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The WiggleZ Dark Energy Survey: High Resolution Kinematics of Luminous Star-Forming Galaxies

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We report evidence of ordered orbital motion in luminous star-forming galaxies at z~1.3. We present integral field spectroscopy (IFS) observations, performed with the OH Suppressing InfraRed Imaging Spectrograph (OSIRIS) system, assisted by laser guide star adaptive optics on the Keck telescope, of 13 star-forming galaxies selected from the WiggleZ Dark Energy Survey. Selected via ultraviolet and [OII] emission, the large volume of the WiggleZ survey allows the selection of sources which have comparable intrinsic luminosity and stellar mass to IFS samples at z>2. Multiple 1-2 kpc size sub-components of emission, or 'clumps', are detected within the Halpha spatial emission which extends over 6-10 kpc in 4 galaxies, resolved compact emission (r<3 kpc) is detected in 5 galaxies, and extended regions of Halpha emission are observed in the remaining 4 galaxies. We discuss these data in the context of different snapshots in a merger sequence and/or the evolutionary stages of coalescence of star-forming regions in an unstable disk. We find evidence of ordered orbital motion in galaxies as expected from disk models and the highest values of velocity dispersion (\sigma>100 km/s) in the most compact sources. This unique data set reveals that the most luminous star-forming galaxies at z>1 are gaseous unstable disks indicating that a different mode of star formation could be feeding gas to galaxies at z>1, and lending support to theories of cold dense gas flows from the intergalactic medium.

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