Astrophysics > Cosmology and Extragalactic Astrophysics

# Cold flows and the first quasars

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Observations of the most distant bright quasars imply that billion solar mass supermassive black holes (SMBH) have to be assembled within the first eight hundred million years. Under our standard galaxy formation scenario such fast growth implies large gas densities providing sustained accretion at critical or supercritical rates onto an initial black hole seed. It has been a long standing question whether and how such high black hole accretion rates can be achieved and sustained at the centers of early galaxies. Here we use our new cosmological hydrodynamic simulation (MassiveBlack) covering a volume (0.75 \Gpc)^3 appropriate for studying the rare first quasars to show that steady high density cold gas flows responsible for assembling the first galaxies produce the high gas densities that lead to sustained critical accretion rates and hence rapid growth commensurate with the existence of ~10^9 solar mass black holes as early as z~7. We find that under these conditions quasar feedback is not effective at stopping the cold gas from penetrating the central regions and hence cannot quench the accretion until the host galaxy reaches M_halo > 10^{12} solar masses. This cold-flow driven scenario for the formation of quasars implies that they should be ubiquitous in galaxies in the early universe and that major (proto)galaxy mergers are not a requirement for efficient fuel supply and growth, particularly for the earliest SMBHs.

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