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International Cooperation in Earth Observation Missions (1)

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NEW CONCEPT OF INTERNATIONAL SATELLITE CONSTALLATION OF COMPACT THERMAL INFRARED CAMERA

Abstract

This paper introduces the new concept of international satellite constellation of compact thermal infrared camera developed in the mission planning department of JAXA.

The compact infrared camera (CIRC) is an uncooled infrared array detector (microbolometer) developed by JAXA. The CIRC was mounted on the Advanced Land Observing Satellite-2 (ALOS-2) and launched in 2014. Also, the other CIRC was mounted on the CALorimetric Electron Telescope (CALET) of the Japanese Experiment Module (JEM) for the International Space Station (ISS) and launched in 2015.The CIRC achieved the reduction of the size, mass, cost and electrical power of the sensor by eliminating the cooling system and emplying athermal optics and shutter-less system.

Because the CIRC is light (3 kg), small (110 mm x 180 mm x 230 mm) and its power consumption is low (< 20 W), it is suitable for the payload of microsatellites or the hosted payload of large earth observation satellites. It has an high spatial resolution as the thermal infrared camera (100 - 200 m depending on the altitude) and wide swath width (100 - 200 km). By launching many satellites with the CIRC, the frequent observation of land and ocean with thermal infrared imagers can be realized.

With the modification of the CIRC and the devleopment of data processing algorithms, it would be possible to use the dataset for monitoring of hotspot of volcano and forest fire, volcano ash, sea surface temperature for fishery, heat island and estimation of evapotranspiration agriculture.

This paper proposes establishment of international cooperation framework to realize the satellite constellation with the thermal infrared cameras by making the most of the opportunities of microsatellite programs in emerging countries and planned large earth observation satellites, and discusses the benefits of applications realized by the dataset from the constellation.