

Journées de la SF2A – Abstract for a contribution

Authors:

Florian Dedieu, Anaëlle Hallé, Françoise Combes

Title:

Investigating the growth of supermassive black holes in barred galaxies via zoom-in simulations.

Abstract:

Supermassive black holes (SMBH) seem to reside at the heart of all massive galaxies and their feedback may be essential to explain their evolution, from the high luminosity of Active Galactic Nuclei (AGN) to large-scale star-formation quenching. It is widely accepted that the mechanism responsible for AGN feedback is matter accretion by the central SMBH. In disk galaxies, this is only possible if some baryonic matter in the disk is able to lose its angular momentum and migrate to the nucleus up to the central SMBH. This scenario however faces a theoretical problem : in barred galaxies, often associated with AGN activity, infalling gas usually accumulates in a ring-shaped region (the stellar bar Inner Lindblad Resonance), which interrupts its migration. Accretion may therefore requires the presence of nuclear structures like a nuclear bar and nuclear trailing spirals which can exert an additional negative torque on the stalled gas, allowing it to reach the center and eventually feed the SMBH. High-resolution gas observations with ALMA have shown such nuclear patterns (e.g. in NGC 1566). However, they have been so far very little studied numerically and our understanding of their role in gas accretion is therefore still poor: in which conditions do they form? What are their properties? How do they precisely affect the gas dynamics on nuclear scales, especially the evolution of the angular momentum?

In this talk, we adopt a numerical point of view and introduce decisive inputs to these questions. First, we present high-resolution simulations, performed with the hydrodynamical code RAMSES, of barred isolated galaxies that exhibit such nuclear structures. By characterizing at the same time the dynamic and kinematic properties of the latter and following on the fly the movement of the gas, we then emphasize the strong connection between the migration of the gas and its interaction with the resonances of the nuclear structures, which hence affect the accretion rate profile. Finally, we compare our results with previous works, both observational and numerical, and lay bare theoretical consequences.