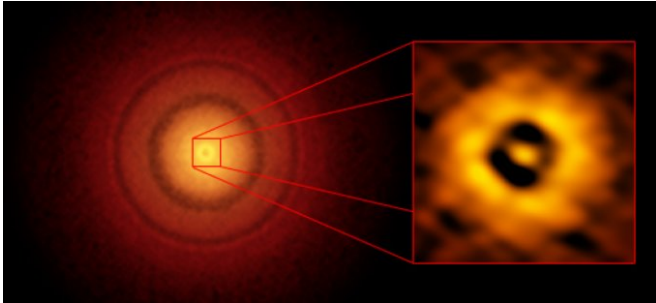


Dusty protoplanetary disks

8 December 2017



An ALMA image of the planet-forming disk around the young, Sun-like star TW Hydrae. The inset image zooms in on the gap nearest to the star, which is at the same distance as the Earth is from the Sun. Astronomers have made a study of 284 disks in three nearby regions to study how they evolve. Credit: S. Andrews; Harvard-Smithsonian CfA, ALMA ESO/NAOJ/NRAO

Planetary systems form out of disks of gas and dust around young stars. How the formation proceeds, however, is complex and poorly understood. Many physical processes are involved including accretion onto the star, photoevaporation of material of the disk, interactions of the disk with planetary embryos, growth of the dust grains, settling of the dust to the midplane of the disk, and more. To unravel these various factors, observations of protoplanetary disks at multiple wavelengths are used; the submillimeter wavelength range in particular offers a way to peer through most of the disk to estimate dust masses directly.

Surveys of star forming regions with facilities such as Submillimeter Array (SMA) and ALMA have determined that disks have typical masses of 0.1%–0.5% of the host star. CfA astronomers Sean Andrews and David Wilner were members of a team that used these two facilities to study systematically the [dust](#) in 284 [protoplanetary disks](#) in three nearby [star formation regions](#). They find clear evidence for grain growth from the spectral shape of the emission, at least for two of the

regions. The result, which is in agreement with previous work, is indicative of the early stages of planet formation.

They also find that the average temperature of the dust is between about 40-50K in all the examples. Their study suggest that the disks in the three regions are all similar, though with individual variations, a result that was mildly surprising since evolutionary effects were thought to become more apparent. The team now plans additional observations to compile better and more complete statistics.

More information: Álvaro Ribas et al. Far-infrared to Millimeter Data of Protoplanetary Disks: Dust Growth in the Taurus, Ophiuchus, and Chamaeleon I Star-forming Regions, *The Astrophysical Journal* (2017). [DOI: 10.3847/1538-4357/aa8e99](https://doi.org/10.3847/1538-4357/aa8e99)

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