



On the response of the mesopause region over an Indian Antarctic station Bharati to the geomagnetic storm of 23-24 March 2023

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We report, in this work, the changes in the thermal structure of the mesosphere-lower thermosphere (MLT) region over an Indian Antarctic station Bharati (69.4° S, 76.2° E, dip lat. -58.4°, modip. ~ -65°) brought about by intense geomagnetic storm of 23-24 March 2023 (Dst ~ -155 nT). We use the temperature and OH airglow measurements of the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument onboard NASA's Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) mission satellite to compare the thermal field of the MLT region on these disturbed days with the neighbouring quietest days of 27-28 March. Such comparison reveals both warming and cooling in the MLT region associated with the storm. An extension of this comparative study in the latitude region located poleward of Bharati, too, shows similar behavior of the MLT region during this geomagnetic storm. Overall, this study reveals the maximum temperature enhancement of ~39-43 K to occur at around 99 km, a significant warming of ~4-43 K in 95-105 km, and a decrease of ~12-16 K in 80-87 km. While the enhancement of temperature in 95-105 km appears to be a consequence of the auroral heating associated with this storm; we are unable to account for the cooling below based on existing theories. Present observation of the development of cooling underneath the region of temperature enhancement during the geomagnetic storm is rare and demands further investigation.