

Predicting Space Weathering Effects on Primitive Asteroids (101955) Bennu and (162173) Ryugu

Two sample-return missions, OSIRIS-REx and Hayabusa 2, will arrive at primitive near-Earth asteroids (NEAs) this year and it would be useful to predict the effects of space weathering on their surfaces. Most spacecraft-accessible NEAs originate in the inner asteroid belt and the two sample-return targets (101955) Bennu and (162173) Ryugu, most likely originated in the Polana asteroid family. Spectroscopic studies of primitive inner-belt families offer a preview of the properties expected in the NEAs they produce. So far, primitive asteroids in the inner-belt fall into two spectral groups. The first group includes the Polana, Eulalia and Clarissa families, which show considerable spectral homogeneity in spite of their dynamical and collisional complexity. In contrast, the Erigone and Sulamitis families are spectrally diverse and most of their members show clear 0.7- μm hydration features (e.g., Pinilla-Alonso et al. 2017; Morate et al. 2018). The Clarissa family is considerably younger, at less than 100 million years, than the Polana family at approximately 2000 million years (Nesvorný et al. 2015), and there are subtle yet significant spectral differences between these two families. These differences are consistent with the space weathering trend suggested by Lantz et al. (2015 and 2017). This agreement between observations of inner-belt families and laboratory simulations of space weathering has testable implications for Bennu and Ryugu: older terrains would be expected to be bluer than younger surfaces (Campins et al. 2018; de León et al. 2018).