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Surface Thermophysical Properties of Near Earth Asteroid (162173) Ryugu from in-situ Observations: First Results from the MASCOT MARA Radiometer.

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The Mobile Asteroid surface SCOuT (MASCOT, [1]) landed on near earth asteroid (162173) Ryugu on October 3rd 2018 to explore the asteroid in situ. MASCOT is part of JAXA's Hayabusa 2 asteroid sample return mission and observed the surface using a camera [2], a near-infrared spectrometer, a magnetometer, and an infrared radiometer (MARA, [3]). MASCOT came to rest at a location at 22.22 $\pm$ 0.05°S, 317.26 $\pm$ 0.07°E the radiometer observed an approximately 60 cm diameter boulder for a full day-night cycle. During the operations, MARA took continuous measurements of surface brightness temperatures, and measurements are consistent with a thermal inertia [4] between 247 and 375 thermal inertia units. This corresponds to low thermal conductivities in the 0.06 to 0.16 W/mK range, much lower than anticipated based on measurements of chondritic meteorites [5]. Low conductivities are likely caused by high intrinsic porosity of more than 28%. Although thin layers of fine material could in principle mask the thermal signature of competent rock, sand to silt-sized grains have not been observed in camera images. Therefore, it seems likely that the values observed by MARA are representative for the bulk rock. However, it cannot be ruled out that the low conductivity zone is limited to a highly porous outer layer, which may for example be generated by cracking due to thermal fatigue [6].

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