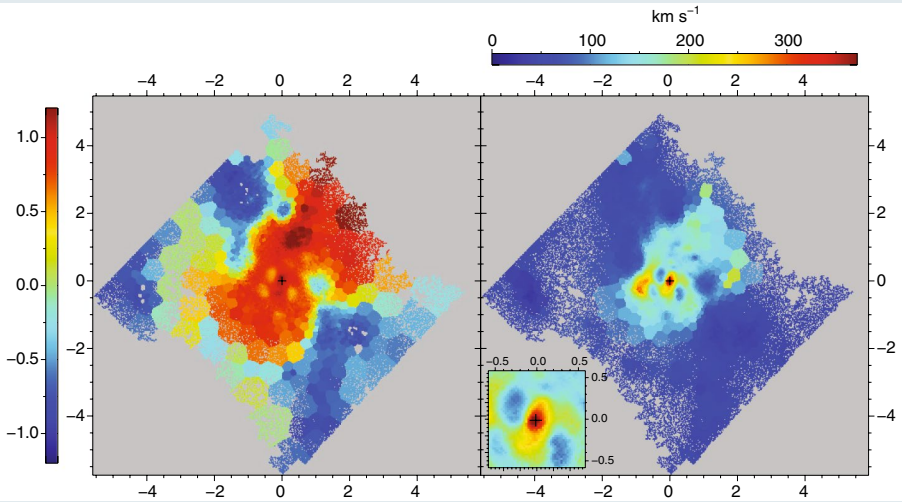
ACTIVE GALAXIES

MUSEings of the highest quality

Active galactic nuclei (AGN) are believed to directly impact their host galaxies through the coupling of the gravitational energy emitted as matter is accreted onto the supermassive black hole at the centre of the AGN with the interstellar medium of the host. Despite this generally accepted picture and the significant observational effort devoted to understanding this feedback process, the details of how and where this coupling takes place remain elusive. Johan Knapen and collaborators report spatially resolved spectroscopic observations of the AGN NGC 7130 at very high angular resolution that reveal the complexity of AGN feedback and the coexistence of strong AGN-driven outflows with pockets of intense star formation.

The Multi Unit Spectroscopic Explorer (MUSE) on the Very Large Telescope is a unique current-generation instrument that provides a wide field of view, while also allowing very sensitive and high-spectral-resolution spatially resolved optical spectroscopic observations. Since 2017, MUSE has been combined with adaptive optics to produce the highest-fidelity observations with such an instrument. Knapen et al. used this specific setup to produce a dataset of spectroscopic observations of NGC 7130 at a spatial resolution of <0.2 arcsec or <60 pc, revealing in rich detail the morphology, kinematics and ionization properties of the ionized gas in this galaxy. The authors confirm the presence of a kinematically decoupled nuclear disk at the centre of the galaxy with a rotation axis at a 90 degree angle with respect to the rest of the galaxy.



Credit: ESO

The galaxy also shows an extended — 160 pc in diameter — nuclear ring of intense star formation. Both of these features could be a result of a merger in the early history of the galaxy.

Emanating from this decoupled core, a complex plume-like AGN outflow was detected, showing evidence for a hard ionization field (shown in orange and red in the left panel) and highly turbulent gas motions (cyan and yellow in the right panel). The outflow is inferred to have a polar direction, launched normal to the disk of the galaxy. More interestingly, however, areas of strong star formation (shown in cyan and blue in the left panel) were found to lie right outside and around the AGN outflow — in addition to the nuclear starburst ring that is embedded within the AGN core. While this apparent coexistence of AGN feedback and star formation has been reported in the literature before, the wealth of information contained in the MUSE data offers an unparalleled view of the inner workings of the interplay between the two. ❐

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