Thermospheric and ionospheric dynamics in the auroral region

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Two- and three-dimensional non-hydrostatic thermosphere-ionosphere models are used to investigate small-scale variation of the thermosphere and the ionosphere associated with local auroral activities. The results are compared with ion and neutral winds measured by the Fabry-Perot Interferometer and EISCAT. In this paper, emphasis is placed on coupling of the thermosphere and the ionosphere. Interaction processes between the global wind system and the locally generated winds are also discussed.

Dynamics of the thermosphere and the ionosphere in the auroral region is quite complicated. There have been a number of reports on strong vertical neutral winds in the auroral region. The magnitude of the vertical winds sometimes exceeds 100 m/s, suggesting that heat sources associated with auroral precipitation could cause extremely large upwelling and downwelling of the thermosphere. Behavior of the ionosphere associated with such neutral winds appears to be complex. Although such small-scale variation is likely be confined into the auroral region, those events are expected to produce equatorward propagating gravity waves. It is also possible that such small-scale phenomena influence the global structure and dynamics of the thermosphere-ionosphere system. Two- and three-dimensional non-hydrostatic thermosphere-ionosphere models are used to investigate small-scale variation of the thermosphere and the ionosphere associated with local auroral activities. The results are compared with ion and neutral winds measured by the Fabry-Perot Interferometer and EISCAT. In this paper, emphasis is placed on coupling of the thermosphere and the ionosphere. Interaction processes between the global wind system and the locally generated winds are also discussed.