

## Study and prediction of the polar upper atmosphere using high-resolution non-hydrostatic thermosphere-ionosphere model

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Although a number of simulation models of the thermosphere and the ionosphere have been developed, behavior of the upper atmosphere has not been fully understood. Two- and three-dimensional non-hydrostatic thermosphere-ionosphere models have been developed and used to study the thermosphere and the ionosphere in the polar region. In this paper, the model is described and some results obtained by the model are presented. Current problems and future prospects for predicting the thermosphere and the ionosphere are also briefly discussed.

The thermosphere and the ionosphere in the polar region have been studied for a long time. Recent observations have shown that the dynamics of the thermosphere and the ionosphere is extremely complicated. Although a number of simulation models of the thermosphere- ionosphere have been developed, behavior of the upper atmosphere has not been fully understood. For example, large vertical wind in the polar thermosphere is still a mystery. There have been a number of reports on very strong vertical winds in the polar thermosphere. The magnitude of the vertical winds sometimes exceeds 50 m/s in the upper thermosphere. Although vertical winds less than about 20 m/s could be generated by Joule heating or particle precipitation in the auroral region, large vertical winds exceeding 50 m/s in the thermosphere are unlikely to be driven by local heating processes alone. In such cases, interaction processes between the global wind system and the local wind system might play an important role in generating strong vertical winds. Two- and three-dimensional non-hydrostatic thermosphere-ionosphere models have been developed and used to study the thermosphere and the ionosphere in the polar region. The model is described and some results obtained by the model are presented. Current problems and future prospects for predicting the thermosphere and the ionosphere are also briefly discussed.