INSIGHTS INTO TITAN'S NITROGEN CHEMISTRY FROM ALMA OBSERVATIONS. M. A. Cordiner[1], C. A. Nixon[1], M. Y. Palmer[1], S. B. Charnley[1], N. Teanby[2], J. Serigano[1], P. G. J. Irwin[3], Z. Kisiel[4]. [1]NASA Goddard Space Flight Center, 8800 Greenbelt Road, Greenbelt, MD 20771, USA (martin.cordiner@nasa.gov). [2]School of Earth Sciences, University of Bristol, Wills Memorial Building, Queen's Road, Bristol, BS8 1RJ, UK. [3]Atmospheric, Oceanic and Planetary Physics, Clarendon Laboratory, University of Oxford, Parks Road, Oxford, OX1 3PU, UK. [4]Institute of Physics, Polish Academy of Sciences, Al. Lotnikow 32/46, 02-668 Warszawa, Poland.

Introduction: Saturn's largest moon Titan has a thick (1.45 bar) atmosphere composed primarily of molecular nitrogen (98%) and methane (2%). Remote and in-situ measurements have revealed a diverse population of trace hydrocarbons and complex nitrogen-bearing compounds, the presence of which can be explained as the result of gas-phase photochemistry, driven by Solar radiation and cosmic rays. Much is still unknown, however, regarding the detailed chemistry of Titan's nitrogen-bearing compounds, a complete understanding of which is necessary for determining the evolution of Titan's nitrogen atmosphere, as well as providing insight into the synthesis of molecules of possible pre-biotic relevance. The incorporation of nitrogen into aromatic species, for example, is a fundamental step towards the formation of DNA nucleobases, but despite the detection of pyridine with the Cassini INMS in 2007 [1], its formation mechanism and chemical evolution on Titan are still not firmly established.

Observational data: ALMA observations of nitrogen-bearing species including HCN, HNC, HC_3N, C_2H_5CN and CH_3CN will be presented, including spectroscopic detections and mapping. Measurements of ^{15}N-substituted isotopologues will also be presented.

Analysis: Measurements of the distributions of Titan's nitriles will shed light on chemical synthesis pathways and important dynamical atmospheric processes such as winds and global transport patterns [2,3]. Radiative transfer models will be used to determine vertical abundance profiles and isotopic ratios for comparison with chemical models. In the context of these isotopic measurements, theories regarding the origin of Titan's nitrogen will be discussed.

References: [1] Vuitton, V., Yelle, R. V. & McEwan, M. J. (2007), Icarus, 191, 722, [2] Cordiner, M. A. et al. (2014), ApJ, 795, L30, [3] Cordiner, M. A. et al. (2015) ApJ, 800, L14.