Séminaire organisé par

AIM &Le service d'Astrophysique CEA/DSM/Irfu

RADIATION PRESSURE FEEDBACK IN MASSIVE STAR FORMATION

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During their evolution, massive stars become so luminous that their radiation pressure onto the environment exceeds their gravitational attraction. We determine the impact of the radiation pressure on the accretion disk and the bipolar outflow in 1D, 2D, and 3D self-gravity radiation hydrodynamics simulations of various collapsing pre-stellar cores of gas and dust. The evolution of the stellar environment is resolved down to the order of 1 AU and the stellar irradiation feedback is computed by use of a highly accurate frequency-dependent ray-tracing (RT) approach (Kuiper et al. 2010, A&A 511) plus flux-limited diffusion (FLD) for thermal dust emission.

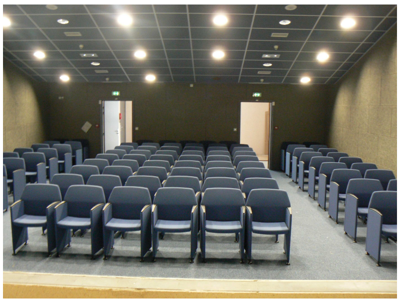
Results:

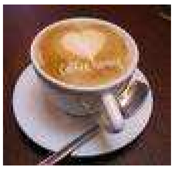
a) Recently (in Kuiper et al. 2012, A&A 537) - we depicted the importance of the accuracy of the RT step in revealing the sustained stability of radiation-pressure-dominated outflow cavities. Treating the stellar irradiation in the gray FLD approximation underestimates the radiative forces acting on the cavity shell. This can artificially lead to situations unstable to the radiative Rayleigh-Taylor instability (Krumholz et al., 2009, Science).

b) The strength of the radiative feedback depends strongly on the shielding property of the inner disk region, e.g. not including the dust sublimation front artificially terminates the disk accretion epoch, such as in Yorke & Sonnhalter (2002), ApJ 569. The formation of long-living massive accretion disks enforces a strong anisotropy of the thermal radiation field, enabling steady accretion through the shielded disk region up to M_star > 100 M_sol (Kuiper et al. 2010, ApJ 722). This so-called flashlight effect is even amplified by the optically thick gas around forming massive protostars (Kuiper & Yorke 2013, accepted at ApJ). In 3D the self-gravity of the massive accretion disk drives a sufficiently high angular momentum transport enabling the accretion flow to overcome the residual radiation pressure (Kuiper et al. 2011, ApJ 732).

10 janvier 2013

11h00 Salle Galilée bât 713 C - Orme des Merisiers





Un café sera servi 15 mn avant le séminaire

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