

Design of a small satellite for global airglow observation of the ionosphere-thermosphere-mesosphere

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A small satellite for global imaging of the ionosphere-thermosphere-mesosphere-plasmasphere is being designed in aiming to be launched to GTO in the next solar maximum around 2011. The new satellite can observe the Earth's upper atmosphere with a wide field of view that cannot be observed from ground-based instruments and LEO satellites. This new observation is expected to clarify several phenomena that have been partially found by the ground-based techniques in the last decade, and the coupling mechanisms among high-, mid-, and low latitude regions, and between lower and upper atmosphere. Main targets of the observation are: (1) generation, evolution and decay mechanisms of plasma bubbles and medium-scale traveling ionospheric disturbances, (2) longitudinal and regional characteristics of the atmospheric gravity waves and tidal waves in the mesosphere, (3) composition change in the thermosphere associated with the geomagnetic storms, (4) electron density distribution in the plasmasphere and its effect on GPS radio waves, (5) the ionospheric effect on the radio waves and development of the correction technique. Three imaging camera is designed to be installed. Visible-band imager can detect the airglow of the ionosphere and the mesosphere. FUV imager can detect the electron density of the ionosphere, and composition of the thermosphere. EUV imager can detect the helium ion in the plasmasphere. To compensate these remote-sensing techniques, in-situ measurement of the electron density and temperature by Langmuir probe is also designed. GPS receiver on the satellite can measure the total electron content between the satellite and GPS orbit. Coordinated study among the satellite, ground-based instruments and models is expected to expand our knowledge of the mesosphere, thermosphere, ionosphere and plasmasphere in the equatorial and mid-latitude regions.