with contributions of:

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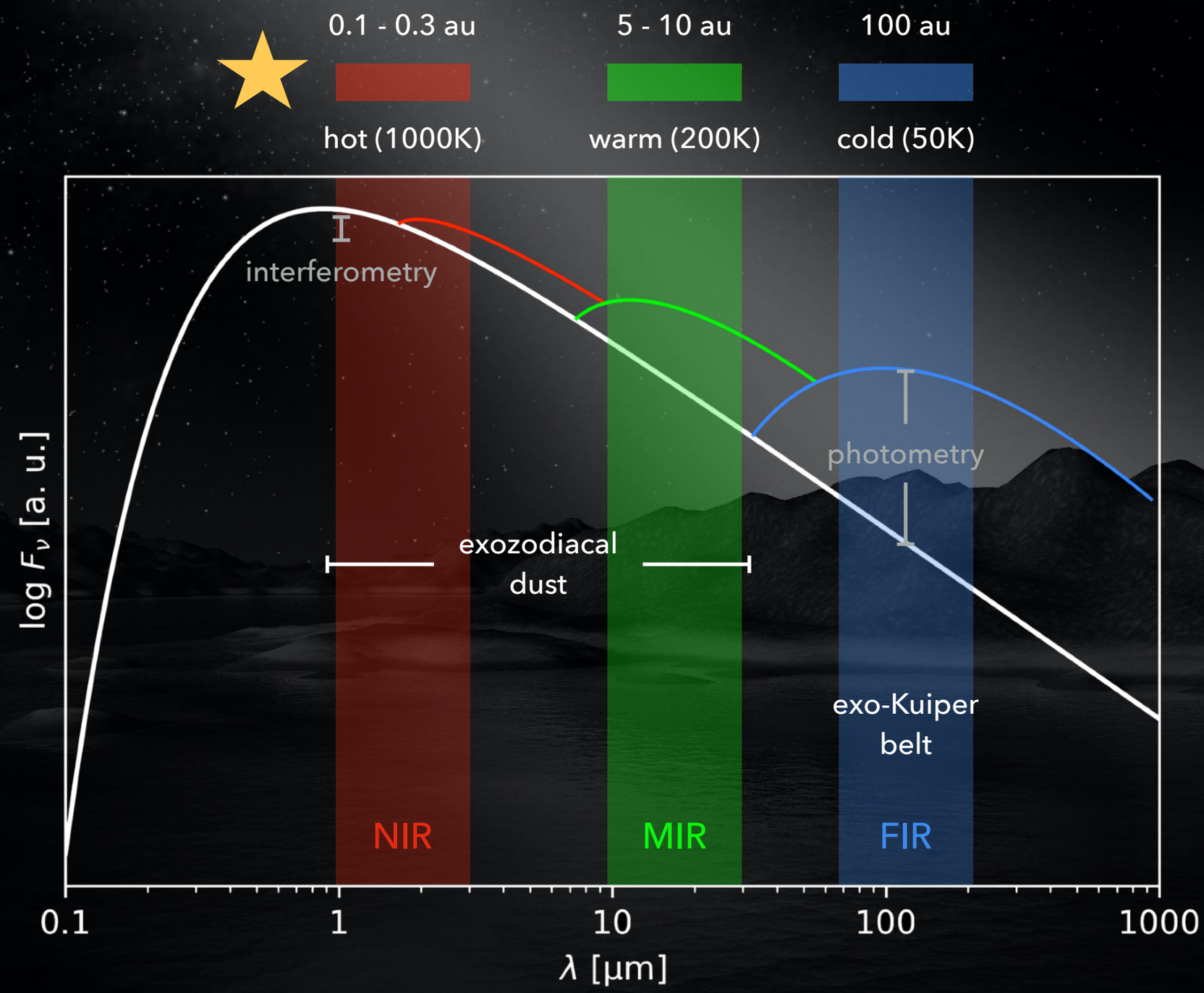
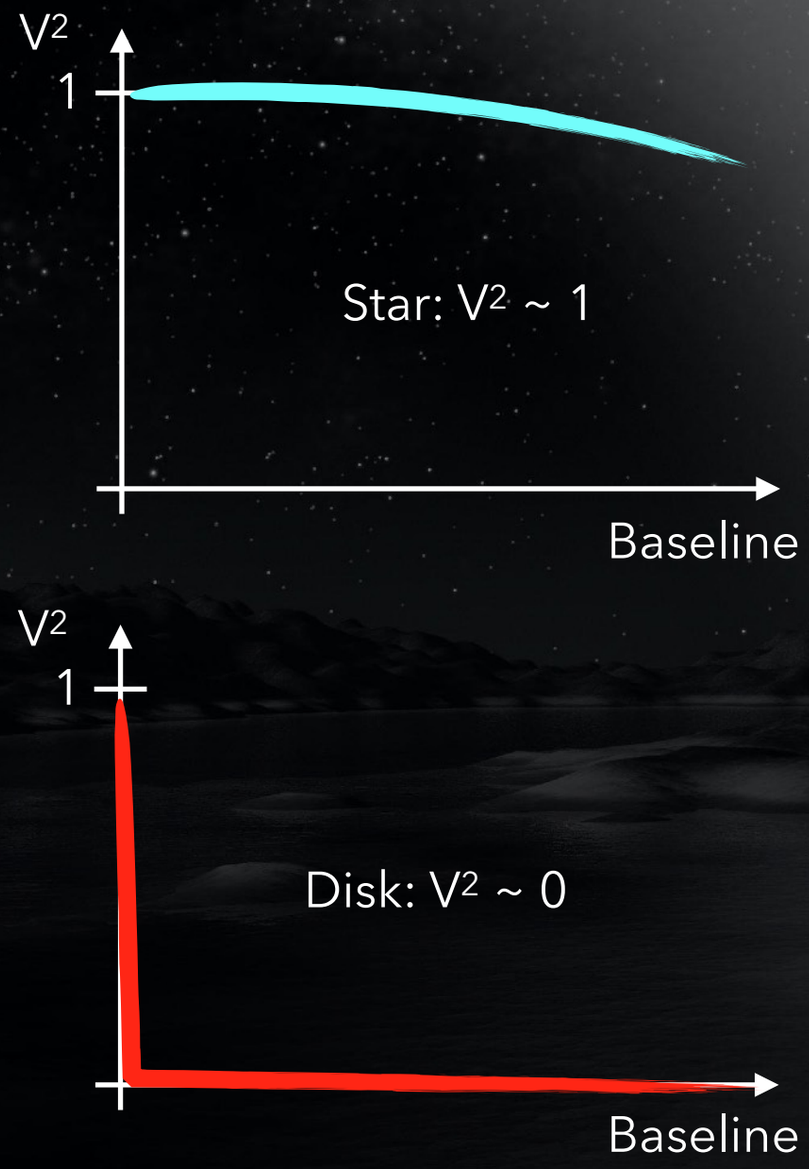
CONNECTION BETWEEN HOT EXOZODIACAL DUST AND OUTER DUST RESERVOIRS

DUST IN MATURE PLANETARY SYSTEMS



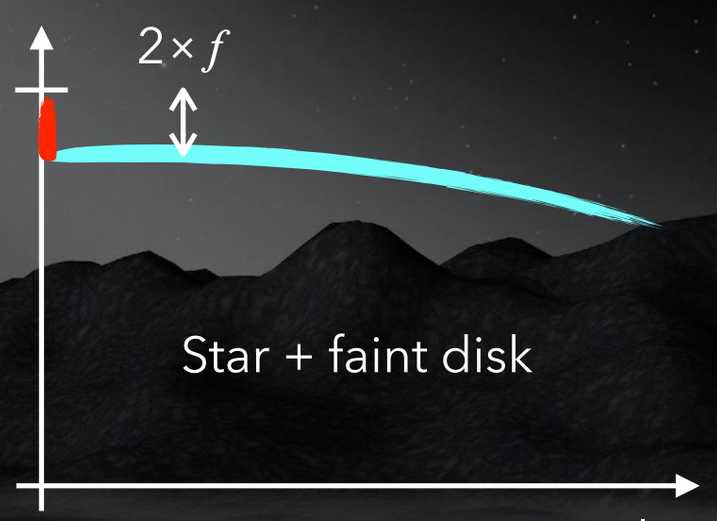
Adapted from Kirchschlager et al. 2017

How to detect hot dust with interferometry?



Star: $V^2 \sim 1$

Disk: $V^2 \sim 0$



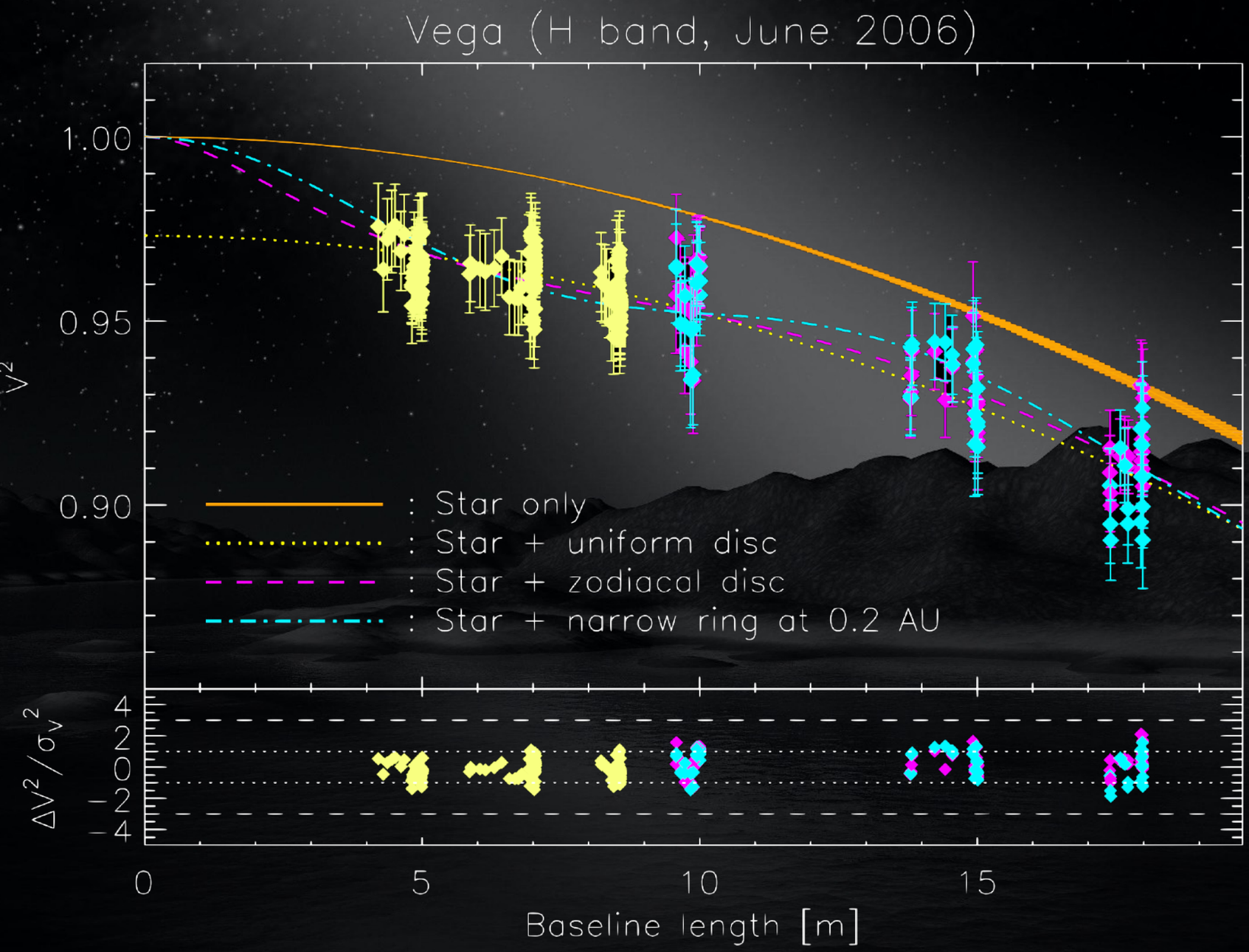
Star + faint disk

$V^2 \sim 1 - 2\,f$

f = dust-to-star flux ratio

DETECTION NOT STRONGLY AFFECTED BY DISK SHAPE

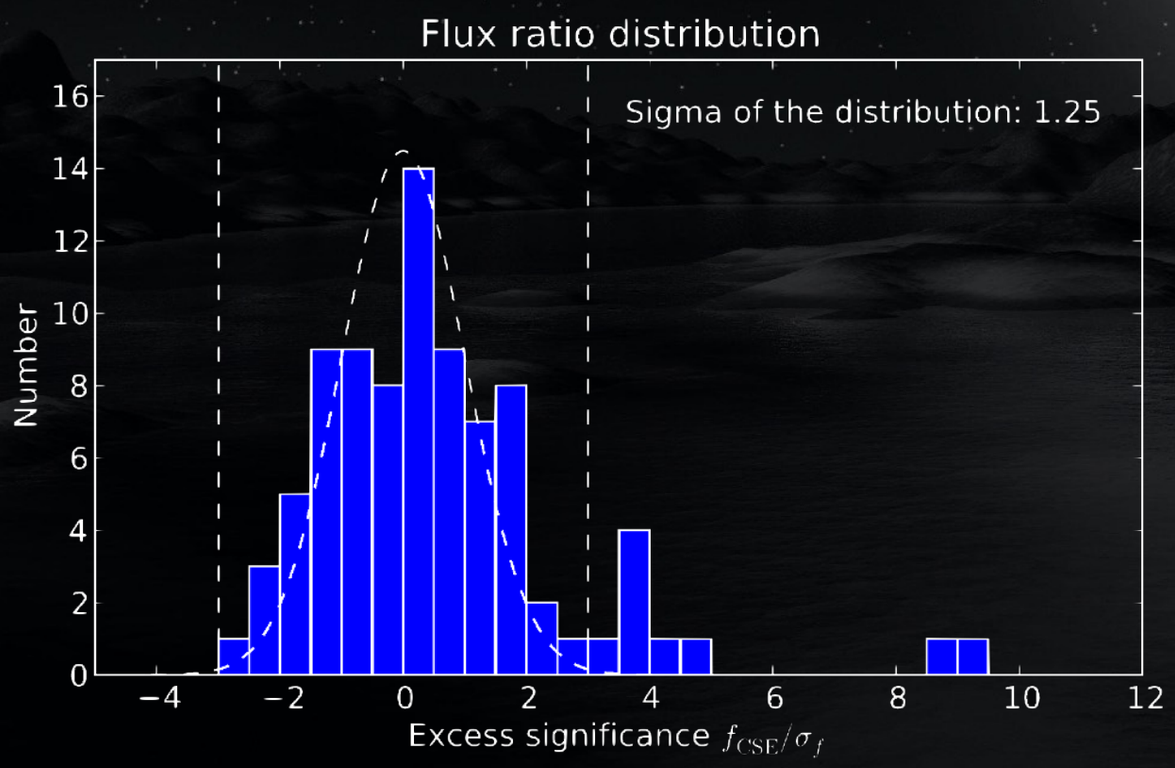
(as long as it's resolved!)

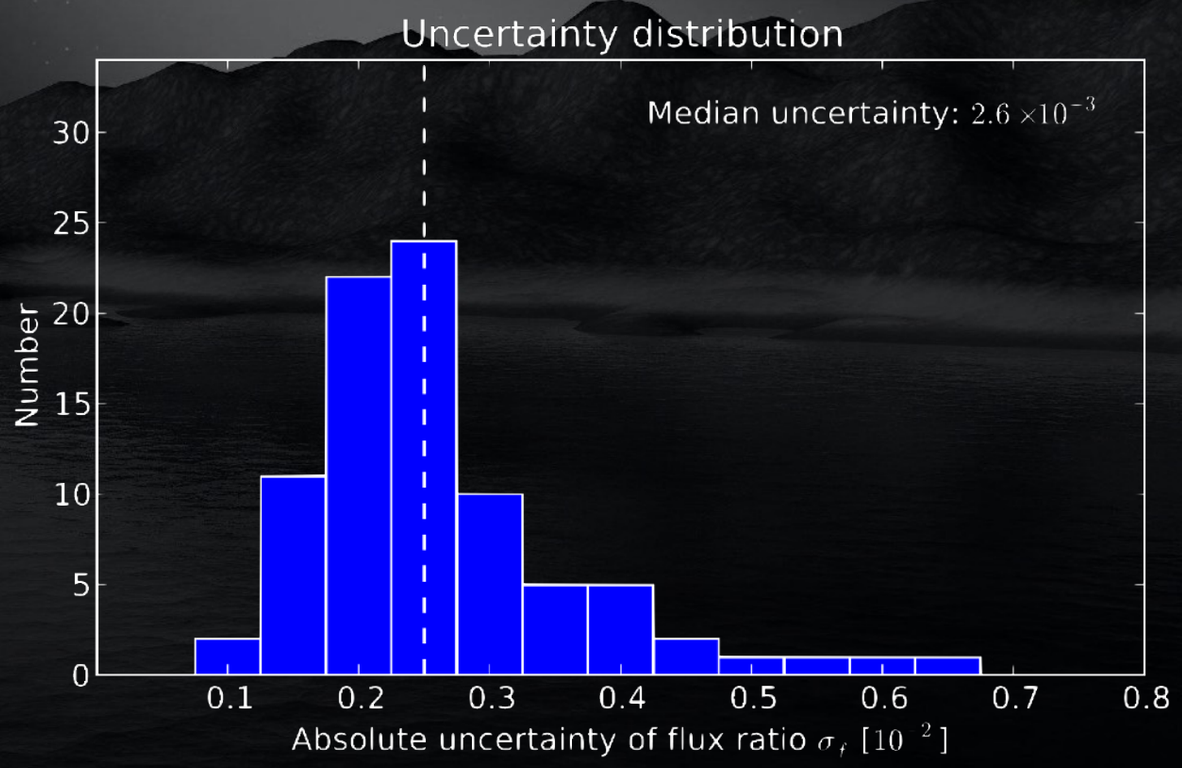


Defrère et al. 2011

PREVIOUS NEAR-INFRARED INTERFEROMETRIC SURVEYS

- 160+ stars surveyed at CHARA (K band) and VLTI (H band)
- ~20% detection rate, with typical excess around 1%
- Closure phase measurements rule out faint companions

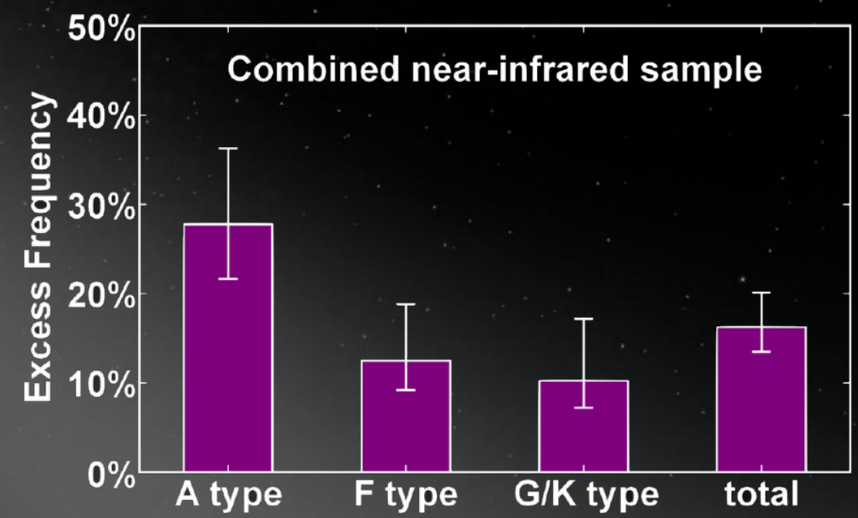


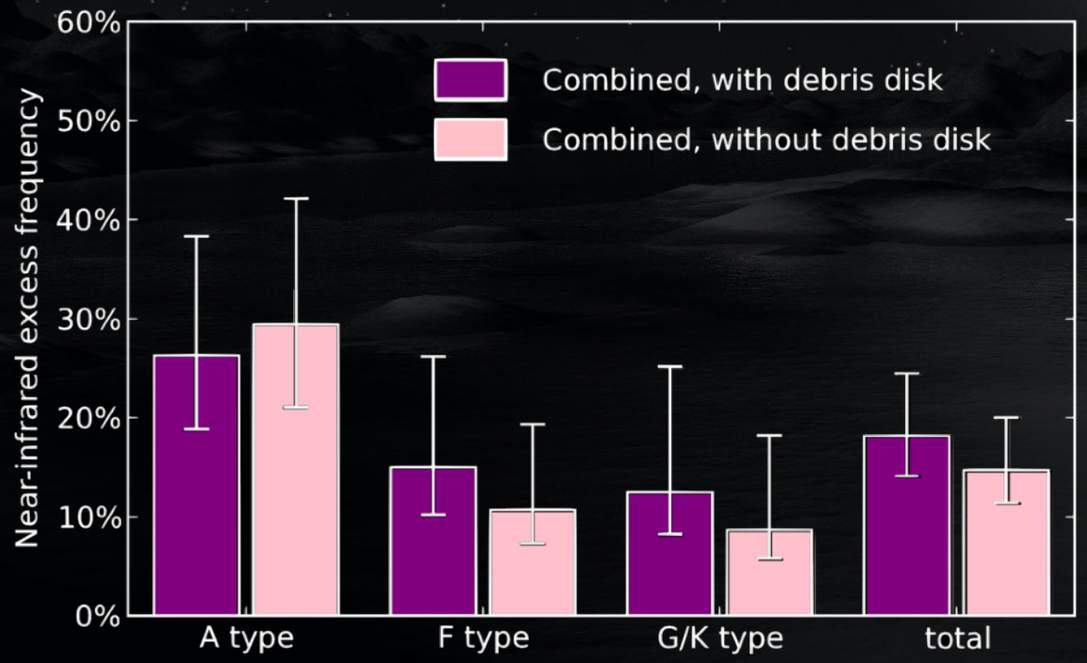


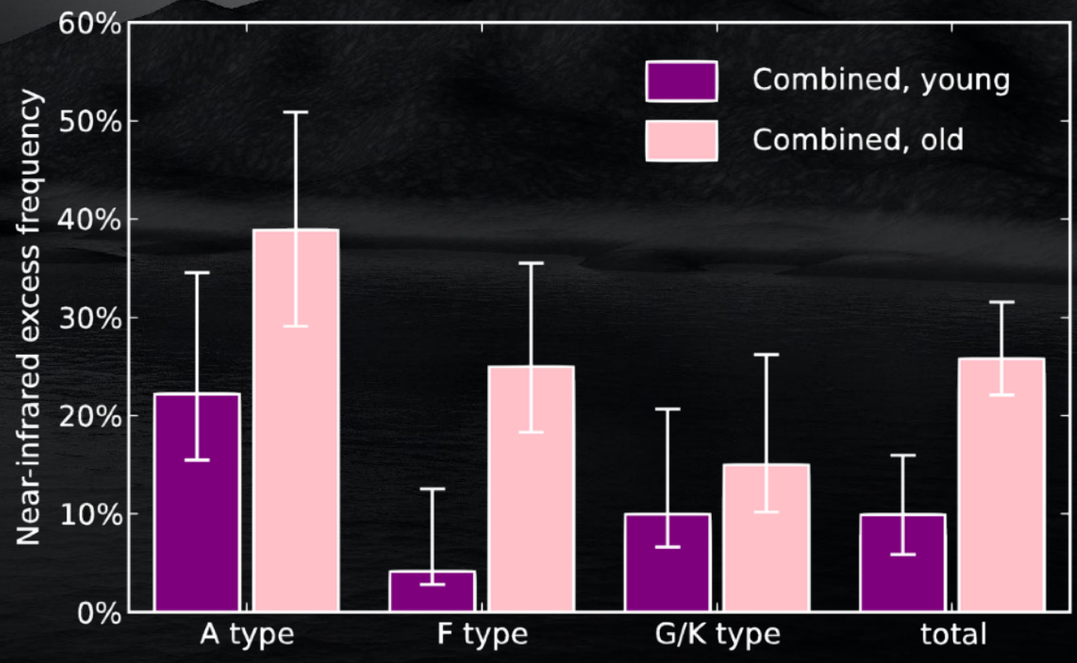
Ertel et al. 2014

MAIN TRENDS FROM NEAR-IR INTERFEROMETRIC SURVEYS

- Possible trend with spectral type
- No correlation with age or presence of massive outer dust reservoir







Ertel et al. 2014

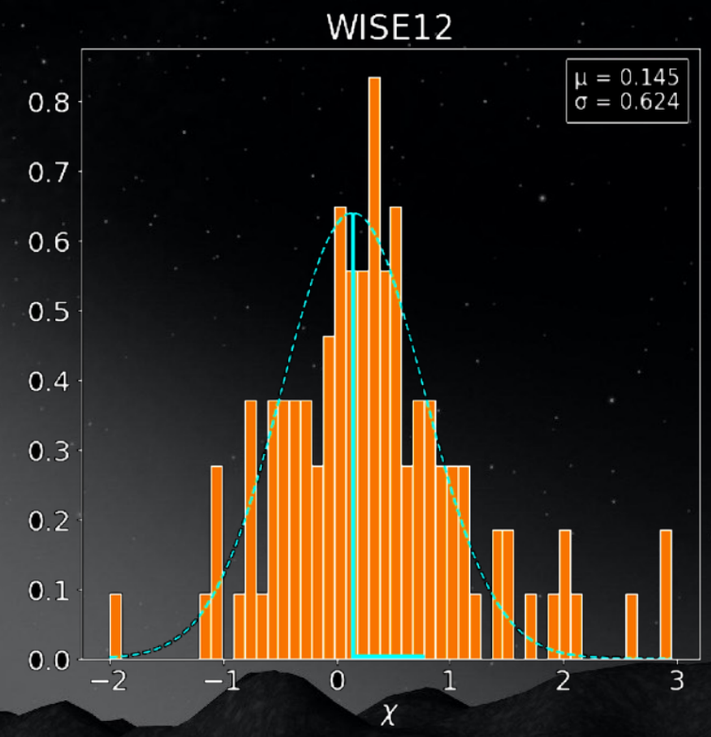
WARM DUST ALSO RESOLVED WITH MID-INFRARED INTERFEROMETRY

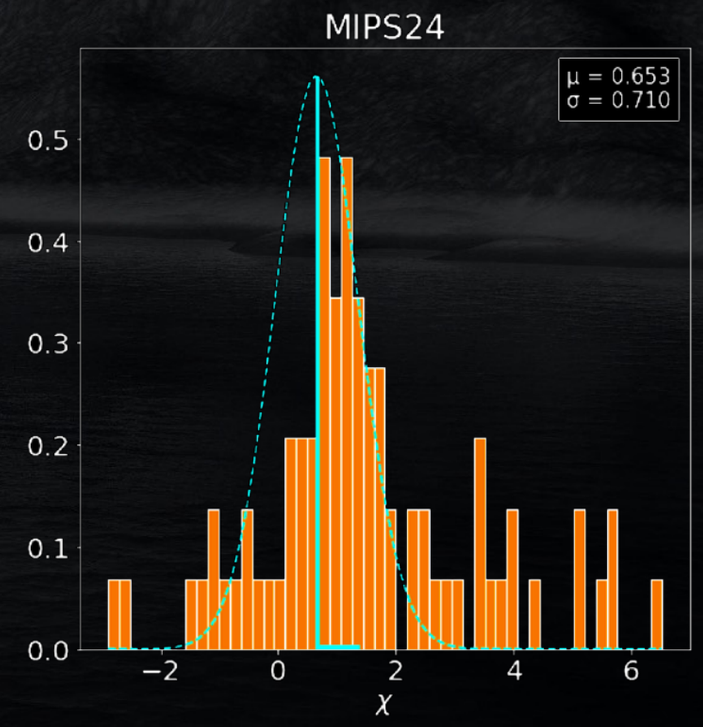
- See Defrère's and Kirchschlager's talks
- Follow-up of CHARA & VLTI detections not showing any correlation between hot and warm dust (small sample)

Is there a connection between hot and warm dust?

NEW SURVEY FOCUSED ON WARM EXCESS STARS

- Warm dust found around a few % of MS stars with mid-IR photometry
- Build catalog of bright (H<7) stars with warm excess from literature
- Re-assessed nature of warm/cold disk for all PIONIER targets
  - 85 stars (Ertel et al. 2014) + 48 stars (this study)
  - significance of excess from histograms
  - SED modeling to derive dust temperature

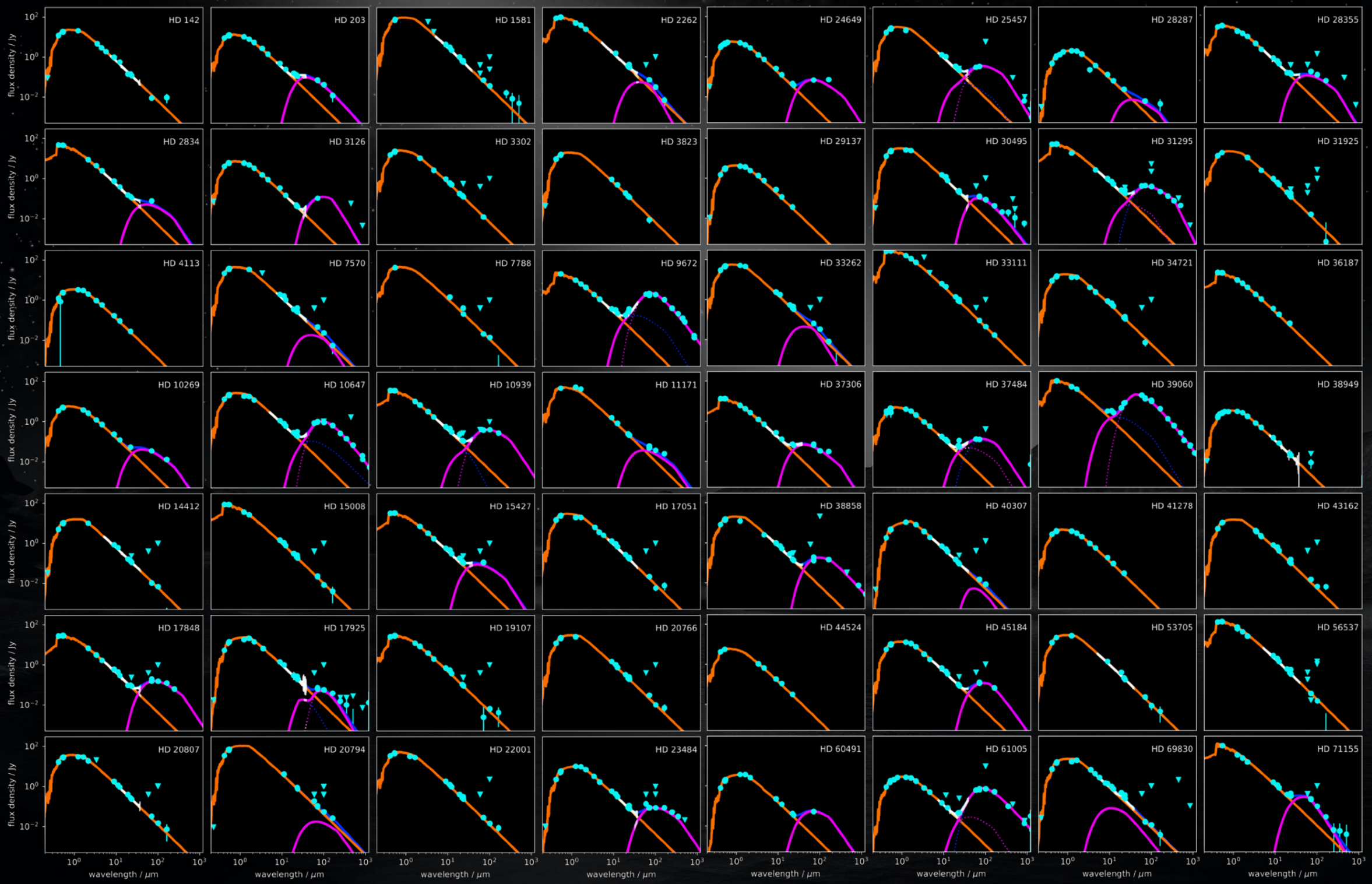




Absil et al. 2021

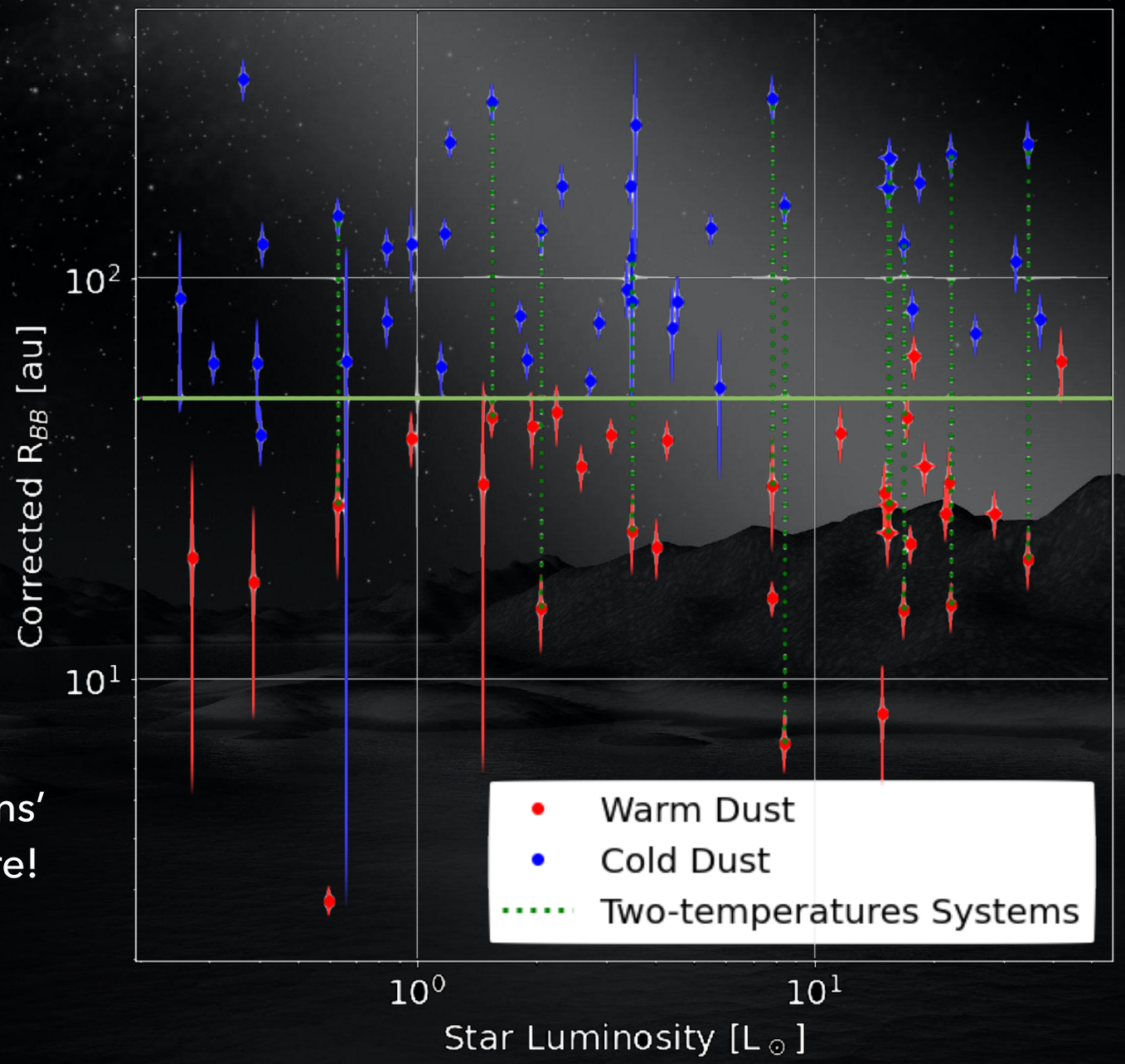
CONNECTION BETWEEN HOT EXOZODIACAL DUST AND OUTER RESERVOIRS

56 of the 133 modeled SEDs (modified blackbody model, up to two temperatures allowed)



Absil et al. 2021

SEPARATE WARM FROM COLD POPULATIONS: 100 K THRESHOLD



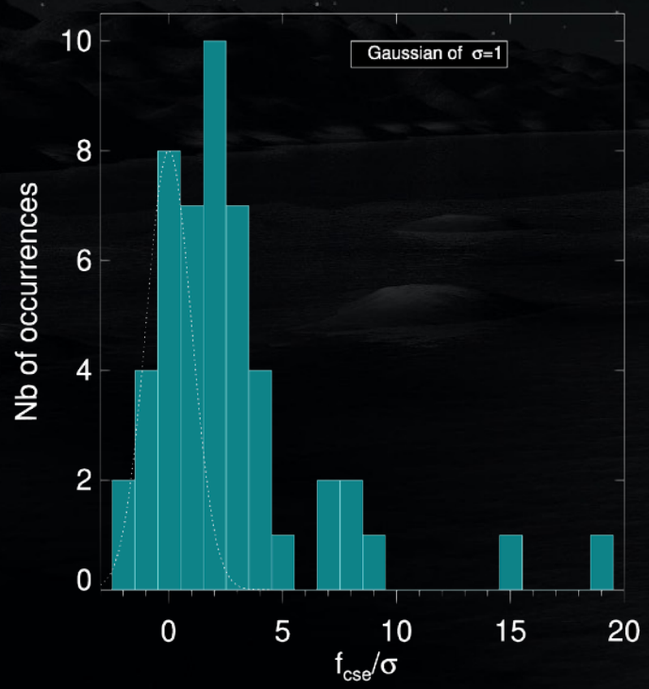
100 K corresponds to ~50 au cut-off based on corrected blackbody of Pawellek & Krivov (2015)

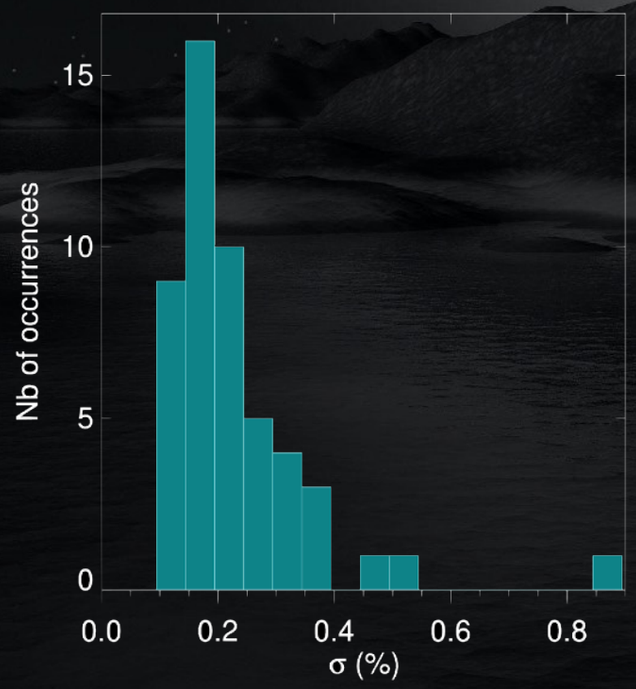
Many ‘re-classifications’ compared to literature!
- 35 warm dust
- 31 cold dust **only**
- 65 no sign of dust

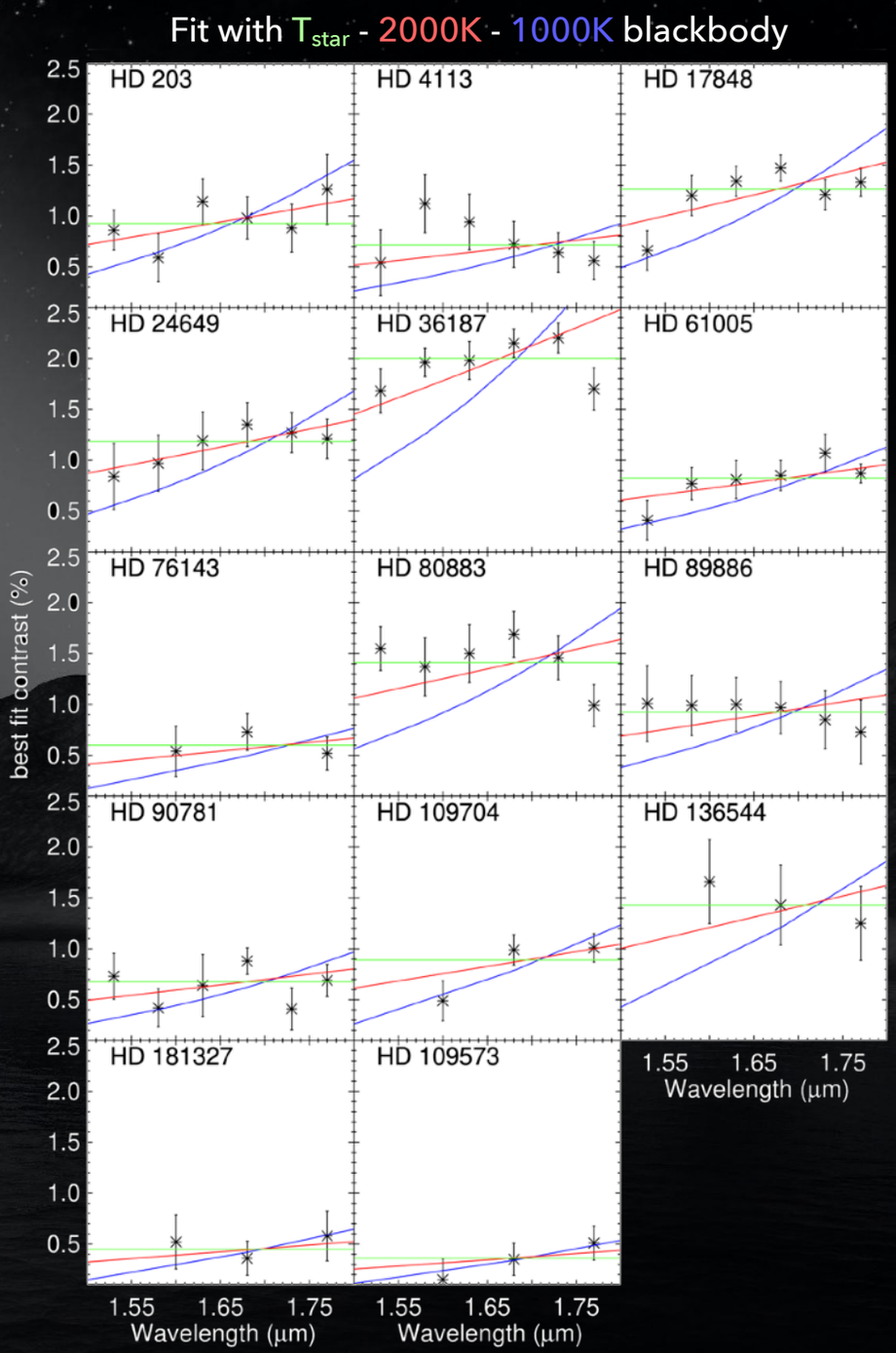
Absil et al. 2021

PIONIER SEARCH FOR HOT EXOZODIS IN NEW SAMPLE

- 4 new binaries (removed from sample)
- 13 new hot disks out of 48 target stars
- Detection limits consistent with previous survey (1σ sensitivity ~ 0.2%)
- Temperature of excess generally > 1000 K



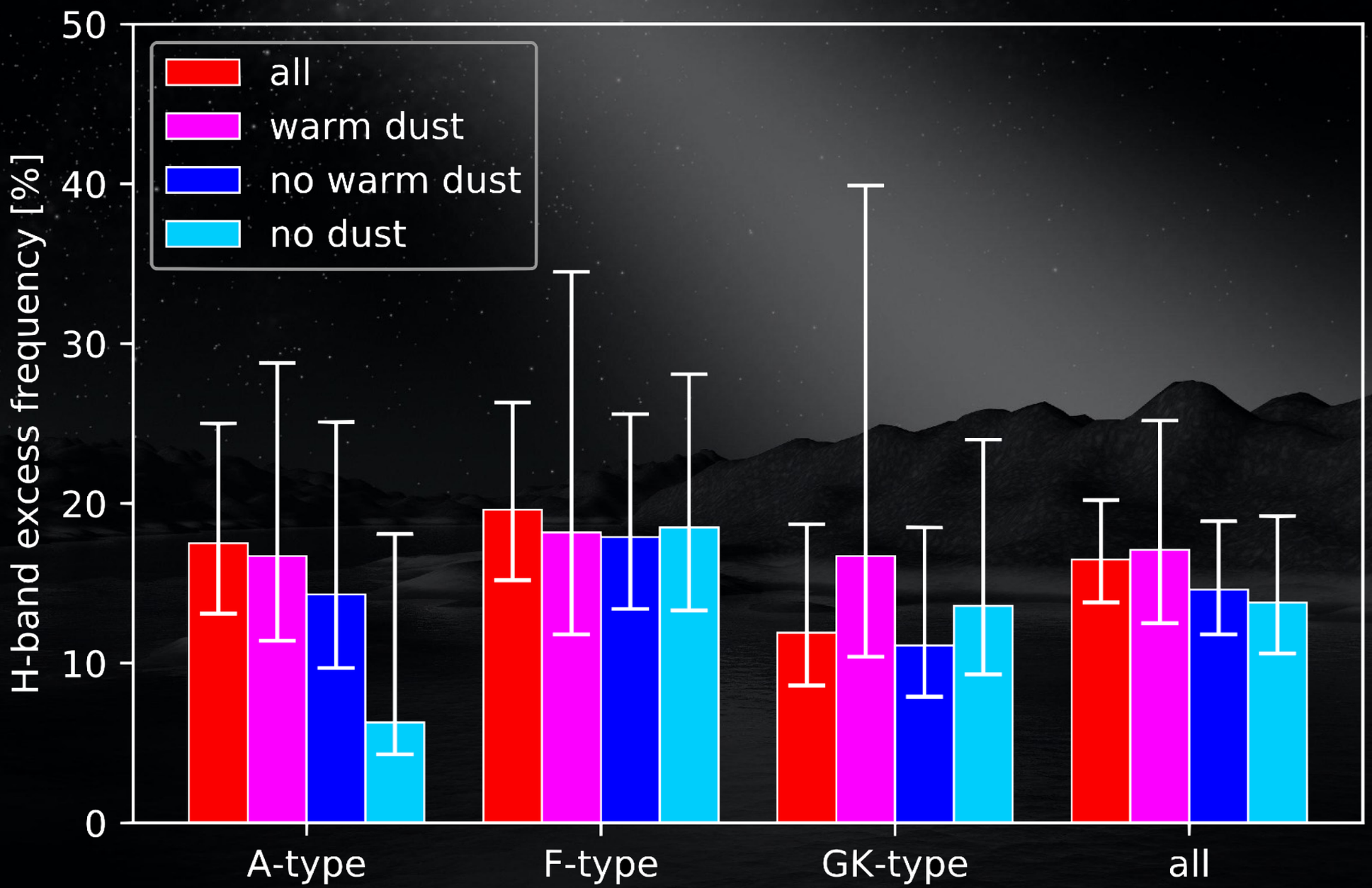




Absil et al. 2021

GLOBAL SAMPLE: NO TREND VS WARM/COLD DUST OR STELLAR PARAMETERS

(trend for more hot excesses around early-type stars not confirmed)



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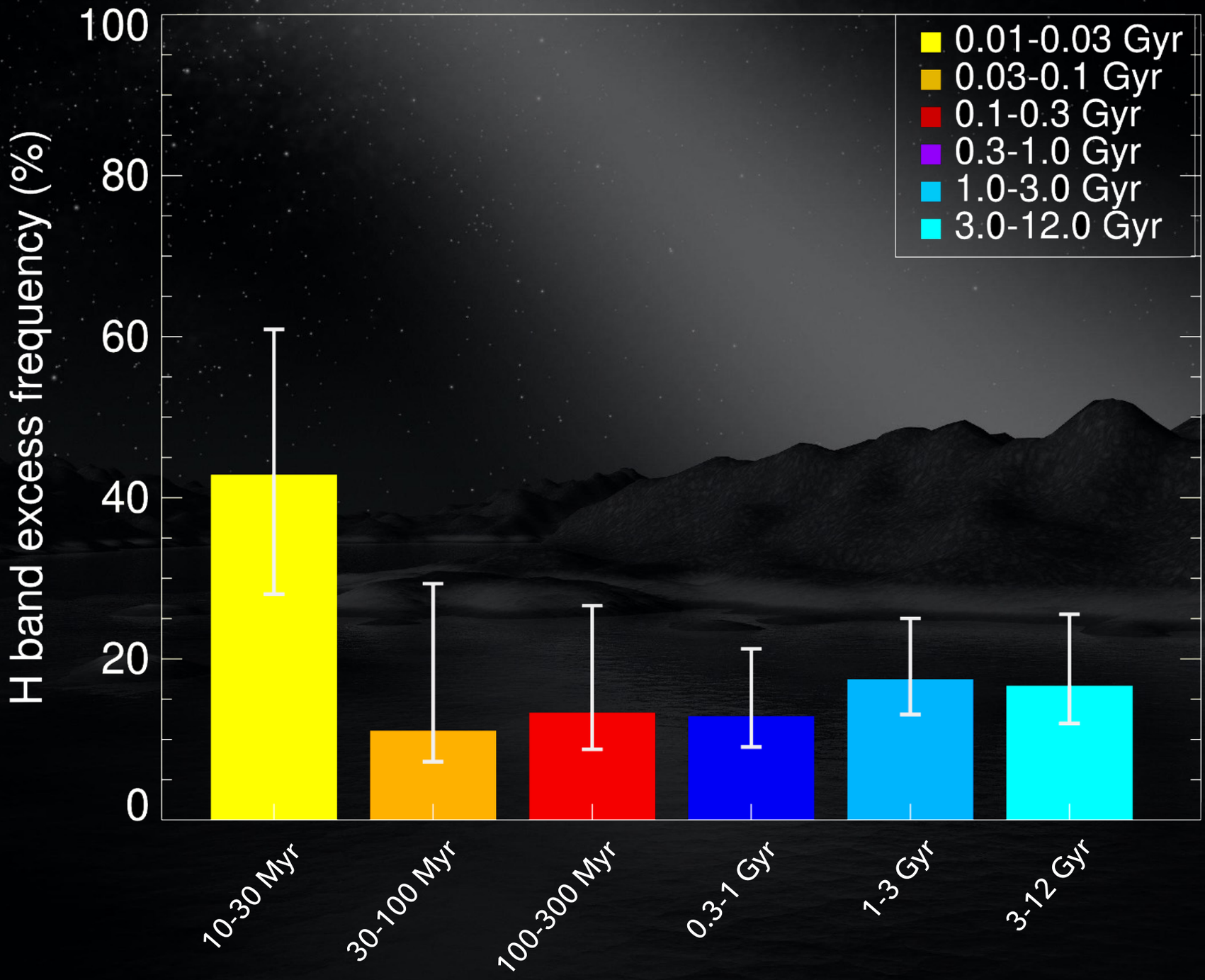
MORE EXCESSES FOR 'ADOLESCENT' SYSTEMS



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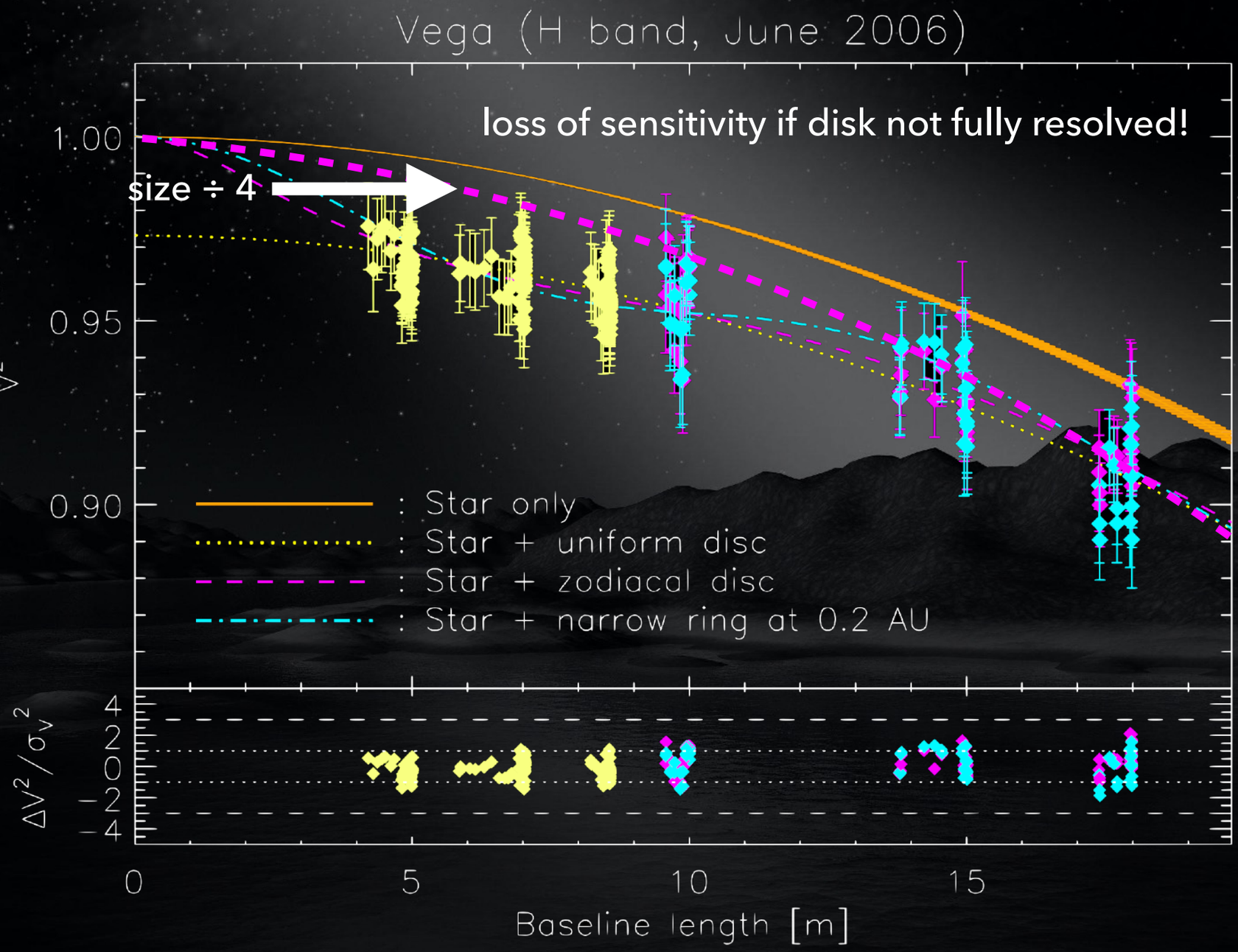
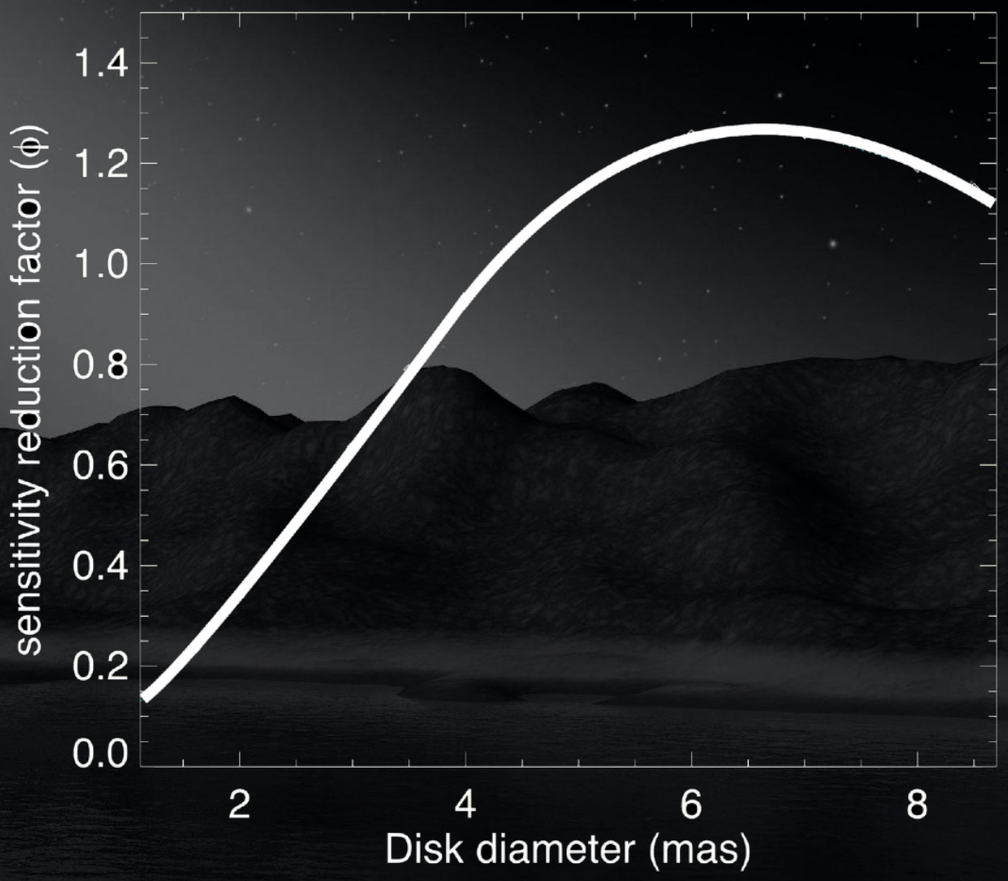
CORRECTING FOR PARTLY RESOLVED DISKS



Absil et al. 2021

CORRECTING FOR PARTLY RESOLVED DISKS

- Some systems have effective 3σ sensitivity >> 1% assuming dust @ sublimation radius
- Removed them from sample and corrected for partly resolved disks
- New hot dust occurence rates:
  - 29% around stars with dust (warm or cold)
  - 13% around stars with no dust
- A-D test: samples originating from same population rejected at 3.4σ level



Absil et al. 2021

WHAT CAN WE CONCLUDE?

- Warm and hot populations seem to be disconnected, although tentative evidence for hot dust connection with outer reservoir
- Origin of hot dust unclear: one mechanism to rule them all?
  - dust delivery: PR drag not favored for some systems
    –> maybe dominated by comets, and driven by system architecture?
  - trapping mechanism would help
- New observations at L-M bands most relevant (MATISSE, Hi5)
- Variability still poorly constrained