

Should I Stay or Should I Go: What Governs Circumstellar Disk Lifetimes

AAS 244 — Madison, Wisconsin

Lisa Prato¹,

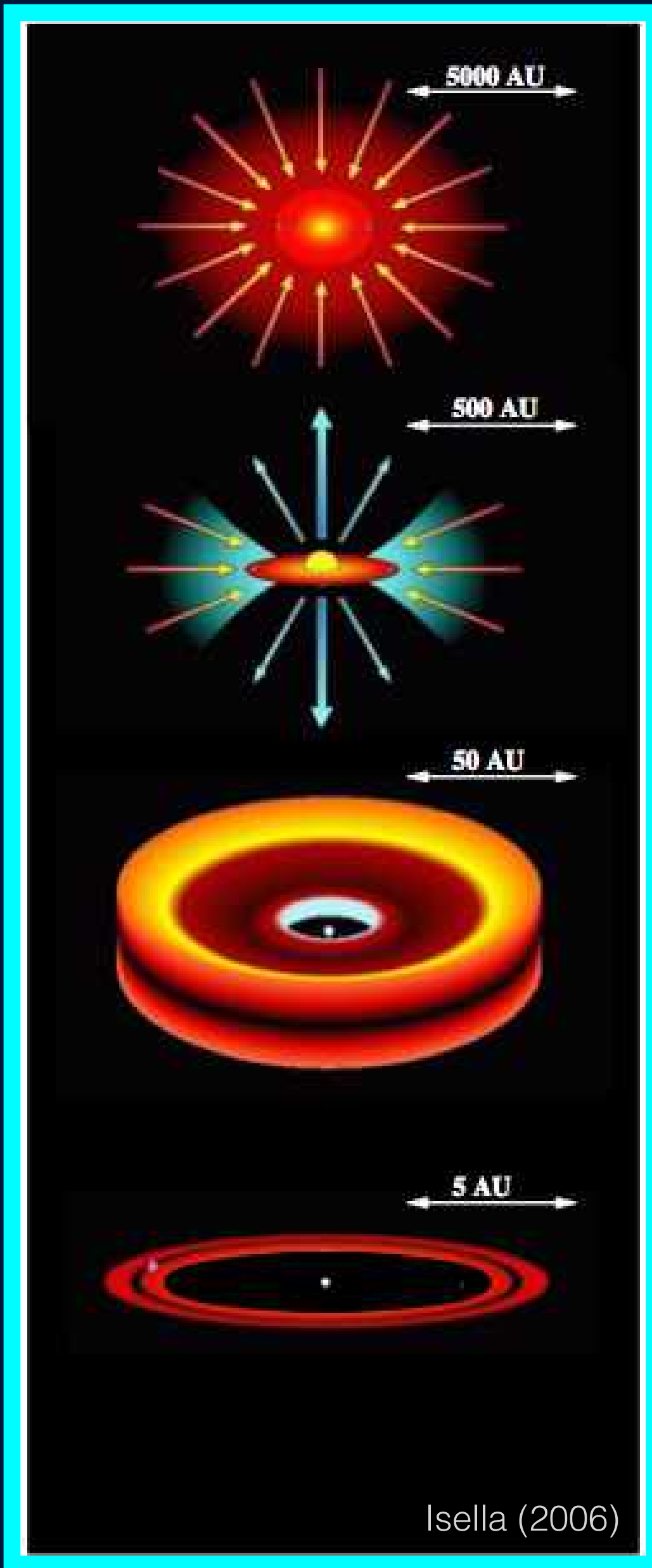
*Taylor Kutra¹, Benjamin Tofflemire², Gail Schaefer³, Rachel Akeson⁴,
Dominique Segura-Cox², Adam Kraus², Christopher Johns-Krull⁵,
Peter Knowlton¹, Jacob Hyden¹, Eric Jensen⁶, Sean Andrews⁷*

1) Lowell Observatory, 2) UT Austin, 3) GSU CHARA, 4) Caltech IPAC, 5) Rice University,
6) Swarthmore, 7) CfA

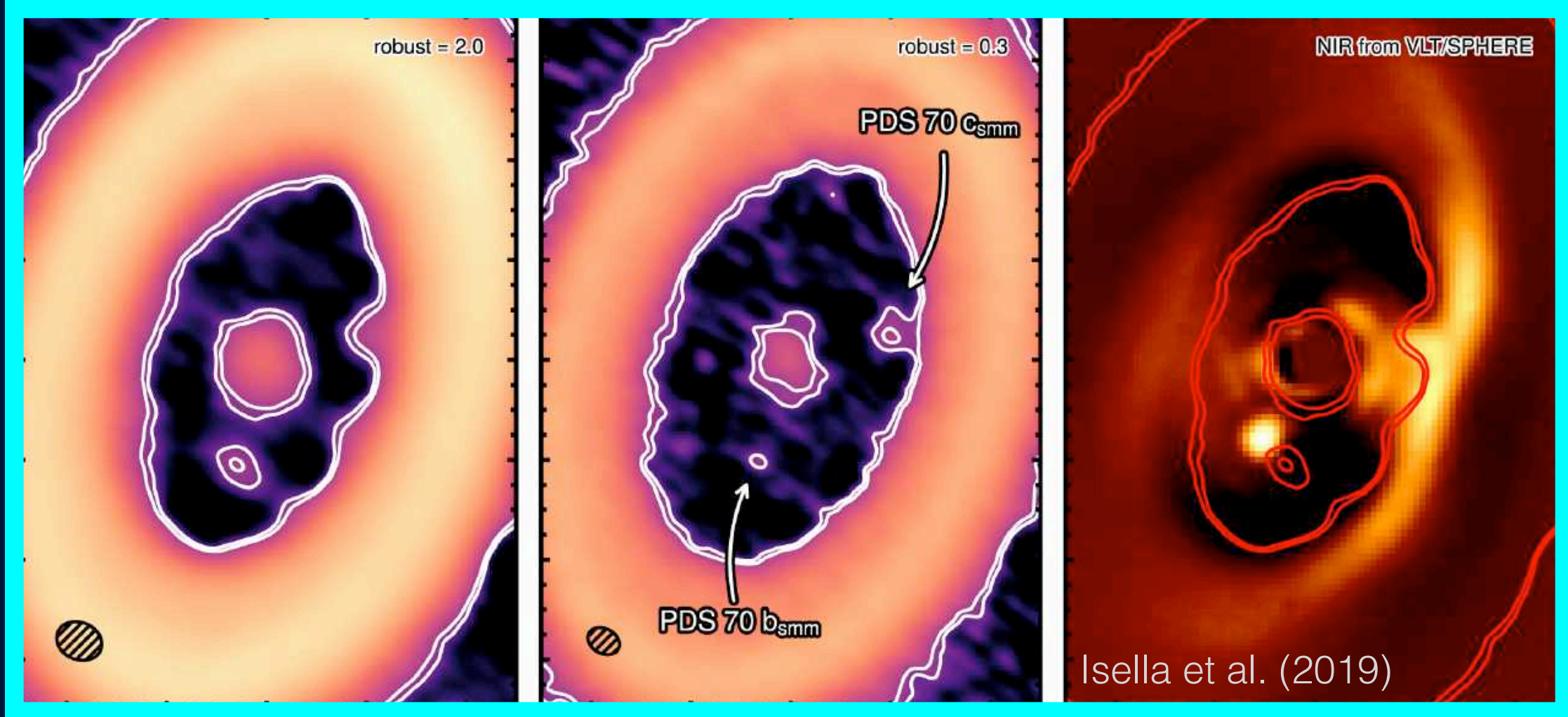
Funding for this research was provided in part by NSF awards AST-1313399 and AST-2109179
& by NASA Keck PI Data Awards, administered by the NASA Exoplanet Science Institute

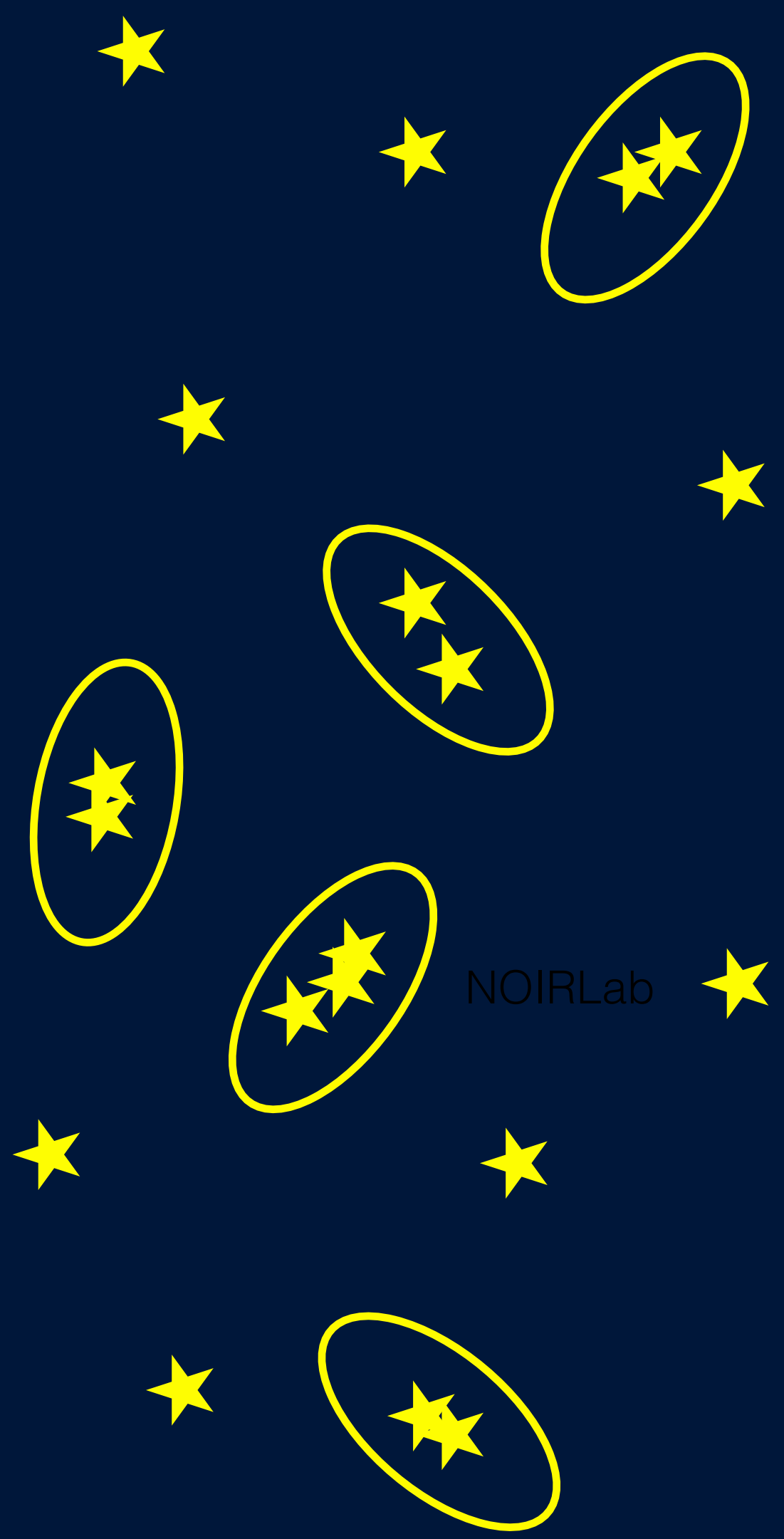


Circumstellar disks:
natural outcome of star
formation



Disks are the sites of
planet formation!



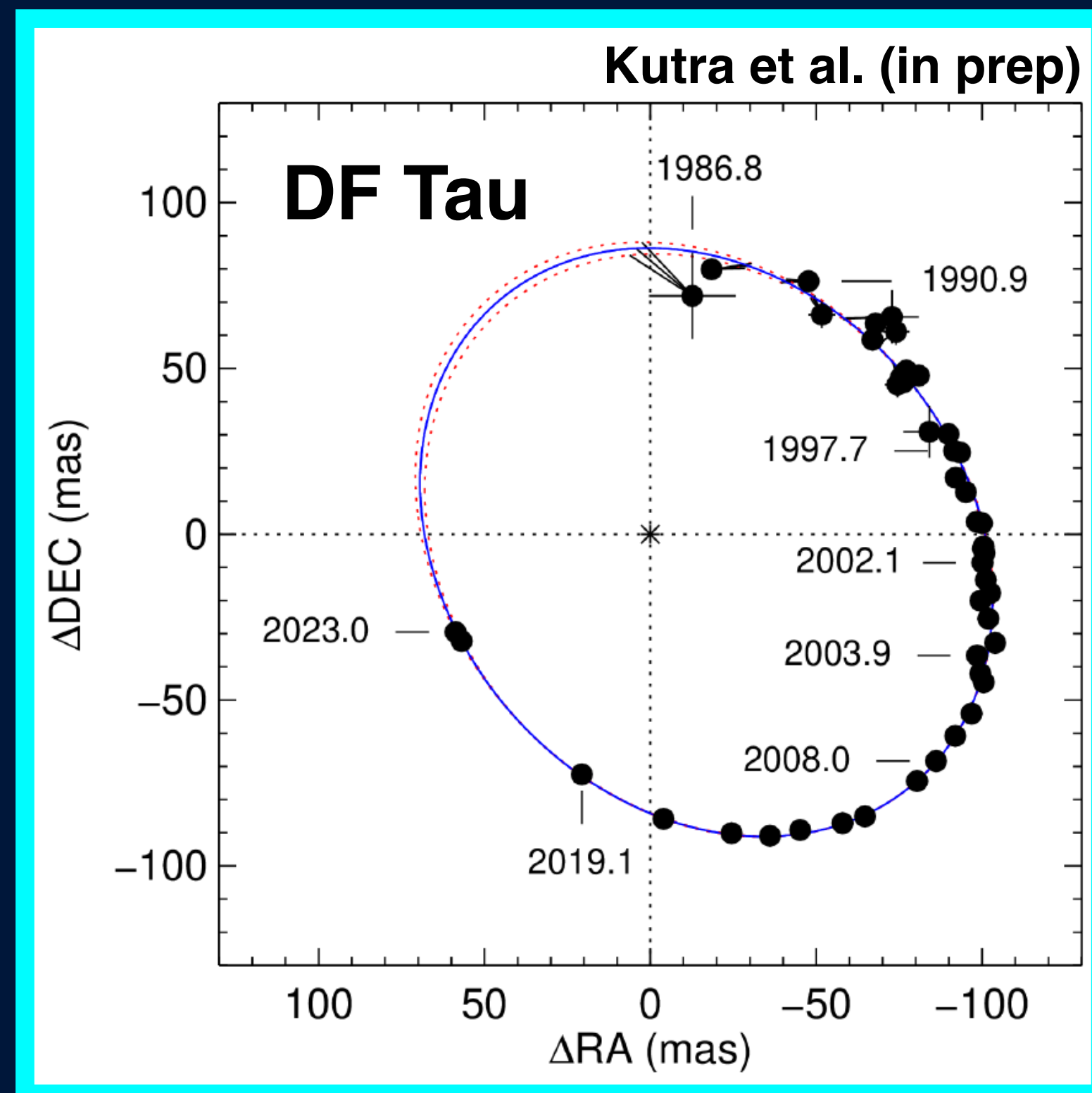
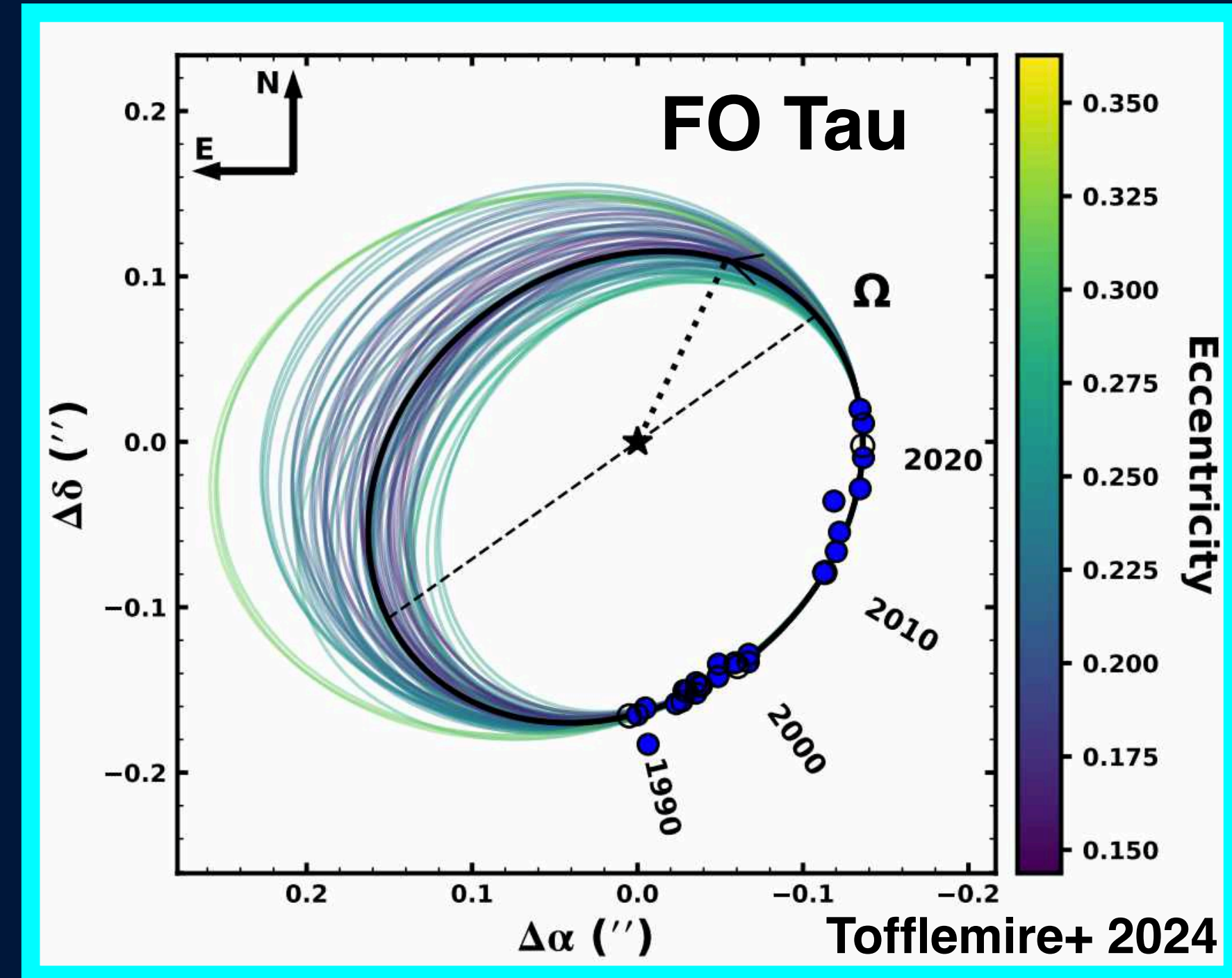


What happens to planet formation in binary systems?

In single young star systems, disks sometimes dissipate quickly, sometimes slowly...

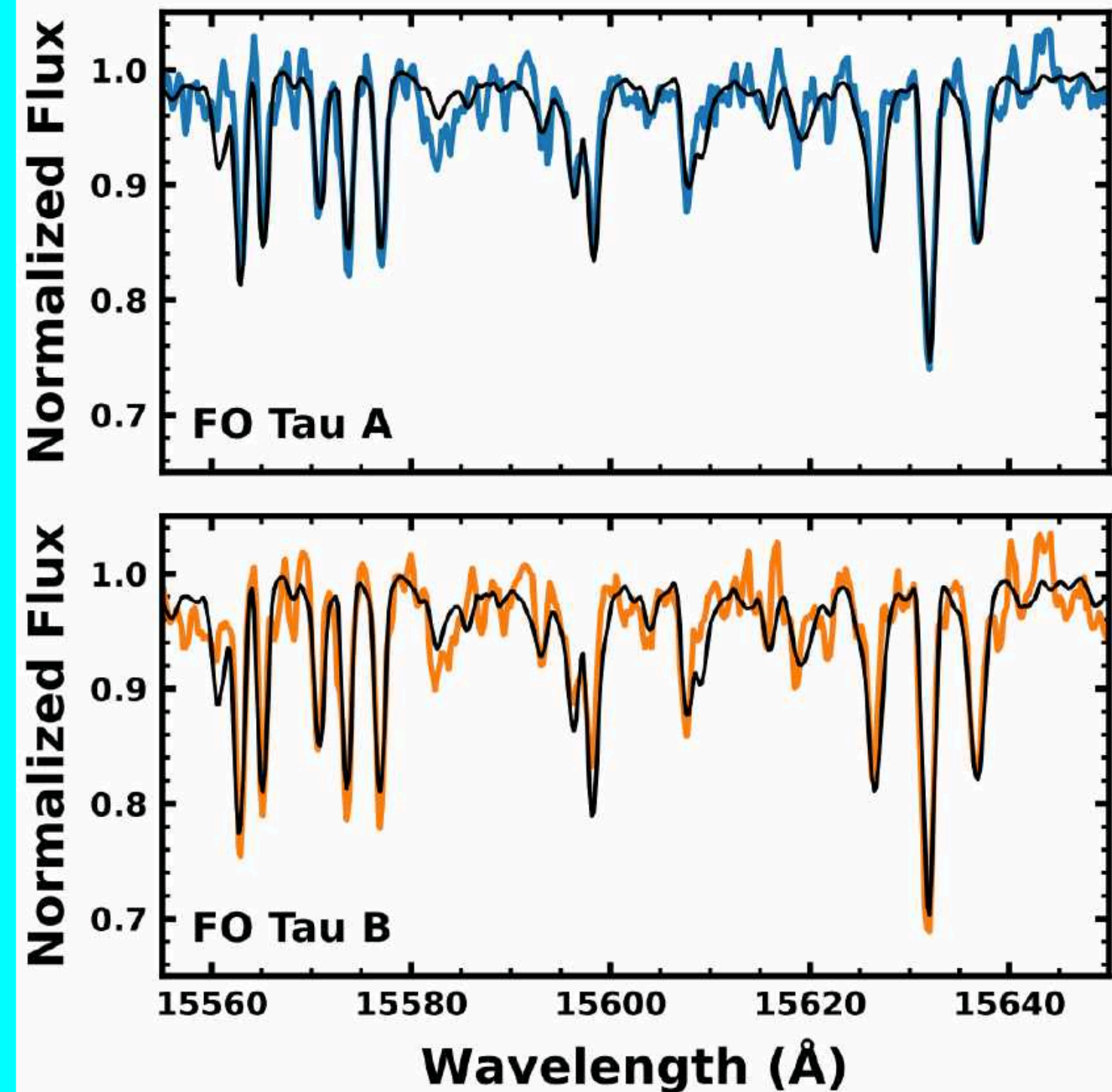
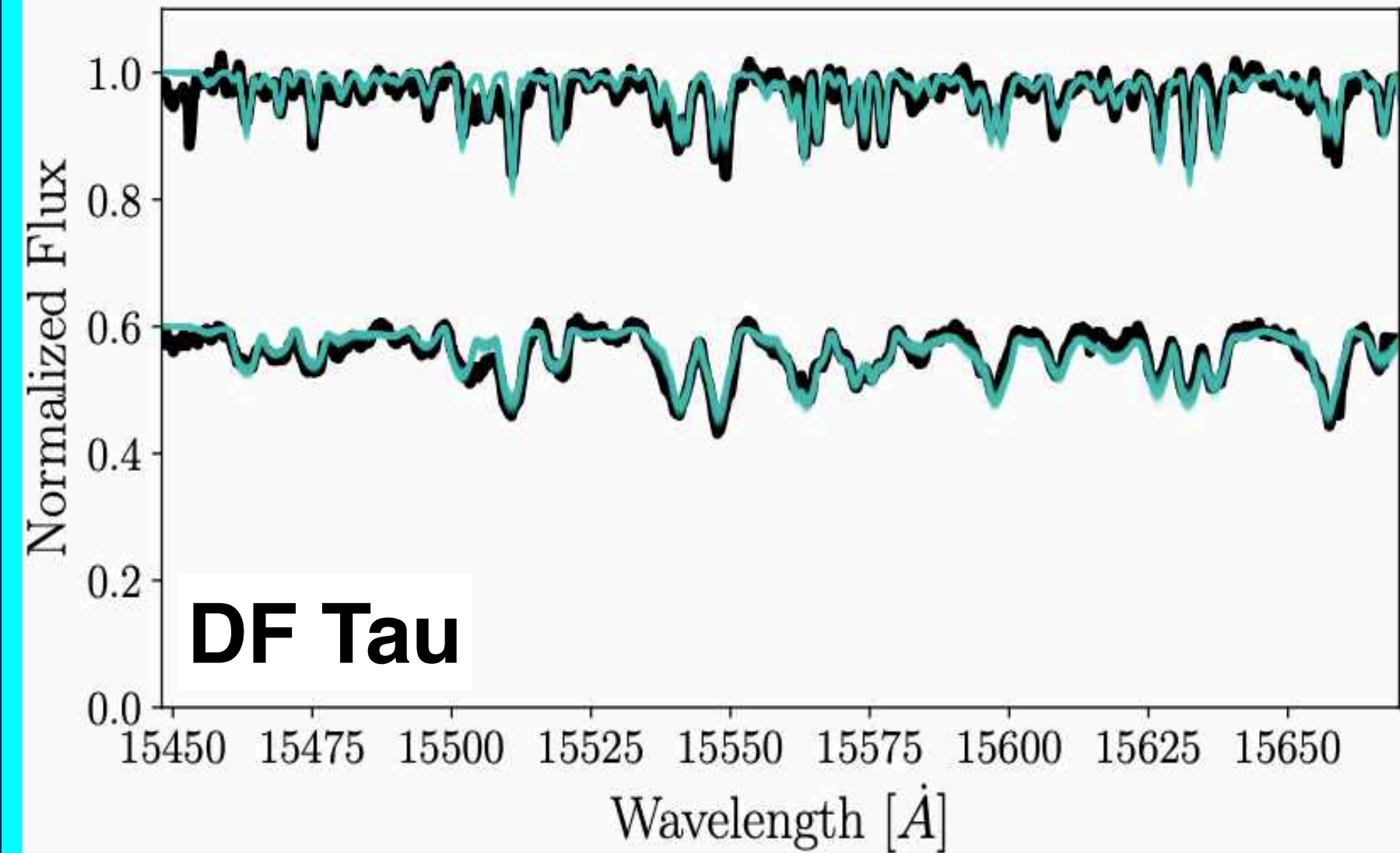
This has important implications for planet formation!

Can studying stars & circumstellar disks in binaries help us understand disk lifetimes?

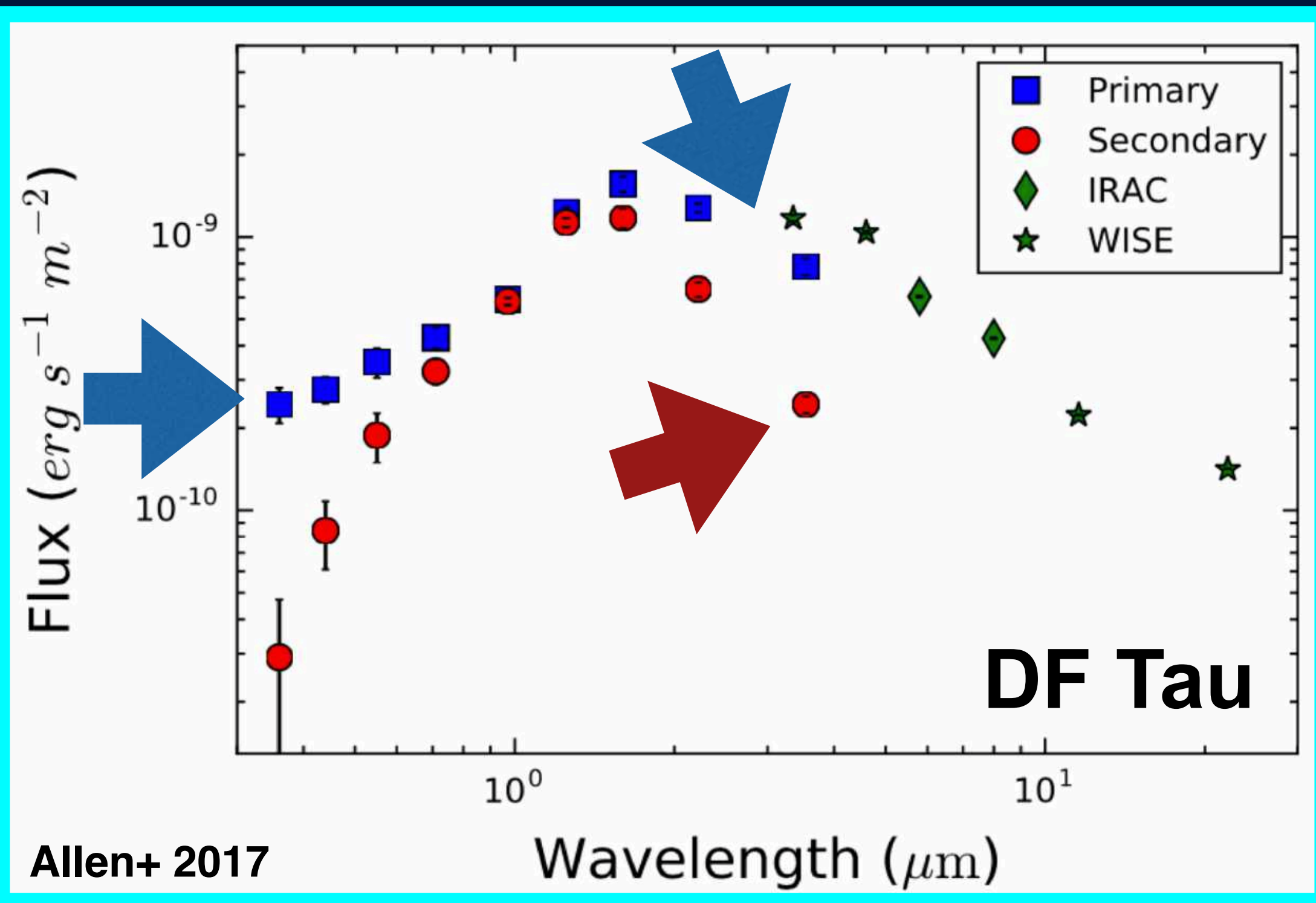


The stars in binaries are the same age & the same composition & both stars experience the same local radiation environment...

Near-infrared, high-resolution spectra from Keck II & NIRSPEC behind adaptive optics



- Compare spectra to synthetic models
- Can determine key stellar properties:
 - Temperature
 - Surface gravity (“fluffiness”, a measure of age)
 - Rotation velocity
 - Radial velocity
 - Magnetic field strength
 - Near-infrared excess from material in inner disk



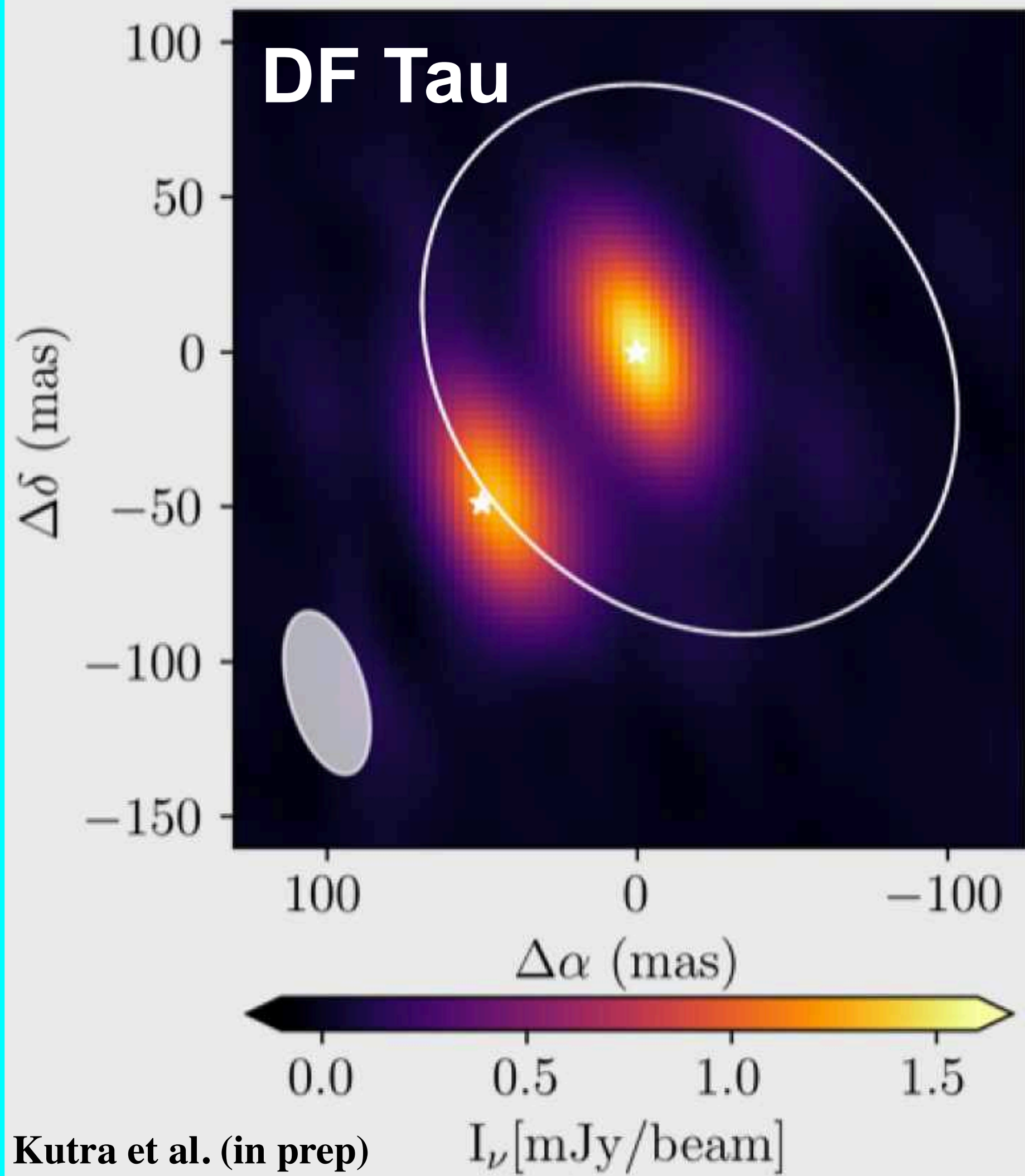
DF Tau appears to have only one disk around the primary star!

What does that disk look like? ALMA imaging shows cool disk dust & gas

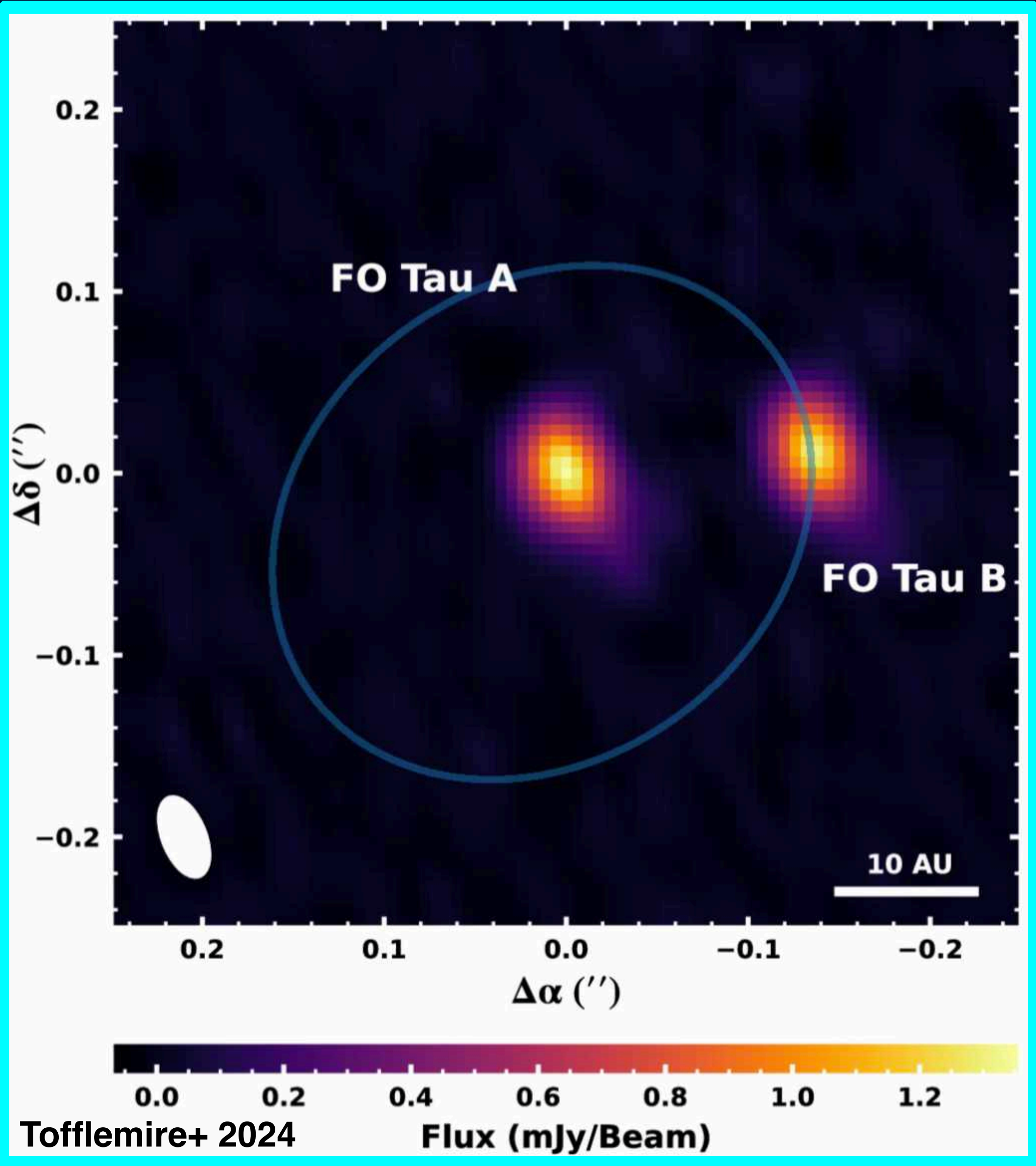


The millimeter wavelength emission from ALMA imaging shows that DF Tau has TWO disks!

There is a central gap or hole in the disk @ the secondary star...

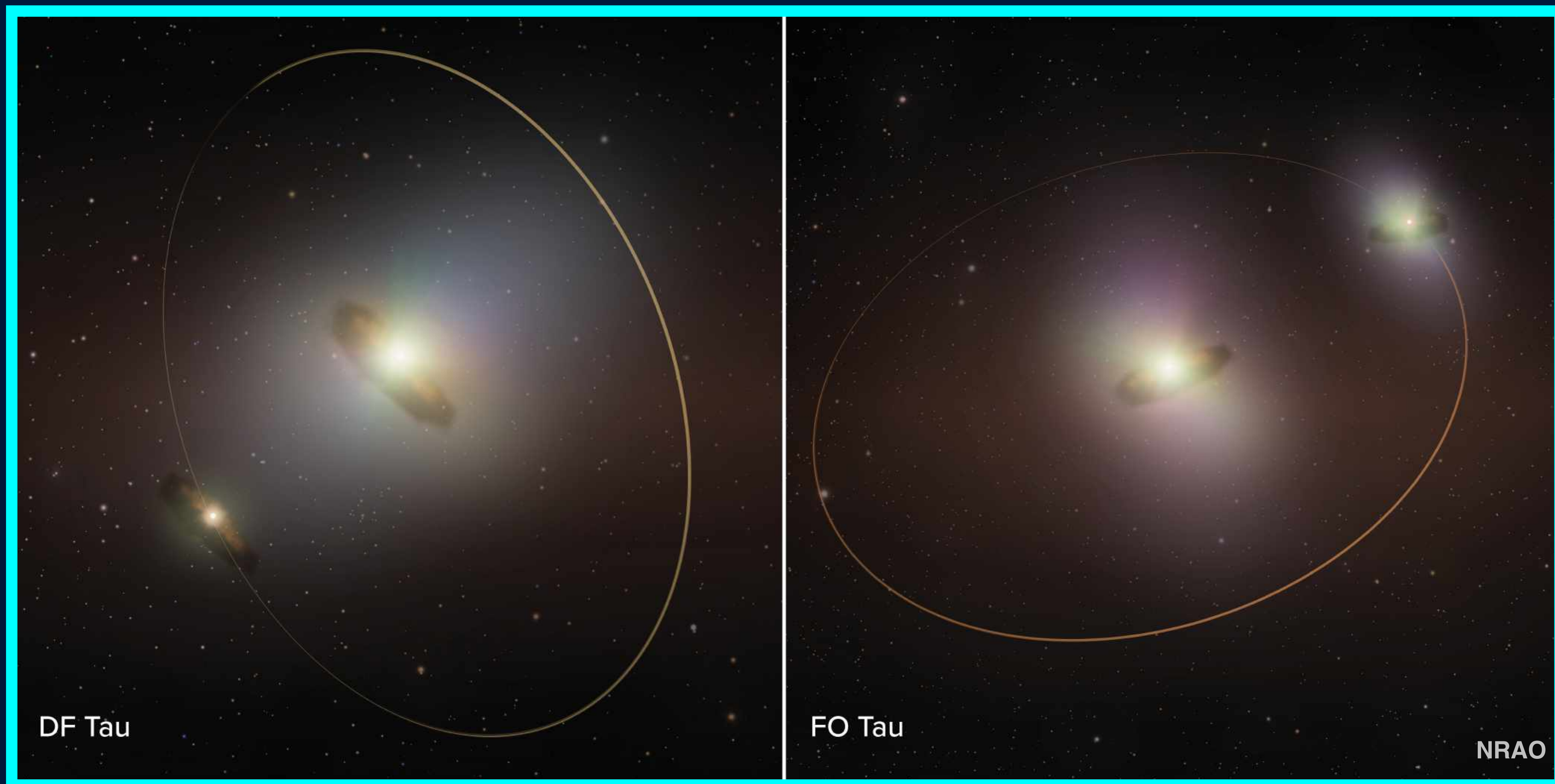


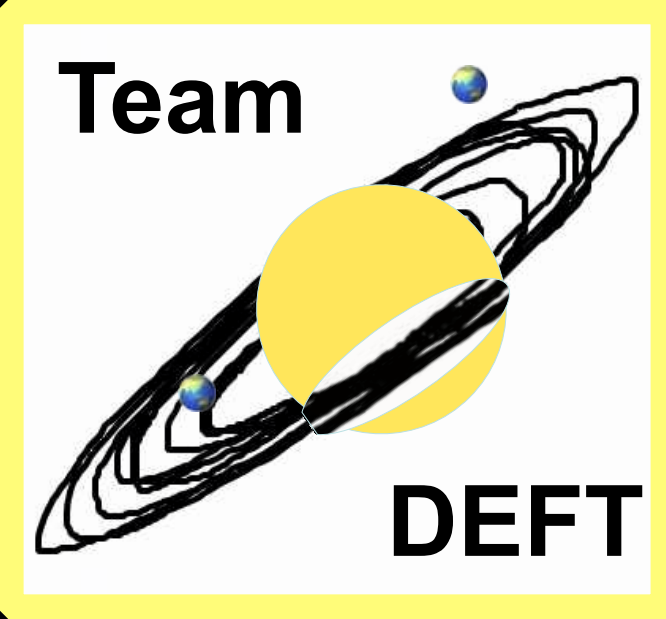
Kutra et al. (in prep)



FO Tau appears to be well-behaved... similar stars, similar disks, disks aligned with orbit

- FO Tau well-behaved: similar stars, similar disks, disks aligned with orbit
- DF Tau disks seem aligned with orbit but anomalies may be present in stellar alignment
- Dynamical characteristics of system may play a role in the onset of disk dissipation
- Our sample of young binaries may yield more insights
- High angular resolution Keck & ALMA data yield a powerful combination





Team DEFT



Disks & Exoplanets Flagstaff Team

