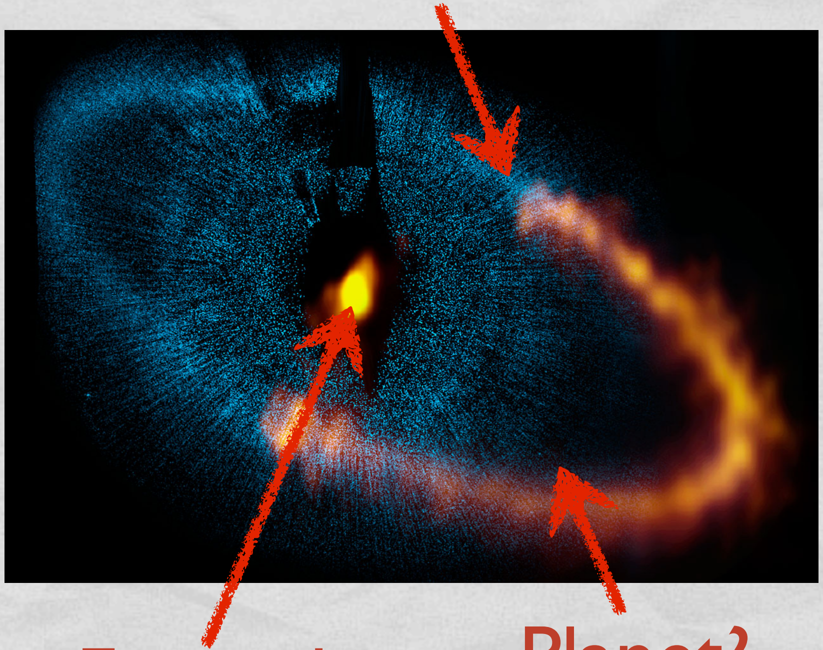
EXOZODIACAL DUST

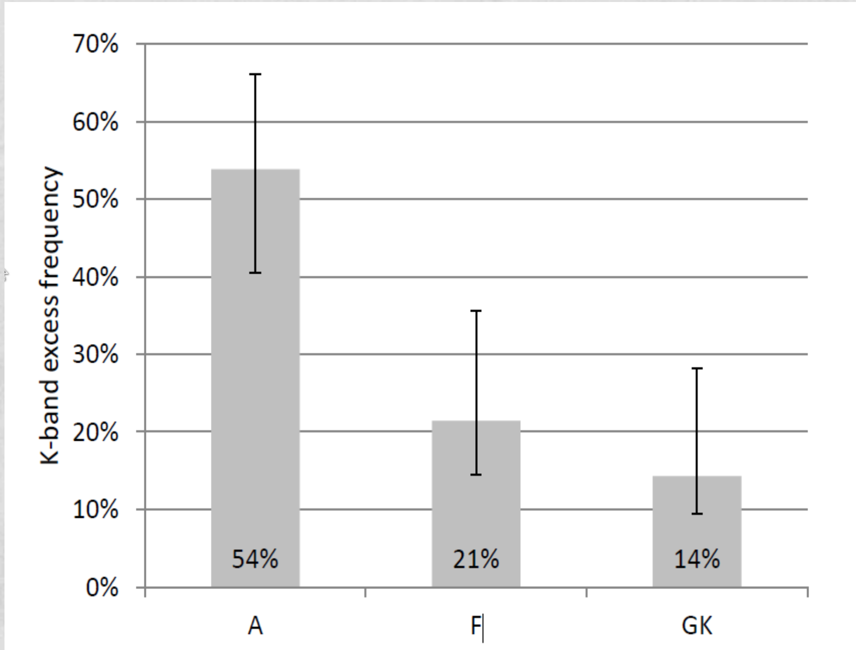
- **General astrophysics** shall be considered when designing L-class missions on exoplanets.
- This includes topics directly connected to exoplanets (e.g. objectives 9, 10, and 11 in Greene et al. 2013, NASA ExoPAG SAG#5 team report):
  - planet formation : **protoplanetary disk**s and forming jovian planets in young, gas-rich disks.
  - planetary systems as a whole : young **debris disks** forming telluric planets, and collisionally evolving debris disks
- **Debris dust in the habitable zone of stars, aka exozodiacal dust**, is clue for the presence of asteroids and comets, that can deliver **volatiles**
- Exozodiacal dust is a potential source of **background noise** and **confusion** for planet detection



Jean-Charles Augereau, April 4th, 2013

EXOZODIACAL DUST

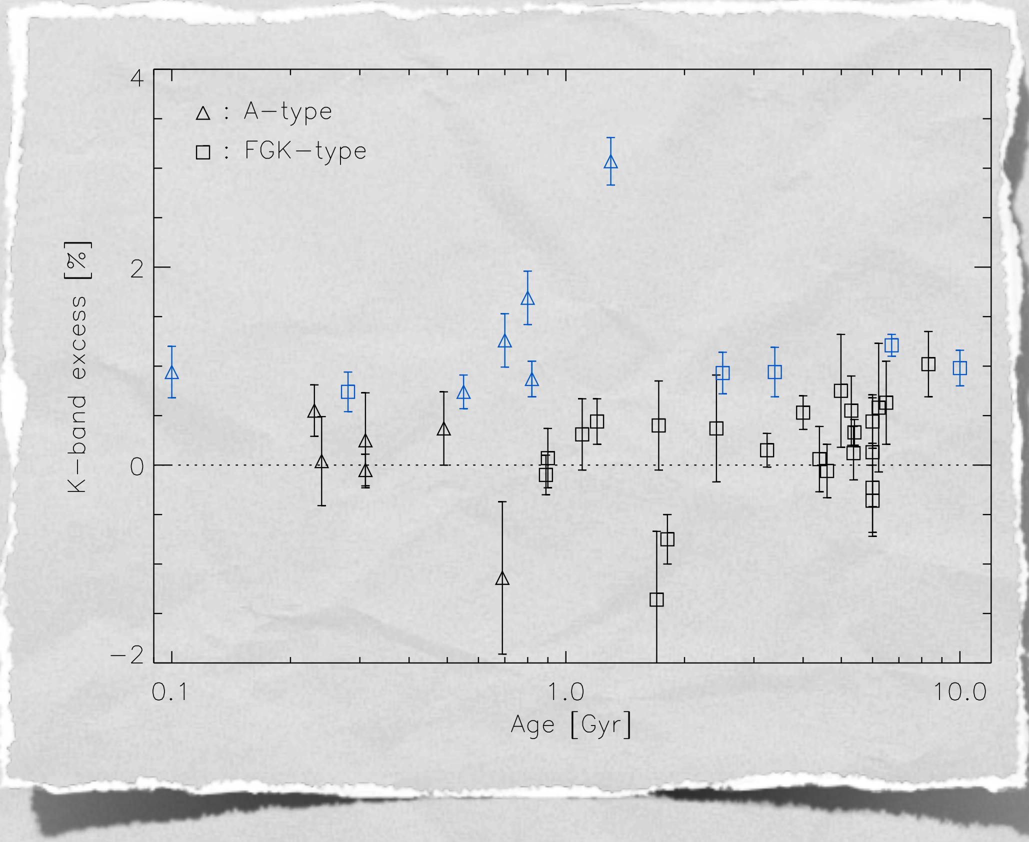
- Ongoing near- and mid-IR interferometric surveys (CHARA/FLUOR, VLTI/PIONIER, soon LBTI)
- 29% of nearby stars have K-band excess (CHARA/FLUOR, Absil et al. 2013)
- 4-13% of stars with N-band excess emission (KIN, Millan-Gabet et al. 2011)



EXOZODIACAL DUST

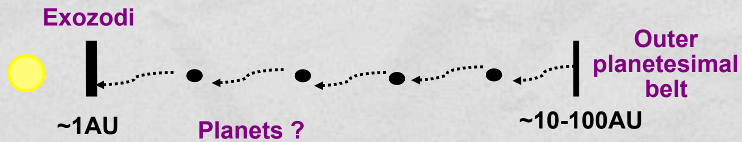
- **Absence of time dependence** (Absil et al. 2013).
  => *Any target, independent of its age, may be affected by the presence of hot/warm dust*

- **Detected exozodis are usually much hotter than our zodi**
  => *Be very cautious when using the zodiacal spectrum as a reference for designing space missions: it might not be representative*

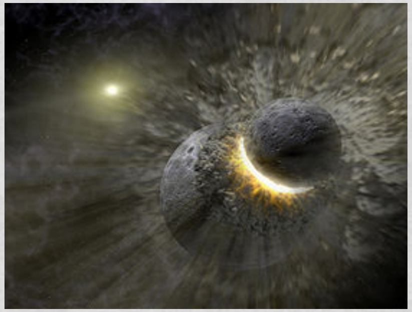


EXOZODIACAL DUST

- Several scenarios are explored to explain their origin:
  - steady-state inward scattering of material by chains of planets
  - LHB-like events (dynamical instability)



  - planet migration driven by planetesimals scattering
  - ...



- In short :
  - likely linked with the presence of planets
  - many interesting science questions to be addressed by observing exozodis, in tight connexion with exoplanetary science

EXOZODIACAL DUST

- Overall impact of exozodiacal dust disks on planet detection (e.g.: Defrere et al. 2010, Absil et al. 2010, Roberge et al. 2012):
  - increased observing time because it creates a background noise => reduced the sample of targets to be observed during the mission lifetime
  - if exozodis are bright, the fraction of systems with exo-Earths has to be higher to get a chance to detect one, and characterize it
  - exozodis might be sculpted by planets => dust blobs might be brighter than the planet to detect and could mimic the presence of a planet