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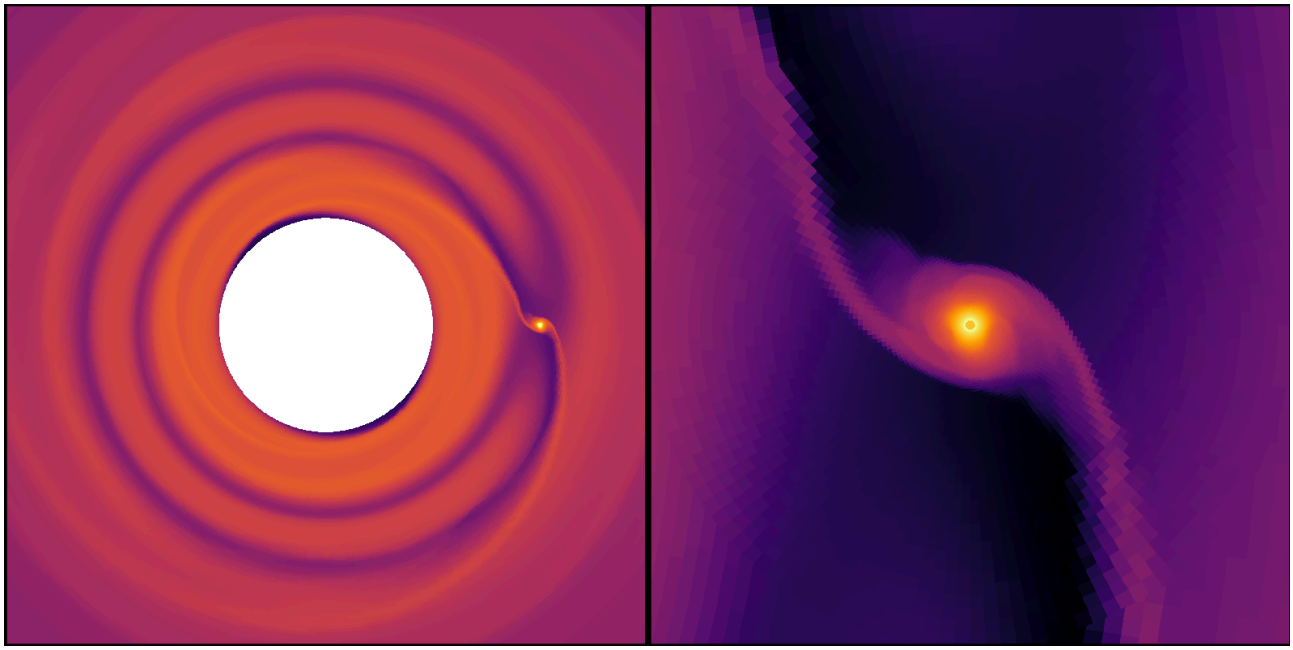
New superimposed grids technique to simulate the formation of exoplanets' first atmospheres

Dennis Wehner
UDE



We introduce a new superimposed grids technique, which is based on the PLUTO code, and solves the radiative-hydrodynamic equations for a circumstellar disk and a forming planet embedded in the disk on two separate grids in spherical coordinates, one centered on the host star and the other one on the planet.
This approach enables the simultaneous resolution of both the global disk dynamics and the formation of the planet's atmosphere. Superior to the classical adaptive mesh refinement technique, the dual-usage of spherical coordinate grids yields a high accuracy of disk orbital motions, angular momentum transport, and planet-disk interaction as well as extremely high resolution of the forming planetary atmosphere including the effects of recycling, head winds, and turbulence.
We plan to use this new technique to examine the relationship between the mass of a planet's atmosphere and the width of the horseshoe region in three-dimensional global simulations. This is particularly important for planet migration, as it could challenge the widely held assumptions about the width of the horseshoe region.