Development of Atmosphere-Ionosphere Coupled Model in cooperation with ISS-IMAP Project

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The thermosphere/ionosphere is the boundary region between the atmosphere and the space. Interactions between neutral and ionized gases cause various phenomena in the thermosphere/ionosphere. Many satellites and shuttles have made flights and the international space station (ISS) has been built up in the region. Recent satellite and ground-based observations and numerical simulations have revealed that the thermosphere/ionosphere is strongly influenced by energy inputs both from the magnetosphere and the lower atmosphere. In addition to scientific interests, the thermosphere/ionosphere is important for our daily lives. For example, radio wave communications (satellite-based communications) and the navigation system with GPS are essential in modern society. In order to understand the thermosphere/ionosphere and to predict ionospheric variations, the ISS-IMAP (Ionosphere, Mesosphere, upper Atmosphere, and Plasmasphere mapping) project has been started. The main purposes of ISS-IMAP are to derive horizontal structures of gravity waves at the mesopause (about 87 km) and in the E region ionosphere (about 95 km), spatial distributions of the electron density in the F region (about 250 km), and spatial distributions of O+ and He+ in the ionosphere and plasmasphere (about 20,000 km) from imaging observations. In cooperation with these observations, we also have a plan to develop a numerical model or simulation techniques. We have developed an atmosphere-ionosphere coupled model which simulates variations of the thermosphere/ionosphere caused by the atmospheric waves from the lower atmosphere. In this study, we present a brief description of the coupled model and demonstrate the effectiveness and impact of collaboration between observations and simulations.