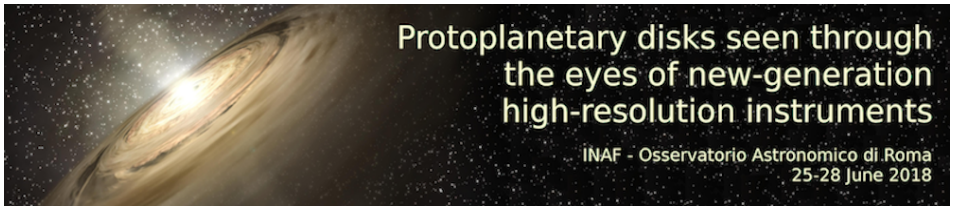

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Disk-planet interaction: theory confronts observations (I)

Thursday, 28 June 2018 10:20 (30 minutes)

Recent spectacular high resolution observations of gaps and ring-like structures in nearby dusty protoplanetary disks have revived interest in studying gap-opening mechanisms. Among all the models proposed to explain the rings and gaps observed in these systems, the planet hypothesis is the most important to test, in order to advance our fundamental understanding of planet formation and explain the characteristics of observed exoplanets.
In this talk I give an overview of the theory of disk-planet interaction in protoplanetary disks, with a focus on the physics of gap opening in dusty viscous protoplanetary disks. I describe the three distinct physical mechanisms for dust gap opening by embedded planets in protoplanetary disks. Starting from numerical evidences, I present a grain size-dependent criterion for dust gap opening in viscous protoplanetary disks by revisiting the theory of dust drift to include disk-planet tidal interactions and viscous forces. These analytical estimates are particularly helpful to appraise the minimum mass of an hypothetical planet carving gaps in disks observed at long wavelengths and high resolution. These findings are applied to the case of the HLTau protoplanetary disks, showing that the three gaps detected by ALMA can be described by the presence of sub-Jupiter mass planets.

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