exo-Zodi and prospects for exo-Earth detection

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Background:

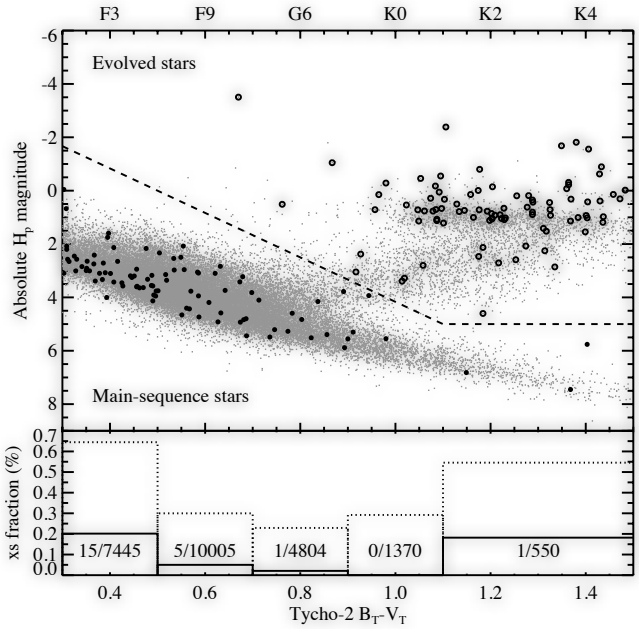
- Terrestrial-zone debris disks (exo-Zodi) will hinder exo-Earth imaging
- Bright exo-Zodi are rare, but the frequency of currently undetectable fainter ones is unknown

Goals:

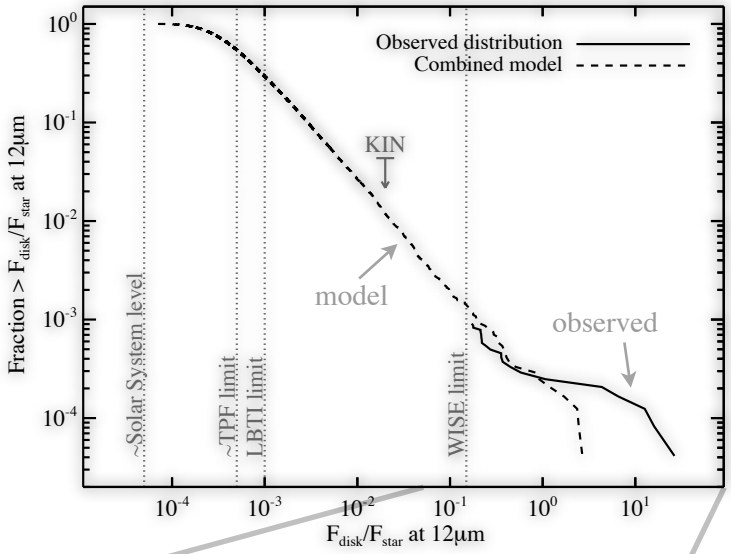
- Quantify rarity of bright exo-Zodi using WISE 12μm observations of Hipparcos stars
- Use a simple collisional evolution model to predict the frequency of fainter exo-Zodi

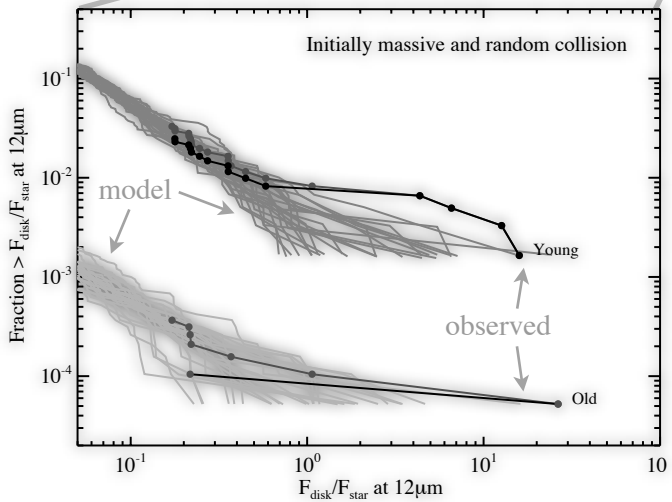
Conclusions:

- Bright exo-Zodi are a 1:10,000 occurrence
- Many stars predicted to host exo-Zodi bright enough to hinder exo-Earth detection
- Other predictions possible, more work needed



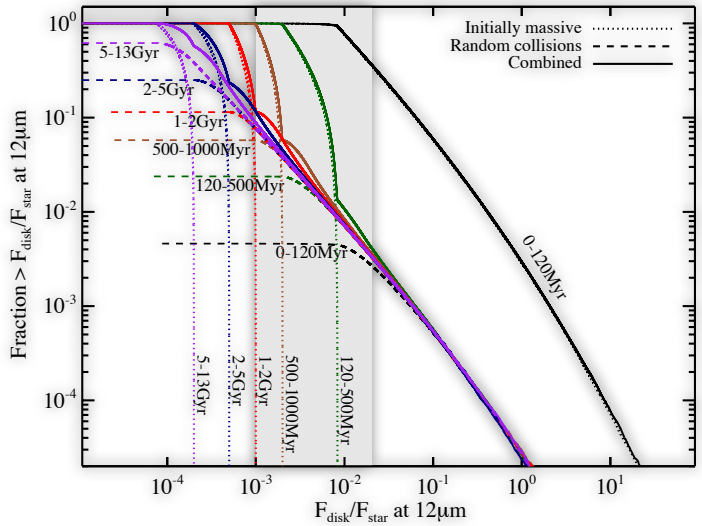
1: Sample stars are Hipparcos FGK-types and exclude giants (i.e. those above the dotted line). Histograms show all stars with apparent WISE W1-W3 (3-12μm) excesses (dotted) and 22 stars found to have robust 12μm excesses following inspection (solid).





2: Observed (black lines) and model (grey) exo-Zodi distributions. Young stars are more likely to have detectable exo-Zodi (~1%), while old stars are less likely (~0.01%). A model where all stars have initially bright exo-Zodi *and* a random dust creation event during the main-sequence lifetime can reproduce the observed distribution.

3: exo-Zodi brightness distribution at 12μm (solid) and prediction using a simple collision model (dashed). This model predicts that ~50% of stars may have dust levels that will impact exo-Earth imaging attempts.



4: Evolution of exo-Zodi brightness for stars of different ages. Initially massive belts (dotted) quickly become faint, but decaying dust levels from random collisions (dashed) can dominate exo-Zodi brightness, even for old stars.