[EE] Evening Poster | P (Space and Planetary Sciences) | P-PS Planetary Sciences

# [P-PS03]Small Bodies in the Solar System: Current Understanding and Future Prospects

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In this session, we welcome presentations regarding small bodies in the Solar System from a variety of approaches (i.e., laboratory experiments, observations, explorations, theoretical modeling, and sample analyses). Especially this year, the Hayabusa2 spacecraft is about to rendezvous with its mission target (Ryugu, C-type asteroid), and ready to make remote-sensing observations for acquiring detailed information of the primordial body. Taking account of the situation, we aim to organize our current understanding of these primordial bodies and further discussing future prospects in this research field.

# [PPS03-P07]Refinement of calibration and conversion from raw data to thermal distribution ~ HEAT: Hayabusa2 Exploration Assistant for TIR ~

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The Hayabusa2 project is a sample return mission to the asteroid Ryugu. It was launched on Dec. 3, 2014, and it is scheduled to arrive at the target in summer of 2018. Hayabusa2 has four optical instruments for scientific observations such as ONC, NIRS, LIDAR, and, TIR. TIR is a thermal infrared imager whose primary goal is to know natures of the asteroid and to select candidate landing sites for safe sampling based on thermo-physical properties of the surface. TIR records infrared radiation from the target as a digital number (DN). The Hayabusa2 TIR science team has been preparing analysis procedures and application for its observations. A part of this application was tested in a simulation drill in 2017. Our team has developed a supporting tool called Hayabusa2 Exploration Assistant for TIR (HEAT). HEAT searches TIR data interactively, displays TIR images, and visualizes thermal models. HEAT is used for visualization, calibration, and analysis.

In this study, calibration is defined as methods of calculating formula using ground test data. TIR requires conversion from a DN to a surface temperature of the target. HEAT has two calibration methods. One is a regression using ground test data, and the other is a direct conversion using interpolation based on near parameter sets from ground test data. These methods are suitable for interpolation, but incompatible for extrapolation. Therefore, calibration using blackbody model is required.

HEAT is required to solve three problems. First, a method of calibration using blackbody model has not implemented. Second, in this project, TIR images need to be converted to temperature one within three days. However, HEAT takes a long time to calculate a calibration formula of 328*248 each pixel because calibration uses large numbers of ground test data. Third,

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HEAT has not supported a standard format (FITS: Flexible Image Transport System). This is a standard format used in the astronomy field. Therefore, this study implements an additional fitting function using blackbody model, refines the calibration and the conversion methods, and establishes compatibility with FITS.
Conversion of DN to temperature using blackbody model was conducted within the range of the accuracy of +/- 2 K.

HEAT has been implemented the blackbody model to conduct calibration with high precision. This makes it possible to extrapolate range of the ground test data.
HEAT can reduce the calibration and the conversion time by two improvements. One is an enhancement of processing capability by parallel processing. The other is a reduction of computation quantity by masking TIR image. These improvements in HEAT make to convert TIR images to temperature ones within the short period, three days.
To make a calibration formula based on imaging conditions before the conversion is a further improvement in this processing.
This study refined the calibration and the conversion of HEAT enough to be used in the Hayabusa2 mission. HEAT will be used by TIR science team at the rendezvous phase. HEAT has been developed to satisfy all requirements.

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