PLANET FORMATION

# Dust devils in the details

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A sharply defined crescent has been seen in high-spatial-resolution ALMA 870-μm images of the evolved protoplanetary disk around V1247 Orionis. This crescent, associated with a faint, single spiral arm structure seen in previous scattered light images (Y. Ohta et al. *Publ. Astron. Soc. Japan* **68**, 53; 2016), could be strong evidence for a 'dust trap' that could help redefine our understanding of the planet formation process.

Drag forces between dust and gas in protoplanetary disks cause the orbits of the dust grains to decay, leading to a radial drift of material into the central star on a timescale too rapid for planetesimal formation to occur. Dust traps, caused by eddies or vortices in the disk, can collect millimetre-sized dust grains and small planetesimals and can slow their inward migration, allowing time for the grains to accrete and form planetary embryos. In the case of V1247 Orionis, authors Stefan Kraus et al. propose a scenario where a planet orbiting at 100 au from the star has cleared a gap between what is now seen as the crescent and an inner dust disk. The dynamical influence of the planet triggers a vortex on either side of its orbit through a hydrodynamic instability such as the Kelvin–Helmholtz or Rossby wave instabilities. An area of excess 870-μm emission in the crescent and a similar one in the inner disk, joined by the putative accretion stream seen in scattered light images of V1247 Orionis, may indicate the location of the two vortices and thus be evidence for dust trapping. This scenario is well supported by the observations, and by the smoothed particle hydrodynamics simulations coupled with radiative transfer calculations performed by the authors.

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