

Black Holes and Massive Galaxies in the Early Universe

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Recent observations with the JWST and ALMA identified at $z > 10$ massive star forming galaxies of up to 1011 solar masses that are already quench at $z > 3$. This very early formation and rapid evolution of massive galaxies produced great surprise, because it is difficult to reconcile with standard Λ CDM predictions alone. I will show that BH feedback regulate the formation and evolution of massive galaxies in the early Universe. Since the diameter of the Universe decreases with redshift z as $1/(1+z)$, the global gas density of the Universe increases with redshift, positive BH-feedback becoming a relevant mechanism in the early Universe. Observations with JWST and ALMA confirm this prediction, and in this context, the existence of massive star formation galaxies at $z > 10$ that are already quench at $z > 3$ is not surprising. If the SMBHs of more than 107 solar masses found in quasars up to $z = 7$ result from rapidly growing BH seeds, I conclude that BHs come first and their feedback regulate the early formation, growth and quench of massive galaxies in the early Universe.

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