

Anomalous Thermal Response of the Mesosphere Lower Thermosphere to the Geomagnetic Storm of 10-11 October, 2024

Speaker: Govind Narayanan K

Abstract

Geomagnetic storms bring significant changes in the composition, circulation, transport, energetics, and dynamics of the mesosphere-lower thermosphere region (MLT). The present study examines the global response of the thermal field of the MLT to the 'G4' class geomagnetic storm of 10-11 October 2024, utilizing SABER/TIMED temperature measurements. An overview of the major heating mechanisms in the auroral oval will be given. During the storm progression, a near-simultaneous temperature enhancement was observed at ~110 km around midnight in the low-latitude region and the Polar Region Auroral Oval (PRAO), and both their scales were similar. However, significant heating and cooling was observed in the Southern Hemisphere on 10 October. We use Weimer-2005 Model simulations to study the extent of Joule heating (JH) rates. Following the storm onset, substantial JH exceeding 150 mW/m^2 was observed around the peak Dst (till 55° N). It is interesting to understand the thermal response of the MLT to short-term events such as geomagnetic storms and how these changes are transported to the low latitudes.