Observations of Organic Chemistry on Titan

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Titan is the largest moon of Saturn, with a thick (1.45 bar) atmosphere composed primarily of molecular nitrogen and methane. Atmospheric photochemistry results in the production of a wide range of complex organic molecules, including hydrocarbons, nitriles, aromatics and species of possible pre-biotic relevance. Studies of Titan's atmospheric chemistry thus provide a unique opportunity to explore the origin and evolution of complex organic matter in a primitive (terrestrial) planetary atmosphere. Underpinned by laboratory measurements, remote and in-situ observations of hydrocarbons, nitriles and oxygen-bearing species provide important new insights in this regard. The Atacama Large Millimeter/submillimeter Array (ALMA) is a powerful new facility, well suited to the study of molecular emission from Titan's upper and middle-atmosphere [1]. This presentation will focus on detection and mapping of rotational emission lines from molecules including HNC, CO, HC3N, CH3CN, C2H3CN and C2H5CN [2,3], as well minor isotopologues [4]. Possible chemical formation pathways for these species will be discussed, and the scope for improved understanding of non-aqueous organic chemistry through laboratory experiments and atmospheric/liquid-phase simulations under Titan-like conditions will be examined [5].

References

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[3] J. Lai et al., AJ, **154,** 206 (2017)
[4] E. Molter et al., AJ, **152,** 42 (2016)
[5] M. Y. Palmer et al., Science Advances, **3,** e1700022 (2017)