

X02a AGN Feedback Model in GADGET3-Osaka: Cosmological Simulation

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As the most massive kind of celestial objects, supermassive black holes (SMBHs) in galactic nuclei play a significant role in galaxy evolution. Energy feedback released by an active galactic nucleus (AGN) is believed to be responsible for some observational issues, such as correlation of SMBH mass to its host galaxy's bulge velocity dispersion, star formation quenching, and the galaxy mass function. The process of how an AGN is actually involved remains unclear until now. Yet, some mechanism were proposed to explain how AGN rules those galactical processes, including heating up gas in circumgalactic medium (CGM), generating a strong outflow from the galactic center, emanating a collimated high energy jet, or simply heating up gas in the black hole vicinity. In our research, we introduce two kinds of AGN feedback schemes into our GADGET3-Osaka code, the quasar mode and radio mode. When the accretion rate is high, the AGN goes into the quasar mode by releasing an isotropic thermal feedback by using geodesic dome. In such a way, a strong outflow is produced through low density regions. In radio mode, we emulate the jet feedback that heats up the CGM preventing the hot gas from being recycled into the galaxy disk. We circumvent the necessity of very high resolution by creating ghost particles that carry feedback information from the AGN. On the other hand, we employ group finder in cosmological simulation to determine galaxies or clusters in which we may plant the SMBH seed.