

RECENT RESEARCH ACTIVITIES

Sounding Rocket/Ground-based Observation Campaign for Medium-Scale Traveling Ionospheric Disturbances (MSTID)

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We have been studying ionospheric irregularities in mid-latitude region by using radars, GPS receiver network, and airglow imagers/Fabry-Perot interferometers. The mid-latitude ionosphere was considered much stable than those in the equatorial or polar region in the past, but our studies have revealed that there are much active variabilities in the region. An interesting phenomenon is medium-scale traveling ionospheric disturbance (MSTID) in the F-region. The MSTID is the wave structure with a wavelength of 100–200 km. These horizontal structures can be observed by using the total electron content (TEC) from GEONET, Japanese dense network of GPS receivers. We planned to study generation mechanism of the MSTID by the combination of sounding rockets and ground observations (Fig. 1). The experiment was just recently succeeded on July 20th, 2013. We monitored horizontal structures of the MSTID by using GPS-TEC real-time monitor system. While active MSTID region appeared over south Kyushu, Institute of Space and Aeronautical Science of JAXA (JAXA/ISAS) launched sounding rockets S-310-42 and S-520-27 from Uchinoura Space Center (USC) at 23:00 JST and 23:57 JST, respectively. Ionospheric parameters, i.e., plasma density, electric field, density fluctuations, were measured by in-situ instruments on board of the S-520-27 rocket. TMA (Tri-Methyl Aluminum) and Lithium were released from the S-310-42 and S-520-27 rockets, respectively, for measurement of the neutral winds. Their luminescent clouds were imaged from the JAXA experimental jet “Hisho” and from three ground sites. The Lithium experiment under the moonlight was the world first trial, and was successful. Both rockets transmitted dual-band beacon signal which was received at five ground sites and one boat over the sea.

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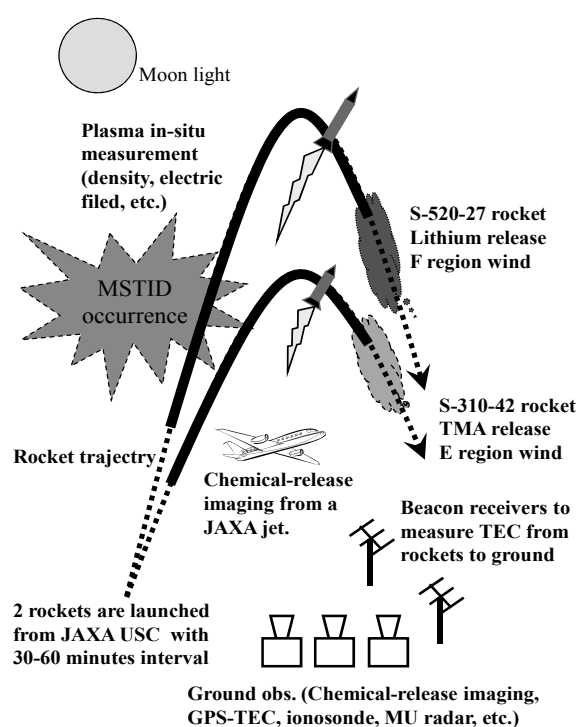


Fig. 1. Schematic of the MSTID experiment conducted on July 20th, 2013. We launched two sounding rockets from JAXA USC at 23:00 JST and 23:57 JST, respectively. All instruments on the rockets worked as scheduled. Neutral wind was measured by using the TMA and Lithium releases.