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The JWST-ERS program ID 1288: Radiative Feedback from Massive Stars as Traced by Multiband Imaging and Spectroscopic Mosaics

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Massive stars disrupt their natal molecular cloud material by dissociating molecules, ionizing atoms and molecules, and heating the gas and dust. These processes drive the evolution of interstellar matter in our Galaxy and throughout the Universe from the era of vigorous star formation at redshifts of 1-3, to the present day. Much of this interaction occurs in Photo-Dissociation Regions (PDRs) where far-ultraviolet photons of these stars create a largely neutral, but warm region of gas and dust. PDR emission dominates the IR spectra of star-forming galaxies and also provides a unique tool to study in detail the physical and chemical processes that are relevant for inter- and circumstellar media including diffuse clouds, molecular cloud and protoplanetary disk surfaces, globules, planetary nebulae, and starburst galaxies.

We propose to provide template datasets designed to identify key PDR characteristics in the full 1-28 μm JWST spectra in order to guide the preparation of Cycle 2 proposals on star-forming regions in our Galaxy and beyond. We plan to obtain the first spatially resolved, high spectral resolution IR observations of a PDR using NIRCam, NIRSpec and MIRI. We will observe a nearby PDR with well-defined UV illumination in a typical massive star-forming region. JWST observations will, for the first time, spatially resolve and perform a tomography of the PDR, revealing the individual IR spectral signatures from the key zones and sub-regions within the ionized gas, the PDR and the molecular cloud. These data will test widely used theoretical models and extend them into the JWST era. We will assist the community interested in JWST observations of PDRs through several science-enabling products (maps of spectral features, template spectra, calibration of narrow/broad band filters in gas lines and PAH bands, data-interpretation tools e.g. to infer gas physical conditions or PAH and dust characteristics). This project is supported by a large international team of one hundred scientists collaborators.

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Yes

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