Updates on Philippines microsatellites DIWATA-1 and DIWATA-2

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The PHL-Microsat program, funded by the Department of Science and Technology (DOST) through the Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD), is a collaboration between the University of the Philippines Diliman, Hokkaido University, Tohoku University, and the Advanced Science and Technology Institute (ASTI) of the DOST. Under this program, two 50-kg class microsatellites, DIWATA-1 and DIWATA-2 were designed and developed and the continuing development of small satellites is now being pursued by the Space Technology & Applications Mastery, Innovation and Advancement (STAMINA4Space) Program as a successor to PHL-Microsat.

DIWATA-1 was released into orbit from the International Space Station on April 27, 2016 and is currently operated at an altitude of ~346 km. More than two years after the release of DIWATA-1, DIWATA-2 was launched via H-IIA rocket from Japan’ s Tanegashima Space Center on October 29, 2018. The second microsatellite has a sun-synchronous orbit with an altitude of ~595 km. Both satellites carry advanced optical systems namely, the High Precision Telescope (HPT) and the Spaceborne Multispectral Imager (SMI) in addition to other cameras. The HPT in both microsatellites can simultaneously capture an image in the blue, green, red, and near-infrared range. It has a ground sampling distance (GSD) of ~2.6 m and ~4.5 m at nadir for DIWATA-1 and DIWATA-2, respectively. On the other hand, the SMI is capable of sensing several spectral bands between 450nm to 1050nm with ~53.1 m and ~121.6 m GSD for DIWATA-1 and DIWATA-2, respectively. The Wide Field Camera (WFC) is a fish eye camera with a field of view of 180 x 134 degrees. This is used in imaging cloud patterns and weather disturbances. Since the start of operation, both DIWATA-1 and DIWATA-2 have been capturing images of various locations in the Philippines. These images are processed to derive geophysical and application products that are useful in monitoring agricultural and aquatic resources. In this presentation, we will highlight land products and coastal and inland water applications. Land applications were produced from the visible and near infrared bands of SMI where vegetation indices namely NDVI and GNDVI. These are used to assess the health and density of vegetation as well as classify areas of agriculture, built-ups, bare soil and river or inland water networks. For water applications, potential capability to assess the health and quality of coastal and inland waters in the Philippines is shown. Retrievals of water quality parameters such as water leaving reflectance and turbidity were done. Furthermore, HPT, SMI and WFC were used to observe cloud patterns and estimate cloud top height. The accuracy assessment and limitations of these satellite-derived products will also be presented.

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