Comparing the ionospheric response to the 2008/2009 and 2018/2019 SSW events

Tarique Adnan Siddiqui, Yosuke Yamazaki, and Claudia Stolle
GFZ Potsdam, Potsdam, Germany (tariq@gfz-potsdam.de)

It is now well accepted that the ionosphere and thermosphere are sensitive to forcing from the lower atmosphere (troposphere-stratosphere) owing mainly to the progress that have been made in the last decade in understanding the vertical coupling mechanisms connecting these two distinct atmospheric regions. In this regard, the studies linking the upper atmosphere (mesosphere-lower thermosphere-ionosphere) variability due to sudden stratospheric warming (SSW) events have been particularly important. The change of stratospheric circulation due to SSW events modulate the spectrum of vertically upward propagating atmospheric waves (gravity waves, tides, and planetary waves) resulting in numerous changes in the state of the upper atmosphere. Much of our understanding about the upper atmospheric variability associated due to the SSWs events have been gained by studying the 2008/2009 SSW event, which occurred under extremely low solar flux conditions. Recently another SSW event in 2018/2019 occurred under similar low solar flux conditions. In this study we simulate both these SSW events using Whole Atmosphere Community Climate Model with thermosphere and ionosphere extension (WACCM-X) and present the findings by comparing the ionospheric and thermospheric response to both these SSW events. The tidal characteristics of the semidiurnal solar and lunar tides and the thermospheric composition for both these SSW events are compared and the causes of varying responses are investigated.