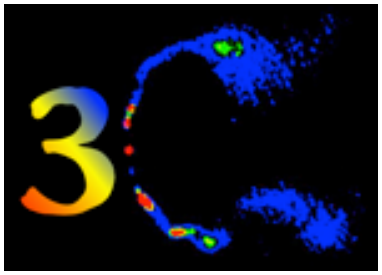

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How relativistic jets from AGNs affect the host galaxy and its environment

Wednesday, 18 September 2019 09:30 (20 minutes)

Relativistic jets from AGNs are an important driver of feedback in galaxies with an active black hole. They first interact with the host galaxy's ISM before breaking out to larger scales, significantly affecting the galaxy's morphology and evolution. Cosmological simulations predict that massive galaxies undergo several such episodes in the course of their evolution. However, large scale simulations are unable to probe the impact of such AGN activity on the ISM of the host galaxy due to limited resolution. I shall present the results of our recent 3D relativistic (magneto) hydrodynamic simulations, performed on scales of several kpc, of AGN jets interacting with the dense turbulent ISM and the ambient CGM. The young relativistic jets initially couple strongly with the dense clouds in the ISM, driving fast moving lateral outflows. The resultant outflows though strong, do not escape the galaxy, supporting a galactic fountain scenario of feedback, rather than a blow out phase as envisaged in earlier models. We have performed a suite of simulations of different jet powers, ISM conditions and morphologies. While AGN activity can potentially quench star formation by driving outflows or inducing turbulence, we find that they can also potentially enhance star formation (positive feedback) in localised patches. In another new effort, we have developed a novel new technique of estimating the evolution of the energy of non-thermal relativistic electrons in the jet, duly accounting for energy losses due to radiative processes (synchrotron + inverse compton) and enhancements due to diffusive shock acceleration at shocks. We perform this in-situ in our relativistic magneto-hydrodynamic framework of PLUTO to create realistic maps of synchrotron emission, estimate particle age and identify potential sites of acceleration of particles. The results of our simulations show qualitative and quantitative similarities with observed results of jet-ISM interaction in several galaxies which I will discuss in the talk.

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