

Observations and modeling studies for understanding atmospheric responses to unusual solar activities

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As pointed out by many researchers, the recent solar activities are very unusual; the solar activity during the last minimum in 2008-2009 was extremely low and that during the next maximum of sunspot cycle 24 shows much lower activities compared with the previous two solar maximums in cycle 22 and 23. In order to understand the complex system of the Earth's middle and upper atmosphere, these solar activities will give us important information and/or good opportunities for searching the basic states of the system both from the observations and GCM simulations. Comprehensive studies by observations from space, ground-based ones, and numerical simulations will enable us to understand the polar mesosphere, thermosphere, and ionosphere quantitatively. In order to understand variations of the polar ionosphere from the solar minimum to maximum periods, we have made EISCAT experiments in January 2011, March, 2012, and March 2013. For example, ionospheric variations were observed during solar flare and CME events on March 12, 2012. These EISCAT data clearly show an example of the solar wind, magnetosphere, and ionosphere coupling. In addition to the EISCAT observations, we have also investigated variations of the polar thermosphere during periods of significant solar activities from GCM simulations. In this presentation, we will introduce our research activities mainly related to the "Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate (ROSMIC)" project in VarSITI.

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