P310b An improved upper limit of Cyanodiacetylene (HC_5N) in the atmosphere of Titan

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In the complex Titan atmospheric chemistry, photochemical reactions involving cyanodiacetylene (HC_5N) may be important as reaction pathways that could lead to the production of amines and aromatic molecules. We carried out a new comprehensive search of HC_5N in Titan's atmosphere using Band 6 spectroscopic archival data from the ALMA. To search for a faint spectral line feature of HC_5N, we used a spectral stacking method that integrates different transition data. Integrating six independent observation datasets with a total integration time of ∼15000 seconds, we found no statistically significant detection of an HC_5N spectral feature. Using the radiative transfer modeling and employing the four previously predicted vertical distributions, we derived the upper limit column density of HC_5N, corresponding to 3–σ noise level, to be $0.3 - 10\times10^{13}$ molecules/cm^2 above ∼60 km altitude. The corresponding upper limit of $[HC_5N]/[HC_3N]$ ratio value derived from three of four models seem to be lower than that measured in High-mass Protostellar Objects, possibly due to the lower abundance of C_4H_2. This work was published in the Astronomical Journal (DOI: 10.3847/1538-3881/ae0621).