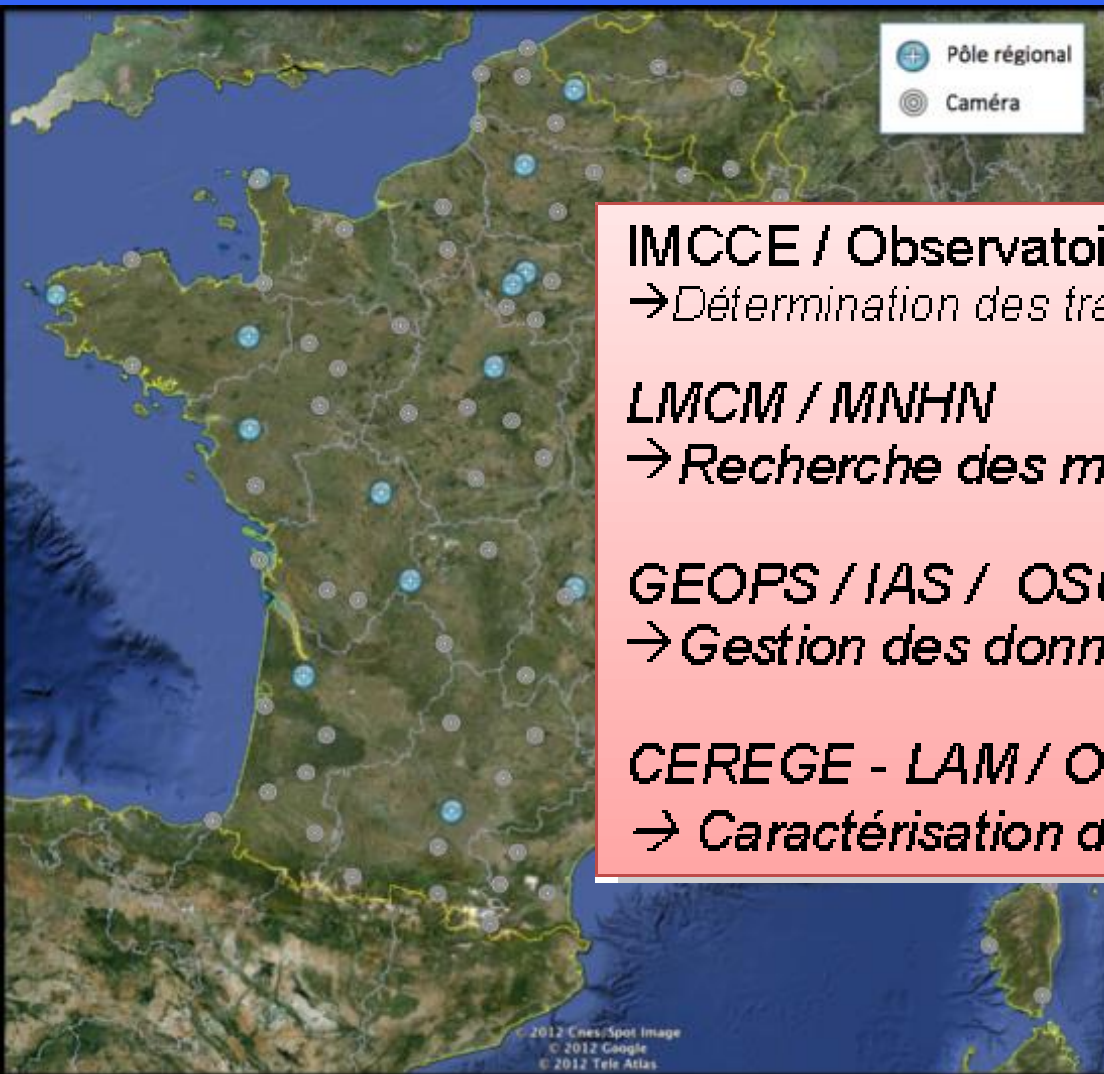


XIXth century: 52 meteorites found on the ground in France

XXth century: only 12 !



The FRIPON network: 100 fisheye cameras and 10 to 20 radios (49 and 143 MHz)



IMCCE / Observatoire de Paris

→ *Détermination des trajectoires/Expertise technique*

LMCM / MNHN

→ *Recherche des météorites/ Science participative*

GEOPS / IAS / OSUPS:

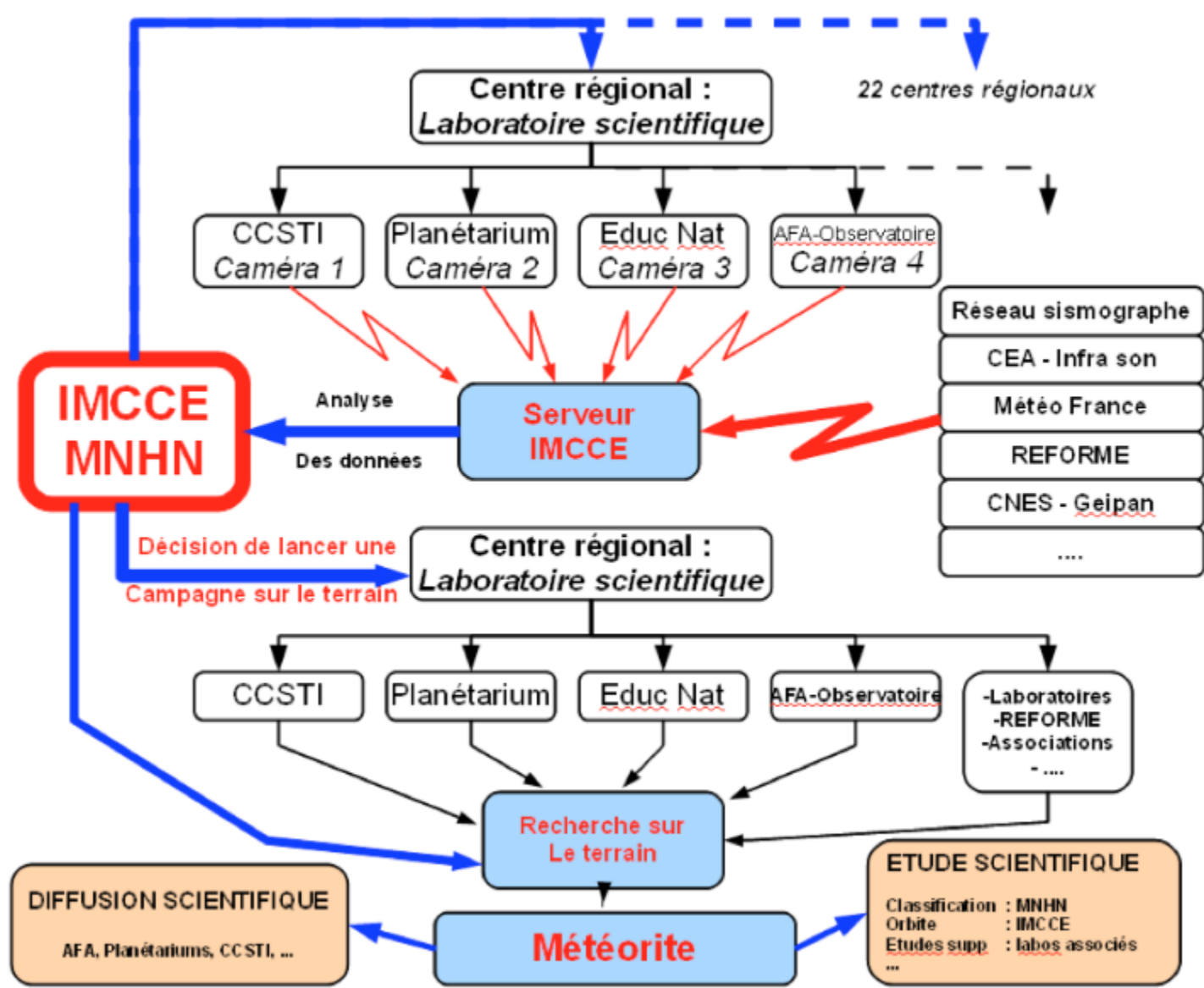
→ *Gestion des données et du réseau humain*

CEREGE - LAM / OSU Pytheas

→ *Caractérisation des météorites/ Régions source*

FRIPON camera prototype





Orbits study:

- **Hundreds of orbits computation**
- **Parent bodies determination**
- **Relationship between meteors and asteroids spectral types**
- **Atmosphere/meteoroids interactions**

Meteorites study:

- **Chemical analysis**
- **Transfer time to Earth (thanks to cosmic rays exposure duration)**
- **Oxygen isotopes**
- **Paleomagnetism**
- **Origin of rare meteorites**

Time & money

- **FRIPON programme financed by ANR (Agence Nationale de la Recherche) and VIGIE-CIEL by ANRU (Agence Nationale de la Rénovation Urbaine)**



- **Network installation : 2014 to 2015**
- **First meteorites hoped in 2015**

Pic du Midi FRIPON camera 7 march 2014



A few words about FRIPON radio



FUNCube Dongle Pro+ from AMSAT-UK

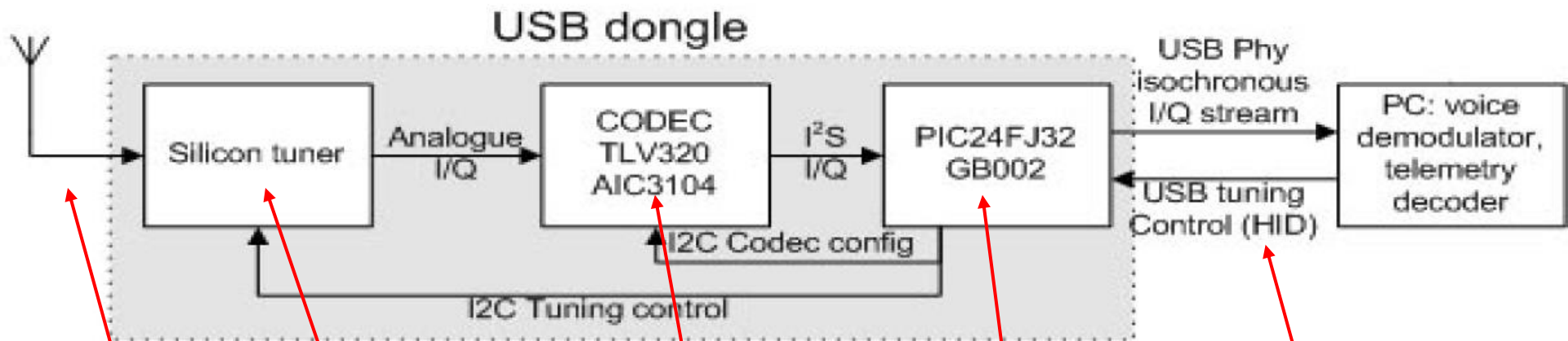
**4 el. 144 MHz and 5 el. 50 MHz Yagi beams
will be used**



**Reception chain tests during GEM 2013 at
Observatoire de Haute Provence**



Simultaneous VHF and ELF/VLF records at OHP



Low Noise Amplifier + SAW filters + LC ? filters bank

E4000 Low power CMOS multiband tuner

TLV320 used as Analogue Digital Converter

PIC 24FJ32 Controller

USB link to computer

Weight, size and interfaces

- 14 grammes
- 86 x 23 x 14 mm
- Antenna input: 50 Ω SMA connector
- Output: USB2 connector



Performances

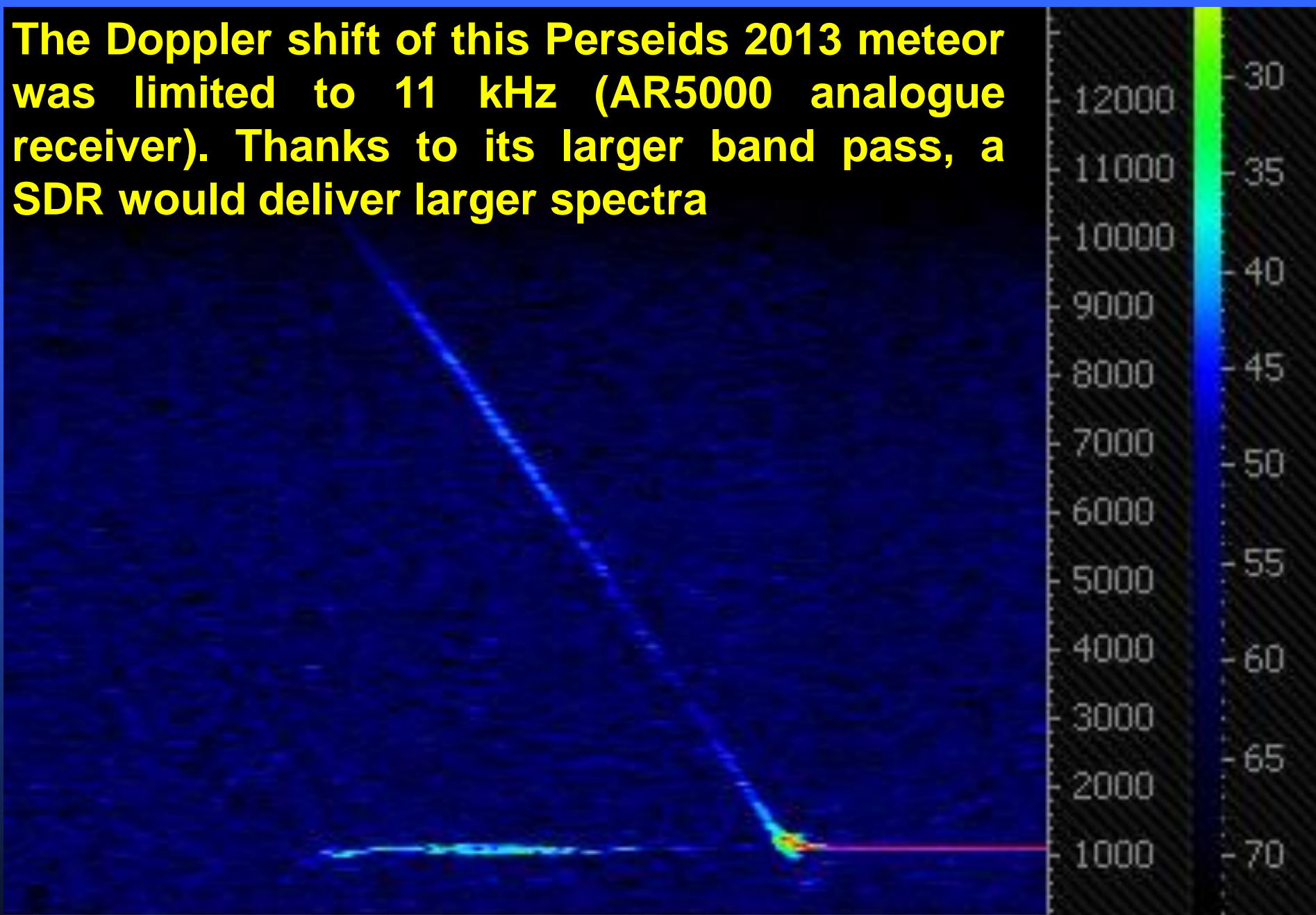
- **IP₃ (third-order intercept point): 30 dBm**
- **TCXO: 0.5 · 10⁻⁶ (frequency offset adjustable by software)**
- **Sample rate: up to 192 kHz (□ 192 kHz large band reception)**
- **16 bits ADC resolution**

First light on meteors

The screenshot displays the SDR# v1.0.0.1000 interface with the FUNcube Dongle Pro+ selected. The main window shows a spectrum plot with a prominent signal at 49.970 MHz. The SDR# interface includes controls for Radio (NFM, AM, LSB, USB, WFM, DSB, CW-L, CW-U), Frequency (49 969 060), Center (49 965 000), Filter type (Hamming), Filter bandwidth (5000), Filter order (400), Squelch, CW Shift (911), Step size (100 Hz), Correct IQ, Swap I & Q, FM Stereo, and Mark Peaks. The Audio section includes AF Gain, Samplerate (192000), Input, Output, Latency (100 ms), and AGC settings (Use AGC, Use Hang, Threshold -100 dB, Decay 100 ms). The Spectrum Lab V2.79 b04 window shows a waterfall plot with a cursor at 1.143364 kHz, -70.819 dB, and 09:23:46.3. The Windows Task Manager window shows system resources: UC utilisée (16%), Mémoire (1,56 Go), Mémoire physique (Mo) (Totale: 3581, En mémoire cache: 1859, Disponible: 1981, Libre: 160), and Système (Handles: 29194, Threads: 861, Processus: 66, En activité: 0:10:26:44, Valider (Mo): 1671 / 7162). The taskbar shows the system clock at 09:32 on 20/07/2013.

Meteor pings from BRAMS beacon received near Paris on 49.970 MHz with FCD and a 5 elements Yagi beam

The Doppler shift of this Perseids 2013 meteor was limited to 11 kHz (AR5000 analogue receiver). Thanks to its larger band pass, a SDR would deliver larger spectra



Savage Chickens

by Doug Savage

