

Tidal variabilities and their effects on the upper atmosphere during stratospheric sudden warmings studied with a long-term whole atmosphere-ionosphere simulation

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Recent studies have revealed that large-scale phenomena in the lower atmosphere have significant impacts on the upper atmosphere. For example, during the period of a prominent stratospheric sudden warming (SSW) in January 2009, the low latitude ionosphere was observed to perturb significantly. In previous study, we have simulated the event using a whole atmosphere-ionosphere coupled model called GAIA which implemented the meteorological reanalysis data in order to examine the effects of realistic lower atmospheric forcing. The model can reproduce overall main features in the middle and upper atmospheric variations during the SSW event, and the analysis suggests that the upward propagating planetary wave in the polar region can change not only global zonal wind distribution but also propagation of atmospheric tides, which leads to the perturbation of low latitude ionosphere [Jin et al., JGR, 2012]. In this study, we have carried out a longer run from 1996 to 2014, and analyzed statistically the effects of stratospheric sudden warmings on the upper atmosphere. We especially discuss the role of migrating tides in detail.

Keywords: stratospheric sudden warming, atmospheric tide, ionosphere, thermosphere, simulation, modeling