

X40a AGN Feedback Model for Galaxy Simulation

Abednego Wiliardy, Kentaro Nagamine (Osaka U.), Renyue Cen (Princeton U.)

It has been widely accepted that a supermassive black hole (SMBH) resides in the center of almost every galaxy and it is called active galactic nucleus (AGN) when observed as a luminous source. The feedback released by an AGN through radiation, wind and jet, is believed to be important for shaping galaxy mass function and star formation quenching. We study these effects of AGN feedback on galaxy evolution using hydrodynamic simulations. In large scale galaxy simulations, the resolution is insufficient to resolve the sub-parsec scale accretion disk around black hole and we need to develop a subgrid model for AGN feedback. Following previous work, we implement two modes of AGN feedback depending on SMBH accretion rate, i.e. quasar mode and radio mode. When the accretion rate is high, quasar mode takes place using geodesic dome bins to assign energy isotropically, but considering the obscuration angle by a dusty torus. On the other hand, radio mode takes place when the accretion rate is low, and we introduce ghost particle treatment to distribute thermal heat from collimated jet, producing outflow and low density lobes emanating from galaxy center following the features of observed jet. We find that the simple thermal feedback from radio mode is inadequate to reproduce massive molecular outflows from AGN. Therefore, we introduce a kinetic feedback and compare against Fermi bubble of Milky Way and extragalactic AGN outflows.