

S26a **Forming circumnuclear disks and rings in galactic nuclei: a competition between supermassive black hole and nuclear star cluster**

Trani, A. Alessandro (The University of Tokyo); Mapelli, Michela (University of Innsbruck); Balone, Alessandro (INAF-Padova)

An increasing number of observations are revealing the presence of molecular gas in the center of galaxies, where gravity may be dominated by a supermassive black hole (SMBH). Circumnuclear gas exhibits a complex morphology and kinematics, with clumpy streamers, warped rings and disks. How the complex spatial and velocity structure of circumnuclear gas forms and evolves remains poorly understood. We investigate the formation of circumnuclear gas structures from the tidal disruption of molecular clouds in galactic nuclei, by means of smoothed particle hydrodynamics simulations. We explore the impact of the tidal field on the morphology of circumnuclear gas. We model the galactic nucleus as composed of a SMBH and a nuclear star cluster, and consider different mass ratios between the two components. We find that the relative masses of the SMBH and the nuclear star cluster have a deep impact on the morphology of the circumnuclear gas. Extended disks form only inside the sphere of influence of the SMBH. In contrast, compact rings naturally form outside the SMBH's sphere of influence, where the gravity is dominated by the nuclear star cluster. This result is in agreement with the properties of the Milky Ways circumnuclear ring, which orbits outside the SMBH sphere of influence. Our results imply that the morphology of circumnuclear gas can be used as a probe for SMBH presence: the inner radius of circumnuclear rings represents an upper limit to the SMBH sphere of influence.