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**Impacts of lower atmospheric dynamics on the ionosphere during the  
geomagnetic storm on 5 April 2010**

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Global whole-atmospheric numerical simulations for the 5 April 2010 geomagnetic storm are carried out using the Whole Atmosphere Community Climate Model with Thermospheric Extension version 2.0. The lower atmospheric dynamics are specified (nudged) using the Modern-Era Retrospective analysis for Research and Applications version 2 reanalysis data during the period of experiment (01 Jan 2010 – 31 May 2010), which is the analysis run. The other experiments (5 forecast runs) are performed without any dynamic specification from 20 days, 10 days, 5 days, 2 days, and 1 day before the storm onset (5 April). The experiment results show that the amplitude and phase of migrating diurnal (DW1), migrating semi-diurnal (SW2), and non-migrating tides (DE3) deviate from the analysis run 2 or 3 days after nudging is turned off. Especially, it is consistently found that the amplitude of DW1 decrease in the forecast runs. This deviation attributes to the tidal-induced winds in the E-region, which subsequently affect the vertical plasma drift velocity in the F-region. In addition, after 10 days without nudging, it is found that the Total Electron Content (TEC) significantly deviates from the analysis run in the high-latitude region. This result is related to the variation of O/N<sub>2</sub> ratio due to the change of meridional circulation. Overall, this study demonstrates the significance of the role of lower atmospheric dynamics in space weather forecast for ionosphere even during the geomagnetic storm period.