ACTIVE GALAXIES

When push comes to shove

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There is an abundance of observational evidence and theoretical arguments supporting the existence of energetic feedback from active galactic nuclei (AGNs) impacting on their host galaxies. What remains unclear is the exact mechanism that couples the energy output of AGNs to their surroundings. Wako Ishibashi, Andrew C. Fabian and Roberto Maiolino reaffirm their assertion that radiation pressure on dust grains may in fact be sufficient to drive galaxy-scale outflows — widely seen as the clearest manifestations of AGN feedback.

AGNs could drive outflows by means of energy transfer, momentum transfer or radiation pressure. While each mode would produce somewhat different signatures, observers have been favouring energy-driven outflows due to the large measured values of outflow energy and momentum compared to the total AGN luminosity. Adopting a radiation-driven outflow as their starting point, the authors calculate the radial profiles of the outflow's energy and momentum and show that they are most strongly dependent on the AGN luminosity and to a lesser extent on the mass entrained in the outflow or the dust-to-gas ratio.

The last piece of the puzzle comes from comparing the model with observations. The authors show that the mass outflow rates and kinetic powers of radiation-driven outflows scale sub-linearly and super-linearly with AGN luminosity, respectively, roughly consistent with measurements. Furthermore, large nuclear optical depths (due to large dust content) seem to be necessary to reproduce the most energetic outflows observed, which ties in with our expectation that AGNs and their hosts experience a phase of strong dust-obscuration during their presumed co-evolution.

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