Project title : Black hole winds and the baryon life cycle of galaxies.

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We propose a PhD Thesis on the subject of observations of black hole winds and the baryon cycle of galaxies, within the AGN-galaxy evolution team of INAF - OATs led by Fabrizio Fiore. This PhD project will benefit from the PRIN 2017 Grant BLACKOUT "Black hole winds and the baryon life cycle of galaxies: the stone-guest at the galaxy evolution supper", coordinated by F. Fiore.

The PhD is co-funded by the University of Trieste and INAF.

The project stems from one of the main open problems in astrophysics, i.e. why the efficiency of galaxy formation, in particular at high masses is kept low? How do galaxies stop forming stars? Despite large observational and theoretical efforts, these questions remain largely unanswered. Many indications point towards black hole feedback as the physical driver for quenching star-formation in massive galaxies, but the sparse observations collected so far have prompted scepticism on the relevance of AGN feedback. We foresee two mains lines of research, outlined below.

(i) A study of the cold molecular and warm ionised interstellar medium in nearby ($z<\sim0.2$)sample of AGN host galaxies. This will be based on observations conducted with the Atacama Large Millimetre/submillimetre Array (ALMA), the NOrthern Extended Millimetre Array (NOEMA), MUSE/VLT and other optical/NIR data. The combination of these data-sets allows tracing the multiphase, cold/warm ISM in the vicinity of the AGN and across the hosts' disk, and to probe the effects of AGN outflows and/or irradiation on the local conditions of the ISM and the star-formation reservoir.

(ii) A study of the baryon cycle at the peak epoch of AGN and galaxy assembly and in high redshift AGN. For this project ALMA, NOEMA and NIR IFU data will

be used to map the cold and ionized gas phases at few kpc scales to probe the main dynamical components (disks, outflows) and star-forming regions.

The projects proposed are based on a large data set collected by our group, which consists of both proprietary and archival observations. The student will be trained in state-of-the-art analysis of interferometric data from ALMA, NOEMA and other major radio interferometers, including phased arrays in the low frequency domain (LOFAR), and in state-of-the-art dynamical modelling of the ISM. The student will also be able to get acquainted with data analysis from flagship optical-NIR instruments such as MUSE/VLT and LUCI/LBT. Several proposals for observations are pending, and additional data will become available to complement and extend the existing projects. The student will contribute actively to new proposals for observations.

The PhD project will be carried out under the supervision of F. Fiore, and in close collaboration with the extragalactic group of OATs. We propose an interdisciplinary approach, where the student will benefit from a continuous and close exchange between observers and theoreticians of our team, and of our collaboration network. We are committed to provide a stimulating and caring work environment, supporting personal growth and professional development.

A list of recent publications by our team can be found here.
More information on the BLACKOUT project can be found at the project website.
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