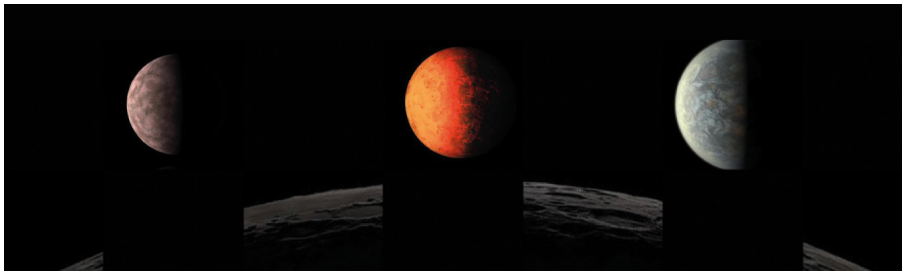

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Formation and presence of molecular and crystalline structures in the NGC 6357 region

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Understanding star and planet formation in extreme environments is crucial for uncovering the origins of our solar system. While most knowledge comes from nearby, isolated regions such as Taurus and Lupus, over half of all stars and planetary systems form in environments exposed to strong far-ultraviolet (FUV) radiation, emitted by massive OB stars, with energies below the Lyman limit (E < 13.6 eV).

NGC 6357—a young (~1–1.6 Myr), massive star-forming complex located 1690 pc away and hosting over 20 O-type stars—provides a unique opportunity to study the effects of FUV radiation on protoplanetary disks. This is the focus of the XUE (eXtreme UV Environments) collaboration.

Here, we present results from XUE2, a disk in the Pismis 24 cluster, based on spectra from JWST/MIRI and VLT/FORS2, complemented by photometric data. We first characterized the central star through spectrophotometric fitting, a fundamental step since protoplanetary disks are shaped by their host stars.

To evaluate the potential for rocky planet formation, we conducted a molecular and mineralogical analysis of the disk. We confirmed the presence of CO and tentatively detected CH_3^+, both key molecules for organic chemistry. Additionally, we identified silicates such as enstatite and forsterite—molecules and minerals also observed in disks exposed to lower irradiation levels.

These findings offer new insights into the composition of inner disk regions under strong FUV irradiation, helping to constrain the formation conditions of rocky planets in massive clusters—an essential contribution to understanding the origins of the diverse exoplanets observed today.

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