

FRIPIPE: the FRIPON pipeline

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Outline

- Reminders
- Update since May 2016: compatibility, photometry, Dark Flight, Algorithms, Validation - Fakeor
- Recommendations to partners
- TODO

Radio
(see Simon Jeanne's talk)

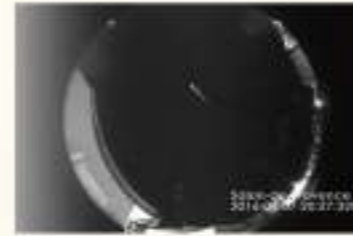
FREETURE : AUTOMATIC METEOR DETECTION

Open source C/C++
Software (Github)

Automatic detection

Reliable false detection
rejection criterias

Automatic gain/exposure
adjustment



X,Y POSITION OF THE METEOR

AFM : ATMOSPHERIC ENTRY SIMULATION

Developed in FORTRAN

Desintegration model
in the atmosphere
(Borovicka 2007)

Trajectory and velocity
computation



2D - POSITION, VELOCITY, MASS LOSS
OF THE METEOR

SEXTRACTOR

Open source C
Software (astromatic.net)

Extracts sources from
FITS images

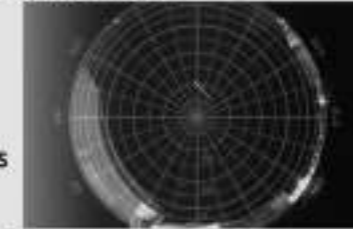
X,Y POSITION OF OBSERVED STARS

SCAMP : AUTOMATIC ASTROMETRY COMPUTATION

Open source C
Software
(astromatic.net)

Reads SExtractor files

Configurable
automatic computation
of astrometric solution



RA, DEC / AZ, EL. POSITION OF THE METEOR

FAKEOR

Developped in Python

NAIF SPICE Toolkit for C
°Standard SPK, PCK
kernel

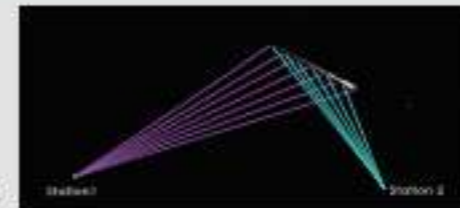
Converts 2D - position
units into 3D and mass
loss into magnitude.

TRAJECTORY COMPUTATION

Developed in Python

Borovicka et al. (2007) optimisation method

Future work A.Egal et al. 2016



RADIANT, DATE, VELOCITY

LAST KNOWN POSTION, VELOCITY

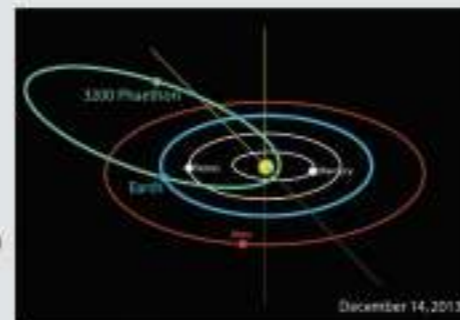


ORBIT COMPUTATION

Developed in Python

NAIF SPICE Toolkit for C
°Standard SPK, PCK
kernel

°Spiceypy C to Python
wrapper



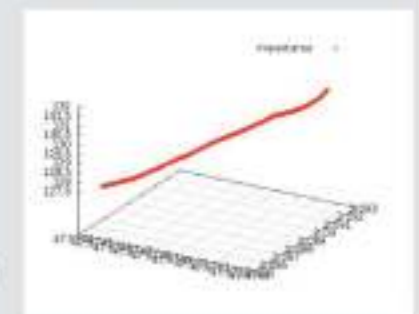
DARK FLIGHT COMPUTATION

Developed in Python

ODEINT Scipy
numerical integrator :

°Meteo France public
meteorological data

°IGN public ground data



Reminders (2)

- FRIPON Pipeline: Fripipe
- python (Astropy, spiceypy) ; ~11500 lines (May 2017) ; object oriented
- Numerical integration of meteoroid disintegration (Fakeors) in F90 ; ~13000 lines (May 2017)
- eventually: open source

Update since May 2016 (1)

- All python organisation scripts + Data organisation change: **done**
- (User) computation of multiple camera event: **done**
- Threshold to trigger Dark Flight computation (40km altitude): **done**
- Summary of each event: **done (might change)**

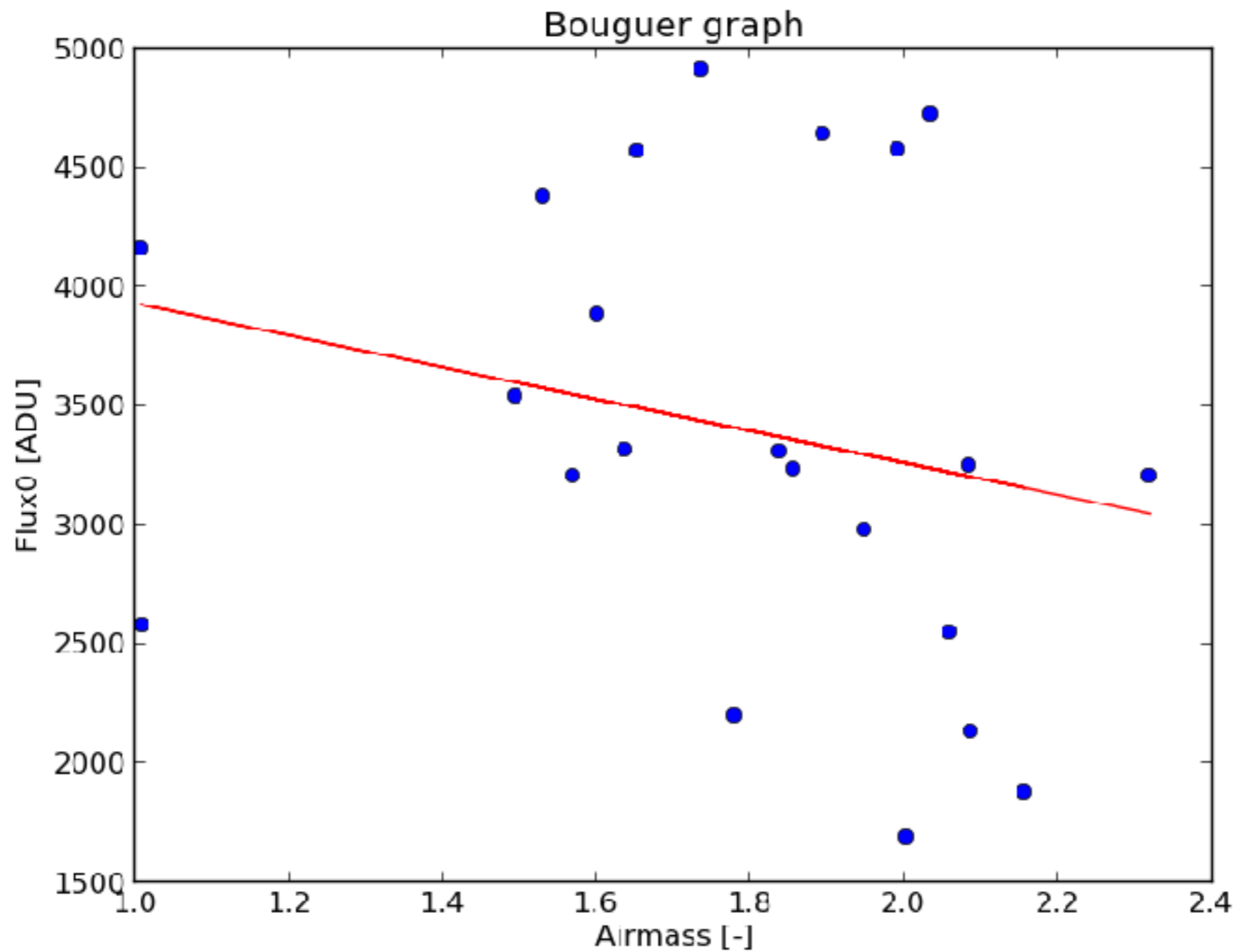
Update since May 2016 (2)

- Compatible with UFOAnalyzer data (widely used in amateur community ; REFORME): **done**
- Dark Flight: debugs+reorganisation (object oriented programming): **done**
- MeteoFrance wind data access and ingestion generalisation: **done** (txt or grib2 - to come)
- IGN data => strewn field topography ; **done**
- Estimate of strewn field =f(mass) & output in kml file: **done**

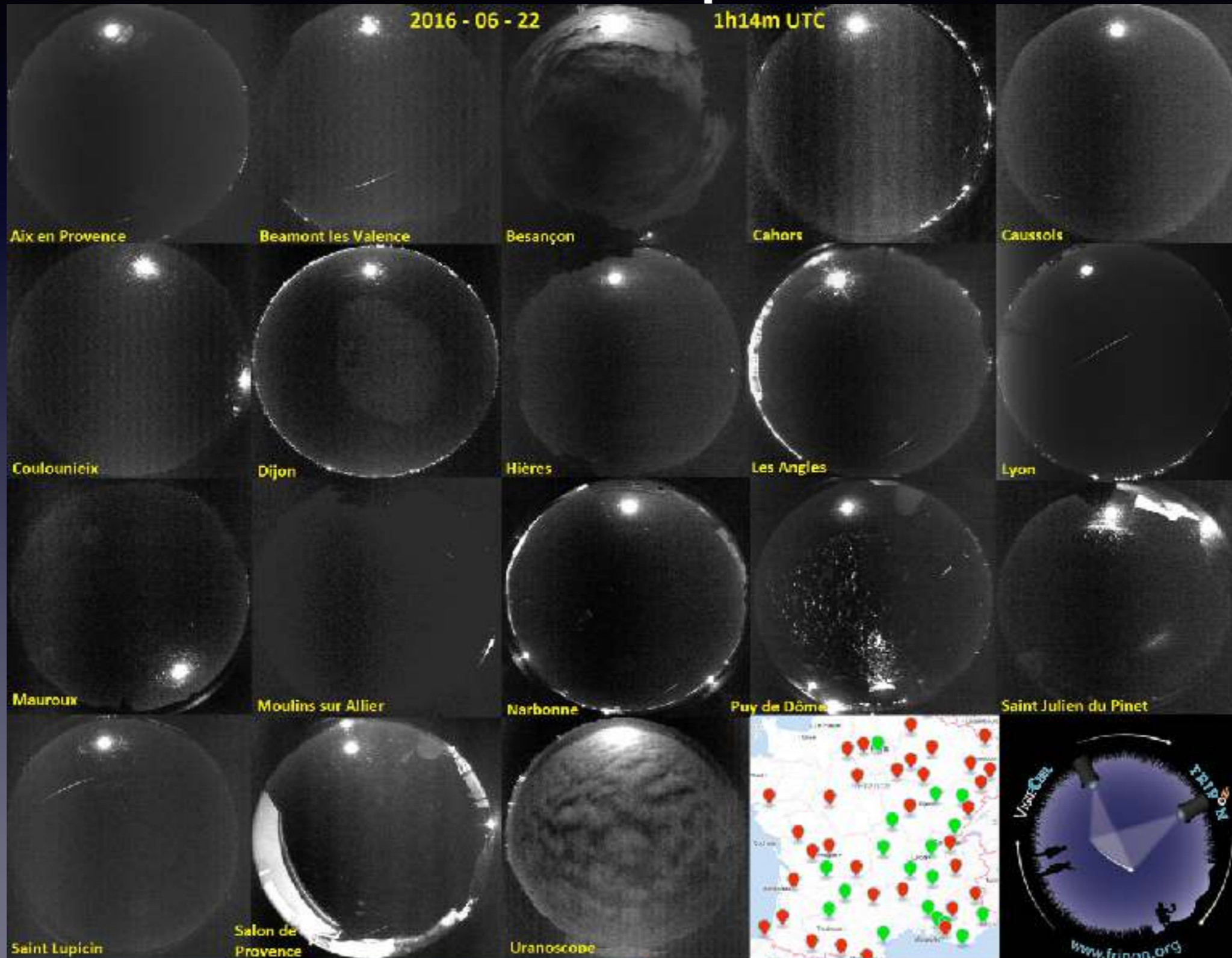
Update since May 2016 (3)

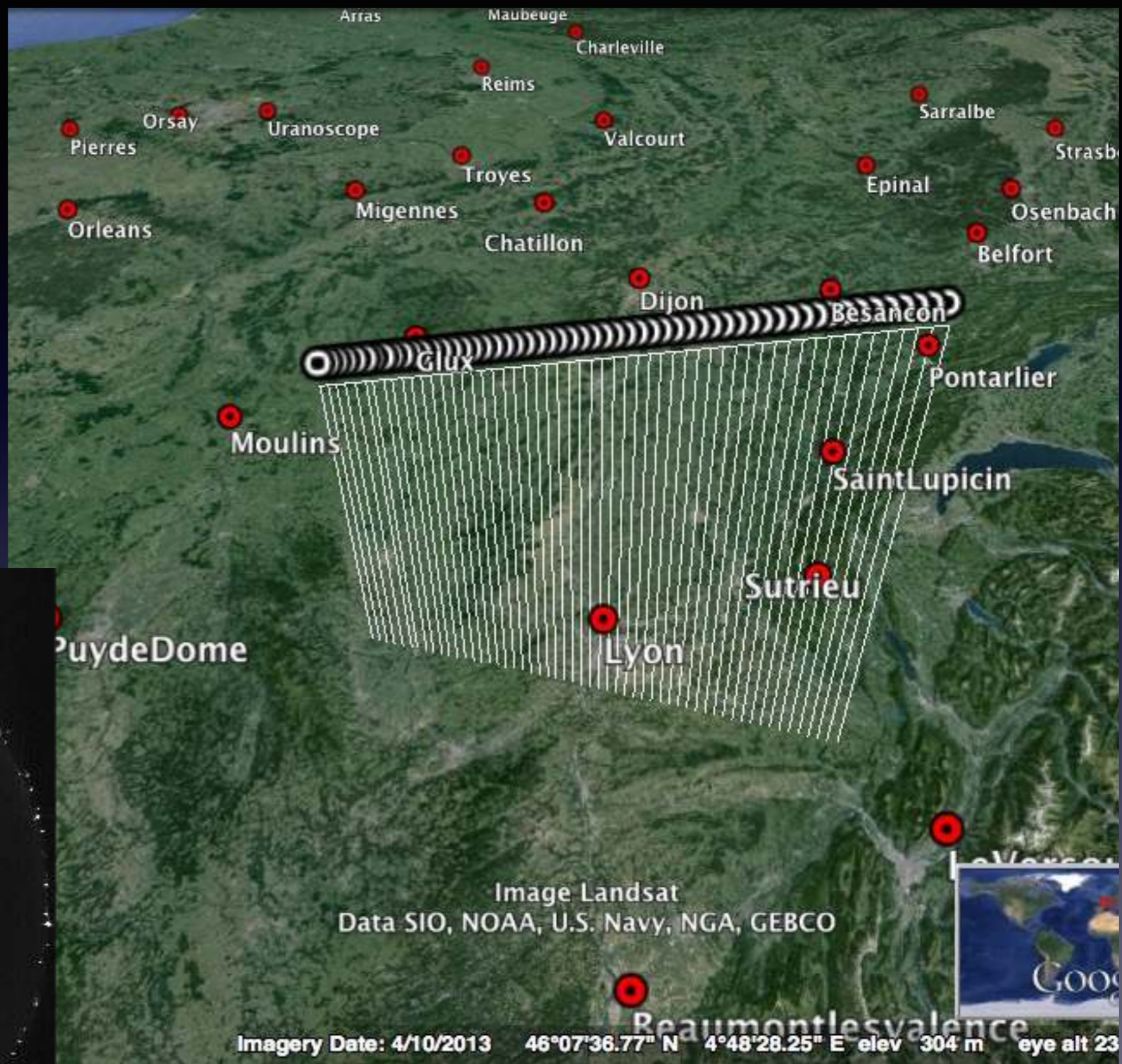
- Compute O-C (\Rightarrow goodness of fit) ; **done**
- Algorithm: A. Egal (2016) implemented (better constrain the trajectory ; global method): **under tests**
- Fakeor (1): call to F90 program of simulation of disintegration, data retrieving, 2D- \rightarrow 3D: **done**
- Fakeor (2): orbital elements - \rightarrow 2D desintegration - \rightarrow 3D projection - \rightarrow fake observation: **done**

Photometry



Example





Lyon

Recommendations to partners (1)

- **Stations that need to (slightly) change location:**
- TROYES : remonter la caméra car la barrière (non visible sur les photos prises à hauteur d'homme) obstruent beaucoup le champs de vue à l'est
- SAINTBONNETELVERT : idem : remonter la caméra car le champ de vue est grandement obstrué
- LILLE : beaucoup trop d'arbres environnant
- ChapelleauxLys : lampadaire generant beaucoup de spots lumineux, ce qui empeche l'astrometrie automatique d'etre faite
- LeVersoud : idem

Recommendations to partners (2)

- **Station which window needs urgent cleaning:**
- Migennes ; Querqueville ; BELFORT ; Epinal ; REIMS ; Dijon ; LesAngles ; Albi ; Chalon ; ChapelleauxLys ; Royan
- **WARNING:** you **MUST** follow the protocol described by François (do use **dish soap** and do **NOT rub** the window to dry it out!!!)

Recommendations to partners (3)

- WE NEED **ACCURATE** (GPS) COORDINATES OF THE STATIONS, INCLUDING **ALTITUDE**

still TODO list

- Fully automated computation of event (easy)
- Automated alerts (see other talk - easy)
- Improve astrometry at low elevation angles (hard ; Achille heel...)
- Change location / clean up camera (easy... or not...)

Acknowledgements

- FRIPON team + extended team
- Meteo France
- IGN
- Uranoscope d'Ile de France, REFORME