Thermophysical Properties of Ryugu Estimated from a Box-A Observation

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TIR has acquired many one-asteroid rotation thermal images of Ryugu, during the proximity phase in 2018–2019. High-resolved thermal images were obtained during the Mid-Altitude Observation Campaign on August 1, 2018, with the resolution of ~4.5 m/pixel, at the sub-solar latitude of 8°S, the solar phase angle of ~20°, and the heliocentric distance of 1.06 AU. The diurnal temperature profiles of Ryugu showed flat patterns. A thermophysical model using a shape model of rough surface well reproduced the diurnal temperature profiles. By comparing the observation and calculation results, the global thermal inertia of Ryugu was estimated to be 225 ±45 J m^{-2} $s^{-0.5}$ K^{-1}, and the global surface roughness was determined as 0.41 ±0.08 (Shimaki et al., submitted to Icarus). Because of the sub-solar latitude, we cannot determine the thermophysical properties in a part of the northern hemisphere. Here we report the thermophysical properties of Ryugu determined by a Box-A observation on November 14, 2018, with the resolution of ~20 m/pixel, at the sub-solar latitude of 2°S, the solar phase angle of 4.8°, and the heliocentric distance of 1.35 AU. The diurnal temperature profiles showed a peak around the late afternoon. We confirmed that the thermophysical model well reproduces the observed temperature profiles. The global distribution of the thermal inertia is similar to that determined by the previous study, however, we see an offset of the values and the global thermal inertia was estimated to be ~300 J m^{-2} $s^{-0.5}$ K^{-1}. The global surface roughness was estimated to be ~0.3, with the small values around the equatorial ridge.

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