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Introduction to the Special Issue on "Earth Observation FORMOSAT-5"

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The National SPace Organization (NSPO) was founded in 1991 to pursue self-reliant space technology to nurture the domestic space industry and promote space science research in Taiwan. As an extension of the widely-accepted FORMOSAT-2 remote sensing satellite, NSPO is self-reliantly developing FORMOSAT-5 to continue its international earth observation image and space science research services. FORMOSAT-5 will offer state-of-the-art ionospheric space science data for geoscience research. It will also provide two-meter panchromatic and four-meter multi-spectrum images at various processing levels. Using the heritage and lessons-learned from the FORMOSAT-1/Ionospheric Plasma and Electrodynamics Instrument (IPEI), FORMOSAT-5/Advanced Ionospheric Probe (AIP) becomes an all-in-one plasma sensor with a sampling rate up to 8192 Hz to measure ionospheric plasma concentrations, velocities, temperatures, and ambient magnetic fields over a wide range of spatial scales. FORMOSAT-5's global coverage capability, smart agility feature and pioneer use of a Complementary Metal-Oxide-Semiconductor (CMOS) sensor for commercial optical earth observation satellites (Chang et al. 2012a) will bring even broader research applications to the geoscience community. The 500-kg FORMOSAT-5 satellite, as shown in Fig. 1, will soon be launched into a two-day revisit Sun-synchronous orbit at 720 km altitude and 98.28° inclination.

This TAO special issue starts with an in-depth description of the FORMOSAT-5/AIP payload scientific mission (Lin et al. 2017). Figure 1 also depicts the AIP sensor cube, consisting of a floating potential plate, a planar Langmuir probe electrode, a series of four electroformed gold grids, and a quadrant collector with four gold-coating segments. Based on the well-proven scientific contributions made by the FORMOSAT-1/IPEI and other similar data, three papers in the special issue conclude that FORMOSAT-5/AIP's high-resolution ionospheric data will also significantly contribute to scientific applications, especially on the ionospheric plasma irregularities study (Liu et al. 2017b), seismo-ionospheric precursors (Liu and Chao 2017) detection, and ionospheric space weather forecast (Chen et al. 2017). During the first made in Taiwan FORMOSAT-5 satellite development process (Chang et al. 2012b), NSPO has also acquired several in-house space technologies including the CMOS-type Remote Sensing Instrument (RSI) payload (Liu et al. 2017a) and key spacecraft components. The latter part of the TAO special issue also presents optical technology breakthroughs for optimizing the support forces to install a large mirror into a telescope support cell (Chan et al. 2017a), RSI sensor Sun exposure survivability analysis (Hsu et al. 2017), space-qualified carbon fiber reinforced plastic structure manufacturing to meet both light weight

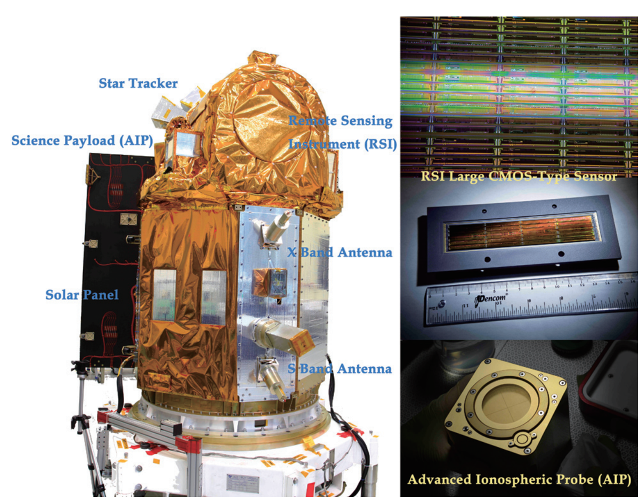

Fig. 1. Ready-for-launch FORMOSAT-5 satellite will provide high resolution global images and state-of-the-art ionospheric space science data.

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and low thermal expansion coefficient requirements (Kuo et al. 2017), and mirror wave front aberrations and structural surface deformation enhancement (Chan et al. 2017b).

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