TECHNOLOGY

PHILIPPINES' FIRST MICROSATELLITE CAPTURES ULTRA-HIGH-RESOLUTION IMAGES

Graduate students from the Philippines assembling DIWATA-1 at Tohoku University in Japan.

Credit: Tohoku University, Hokkaido University, University of the Philippines Diliman and Philippines Department of Science and Technology

Satellite success is a big step forward for the Philippines and for broader efforts to establish a microsatellite consortium across Asia.

The DIWATA-1 microsatellite, developed jointly by the Philippines and Japan, took pictures of the Earth's surface with a resolution ten times better than the much larger US Landsat 8 satellite. DIWATA brought into sharp focus what was a blurry abstract of colours with a data point captured every three metres on the ground versus every 30 metres by Landsat 8.

The more detailed information will help the country better observe weather patterns and typhoons, which will improve disaster preparations and assist farmers with real-time harvest decisions. The remote sensing data will also aid long-term management of fields, forests, water resources and fisheries.

The Philippines Department of Science and Technology and the University of the Philippines Diliman partnered with Hokkaido University and Tohoku University in Japan to design and build the microsatellite, which was released into orbit in April 2016.

Diwata is the Filipino word for 'fairy'. True to its name, the satellite is much smaller and nimbler than its larger counterparts. It weighs about 50kg (110 pounds) and is about the size of a carry-on suitcase. It is equipped with four imaging sensors, including a high precision telescope and a wide-angle lens camera. The on-board liquid crystal multispectral camera, developed by Tohoku and Hokkaido universities, is capable of detecting visible and near-infrared wavelengths—seeing far more than regular cameras that just capture three spectral bands (red, green and blue).

DIWATA also collects images with much greater frequency. The microsatellite can capture images of an area on the Earth's surface once a day because it can be rotated as needed and has four fields of view. In contrast, larger satellites with cameras that are set to a fixed position image the same area every 16 days.

"Based on data from the space-based multispectral imager, we can tell if rice crops have blast infection before farmers can even detect symptoms," says Professor Yukihiro Takahashi of Hokkaido University, who helped design the imager and organize the partnership with the Philippines. Blast infection is a fungal disease that destroys large numbers of crops every year. The camera is capable of detecting subtle disease-causing changes in the crop spectra that the human eye cannot detect, explains Takahashi.

The microsatellite can also be used to pinpoint the location of squid shoals by studying the distribution of phytoplankton in the ocean, he adds.

DIWATA-1 is part of a broader effort to grow the new Asian Micro-Satellite Consortium, which aims to launch 50 to 100 microsatellites to collect data for nine countries. The consortium formally began November 2016, with a signing ceremony.

Takahashi spearheaded the formation of the consortium, which includes Japan, the Philippines, Vietnam, Myanmar, Thailand, Mongolia, Malaysia, Indonesia and Bangladesh. The goal is to strengthen the region by sharing information across borders using standardized data collection tools. Any participating country, even if it has not launched a microsatellite, will have access to the data.

Several more satellites from participating countries are in the works, with expected launches in 2017 and 2018. Since they are smaller, microsatellites are much easier and cost-effective to launch on a regular basis. For the price of one large satellite, Takahashi anticipates 100 Asian microsatellites will be orbiting the Earth within the next ten years.

The (a) and (b) inserts compare two RGB images of Dumingag on the island of Mindanao, Philippines. Image (a) was taken by the high performance telescope installed in DIWATA-1, while image (b) was taken by Landsat 8's operational land imager. These results demonstrate that DIWATA-1 can observe the Earth at significantly higher resolutions than existing large satellites.

Further information
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