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When being super makes you too strong for the job: how the super-Eddington regime regulates black hole growth in high-redshift galaxies

mercredi 23 mars 2022 10:00 (10 minutes)

Super-Eddington accretion is one scenario that may explain the rapid assembly of ~ 10^9 $M_\odot$ supermassive black holes (BHs) within the first billion year of the Universe. This critical regime is associated with radiatively inefficient accretion and accompanied by powerful outflows in the form of winds and jets. By means of hydrodynamical simulations of BH evolution in an isolated galaxy and its host halo with 12 pc resolution, we investigate how super-Eddington feedback affects the mass growth of the BH. It is shown that super-Eddington feedback efficiently prevents BH growth within a few Myr. The super-Eddington accretion events remain relatively mild with typical rates of about 2-3 times the Eddington limit, because of the efficient regulation by jets in that regime. We find that these jets are powerful enough to eject gas from the centre of the host galaxy all the way up to galactic scales at a few kpc, but do not significantly impact gas inflows at those large scales. By varying the jet feedback efficiency, we find that weaker super-Eddington jets allow for more significant BH growth through more frequent episodes of super-Eddington accretion. We conclude that effective super-Eddington growth is possible, as we find that simulations with weak jet feedback efficiencies provide a slightly larger BH mass evolution over long periods of time (~ 80 Myr) than that for a BH accreting at the Eddington limit.

Field

Compact objects (supernovae, black holes, neutron stars)

Day constaints

I'd prefer to do the talk in the first two days.

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