Impact of Solar Proton Events (SPEs) on Thermospheric Cooling Emission

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The Nitric oxide (NO) emission at 5.3 μm wavelength represents a 'natural thermostat' by which the heat and energy are efficiently lost from the thermosphere. It is the dominating coolant above 100 km. The primary production mechanism is the temperature dependent reaction between the nitric oxide and atomic oxygen densities. Consequently, the radiative emission linearly depends on NO and Atomic oxygen densities and non-linearly on the thermospheric temperature. Since it is well established that the solar proton event (SPE) dictates the variations in the MLT region nitric oxide density and thermal structure, it is worthwhile to investigate its relationship with NO cooling emission. We utilized the NO radiative emission at 5.3 μm as observed by the SABER (Sounding of the Atmosphere using Broadband Emission Radiometry) instrument onboard the NASA's TIMED (Thermosphere Ionosphere Mesosphere Energetics Dynamics) satellite along with the particle flux from the DMSP satellite and EISCAT measurements to investigate the impact of SPEs on NO cooling emission during geomagnetic quiet period. Furthermore, we also quantify the spatial and temporal impacts of SPEs and their relation and cross-correlation with the thermospheric cooling emission during the geomagnetic quiet periods.

Figure 1. Figure font size is also 9pt.