Supplementary figures

The shape, color-scaled topography, normalized slope distribution, and topographic variation $h_{var}$ as a function of scaled spin $\omega_{sc}$ for the 32 small body shape models selected for this study are shown in Supplementary Figs. 10-17, in order of increasing scaled spin $\omega_{sc}$, the same order as that used in Table 1. The left column shows the shape model for the body, color-coded according to dynamic topography (Eq. 1) using a rainbow color scale, with red-pink high areas and cyan-blue low areas. The middle column shows a plot of the normalized regional slope distribution over the surface of the body at the resolution of the polyhedron shape model. The right column shows the topographic variation of the body (Eq. 4), plotted as a function of scaled spin (Eq. 3) by varying either the body’s density $\rho$ or rotation period $T$.

This topographic variation plot also shows the current position (or estimated position range) of the body on its topographic variation curve, with Group A slow rotators indicated by a blue dot(s), Group B optimum rotators indicated by a green dot(s), and Group C fast rotators indicated by a red dot(s). Three different cases are shown with these dots (note that for all selected objects, the rotation period $T$ is known (measured with good accuracy):

- If the bulk density $\rho$ of the object is also known (as listed in Table 1), then a single dot is shown at the known bulk density and rotation period.
• If the bulk density $\rho$ of the object is not known, then a range of bulk densities (shown by two dot endpoints) were assigned, according the object’s known spectral class: C (carbonaceous chondrite) related types were given an assumed bulk density value of $\rho = 1500 \pm 300 \text{ kg m}^{-3}$; S (stony) related types, $\rho = 2300 \pm 300 \text{ kg m}^{-3}$; E (enstatite chondrite) related types, $\rho = 3000 \pm 500 \text{ kg m}^{-3}$; and M (metallic) related types, $\rho = 4000 \pm 500 \text{ kg m}^{-3}$.

• For Group B optimum rotators, when no measured bulk density $\rho$ for the body exists, the optimum density (listed in Table 1) corresponding to the body’s current rotation period $T$ is used as one endpoint (Richardson and Bowling, 2014), as long as the optimum density is consistent with the body’s spectral classification. The other endpoint uses the assumed density listed in Table 1 for the body, which is also consistent with the body’s spectral class.

These dots thus mark the most likely position of the body on its corresponding topographic variation curve, given what we currently know about it.
Figure 10: Surface topography, slope distribution, and the topographic variation curve for 4179 Toutatis, 4486 Mithra, Martian moon Deimos, and comet 9P Tempel 1.
Figure 11: Surface topography, slope distribution, and the topographic variation curve for 2100 Ra-Shalom, 4660 Nereus, 2063 Bacchus, and 52760 1998 ML14.
Figure 12: Surface topography, slope distribution, and the topographic variation curve for 25143 Itokawa, 2002 CE26 Alpha, 8567 1996 HW1, and 216 Kleopatra.
Figure 13: Surface topography, slope distribution, and the topographic variation curve for 10115 1992 SK, 951 Gaspra, Martian moon Phobos (the insert shows the topography including the strong tidal effects of Mar’s gravity field), and 16 Psyche.
Figure 14: Surface topography, slope distribution, and the topographic variation curve for 433 Eros, 33342 1998 WT24, comet 103P Hartley 2, and 1627 Ivar.
Figure 15: Surface topography, slope distribution, and the topographic variation curve for 243 Ida, 1620 Geographos, 1580 Betulia, and 4769 Castalia.
Figure 16: Surface topography, slope distribution, and the topographic variation curve for 6489 Golevka, 101955 Bennu, 341843 2008 EV5, and 66391 1999 KW4 Alpha.
Figure 17: Surface topography, slope distribution, and the topographic variation curve for 29075 1950 DA (Prograde model only), 136617 1994 CC Alpha, 54509 YORP (2000 PH5), and 1998 KY26.