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# Thermal Infrared Imager on Hayabusa2: Science and Development

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Thermal Infrared Imager TIR was developed and calibrated for Haya-busa2 asteroid explorer, aiming at the investigation of thermo-physical properties of C-class near-Earth sub-km sized asteroid (162173) 1999JU3. TIR is based on the 2D micro-bolometer array with germani-um lens to image the surface of asteroid in 8 to 12 $\mu$m wavelength (1), measuring the thermal emission off the asteroid surface. Its field of view is 16° x 12° with 328 x 248 pixels. At least 40 (up to 100) images will be taken during asteroid rotation once a week, mainly from the Home Position which is about 20km sunward from asteroid surface. Therefore TIR will image the whole asteroid with spatial resolution of < 20m per pixel, and the temperature profile of each site on the asteroid will be traced from dawn to dusk regions by asteroid rotation. The scien-tific objectives of TIR include the mapping of asteroid surface condi-tions (regional distribution of thermal inertia), since the surface physical conditions are strongly correlated with thermal inertia. It is so informa-tive on understanding the re-accretion or surface sedimentation process-es of the asteroid to be the current form. TIR data will be used for searching for those sites having the typical particle size of 1mm for best sample collection, and within the proper thermal condition for space-craft safe operation. After launch of Hayabusa2, TIR has been tested successfully, covering from -100 to 150 °C using a single parameter settings (2). This implies that TIR is actually able to map the surface other than the sunlit areas. Performance of TIR was found basically the same as those in the pre-launch test, when the temperature of TIR is well controlled.
References: (1) Fukuhara T. et al., (2011) Earth Planet. Space 63, 1009–1018; (2) Okada T. et al., (2015) Lunar Planet. Sci. Conf. 46, #1331.