

Numerical modeling of the thermospheric and ionospheric dynamics in the auroral 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. In particular, in the auroral region, various processes, such as Joule heating, particle precipitation heating, and ion-neutral drag force enhanced by particle precipitation, are strongly coupled. Previous observations have shown some characteristic mesoscale phenomena such as neutral vertical winds and increasing neutral density in the auroral region. However, the behavior of such phenomena is still not well understood. In order to study the mesoscale thermospheric dynamics in the auroral region, nonhydrostatic atmosphere modeling is required instead of traditional hydrostatic atmosphere models. We will report on how the thermospheric dynamics is modified depending on the magnitude of the heating and the spatial structure of the heating region using a two-dimensional nonhydrostatic atmospheric model. In addition, interaction between the thermosphere and the ionosphere will be discussed.