Chemical complexity in the Galactic Centre GMCs: The nitrogen-bearing family

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The Galactic Centre (GC) is a harsh environment where molecular clouds are exposed to energetic phenomena such as intense UV radiation fields, widespread shock waves and enhanced cosmic ray ionization rates. For the latter, recent observations of molecular ions such as H3+ toward different lines of sight across the Central Molecular Zone of the GC (the CMZ, or the central 100pc of the Galaxy), suggest that the molecular gas in the CMZ is affected by enhanced cosmic ray ionization rates $>10^{15}$ s^{-1} (Goto et al. 2014) G+0.693 is a quiescent giant molecular cloud located in the CMZ, which represents a prolific repository of large organic species in the ISM. Although this region has shown no signatures of star formation, it presents almost the same level of chemical complexity as that found in the star-forming cluster Sagittarius B2(N). In order to explore the complexity of organic species in this source, and how it is affected by cosmic rays, we performed a spectral line survey toward this GC cloud with the IRAM-30m telescope and the GBT telescope. Over 20 nitrogen-bearing species including long carbon chain cyanopolyynes (HC3N through HC7N) and several molecules with peptide-like bonds such as formamide (NH2CHO) and methyl isocyanate (CH3NCO) have been conclusively identified. By comparing our derived abundances in G+0.693 with those from other astrophysical environments such as dark cloud cores, we find that the chemistry of these N-bearing species is possibly affected by an enhance cosmic ray ionization rate. This suggests that cosmic rays can play an important role in the chemistry of complex organics in the quiescent GMCs in the GC. The detection of such high chemical complexity in this cloud demonstrates that complex organic molecules can survive even in very harsh environments such as galactic nuclei.

Molecular Clouds