RYUGU: 15 MONTHS TO SHOWDOWN

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The JAXA Hayabusa-2 mission was approved in 2010 and launched on Dec. 3, 2014. The spacecraft will arrive at the near-Earth asteroid 162173 Ryugu (1999 JU_3) in July 2018 where it will perform a survey, land and obtain surface material, then depart in Dec. 2019 and return to Earth in Dec. 2020.

We analysed all available Ryugu thermal measurements: photometric measurements from space (Herschel-PACS, AKARI-IRC) and ground (Subaru-COMICS), a full thermal spectrum from Spitzer-IRS, a 4-months Spitzer-IRAC "point-and-shoot" photometric sequence, and 2-band Spitzer-IRAC thermal lightcurves from two epochs. Our thermal data cover a time span from May 2007 to May 2013, a phase angle range from -85° deg to +60°, and wavelengths from 3 to 70 μm. In our work, we also included all accessible visual lightcurves, but Ryugu has a very low lightcurve amplitude and most of the visual measurements have insufficient quality for standard lightcurve-inversion techniques.

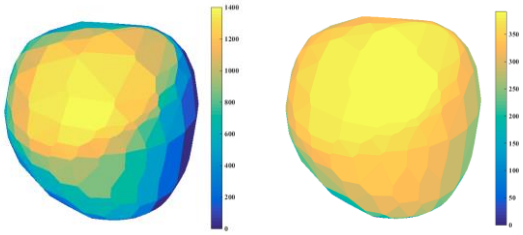

Figure 1. Ryugu as seen from Earth on 1st July, 2018, close to the arrival time of the Hayabusa-2 mission at the asteroid (r=0.988 AU, Δ=1.903 AU, α=18.6°), calculated using our reference shape, spin, size, thermal solution, with the z-axis pointing in the direction of the spin axis (along the insolation/temperature colour bars. Left: Solar insolation in W/m^2, with the sub-solar point located at the peak insolation. Right: The TPM-calculated temperatures (in K).

We present our recently published [1] physical and thermal properties of Ryugu (size, shape, rotation period, spin-axis orientation, albedo, thermal inertia, surface roughness, grain size on the surface) and discuss it in the context of new high-quality lightcurves. All properties are derived from remote, disk-integrated measurements. Recent VLT lightcurves are in agreement with our shape and spin solution, more data from 2016 are currently analysed. It will be very interesting to see (i) if our predictions are confirmed by other groups; (ii) what Hayabusa-2 will show us in about 15 months from now.

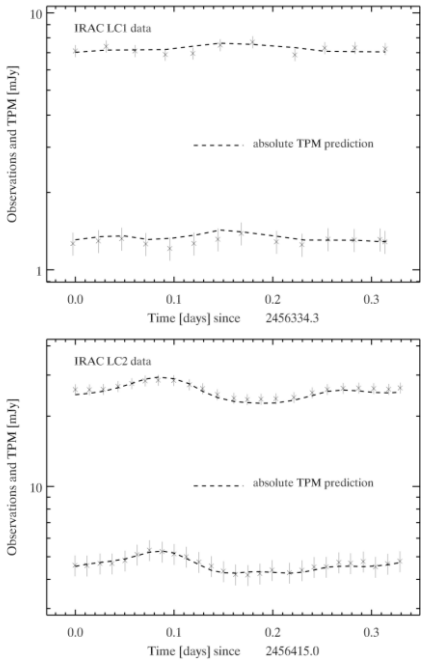

Figure 2. The absolutely calibrated Spitzer-IRAC lightcurves in both channels from 10/11th Feb, 2013 (phase angle α: -83.6°, aspect angle φ: 137.8°) (top), and from 2nd May, 2013 (α: -85.0°, φ: 129.5°) (bottom). The absolute TPM predictions are shown as dashed lines.

Acknowledgments: This research project has received funding from the European Union's Horizon 2020 Research and Innovation Programme, under Grant Agreement no 687378.

References: [1] Müller, T. G., Durech, J., Ishiguro, M. et al. 2016, A&A, accepted.