

FORMOSAT-5/AIP observes seismo-ionospheric precursors

*JANN-YENQ Liu¹, Chi-Kuang Chao¹

1. Center for Astronautical Physics and Engineering; and Graduate Institute of Space Science, National Central University, TAIWAN

FORMOSAT-5 (F5) was launched at 18:51 UT (universal time) on 24 August 2017 with a sun-synchronous orbit at 720 km altitude and 98.28° inclination, which passes at almost the same local time everywhere in the daytime of about 10:30 LT and the nighttime of about 22:30 LT. It carries a primary payload, optical RSI (Remote Sensing Instrument), and a science payload, AIP (Advanced Ionospheric Probe), which are normally operating in the daytime and nighttime, respectively. The AIP mission is to monitor seismo-ionospheric precursors (SIPs) and observe ionospheric space weather. It is basically a multi-grid planar ion probe integrated with a planar Langmuir probe within a 10 cm × 10 cm aperture, which consists of Retarding Potential Analyzer (RPA), and Ion Drift Meter (IDM)/Ion Trap (IT) to maximize the total availability of ionospheric ion concentration (or density), ion velocities, and ion/electron temperatures at a sample rate up to 8192 Hz over a wide range of spatial scales in ionospheric plasma. The electroformed gold grids used has almost no hysteresis in sweeping current-voltage curves, and results in that the AIP can accurately probe plasma quantities in the ionosphere. The RPA and IDM/IT have been alternatively operating on every other orbit since end of October 2017. The RPA probes the ion density, while the IDM/IT derives the ion density and ion drift velocity. This paper combines in situ plasma measurements of F5/AIP and remote sensing of the TEC (total electron content) derived by ground-based GNSS (global navigation satellite system) receivers to three-dimensionally study SIPs of the 12 November 2017 M7.3 Iran-Iraq Border Earthquake and disturbances of ionospheric storms on 1 and 21 November 2017. The F5/AIP ion density is employed to confirm the SIP signatures and storm signatures being observed, while the F5/AIP ion velocity is employed to find electric fields associated with the SIPs and the ionospheric storms.

Keywords: FORMOSAT-5, AIP (Advanced Ionospheric Probe), seismo-ionospheric precursors