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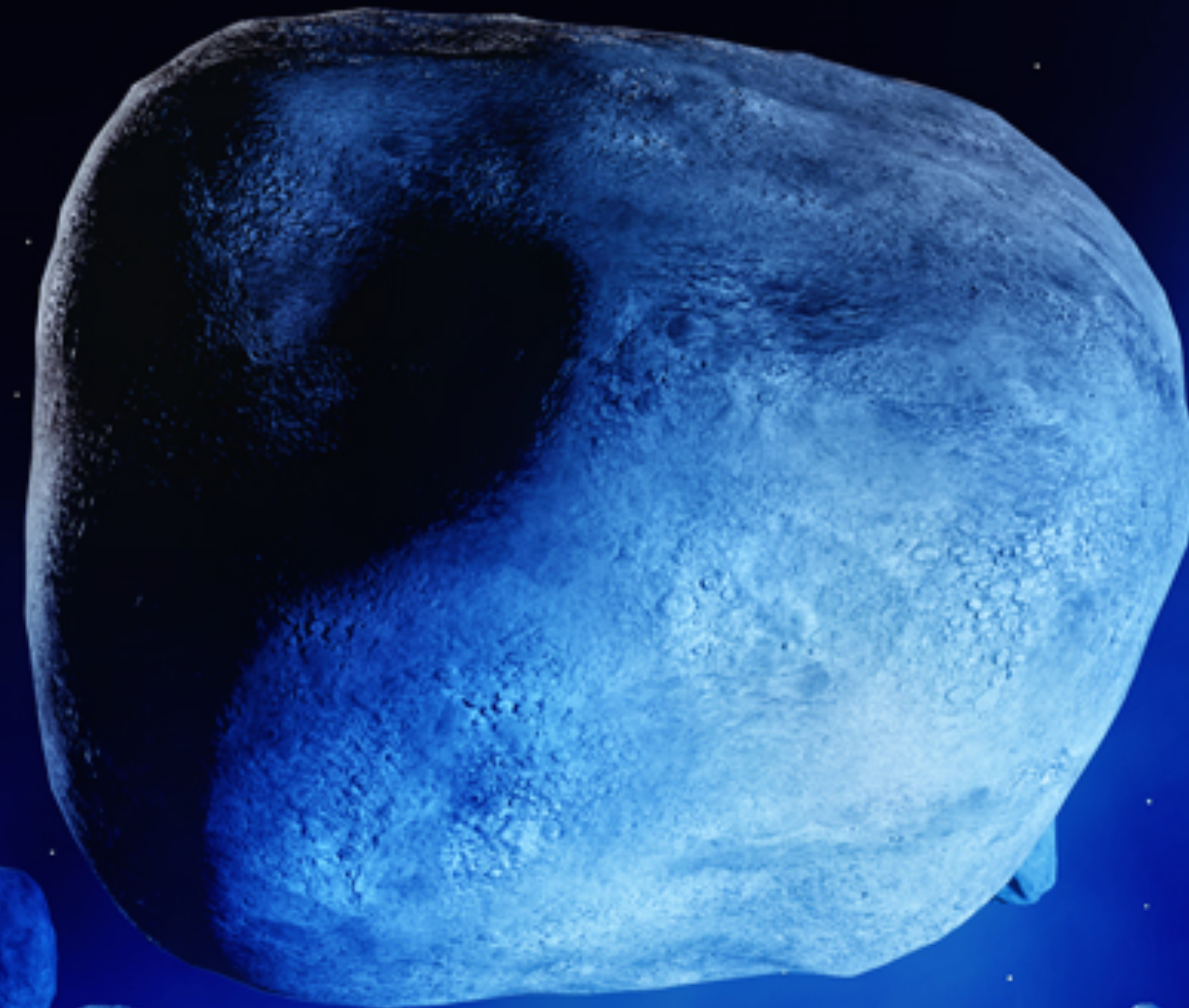


# The Structure of Debris Discs exoKuiper belts

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Credit: Amanda Smith





# Debris discs are common

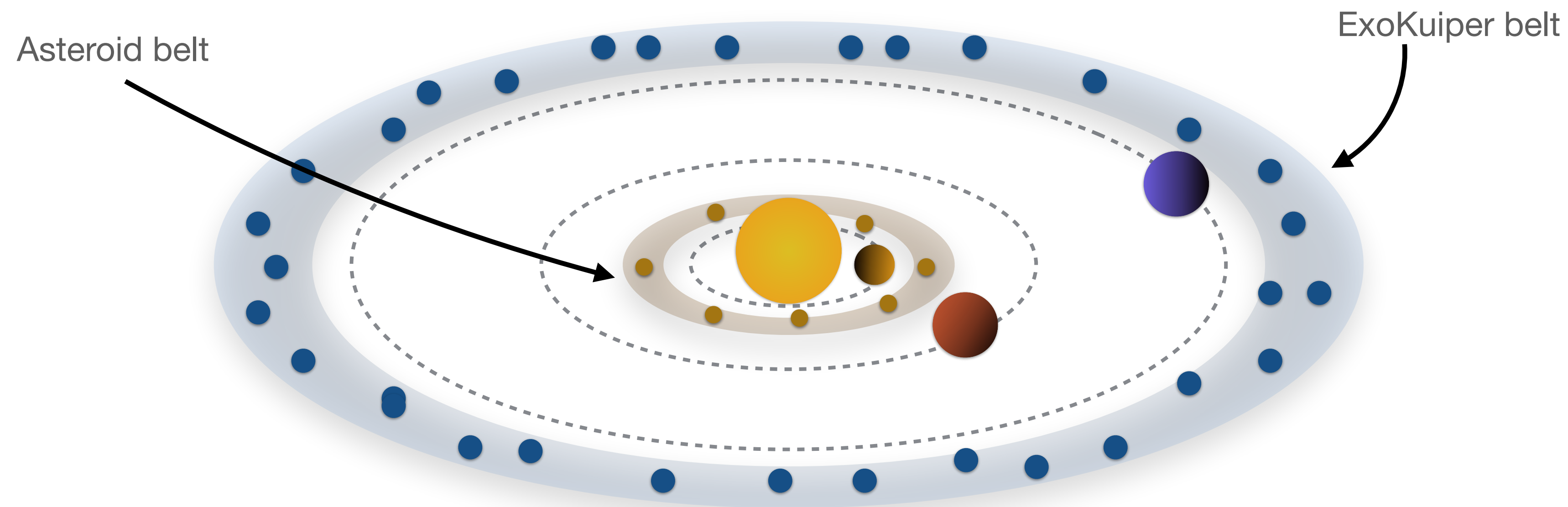
Dusty extrasolar **analogues of the asteroid and Kuiper belts**.

Dust IR excess **around >20% of Solar-type stars**.

**Dust is short-lived** due to radiation forces and collisions.

Dust is replenished by **collisional cascade** from um- to km-sized bodies.

**Gas** can be present and released from solids or protoplanetary disc leftover

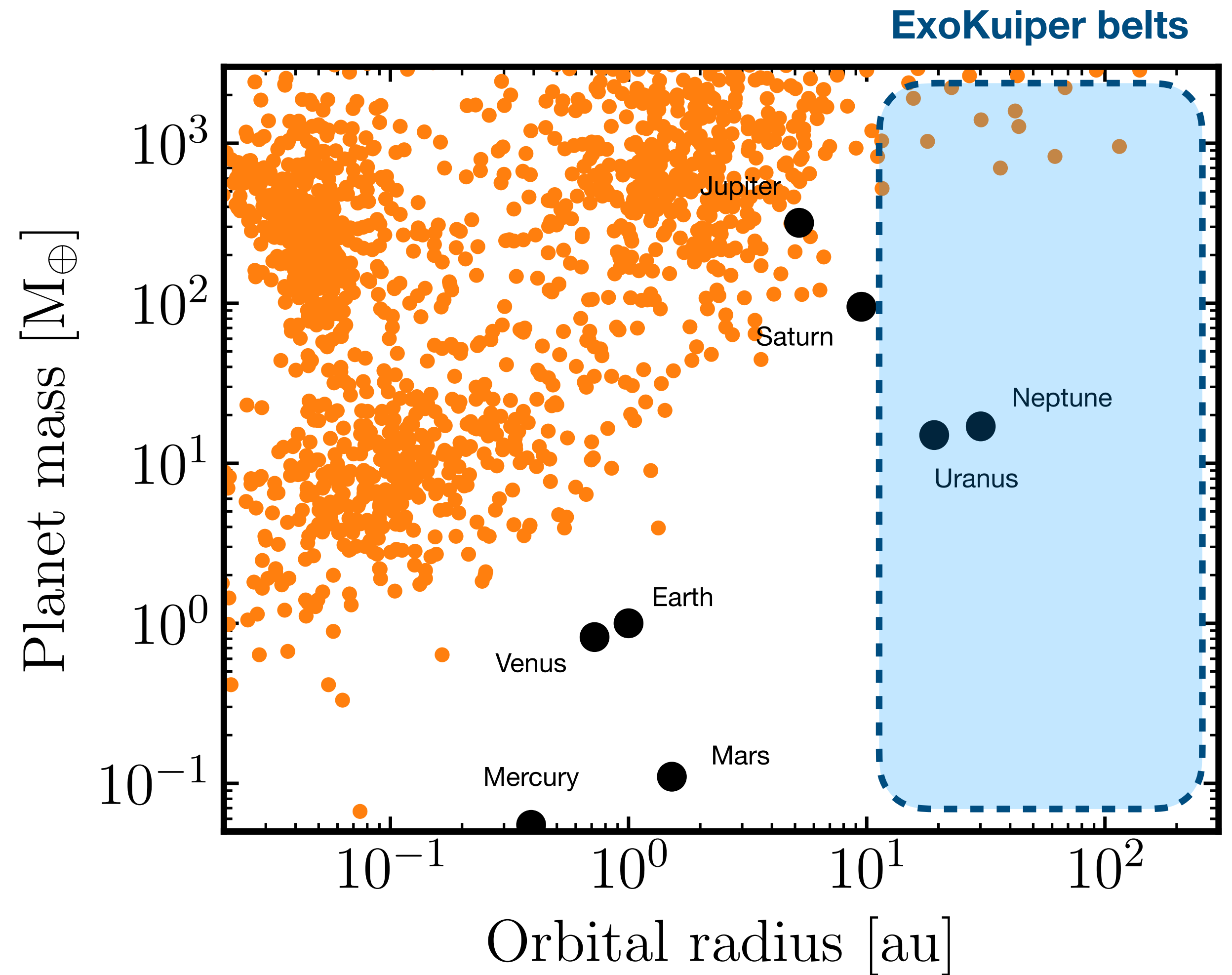


# Why do we study them?

ExoKuiper belts probe the outer regions.

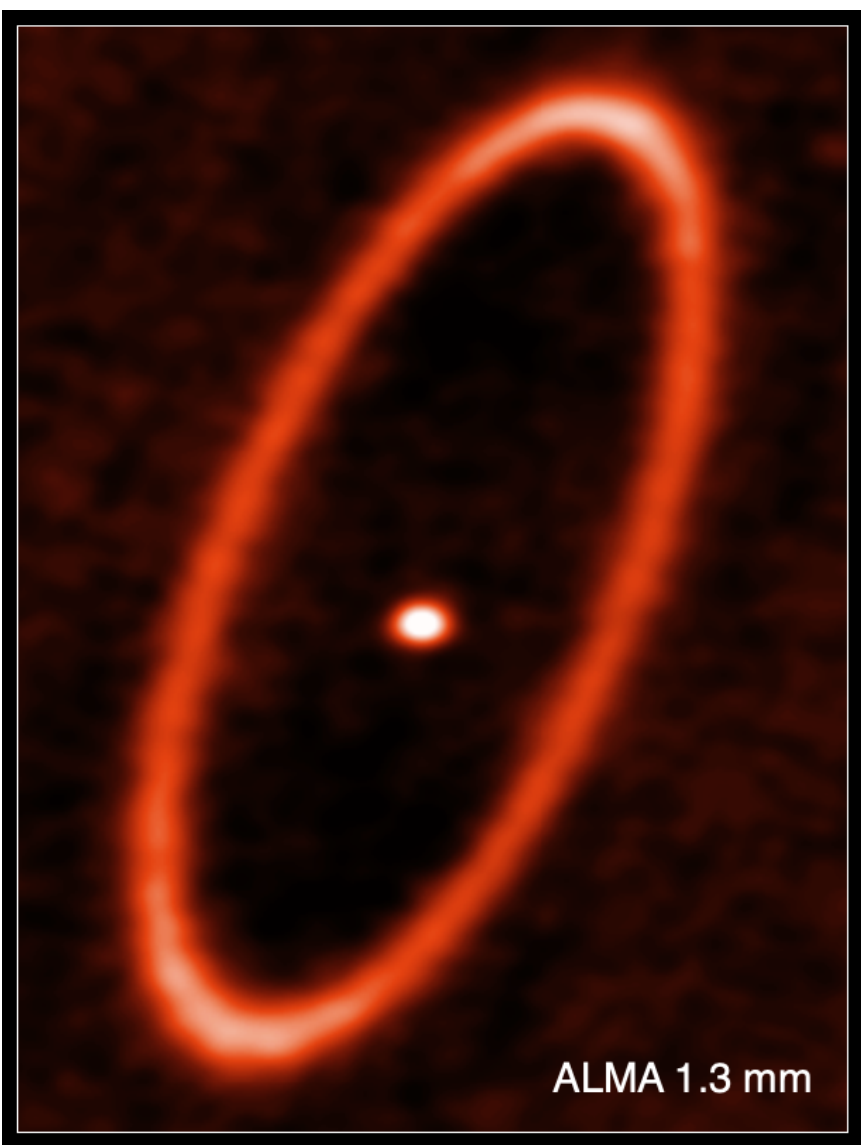
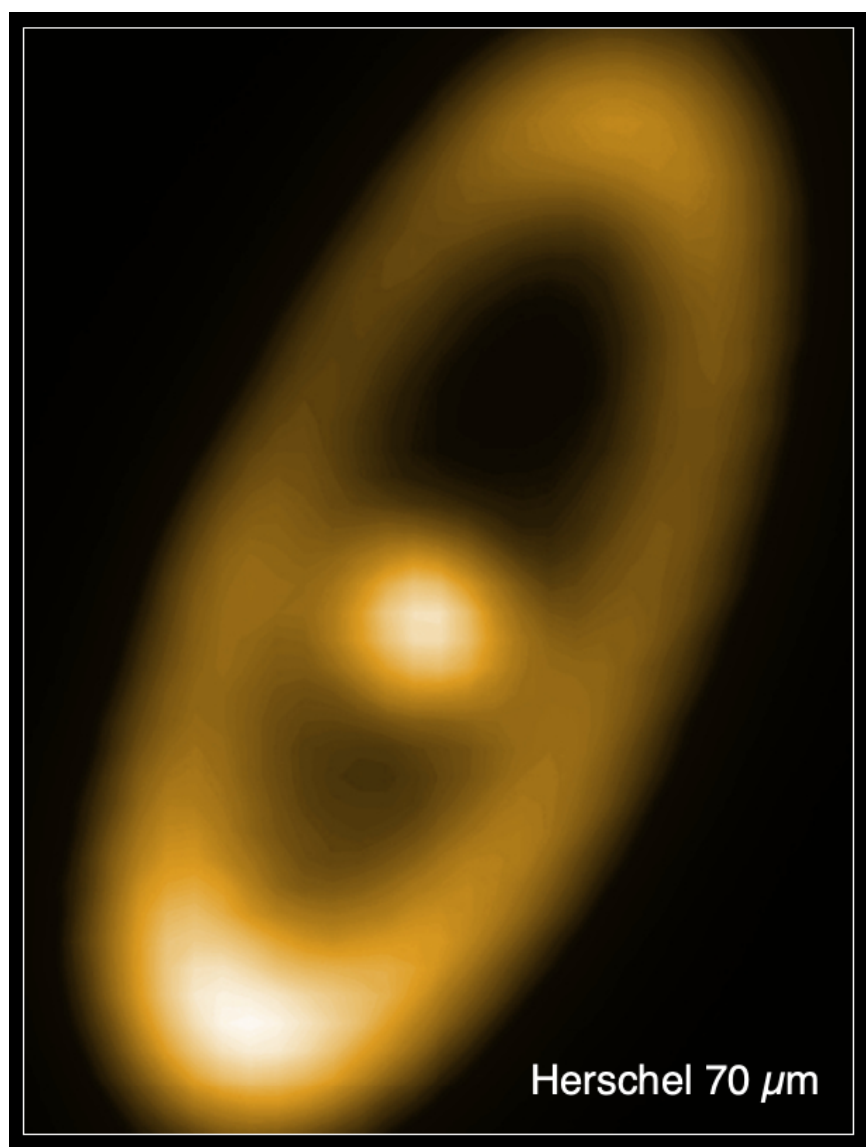
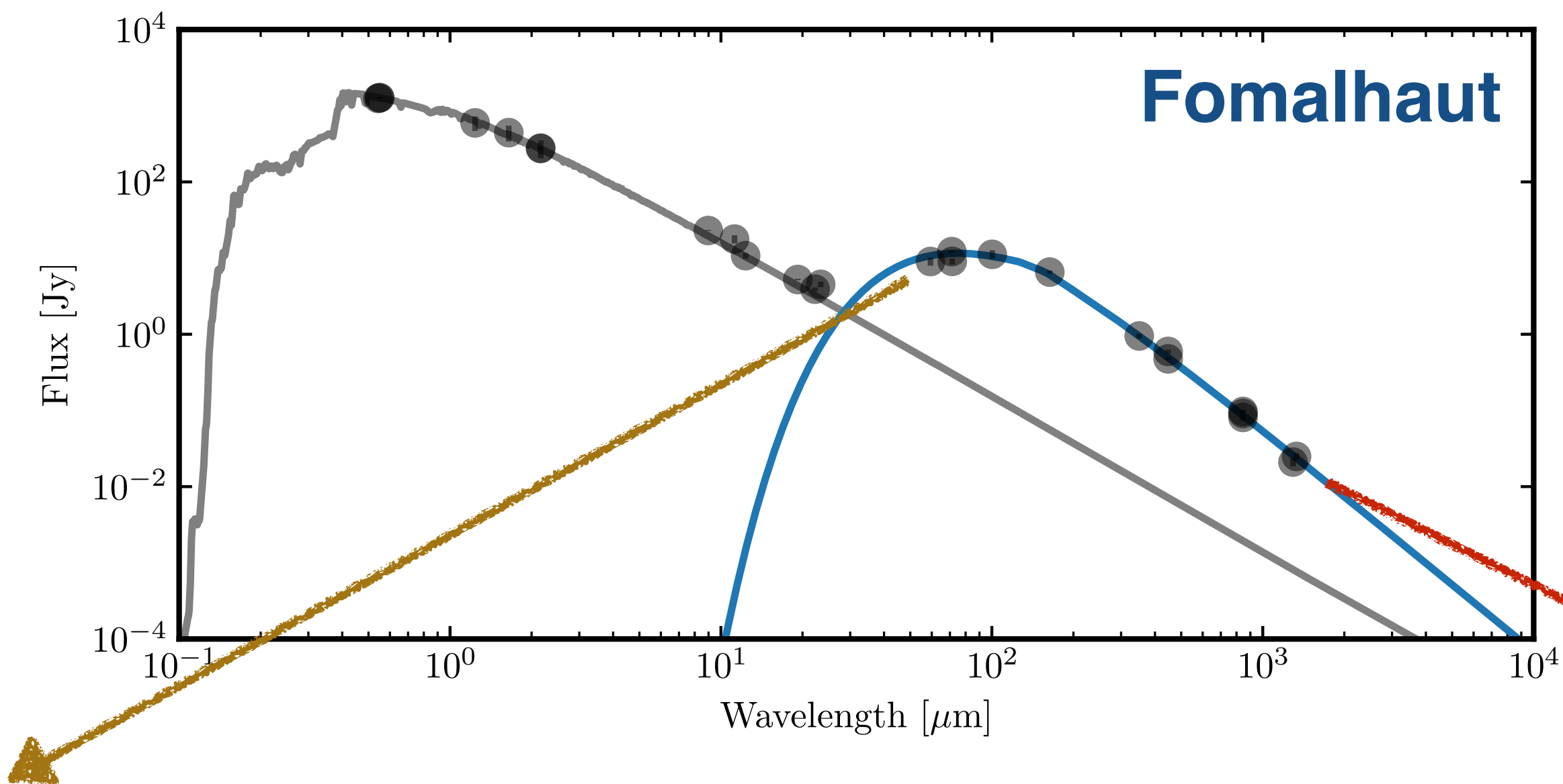
Unique constraints on:

- Presence of planets
- Dynamical history
- Planet Formation



source: [exoplanet.eu](http://exoplanet.eu)

# Why is the FIR-Submm so important?





# 10 years of ALMA have raised fundamental questions

- Are substructures common?
- How excited are exoKuiper belts?
- What is the origin, distribution and kinematics of gas?

The **ALMA** survey to **R**esolve exo**K**uiper belt **S**ubstructures (**ARKS**)

PI: S. Marino, co-PI's: M. Hughes and L. Matrà

51 members, >30 institutions

Sample of 18 new + 6 archival exoKuiper belts

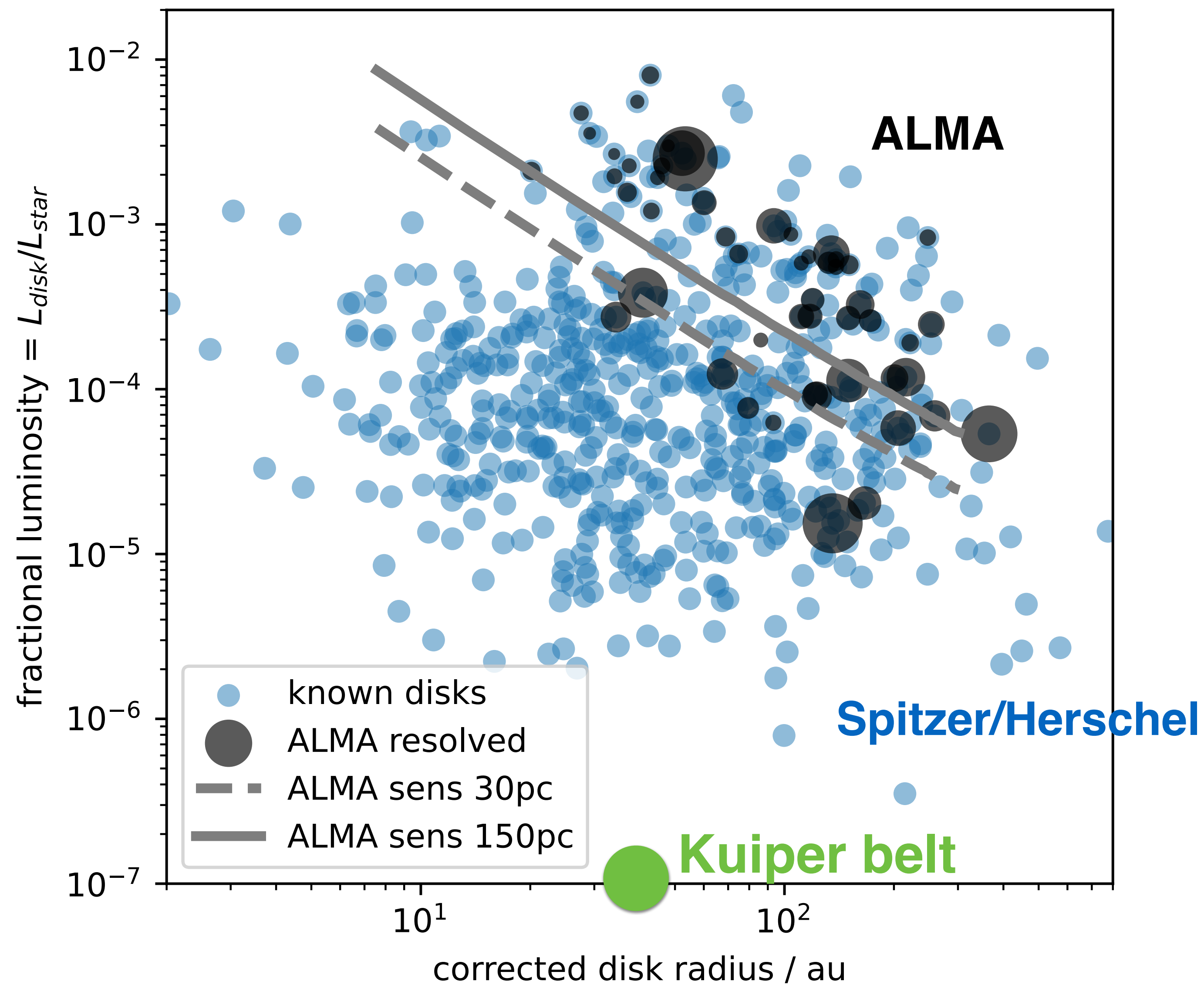


ARKS meeting, Dublin 2023





# Only scratching the surface with ALMA

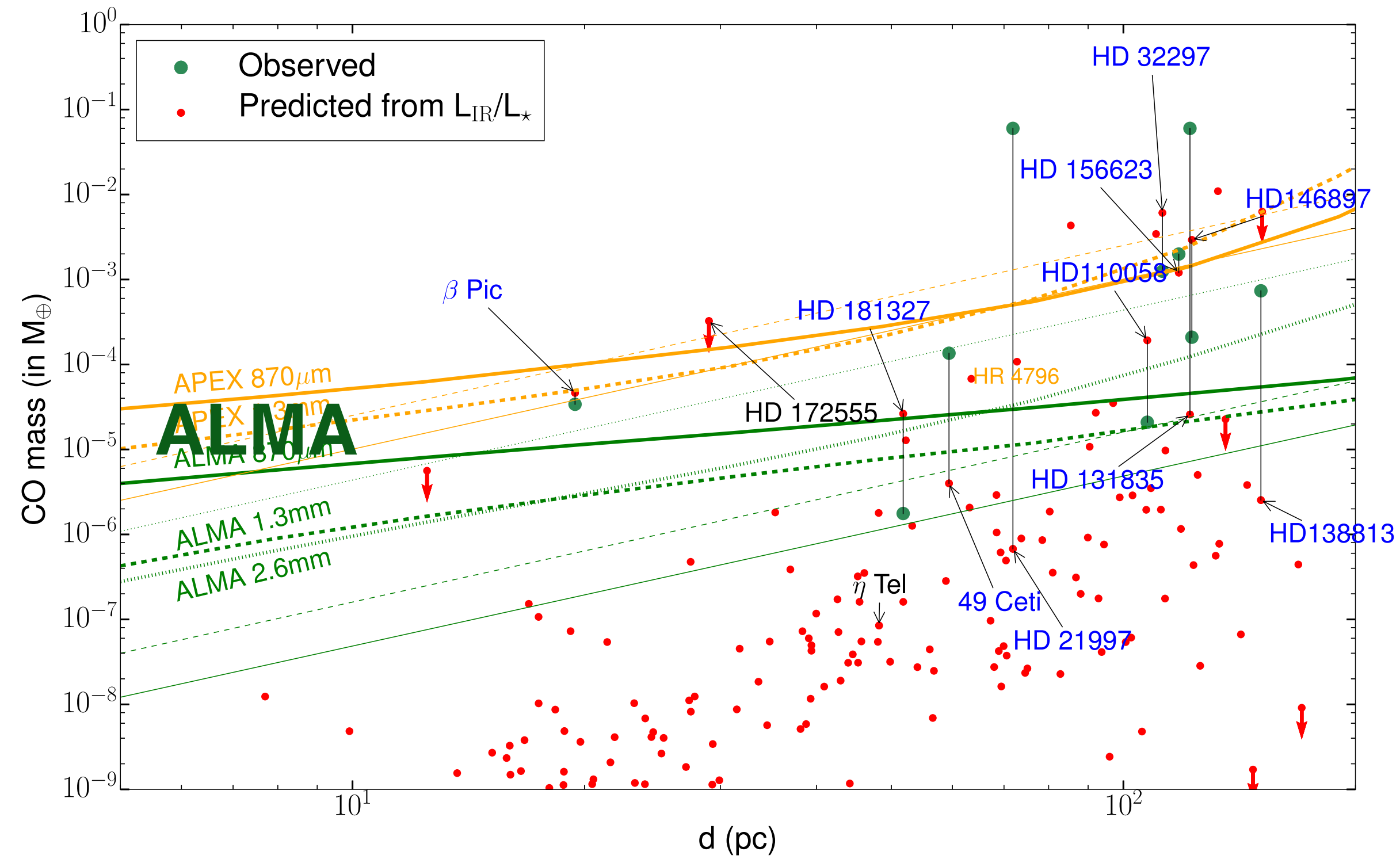




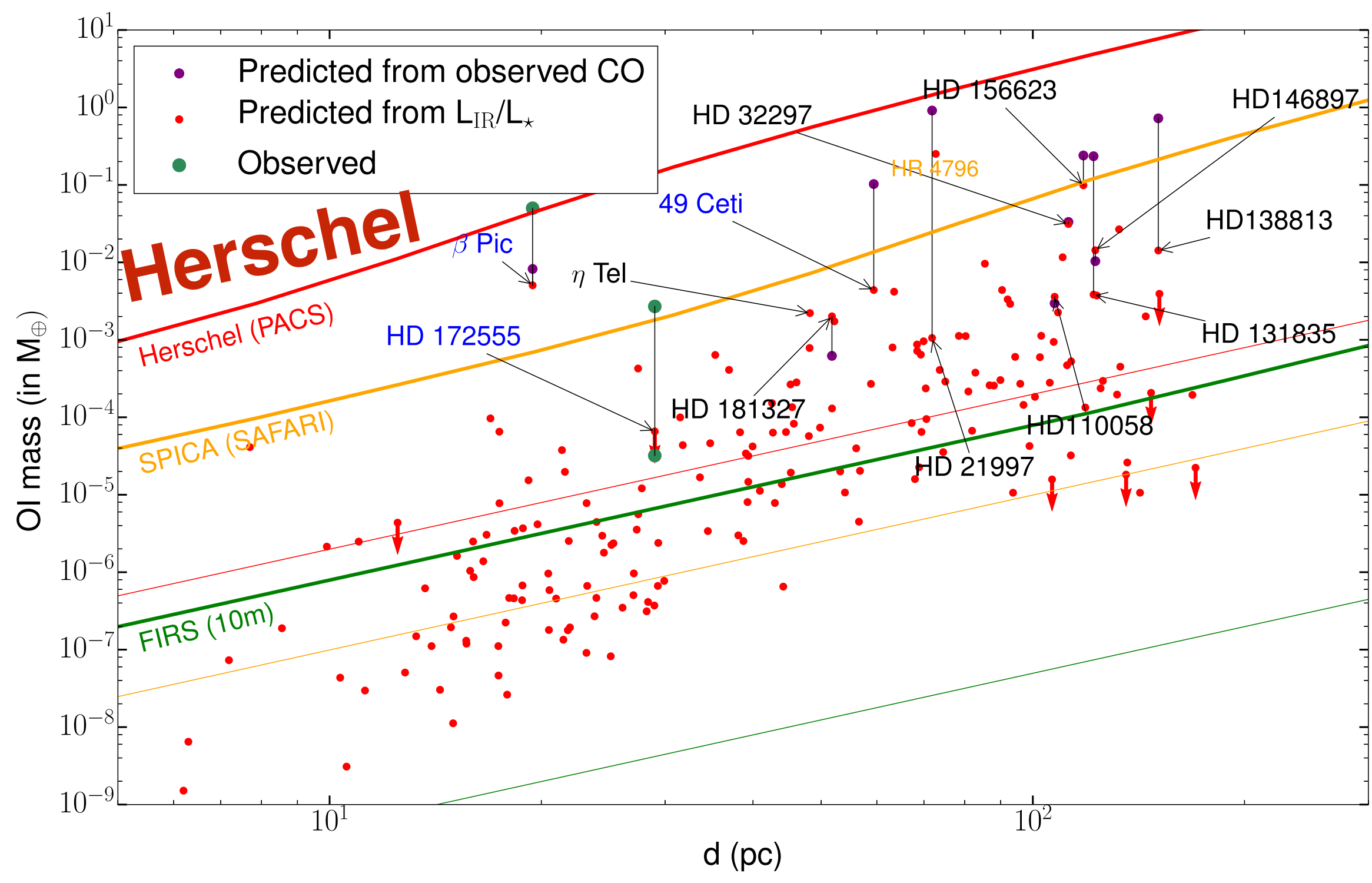
# Future FIR-submm could reveal gas composition -> origin

Gas mass distribution (predicted by Kral+2017)

CO in submm



OI in FIR



# Summary



**ExoKuiper belts are common and trace outer regions of planetary systems**

**ALMA large program ARKS is revealing their detailed structure**

- **Very diverse**
- **Radial structure can tell us about outer planets**
- **Vertical structure —> wide range of dynamical excitation**

**Gas can be present, but its origin is still unclear**

**Future FIR-Submm facilities could allow to study the bulk population of belts**



# Preferred capabilities of FIR/Submm missions



- **arcsec or higher resolution**
- **FOV of 20'' or larger (similar to ALMA)**
- **High continuum sensitivity: 3-10x Herschel or 3-10x ALMA**
- **High line sensitivity: 10x Herschel or 10x ALMA**