

Mapping Black Hole winds, from the event horizon up to galaxy scales

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Powerful winds driven by active galactic nuclei (AGN) are often invoked to play a fundamental role in the evolution of both supermassive black holes (SMBHs) and their host galaxies, possibly quenching star formation and explaining the tight SMBH-galaxy relations. Renewed support for this “quasar-mode” feedback came from recent X-ray observations of mildly relativistic disk winds, a.k.a. ultrafast outflows, in some ultra-luminous infrared galaxies and their connection with galactic molecular outflows observed in mm and IR wavebands. In particular, the combination of X-ray (Suzaku, NuSTAR), IR (Herschel), and mm (ALMA) observations of IRAS F11119+3257 allowed us to link the SMBH activity to molecular outflows that may quench star formation. These results appeared as the “cover page” of Nature in March 2015 and a series of ApJ papers. Further follow-up investigations on other ULIRGs and quasars are underway. These results clearly show that synergistic observations between X-rays and other wavebands have the power to map AGN winds from the event horizon up to galaxy scales, providing a promising avenue to study the multi-phase SMBH feeding and feedback. Revolutionary improvements are expected from upcoming X-ray space observatories, such as XARM and Athena, in synergy with other major space- and ground-based facilities, such as JWST, ALMA, E-ELT, SKA.

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