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Star formation efficiency in giant molecular clouds at z=1 as probed by JWST

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Deep HST images of strongly lensed clumpy galaxies at redshift z~1-3 shows UV-bright clumps, on average, 100x more massive than local star
cluster complexes. Their physical properties supports an in-situ clump formation under fragmentation of turbulent, marginally stable high-redshift gas disks. Among these galaxies, the Cosmic Snake, a strongly lensed clumpy galaxy at z=1, resolved down to physical scale of 30-70 pc, sets a record of hosting 21 stellar clumps and 17 giant molecular clouds (GMCs) based on HST and ALMA CO observations. These GMCs have gas masses high enough to allow for the formation of the massive stellar clumps. The comparison of GMCs and stellar clump masses suggests a GMC star formation efficiency (~30%) much higher than observed in contemporary galaxies (<6%). If confirmed, it would suggest an evolution in the efficiency of forming stars with redshift. Our accepted Cycle 1 JWST / NIRSpec-IFU program probing Halpha in this galaxy aims at using an independent approach to derive the star formation efficiency of these GMCs based on a statistical framework recently applied to nearby galaxies, which translates cloud-scale variations of the flux ratio between tracers of molecular gas and star formation to the molecular cloud evolutionary timeline, necessary to reliably determine the cloud-scale star formation efficiency.