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Simulation of ionospheric variations associated with thermospheric vertical winds in the polar region

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Recent observations have indicated that extremely large and variable vertical winds are locally generated in the polar thermosphere associated with auroral activities. It is expected that vertical winds in the thermosphere alter ionospheric conditions, for example, plasma density, ion compositions, plasma velocities and plasma temperatures.

We have developed a high-resolution nonhydrostatic thermospheric model as well as an ionospheric model. Combining the two models, disturbances in the thermosphere and the ionosphere are studied for various conditions in the polar region. We modeled the polar ionosphere using vertical wind profiles which were calculated from the thermospheric model.

The results show that vertical winds of about 10 m/s significantly affect the ionospheric structure. Simulation results for various conditions are presented and discussed.