Star Formation Relations at z∼5 from [CII] Observations and SED Modeling

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The Kennicutt-Schmidt (KS) relation, linking star formation rates (SFR) to gas surface densities, is well-studied locally but challenging to probe at high redshifts due to difficulties in detecting traditional gas tracers. This leaves our understanding of galaxy behaviour in the early universe incomplete. The [CII] emission line has emerged as a promising alternative gas tracer at high redshifts (z∼5). Studying the [CII]-SFR relation offers insights into early galaxy evolution and potentially extends to the KS relation, though assumptions about [CII]-to-gas conversion are needed. Previous work confirmed the extension of the KS relation to z∼5 looking at 4 [CII]-detected main-sequence galaxies, revealing that high gas-density regime aligns with low-redshift counterparts. However, this study, like others, was limited by resolution, sample size, and wavelength coverage. In this talk, I will present an analysis of 13 similar galaxies with new high-resolution data from JWST, HST and ALMA. The methodology involves producing resolved maps of physical properties, including SFR, to measure the slope and scatter of the [CII]-SFR relation. Findings indicate that individual galaxies show different slopes and scatter compared to the full sample relation. Finally, I will discuss how variations in the [CII] conversion factor impact gas mass estimates and our understanding of star formation efficiencies. This discussion will be highlighting ongoing studies relying on numerical simulations.