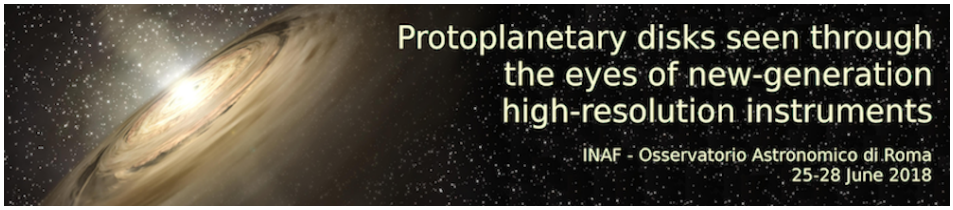

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Non-spherical dust dynamics in protoplanetary disks: the effects of particle nonsphericity on the evolution timescales.

Thursday, 28 June 2018 12:00 (20 minutes)

Recent high-resolution ALMA observations of protoplanetary disks (e.g. Isella et al. 2016, PRL, 117; ALMA Partnership et al. 2015, ApJ Lett. 808:L3,10pp) triggered interest in studying solid bodies in discs at different scales, ranging from small sub-micron grains up to solid bodies of sizes of hundreds of meters, for which the dynamical evolution is governed by the interaction with the gas in the disk. For subsonic motion, the interaction with the gas causes a drag force acting on the dust particle that results in dust acceleration or deceleration. If the mean free path of the gas molecules is much larger than the size of the particles, the particles move in Epstein regime. In such regime, the difference in particle shape, size and composition lead to different aerodynamics and particle speeds. Applying the non-spherical dust dynamics model developed for cometary environment (Ivanovski et al. 2017, Icarus 282, 333-350), we study the dynamics of non-spherical particles in protoplanetary disks when the gas flow is in Epstein regime. In particular, we revise the timescales of the dimensionless stopping time (tstop = mv/Fdrag, with m and v being particle mass and velocity, Fdrag the drag force) and the settling timescale in the vertical settling phenomena in disks. We obtain the dust terminal velocities owing to the assumed shape/elongation and the region at which the settling could occur as a function of the particle non-sphericity. The results of this study have a direct application to the investigation of the effects of the unseen planetesimal population of protoplanetary disks to the evolution of their dusty environments (Turrini et al., submitted, arXiv:1802.04361).

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