



***LSST :  
les petits corps  
du  
système solaire***

Jean-Marc Petit (PNP)

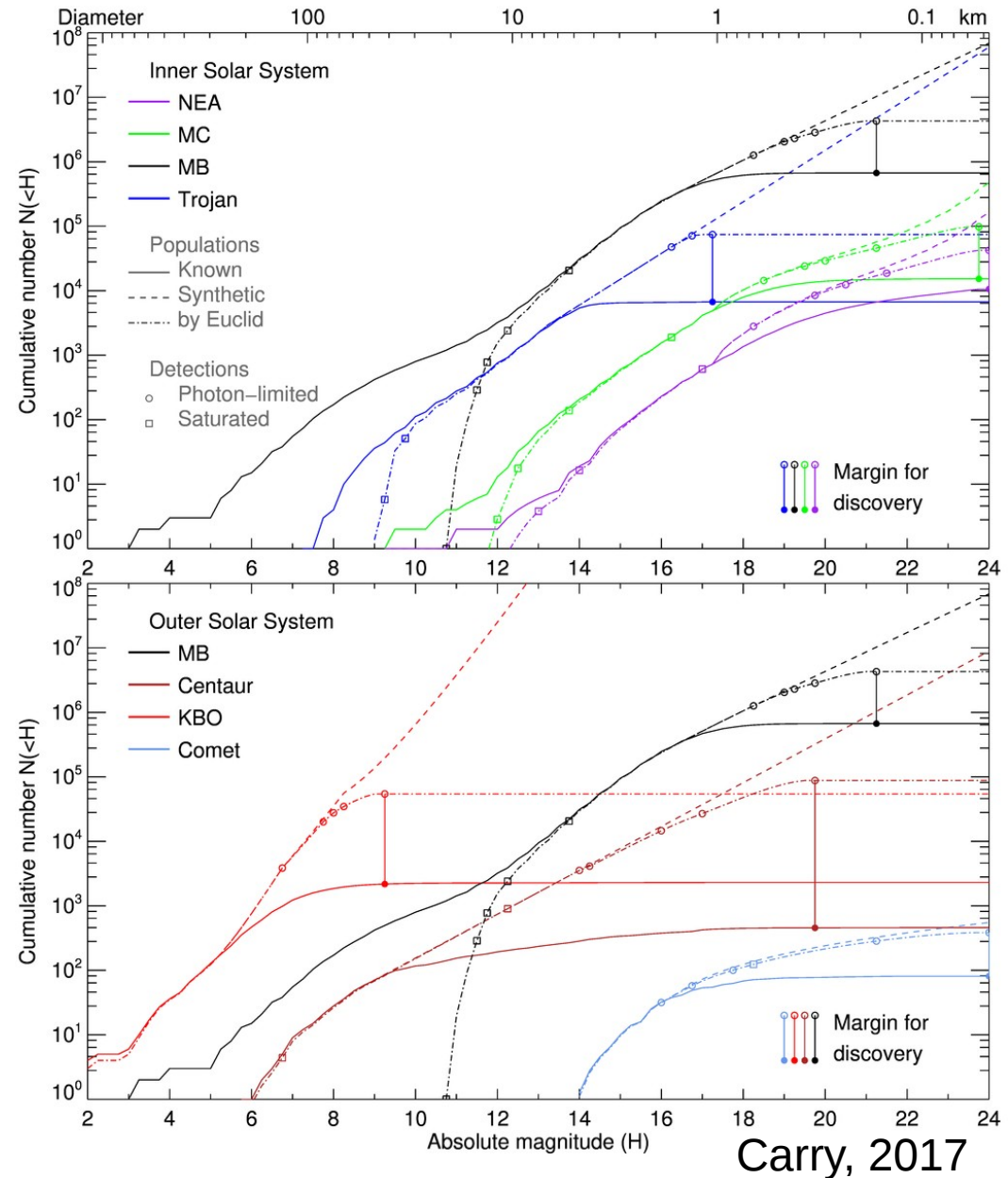
B. Carry, D. Hestroffer, P. Rousselot, J. Vaubaillon

# Compositional diversity of asteroids

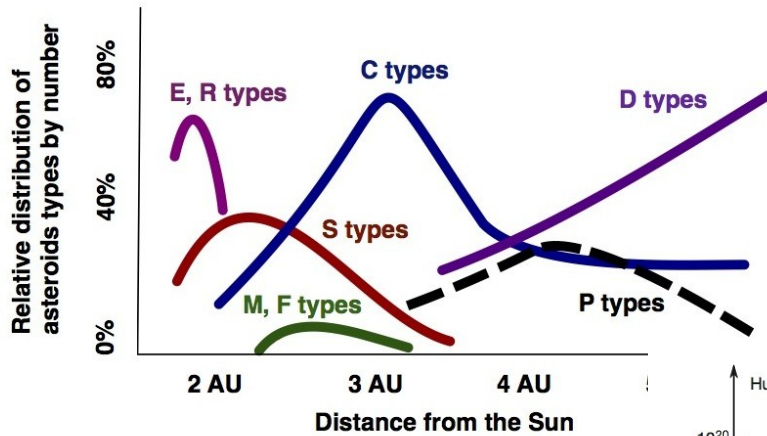
- Main belt structure?
  - Solar System History
  - Dynamical families
- Source of NEAs?
  - and meteorites...

- Surface aging

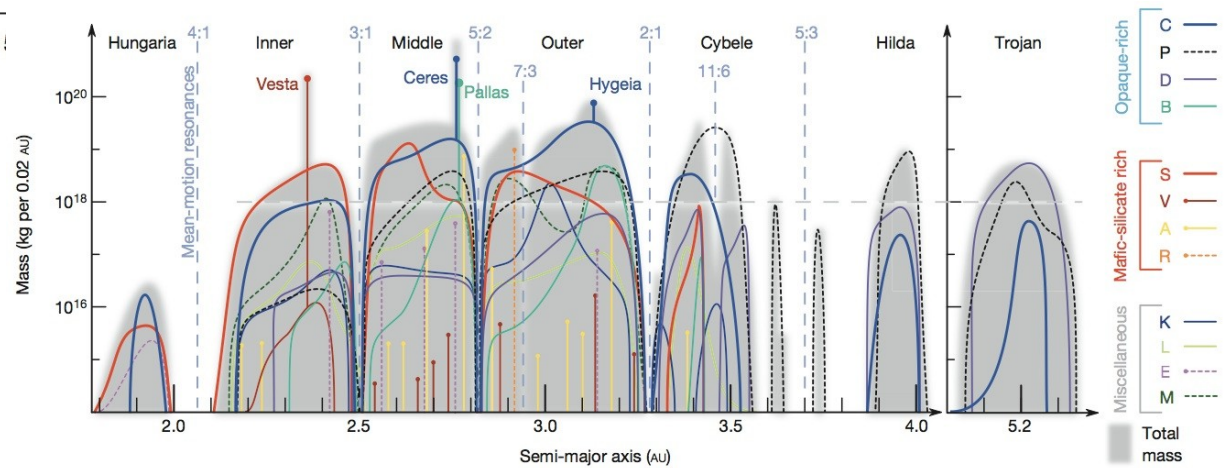
Require large samples



# Compositional diversity of asteroids



Gradie & Tedesco, 1982  
600 asteroids



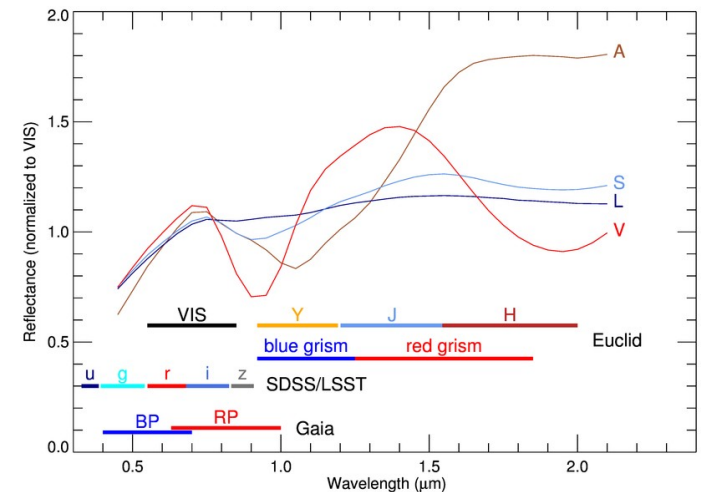
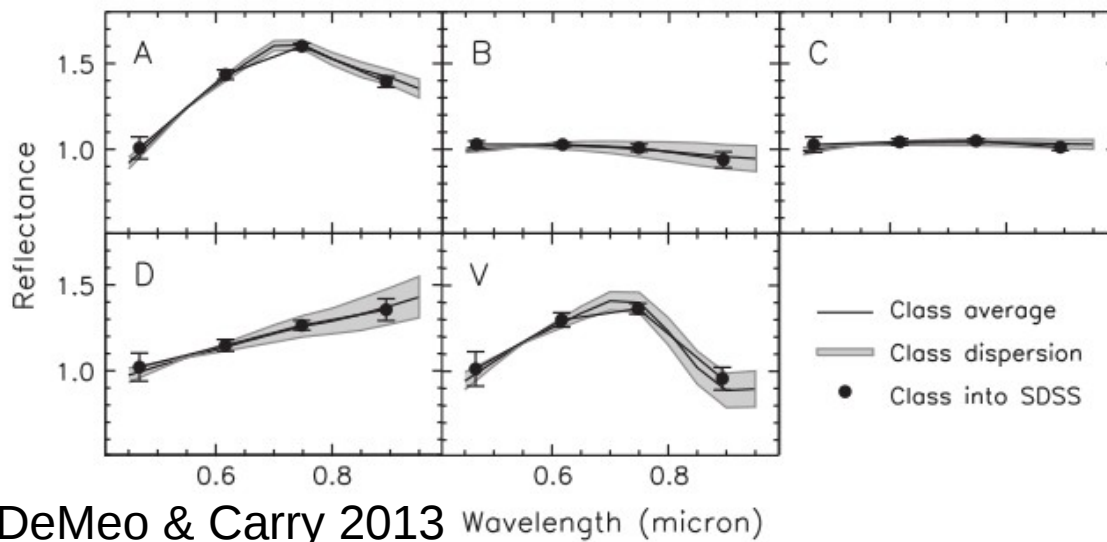
DeMeo & Carry 2014  
34 000 asteroids

- Gaia: 300 000 asteroids
- LSST: Some  $10^6$  asteroids
- Euclid: Some  $10^5$  asteroids

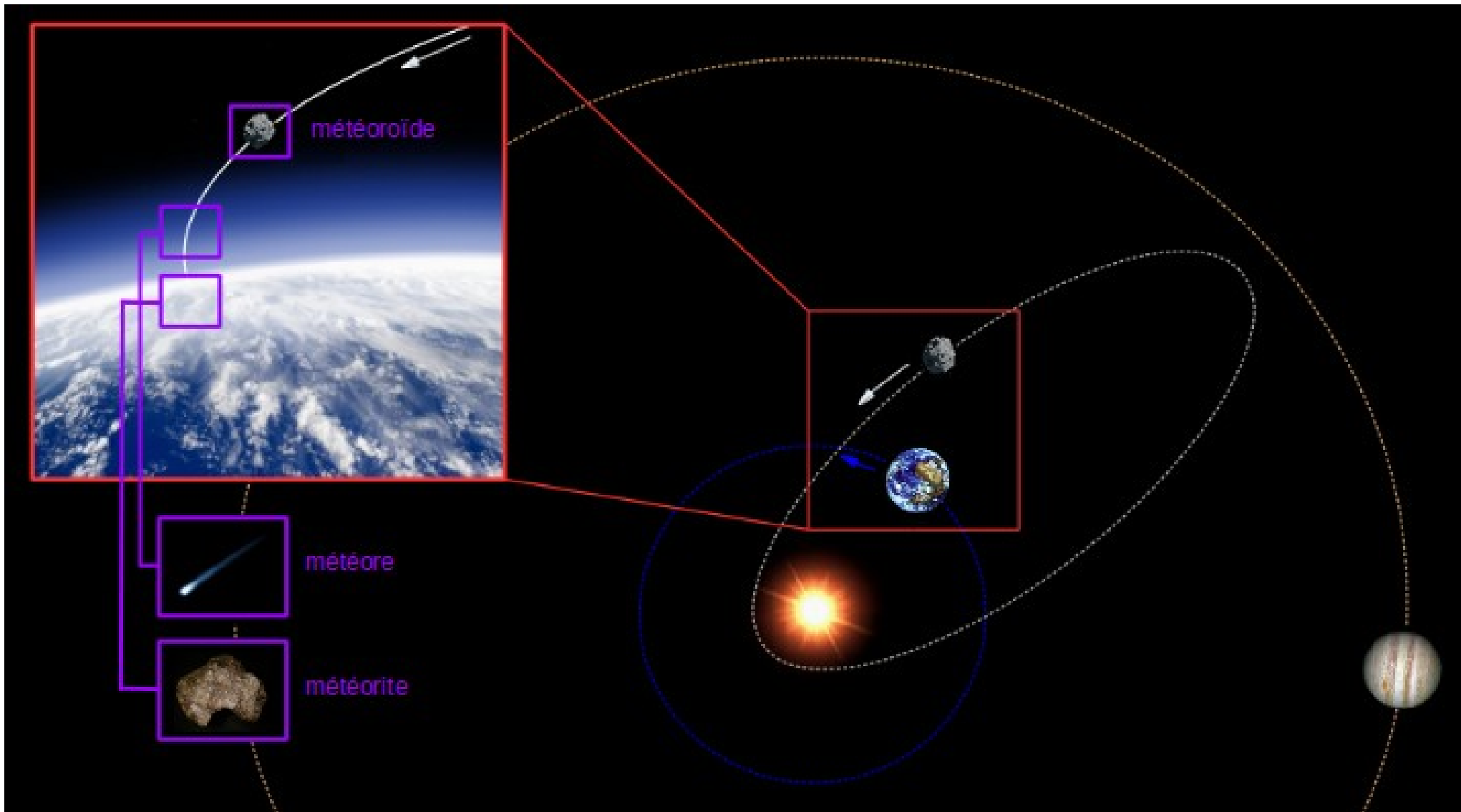
?

# Asteroid composition from colors

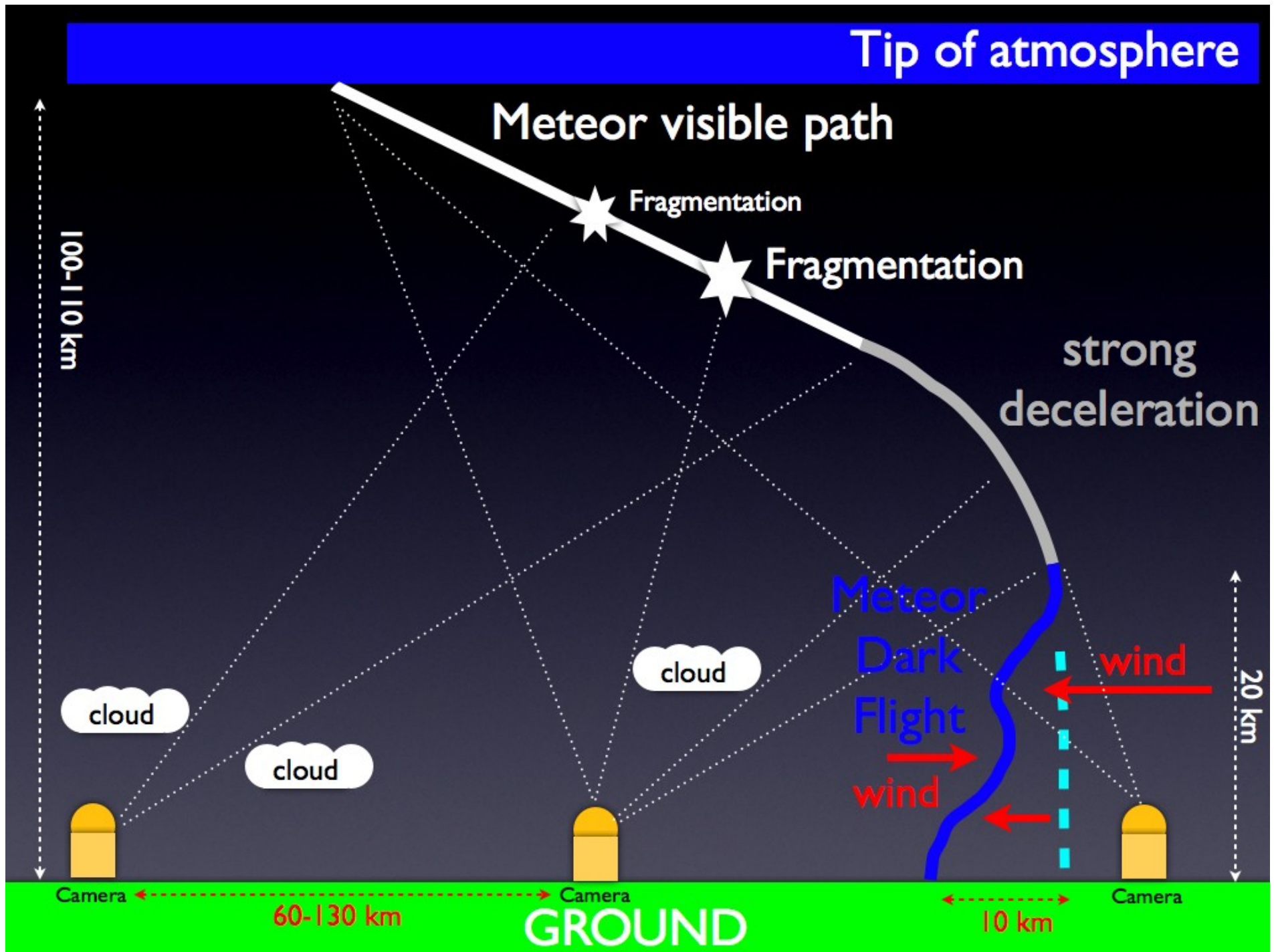
- SSO spectra are modulated solar spectra
  - Spectral features are broad
  - Spectral classification achievable with BB colors
- SDSS was great → LSST will be amazing
- Great synergies with Euclid-WFIRST NIR surveys



# meteor(oid/ite): very small objects of the solar System



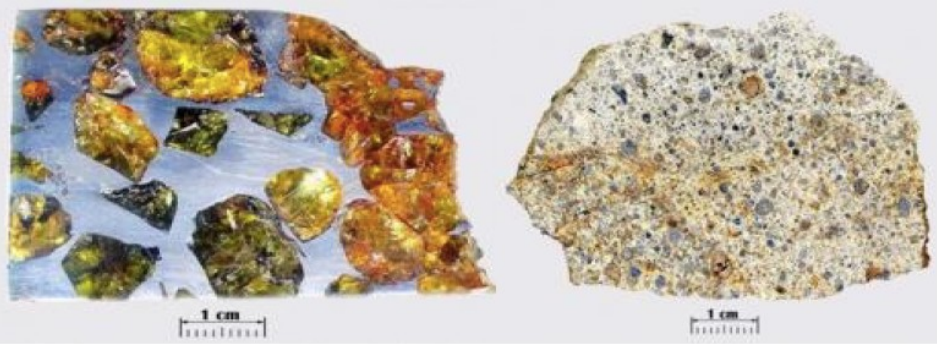
# FRIPON: 100 cameras



# Connecting sciences



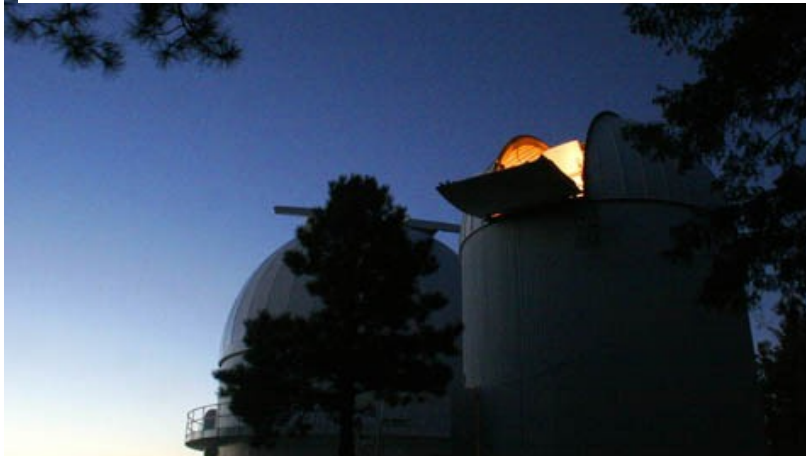
Météorite de fer



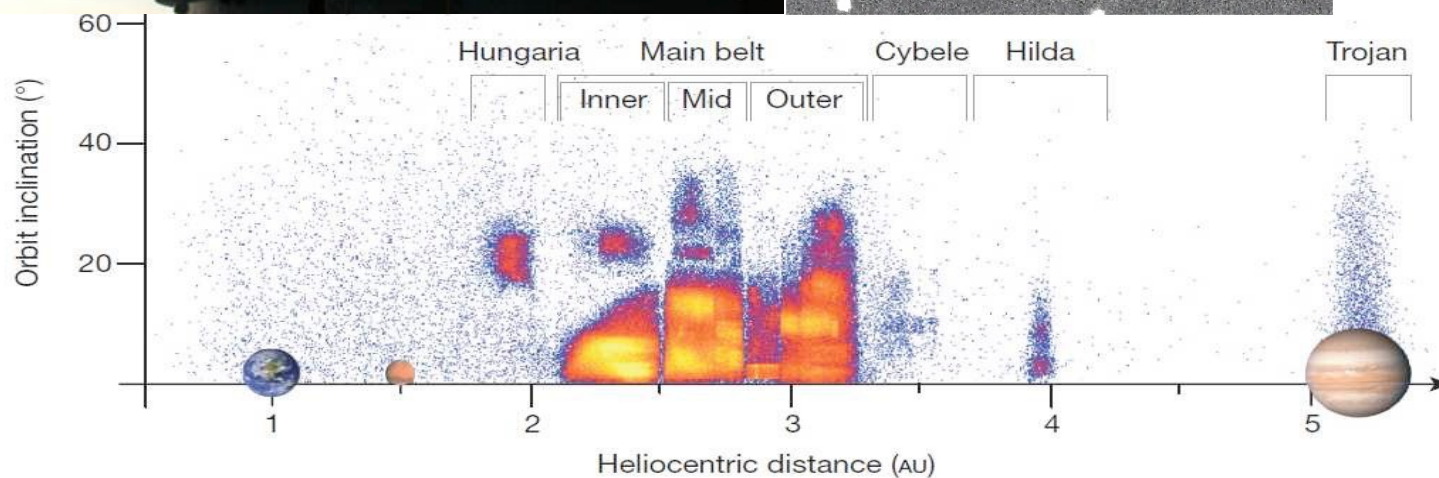
Pallasite

Achondrite

Geology



Astronomy



Dynamics

# LSST & FRIPON

- LSST will discover several “2008-TC3” like objects (=object impacting the Earth)
- FRIPON team has experience with meteoroid entry observation and witness data collection
- Wish to know when/where next collision will happen
- FRIPON team will gather maximum information of the fall
- science results: structure (rubble pile?), tensile strength, independent estimate of size, energy etc.



# Ticket PNGRAM

- Science - Caractérisation dynamique et physique de petit corps du système solaire (aka astéroïdes)
  - Membre Gaia DPAC SSO - Global effects on dynamics
- LSST Astrométrie et dynamique
  - systèmes binaires ou multiples
  - masses d'astéroïdes
  - effet Yarkovsky long terme
  - tests de la relativité et théories alternatives
  - liens de systèmes de référence

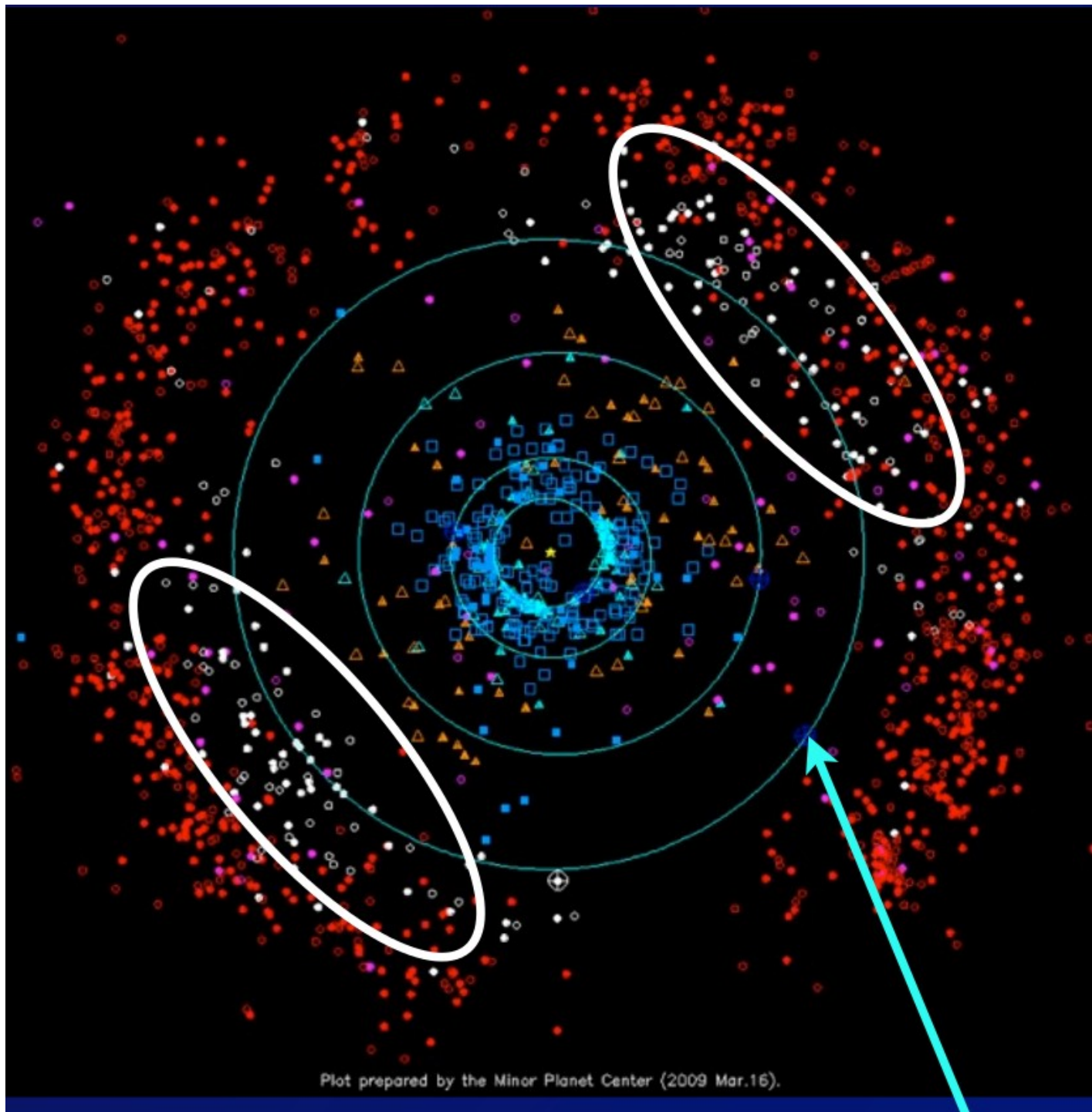
# Ticket PNGRAM

- Observation astrométrie et dynamique
- Apport LSST
  - astéroïdes NEO, MBA, TNO sur le long terme et haute précision
  - en continuation de Gaia en magnitude, précision et calendrier
  - combinaison binaires astrométriques et binaires résolues
- Réduction
  - re-réduction d'observations astrométriques à partir des catalogues Gaia et LSST
  - Systèmes binaires astrométriques (Ortiz et al. 2011)
  - Inversion statistique, non paramétrique
- Besoin
  - Besoin observations niveau2
    - petites perturbations, divers effets systématiques, analyse des poids et incertitudes, analyse PSF, ...
    - Pre-covery, observations erronées/contaminées
  - (*extension astrométrie et dynamique satellites naturels, comètes*)

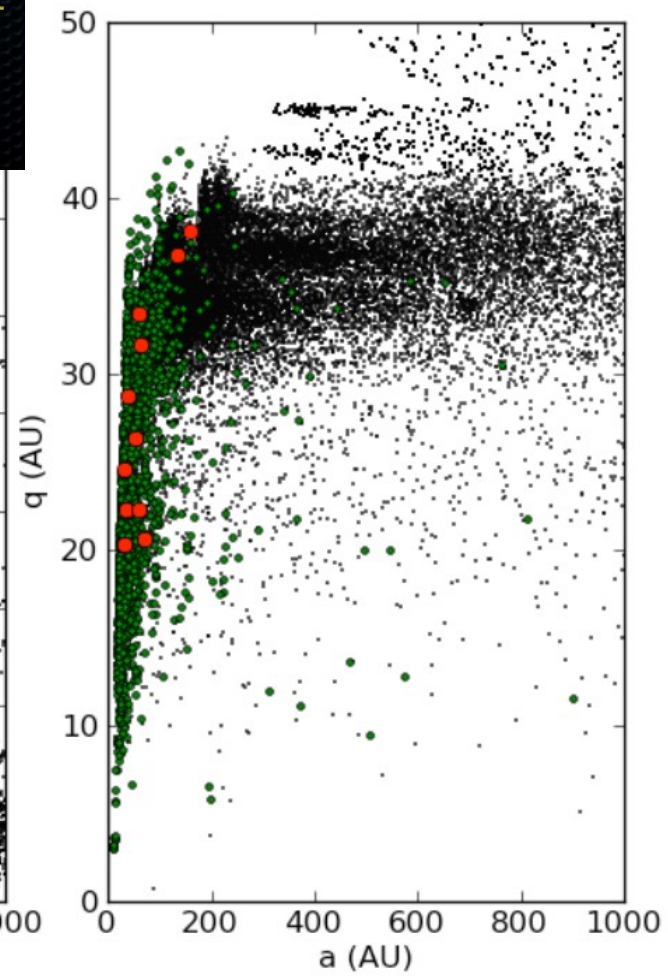
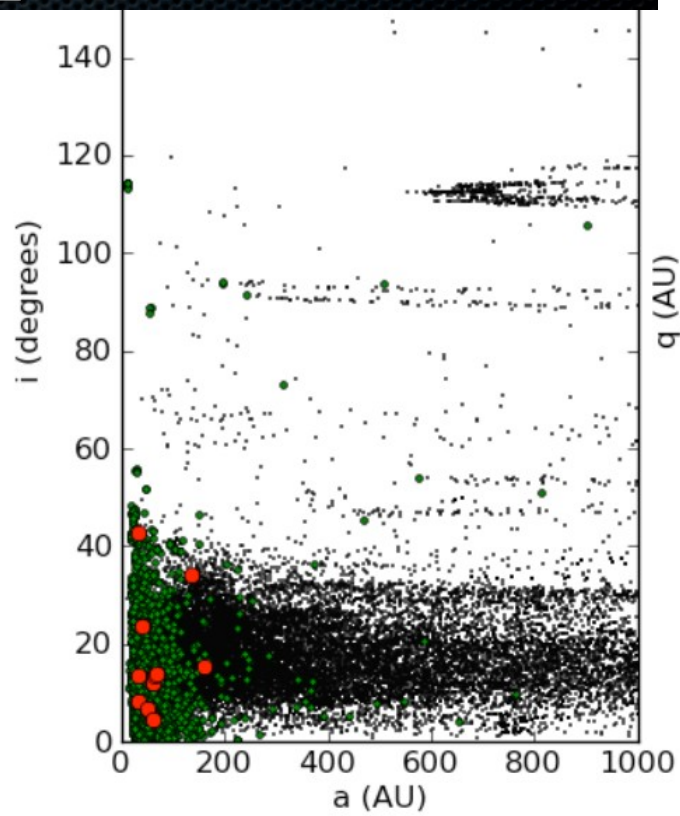
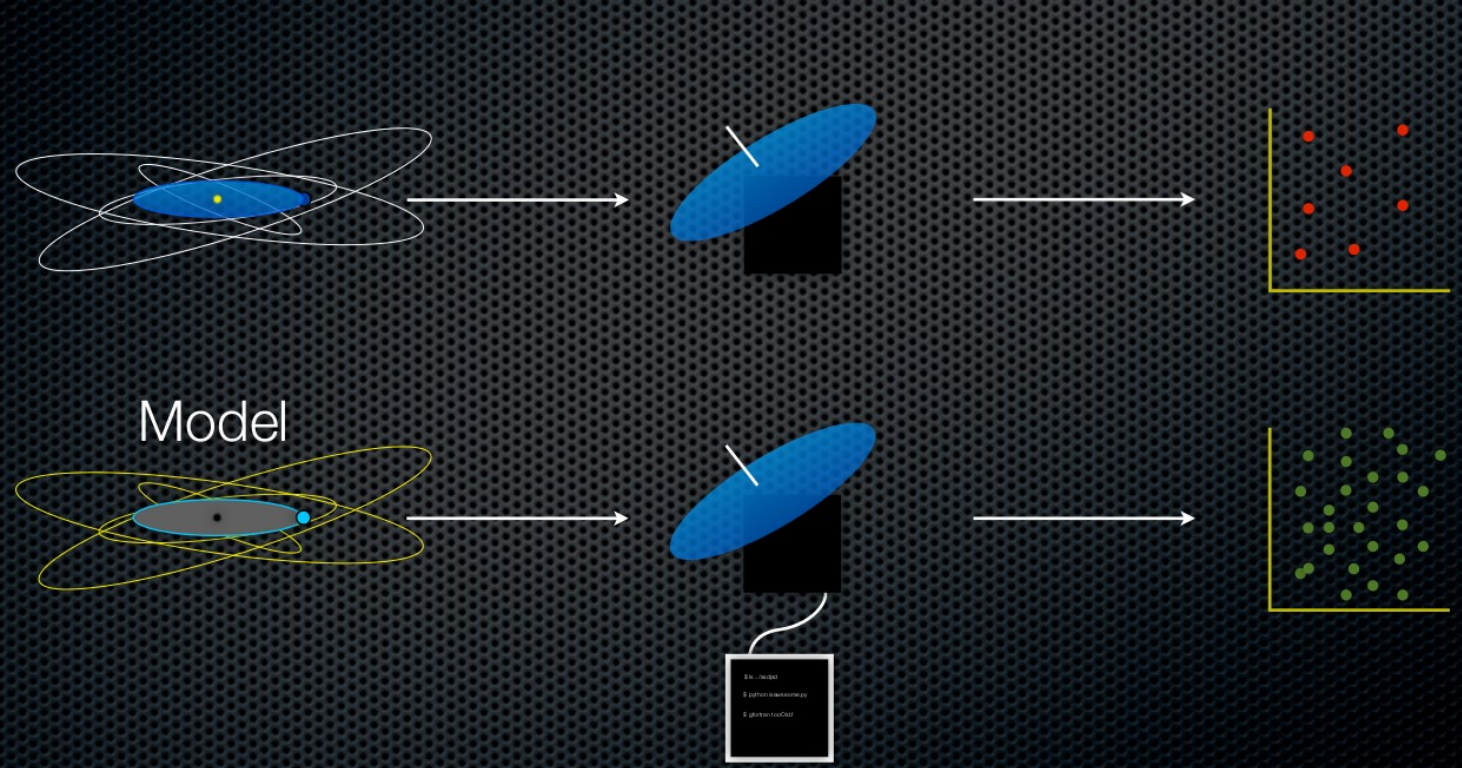
Orbital and H-mag distributions  
of TNOs

Cometary activity

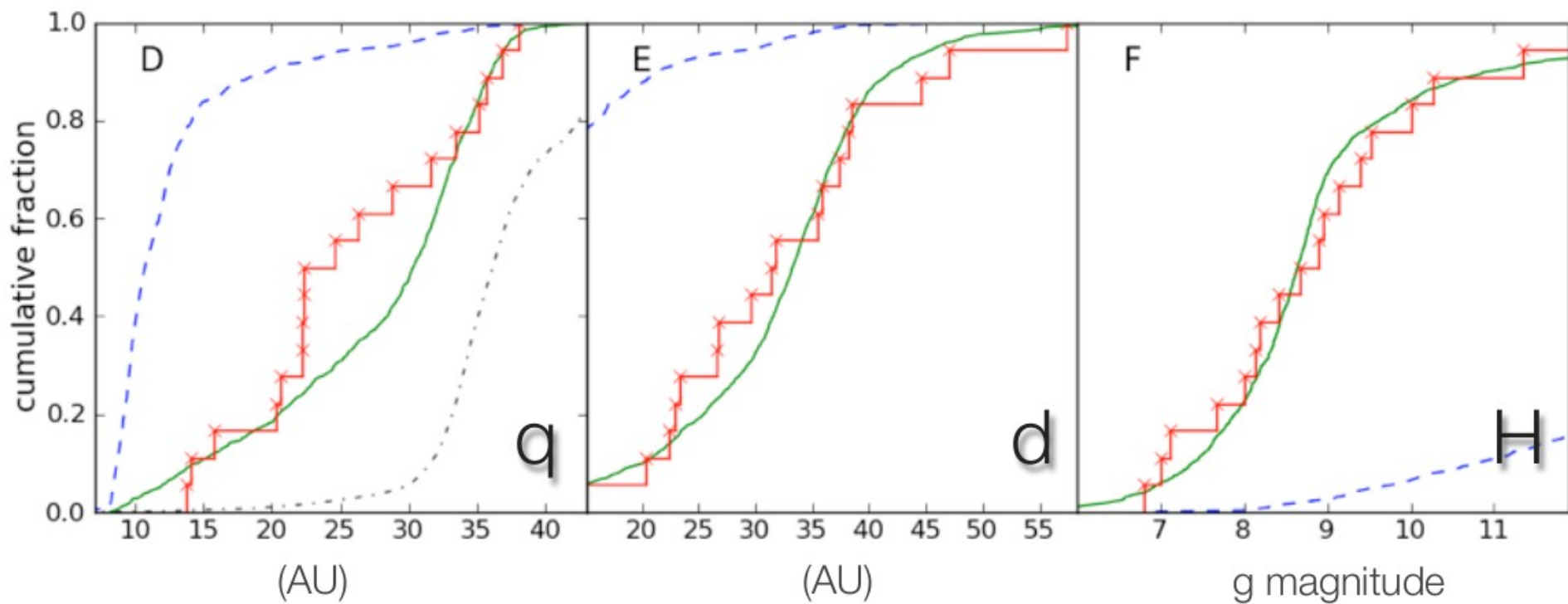
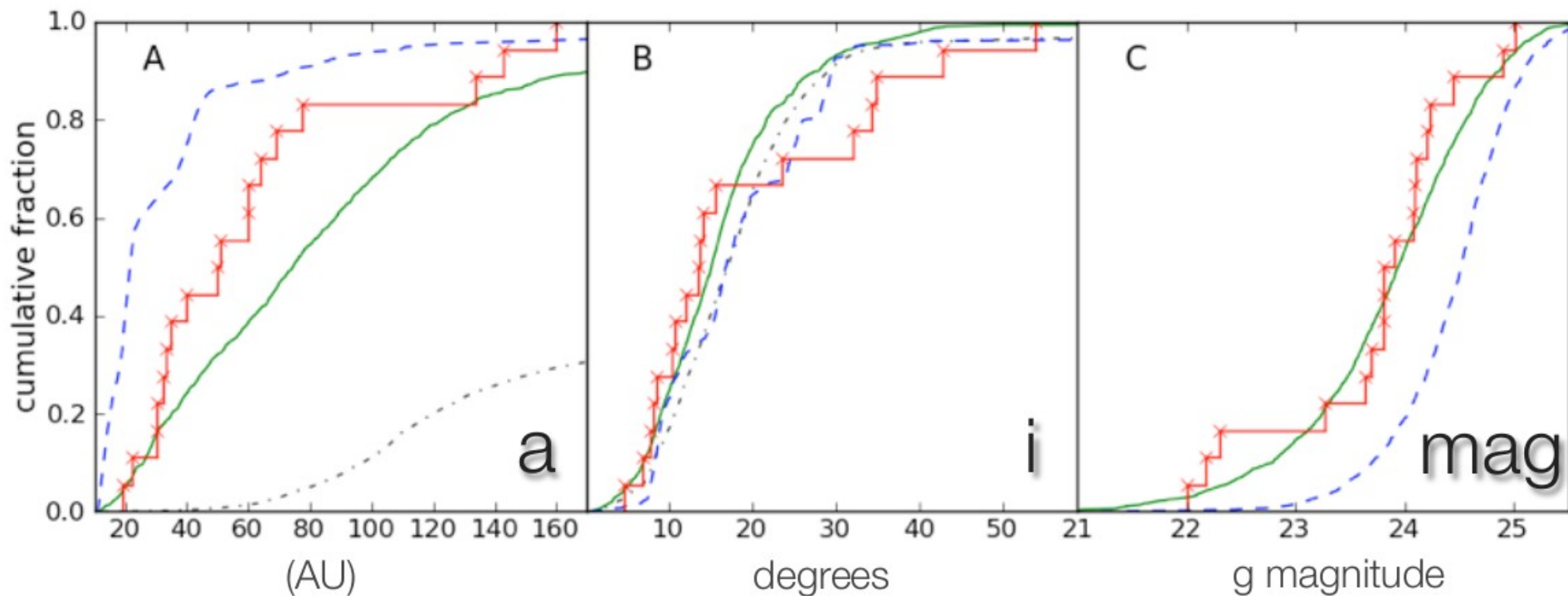
Binarity



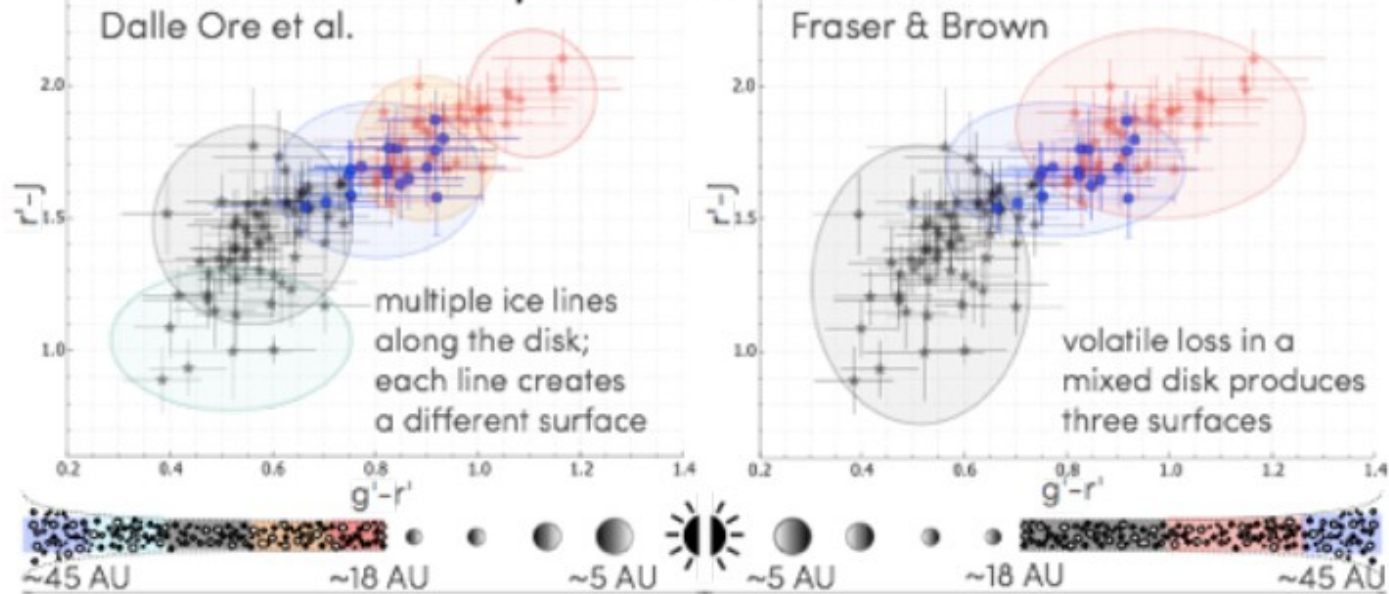
Neptune



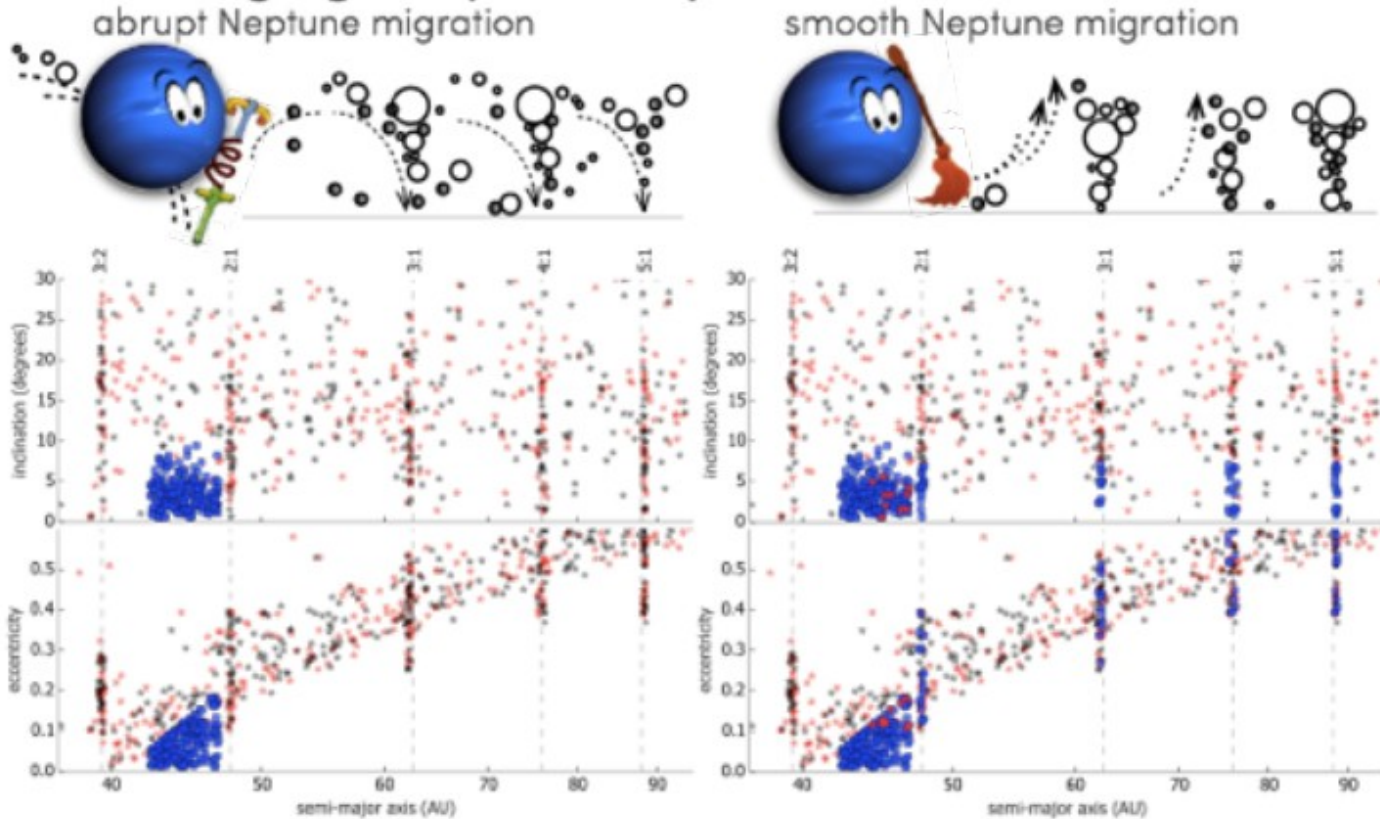
# Divot SPL

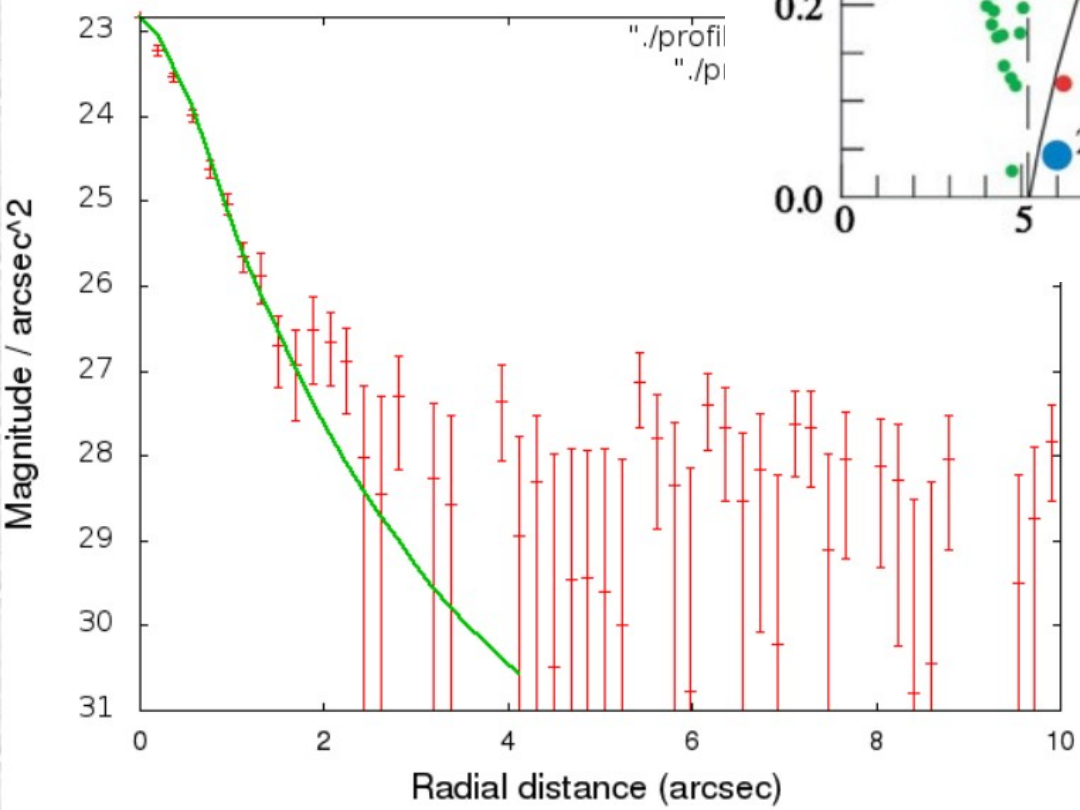
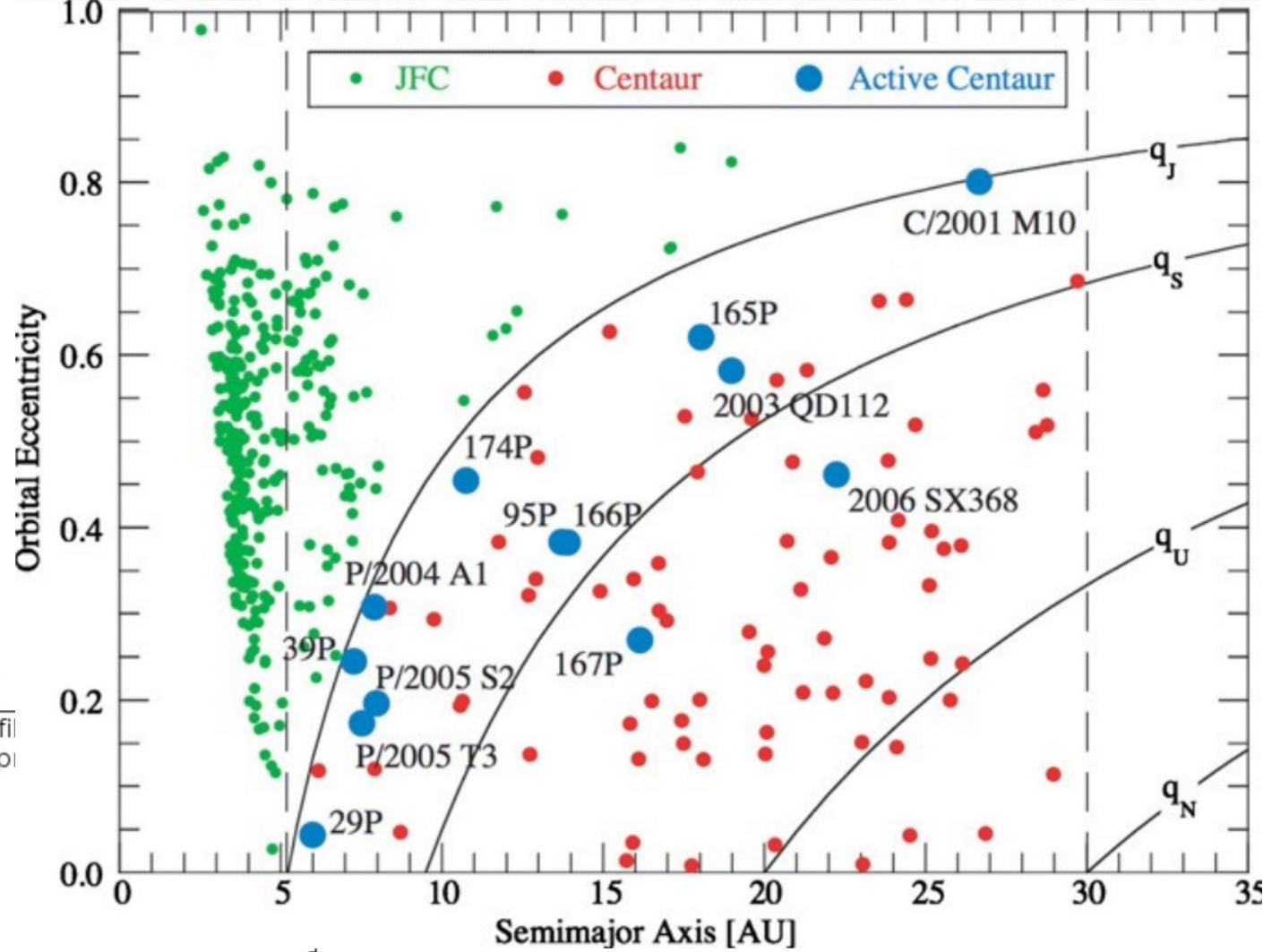
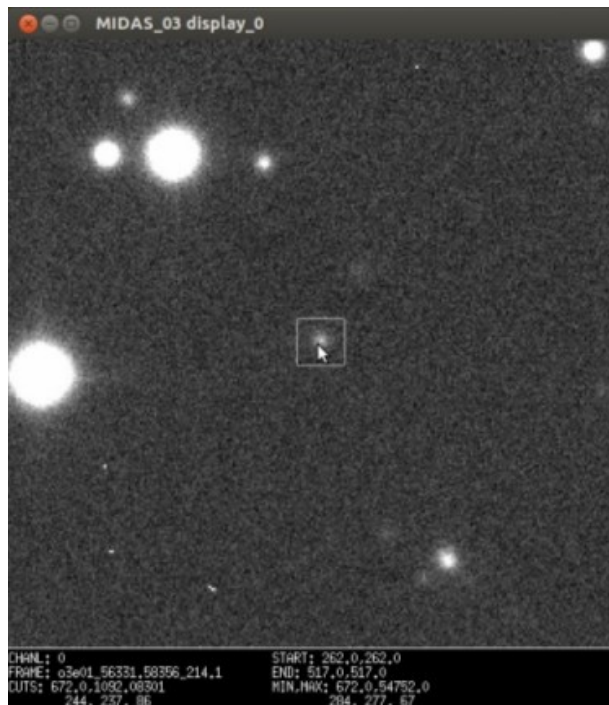


# a. colour and the planetesimal disk



# b. changing the planetary architecture





**Long distance cometary activity**