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JWST/NIRSpec insights into the nuclear environment of Arp 220: A detailed kinematic study

Major mergers represent an important key in the evolution of galaxy during which large quantity of gas and dust are funneled to the central regions of the system and intense star formation and possibly AGN activity are triggered.

Arp 220 represents the closest prototypical ultraluminous infrared galaxy (ULIRG) in an advanced phase of a major merger.

By using new JWST NIRSpec IFU observations, we investigated the spatially resolved gaseous (in both ionized and warm molecular phases) and stellar kinematics in the innermost 1 kpc encompassing the two bright nuclei.

We decoupled the different kinematic components through multi-Gaussian fitting. In this way, we isolated the contributions of multi-phase outflows, bubbles, streams due to the merging, as well as two counter-rotating discs around each nucleus embedded in a larger-scale rotational disc.

We identified broadening and multiple kinematic components both in warm molecular and ionized lines with velocities up to 900 km/s.
We computed the mass, mass outflow rate and energetics of each outflowing and bubble component in each gas phase. We compared these with both large-scale (10 kpc) ionized and small scale (few hundreds of pc) cold molecular outflow properties, to obtain a complete picture of the multi-phase outflow phenomenon from the nuclear to galactic scales in the nearest ULIRG.
We also investigated the presence of possible AGN, which still remains challenging due to the extreme dust obscuration.

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