Characteristics of mesoscale thermospheric-ionospheric dynamics associated with heating 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 polar thermospheric and ionospheric dynamics are extremely complicated. In particular, in the auroral region, various processes, such as ion-neutral drag, Joule heating, heating and ionization by particle precipitation, chemical processes, diffusion, and atmospheric gravity waves, are strongly coupled. Previous observations have shown some characteristic mesoscale phenomena such as large vertical winds and significant increasing of mass density in the auroral region. It is considered that local heating plays an important role in such phenomena. However, we still have not quantitatively understood how such large vertical winds and significant increasing of mass density occur. In order to study the mesoscale thermospheric and ionospheric dynamics in the auroral region, a high-resolution numerical model including various physical and chemical processes is required. We will report on how the thermospheric and ionospheric dynamics change depending on the magnitude of the heating and the spatial structure of the heating region using a two-dimensional numerical model. In addition, interaction between the thermosphere and the ionosphere will be discussed.

Keywords: vertical neutral wind, neutral mass density, heating, auroral region, mesoscale, numerical simulation

