

Overview of MicroDragon, a microsatellite for ocean color observation

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MicroDragon is an Earth observation satellite with the weight of 50kg and size of 50x50x50 centimeters cube. MicroDragon was developed with participation of 36 Vietnamese engineers from Vietnam National Space Center, Vietnam Academy of Science and Technology, who studied space technology in five Japanese universities (The University of Tokyo, Keio University, Tohoku University, Kyushu Institute of Technology, and Hokkaido University). Starting the manufacturing in 2013, MicroDragon has successfully been completed and tested in 2018 with the strong support of Japanese professors and experts.

The main mission of MicroDragon satellite is ocean color observation to assess coastal water quality and locate living resource. The target of the MicroDragon is to enhance observation of the ocean color and the phenomena in the coastal region as well as the cloud detection and the atmospheric correction. The system will provide data that researchers and scientists in fishery field and oceanography use to analysis and distribute information to fishermen and environmental managers.

For applications in the coastal zone, high spatial resolution, high spectral resolution, and many spectral bands are required. Image data of the old sensors can provide each of them but not all. With advantages of a new technique of Liquid Crystal Tunable Filter (LCTF), all three parameters can be included by a sensor. The LCTFs are optical filters that use electronically controlled liquid crystal elements to transmit a selectable wavelength of light and exclude others. The LCTFs are often used in multispectral imaging or hyperspectral imaging systems because of their high image quality and rapid tuning in small increments (1 nm) over the wide range of wavelengths. Moreover, the LCTF sensor that is small, light and low power consumption is suitable to install in a micro-satellite.

The MicroDragon carries two main scientific instruments including a Space-borne Multispectral Imager (SMI) and a Triple Polarization Imager (TPI). The SMI uses two LCTFs with one in the visible spectrum and another in the near-infrared spectrum for the ocean color observation. The TPI consists of three LCTF cameras, each camera's polarizer tilted 60° to the others to observe the polarized solar radiance reflected from the predefined targets for atmospheric correction.

MicroDragon was successfully launched on 18 January 2019 with 6 other technology demonstration satellites by Epsilon rocket from the Uchinoura Space Center in southwestern Japan. After launching, satellite also already communicated and controlled by a ground station and control center in ISAS/JAXA and the University of Tokyo. First images of satellite were sent to ground station after 4 days from launch time.