

Witnessing the genesis of exotrojans in PDS 70

Olga Balsalobre-Ruza, Jorge Lillo-Box & Nuria Huélamo

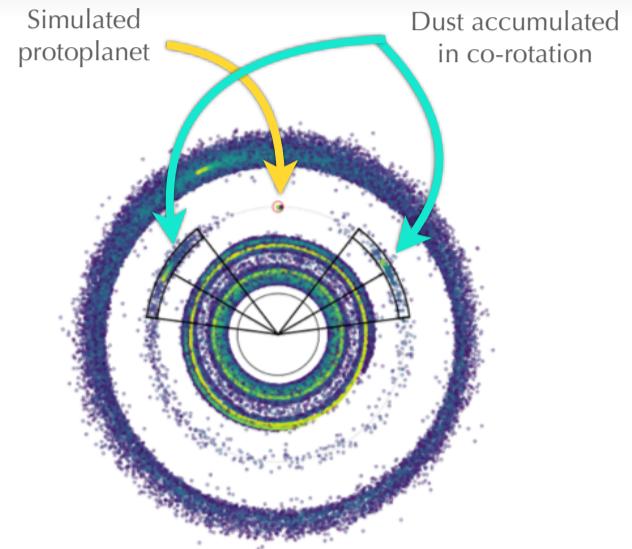
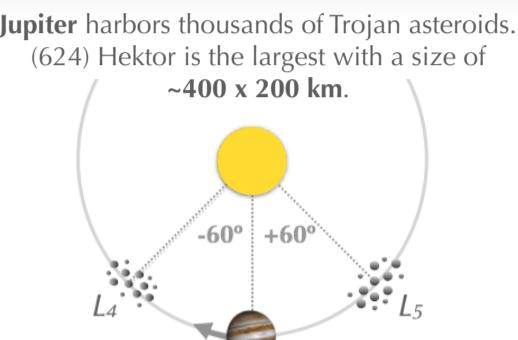
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TROJANS ARE
bodies trapped in 1:1
resonance with a planet.

In the tadpole configuration, the pair populates the **Lagrangian regions L_4 and L_5** of each other, which are extended regions **60 degrees** ahead or behind in their orbit.

PROTOPLANETS

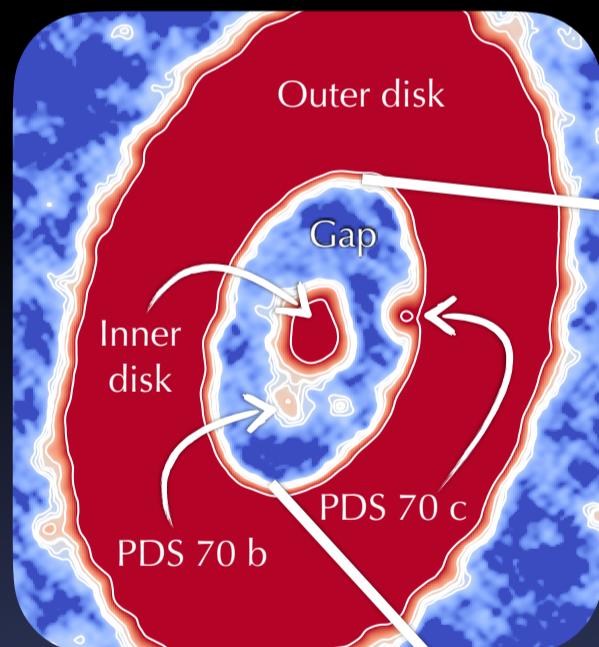
PDS 70 harbors the only two confirmed planets that are still forming PDS 70 b & c (Keppler et al. 2018; Haffert et al. 2019).



PLANET - PLANET CO-ORBITAL PAIRS
are theoretically possible.

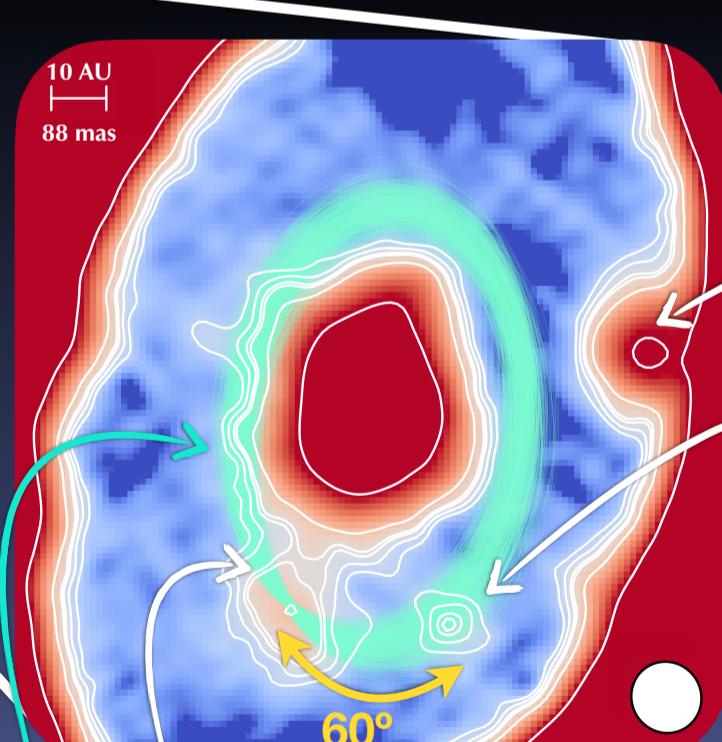
Pairs of co-orbitals with **similar masses** can be stable up to stellar lifetimes (Laughlin & Chambers 2002).

PDS 70 with ALMA Band 7 Continuum



The inner disk surrounds the host star, a ~5 Myr old T-Tauri type.

The disk shows a wide dust gap presumably sculpted by the protoplanets.



Here, it is located PDS 70 b according with the infrared data.

These are 10^3 random orbits of PDS 70 b as characterized with VLTI/GRAVITY (Wang et al. 2021).

THEIR FORMATION

is a **natural by-product according with hydrodynamical simulations**.

They can be assembled **from the planetesimals** that accumulate in the L_4 and L_5 regions and can grow to masses up to those of Super Earths (e.g., Montesinos et al. 2020; Lyra et al. 2009).

EXOTROJANS

We have tentatively detected **dust accumulated** within the **orbital path of PDS 70 b** and falling in its **L_5 region**. Are we **witnessing the genesis of an exotrojan for the first time?**

This is the CPD of PDS 70 c (Benisty et al. 2021).

Accumulation of dust detected at $6-\sigma$ potentially trapped within the L_5 region of PDS 70 b. The co-orbital nature will be tested by checking its motion with future observations (Balsalobre-Ruza et al. 2023, A&A, in press).



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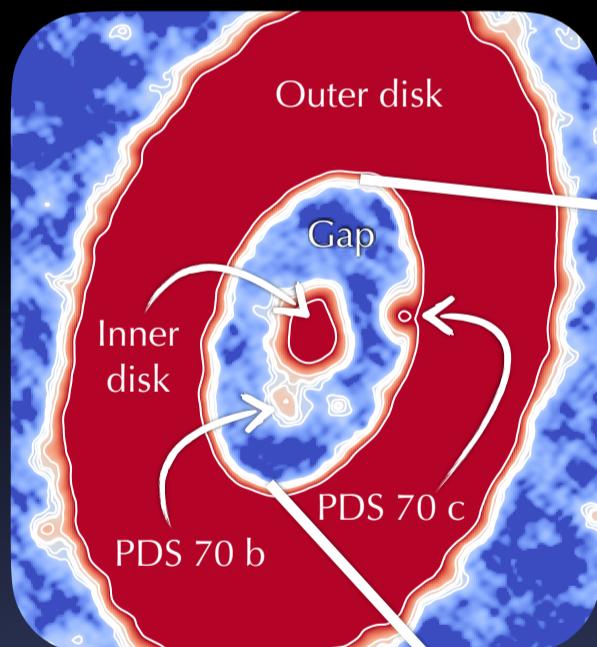
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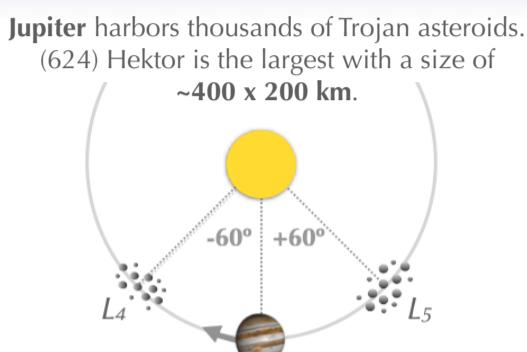
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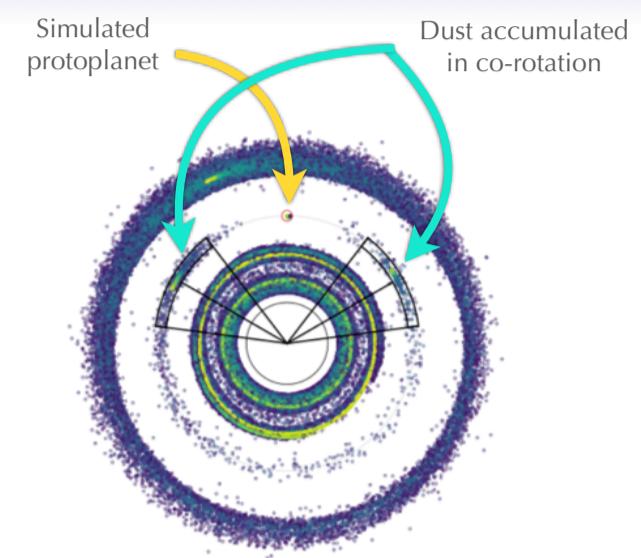


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EXOMOONS

PDS 70 c is surrounded by the only circumplanetary disk (CPD) ever detected, site where moons might form.



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EXOTROJANS

Results under embargo

until **July 19th**

Astronomy & Astrophysics



Balsalobre-Ruza et al., 2023

