

Local modeling of the thermosphere-ionosphere dynamics in the polar region

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The thermosphere and ionosphere in the polar region have been studied for a long time. Recent results of the ground and satellite measurements have suggested that local dynamics of the auroral thermosphere and ionosphere are extremely complicated. Global dynamics can be basically explained by Joule heating or particle precipitation heating, or convection driven by the ion-neutral drag force. However, various observations indicate that superposition or interaction of several processes play an important role in controlling the local dynamics of the thermosphere and ionosphere. Although phenomena with a typical horizontal spatial scale larger than the vertical scale height can be reproduced with traditional hydrostatic atmosphere models, mesoscale phenomena with a horizontal scale less than about 100 km can only be quantitatively treated with nonhydrostatic atmosphere models. In order to study the behavior of the local thermosphere-ionosphere dynamics, we employ a nonhydrostatic local atmospheric model coupled with the ionospheric model. We will report on how the thermosphere-ionosphere dynamics is modified depending on the temporal and spatial scales of the polar heating region.

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