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**Presentation Requested: oral**

**Category: Evolution of the Interstellar Medium and Star formation over Cosmic Time**

**Question:** Is there a common Schmidt-Kennicutt law at all redshifts and all scales? How is this "law" affected by different measurement limitations or conversion factors from tracer molecules or emission / absorption lines to amounts of gas and SFR?

### **The [CII] 158 micron Emission as a Star Formation Tracer in the ALMA Era**

The [CII] 157.74  $\mu\text{m}$  transition is the dominant coolant of the neutral interstellar gas, and has great potential as a star formation rate tracer. Thanks to ALMA, the [CII] 158  $\mu\text{m}$  line can now be detected in a wide range of high redshift ( $z > 1$ ) objects that goes from quasi-stellar objects and ultra luminous-infrared galaxies to systems like the Milky Way. For many of these high redshift galaxies, the [CII] luminosity might be the only available tool to measure the star formation rate (SFR). In this talk I will discuss the reliability of the [CII] 158  $\mu\text{m}$  emission as a SFR tracer in a wide range of environments that include low metallicity and normal, star-forming galaxies, active galactic nuclei, and luminous infrared galaxies. Our work is based on a sample of resolved regions from 49 nearby galaxies observed by *Herschel* as part of the KINGFISH project. We conclude that the [CII] emission can be used for measurements of SFRs on both, global and kiloparsec scales, in normal star-forming galaxies in the absence of strong AGNs. The main source of scatter in the correlation is associated with regions that exhibit warm IR colors, and we provide an ad hoc correction based on IR color that reduces the scatter. We show that the color-corrected  $\Sigma_{\text{[CII]}} - \Sigma_{\text{SFR}}$  correlation is valid over almost 5 orders of magnitude in  $\Sigma_{\text{SFR}}$ , holding for both normal star-forming galaxies and non-AGN luminous infrared galaxies. Using [CII] luminosity instead of surface brightness to obtain the SFR suffers from worse systematics: for systems brighter than  $10^{11} L_{\odot}$  the [CII] luminosity frequently underestimates the SFR even after applying the IR color correction.