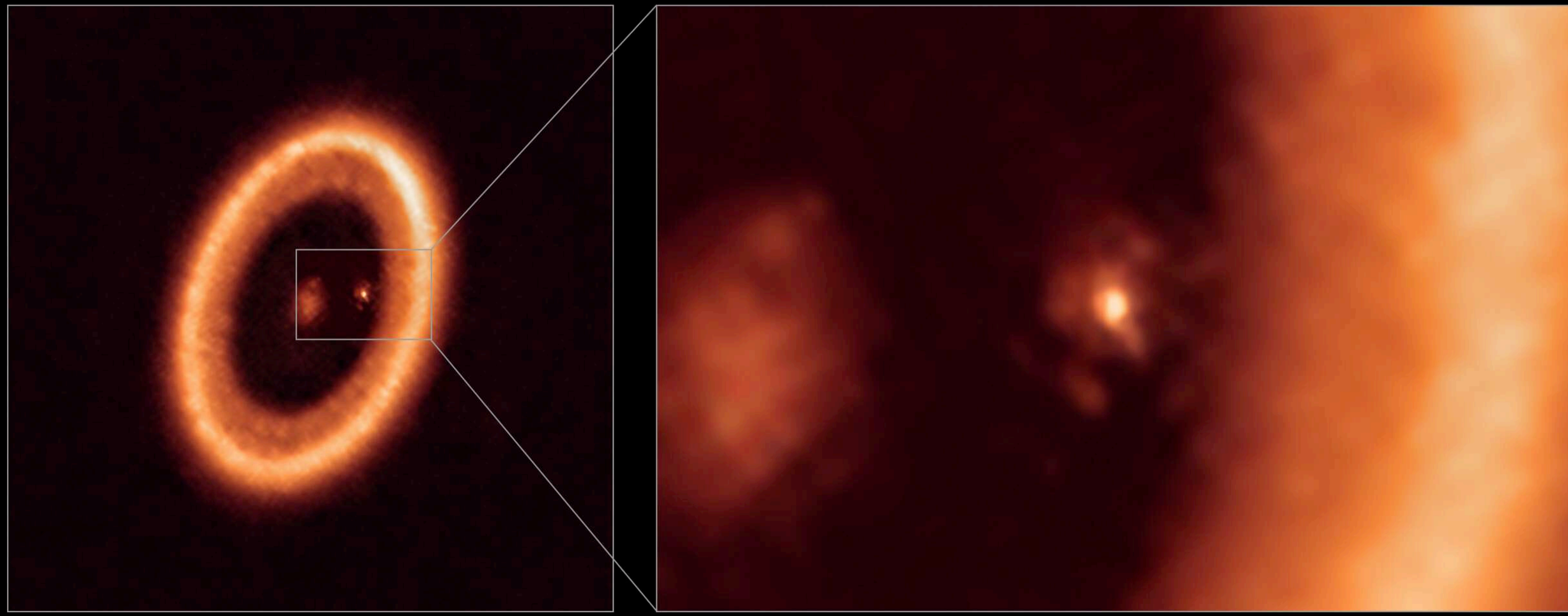
Detección de exoplanetas jóvenes o protoplanetas

The birthplaces of exoplanets are now at the reach of modern observations

…yet only **one** strong direct detection of a moon-forming circumplanetary disk exists.



Benisty et al. (2021)

ESO/NRAO press release

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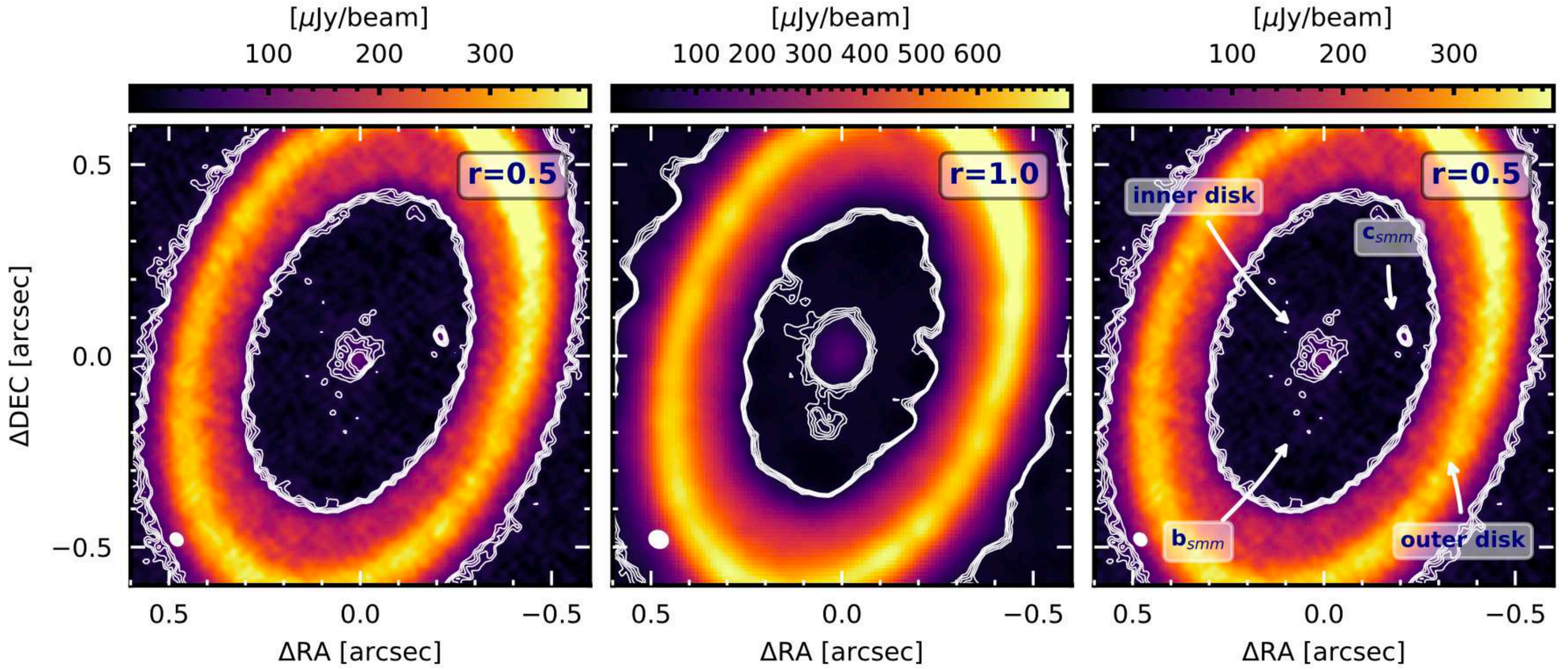

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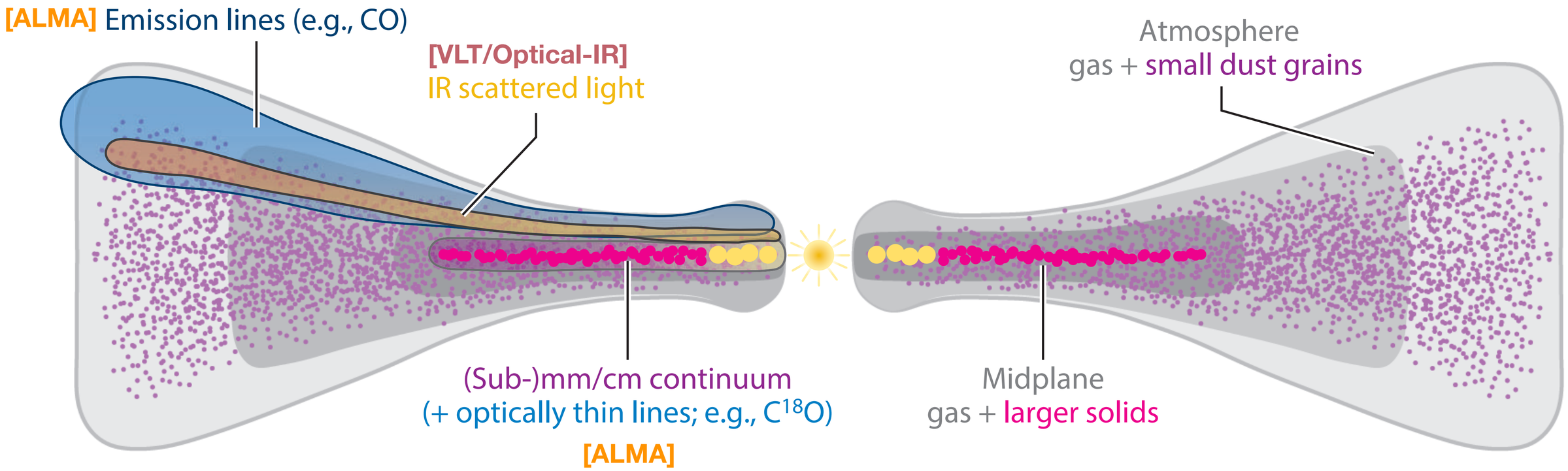
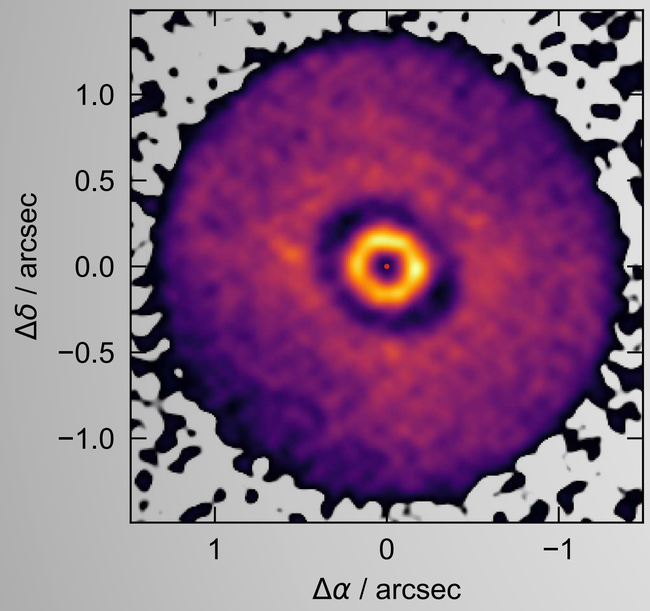
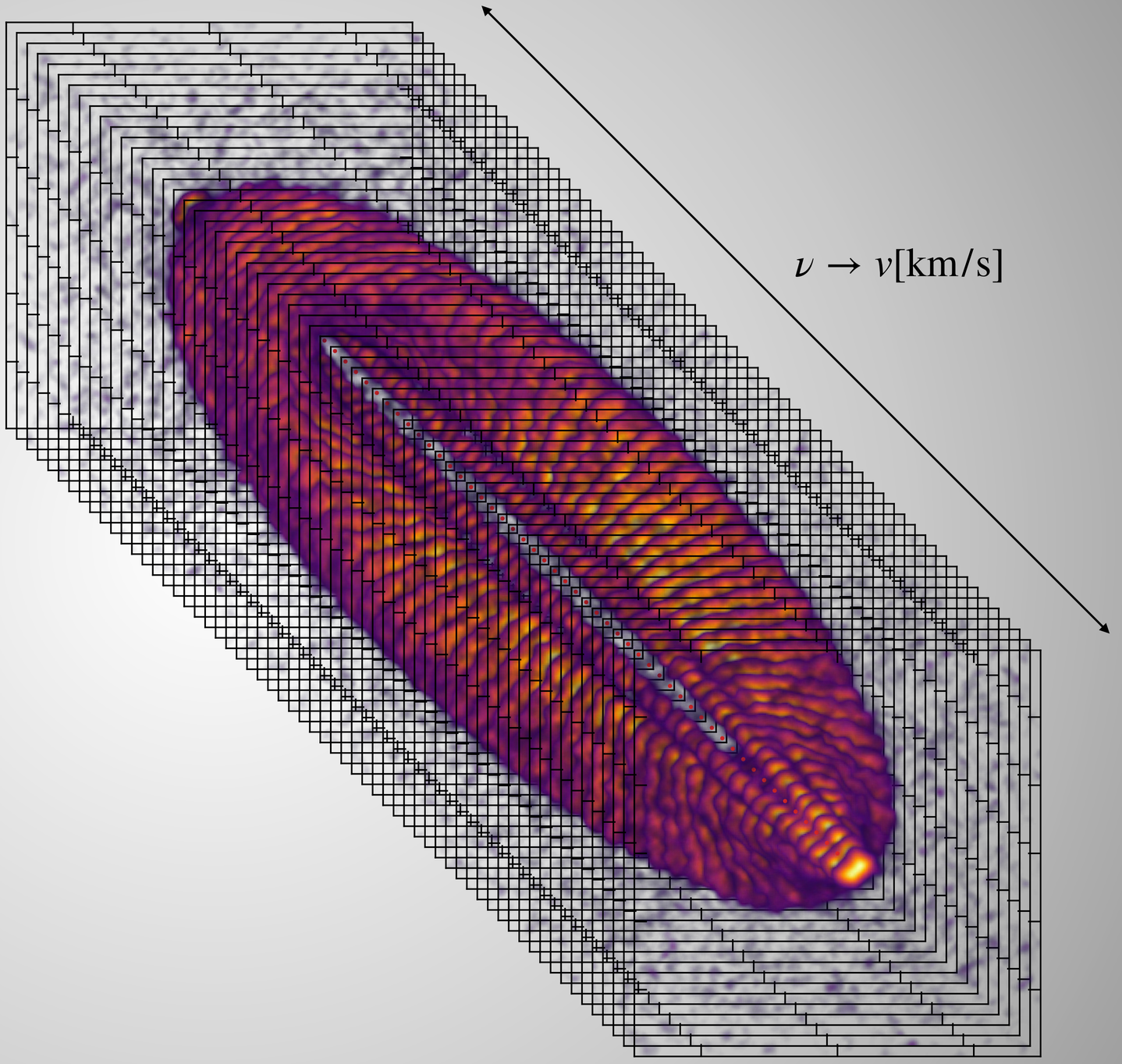


Andrews ARAA

Example gaseous disk
inclination ~20 deg

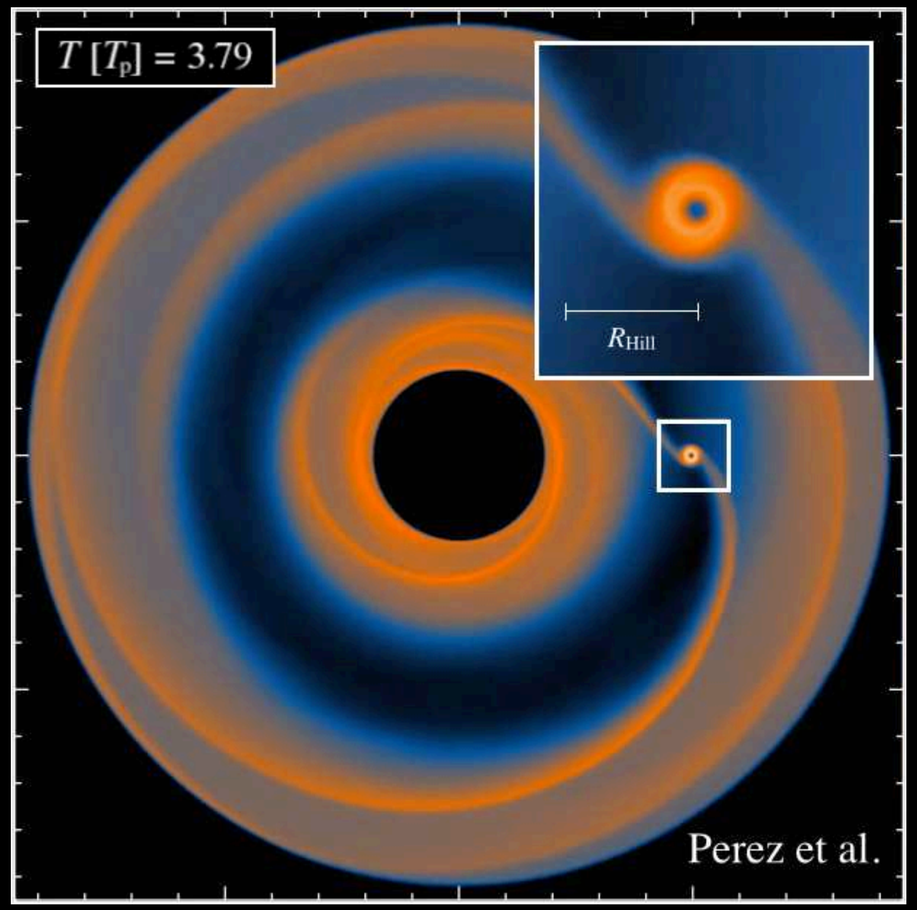




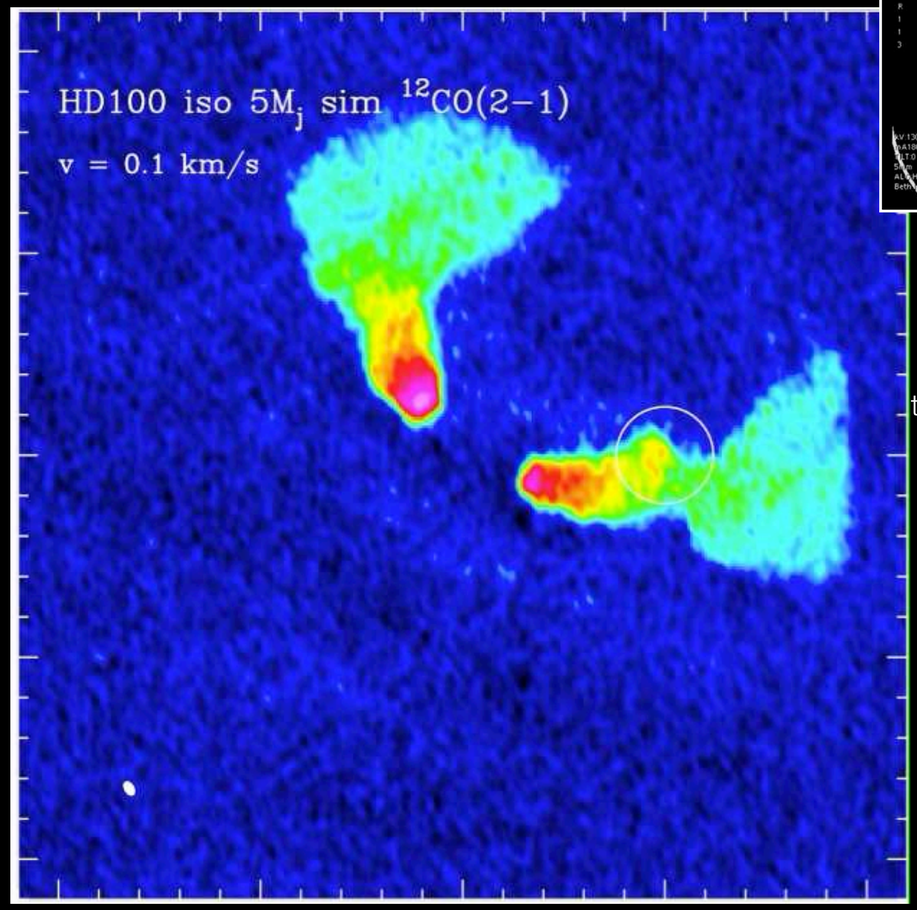
Young exoplanet detection via kinematics

A method to reveal young exoplanets via their dynamical interaction with their protoplanetary disk.

Our original prediction from Perez et al. (2015).

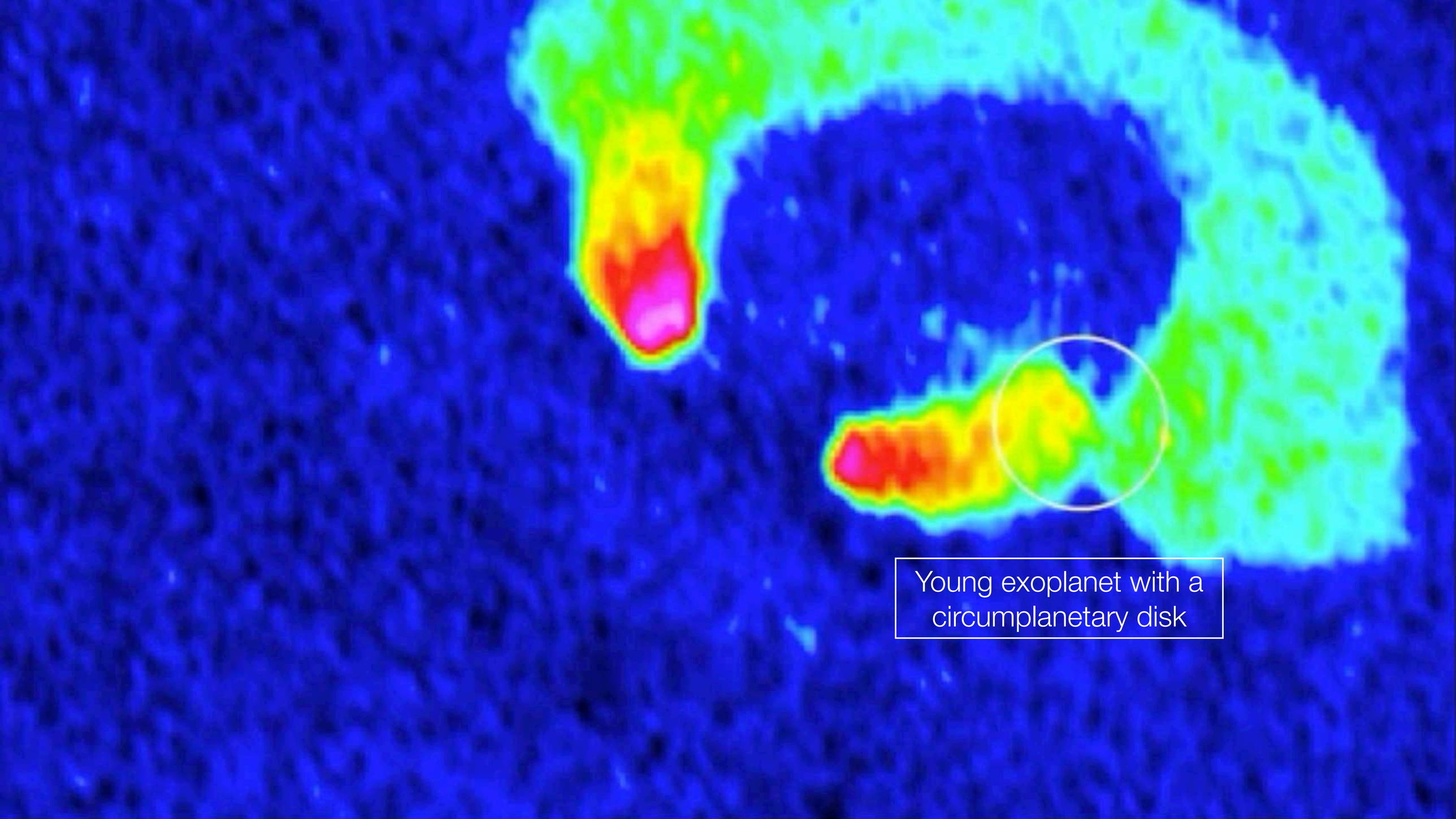


Simulation



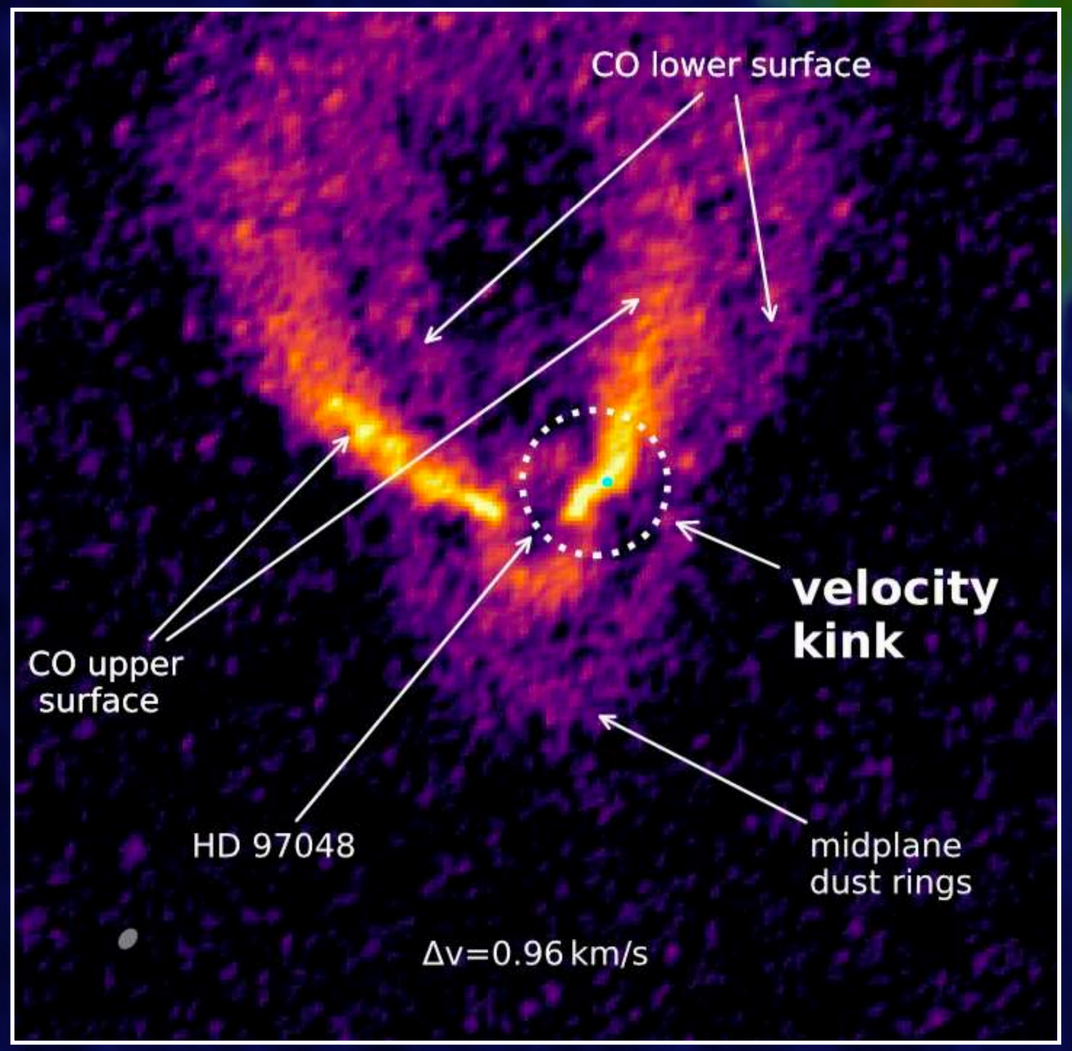
Prediction

Gas observations with ALMA are similar to a “tomography” of the disk. But instead of looking for tumors, we look for planets.


Young exoplanet with a
circumplanetary disk

Our predictions were confirmed in 2018 and 2019

These are now called **disk kinematic** detections



HD 97048 (Pinte et al. (2019), *Nature Astronomy*), see also AS209 by Fedele et al. (2023), Bae et al. (2022)

Overview

Demografía de discos y Estructuras (2023)

- Hay 479 YSOs en regiones de formación estelar
- 355 discos con medición de su masa y radio
- Todos los discos masivos tienen estructuras
  - 62 discos tienen anillos (y gaps)
  - 22 discos tienen espirales
  - 13 discos tienen vórtices/crecientes
  - 19 vórtices en total
- 19 discos tienen otro tipo de subestructura