

Small satellite plan for imaging observation of the ionosphere, mesosphere, thermosphere and plasmasphere

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A small satellite project is planned for the global imaging observation of the ionosphere, mesosphere, thermosphere and plasmasphere by a Japanese scientist group. The satellite is designed in aiming to be launched to the geo-transfer orbit in the next solar maximum between 2011 and 2013. The observation is focused on the Earth's upper atmospheres in the mid- and low-latitude regions. Three imaging instruments are proposed. VISI (Visible light Imager) will observe the airglow emission of 557.7nm, 630.0nm and OH bands for the mesosphere and ionosphere. FUVI (FUV Imager) will detect 135.6nm band for the ionospheric observation. The plasmasphere will be observed by the EUVI (EUV Imager) with 30.4nm and 83.4nm bands. To compensate the optical imagers, in-situ measurement of the electron density and temperature by the Langmuir probe, and total electron content observation by a GPS receiver are proposed. Main targets of the observation are: (1) generation, evolution and decay mechanisms of the meso-scale ionospheric structures, such as plasma bubbles and medium-scale traveling ionospheric disturbances, and large-scale structures, such as storm enhanced density, (2) longitudinal and regional characteristics of the atmospheric gravity waves and tidal waves in the mesosphere, (3) coupling processes among the mesosphere, ionosphere and thermosphere through the atmospheric waves, and the electric field, (4) electron density distribution in the plasmasphere and its interaction with the ionosphere, (5) ionospheric effect on the radio waves, such as GNSS, and development of its mitigation technique. Coordinated study among the satellite, ground-based observations, and ionospheric and thermosphere models is expected to be a powerful tool for studies of the mesosphere, thermosphere, ionosphere and plasmasphere in the low- and mid-latitude regions. The observation of this small satellite can fill the gap of our knowledge, and integrate the fragmented information of the Earth's upper atmospheres.