A study of Nitric oxide dayglow in the upper atmosphere of Mars using MAVEN/NGIMS data

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Abstract:

Nitric Oxide (NO) photochemistry is well studied in the terrestrial atmosphere for decades. A comprehensive study of NO photochemistry in the Martian upper atmosphere is still restricted due to lack of requisite measurements[1]. NO is the most abundant form of odd nitrogen species in the Martian upper atmosphere and its density in the dayside depends mainly on the production and loss of atomic nitrogen in ground (^{4}S) and excited (^{2}D) states in the dayside. We have developed a photochemical model to calculate NO number density profile in the sunlit Martian upper atmosphere. Using our model and neutral and ion densities as measured by Neutral Gas and Ion Mass Spectrometer (NGIMS) on-board Mars Atmosphere and Volatile Evolution (MAVEN) mission, NO density profiles are calculated in the altitude range 120–200 km for deep dip 8 and 9 campaigns. The derived NO densities are employed to calculate NO γ band dayglow emission intensity in the dayside upper atmosphere of Mars. The modelled NO density and its γ band intensity profiles are found to be consistent with earlier in-situ (Viking 1 and 2) and remote observations (IUVS/MAVEN), and also model calculations ([2]). We found that the local CO_2 density variation can lead to a change in NO density and consequently its dayglow intensity by a factor 2 to 5. Since NO is a trace constituent and also its dayglow emissions are strongly obscured by CO Cameron band emission[3], we suggest that the derivation of NO number density based on the photochemical reactions can serve as a base line to constrain its dayside abundance. More observations are required to study NO density variation and its dayglow during different seasons and various solar activity conditions in the dayside upper atmosphere of Mars.

References:

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