The effect of AGN feedback in the migration timescale of supermassive black holes binaries

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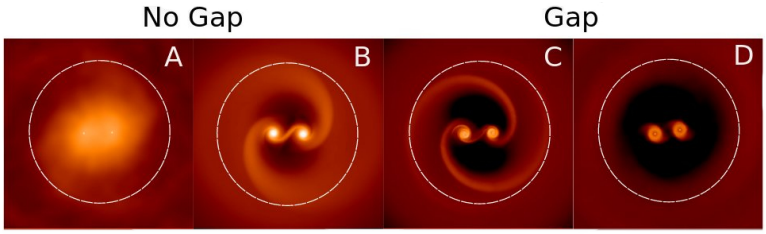
When a SMBH binary (SMBHB) is formed after a major merger of gas rich galaxies, we expect that the SMBHB will end in a gas-rich environment in the nuclear region of the remnant. The possibility that this SMBHB will coalesces, and be seen by LISA as an intense source of gravitational waves, will depend in how fast the binary can shrink down to mili-parsec scales, which is determine by the dynamical interaction with gas and stars around the binary.

Studying the effect of gas around SMBHB in del Valle & Escala (2014) we find that the typical timescale in which this shrinking occurs, due to the gravitational torque of the gas onto the SMBHB, can be separated in two main regimes:

I) A *slow migration regime* ($T_{\rm mig} \sim 10^3\, T_{\rm orb}$) in which the viscous torques are not efficient enough to redistribute the extracted angular momentum from the binary, leading to the formation of a low density gap around the binary.

II) A *fast migration regime* ($T_{\rm mig} \sim 10\, T_{\rm orb}$) in which the redistribution of angular momentum is efficient enough in the disk and no low density gap is formed.



We expand our study by considering the effect of AGN feedback in this scenario of the shrinking of SMBHBs. For this study, we implement an AGN feedback/accretion recipe in the SPH code Gadget-3 which include momentum feedback from winds, x-ray heating/radial-momentum, radial Eddington force and flux accretion (Choi *etal* 2012). A preliminary exploration of different SMBHB-gas systems suggest that the shrinking timescale of the *slow migration regime* does not change significantly under the presence of the AGN feedback neither the black hole accretion. However, the *fast migration regime* shrinking timescale can change significantly by the AGN feedback when we allow the SMBHB to reach super Eddington accretion levels.

References

Choi E., Ostriker J.P., Naab T., Johansson P.H., 2012, *ApJ*, 754, 125C
del Valle L., Escala A., 2014, *ApJ*, 780, 84