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Interdisciplinary science of Hayabusa 2 mission

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The Hayabusa 2 mission, an asteroid exploration rendezvousing at a C-type near-Earth asteroid 1999 JU3, dropping off an explosively formed impactor colliding the surface to excavate a crater, and retrieving samples of the surface to the earth, is now developing the spacecraft and payload instruments aiming at a proposed launch in December 2014. The payload scientific instruments are a near IR spectrometer (NIRS3), a thermal IR imager (TIR), an optical navigation camera (ONC-T), a laser altimeter (LIDAR), a sampler (SMP), a small carry-on impactor (SCI), a separation digital camera (DCAM-D), and a small lander (MASCOT). ONC-T is a multi-band imager with seven band-pass filters (one of which is a narrow band-pass Na D line filter). MicrOmega, a hyperspectral microscope mounted on MASCOT, has a resolution of 20 um and covering wavelength from 0.9 to 3.5 um. Observation, experiments, and sampling by Hayabusa 2 needs a sound base of integrated science through each instrument.

In succession to activities of the Hayabusa 2 Task Force under the ISAS Space Science Committee, the Hayabusa 2 project set up the Interdisciplinary Science Team in the end of 2012. The objectives of the team are (1) drawing the entire picture of sciences of the mission, (2) finding cross-cutting themes derived from integration of scientific data by each instrument, (3) clarifying scientific constraints on mission scenario in process of creation, and (4) expanding the range of the project science under the mantra of ”planetary science from asteroids”.

The agenda is as follows: the method of selection of touch-down points from remote-sensing data, scientific strategy according to possible surface conditions of the asteroid, observation planning of the SCI crater, strategy for analyses of retrieved samples, refinement of the mission scenario, modeling of the origin and evolution of 1999 JU3 (by solar system dynamics and observational facts), mechanism of material transfer from the Main Belt to the earth.

Keywords: asteroids, 1999 JU3, remote sensing, cosmic and planetary material science, science of collision phenomena, planetary exploration