Radiative cooling of Nitric Oxide emission observed by TIMED/SABER over asian sector during severe geomagnetic storms

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Nitric oxide (NO) is a very important trace species in the mesosphere-lower-thermosphere (MLT) region. It plays a significant role in the MLT region due to its low ionization energy and the presence of IR-active vibrational bands. The radiative emission due to NO at 5.3 μm is the main cooling mechanism in the thermosphere. It is very well known that geomagnetic storms strongly alter the energetics and chemistry of thermosphere. The effect of geomagnetic storms on the nitric oxide (NO) radiative cooling at 5.3 μm, in MLT region, has been studied over Asian sector during 26-29 September 2011 and 18-21 February 2014 using measurements made by SABER onboard the NASA's TIMED satellite. The SABER retrieved data along with the densities from NRLMSISE-00 model have been used to study the latitudinal variation of nitric oxide radiative cooling during the storm period. The variations induced in the radiative cooling are understood with the help of fluctuations in neutral species and the resulting changes in chemistry. It has been found that the NO radiative emission is strongly influenced by the storm conditions. The altitude of peak emission rate shows an upward movement in the higher latitude regions during day and night time. Similarly, the magnitude of peak emission rate is also observed to show enhancement in the high latitude sectors during the main phase of storm in day as well as night time. The atomic oxygen number density and O/N2 ratio calculated using NRLMSISE-00 model, shows depletion in the higher latitude region. Consequently, there is a negative correlation among the nitric oxide volume emission rate, atomic oxygen density and O/N$_2$ ratio over Asian sector during the geomagnetic storm period. The various factors influencing the correlation between density ratios and radiative cooling will be presented.

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