

Title:Unlocking Titan's Atmospheric Secrets: A Comprehensive Search for Biotic Molecules  
Precursors

Summary:

Laboratory experimental studies have shown that the synthesis of biotic molecules, such as amino acids and nucleotide bases, the building blocks of life, are possible through photochemical reactions in the atmosphere and surface of Titan. In particular, observational detection of precursor of some of the nucleotide bases, Pyrimidine, cyanopolyynes and other long carbon-chain molecules, are important and crucial target to investigate the biotic environment of Titan. We have constructed the complete Titan ALMA archive containing both the calibration and dedicated observation data, and performed the atmospheric chemistry study by determining the isotopic ratios and the upper limit abundance of trace organic molecules. By introducing the new noise reducing technique and combining the visibilities of the massive data, highly sensitive observation of trace organic species will be available. The atmospheric chemical network simulation will be performed to illustrate the possible synthesis process of such molecules. In this study, applying both observational and theoretical/computational approach, we aim to broaden the understanding of the biotic and chemical environment on Titan.