Search for Candidate Exogenous Material on Bennu using MapCam and PolyCam Images

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Outline

I. Exogenous Material on Bennu & Ryugu (Della Giustina et al. 2020; Tatsumi et al. 2020)

II. New Candidate Exogenous Material on Bennu
   ▪ 44 new boulders identified with red slope and x-band (0.85 µm) absorptions in MapCam colors

III. Conclusions
I. Exogenous Material on Bennu

- Exogenous material reported on asteroids (101955) Bennu and (162173) Ryugu (DellaGiustina et al. 2020; Tatsumi et al. 2020)
- Albedo, color, and spectra of six bright boulders are distinct from the rest of Bennu’s surface and are likely basaltic material from asteroid (4) Vesta (DellaGiustina et al. 2020)
- Bright boulders identified on asteroid Ryugu show absorptions near 1 µm but not near 2 µm, suggesting olivine-rich anhydrous silicates (Tatsumi et al. 2020)
I. Exogenous Boulders on Bennu (DellaGiustina et al. 2020)
II. New Candidate Exogenous Material on Bennu

- We used images of Bennu obtained by the MapCam and PolyCam instruments (Rizk et al. 2018; Golish et al. 2020) on NASA’s OSIRIS-REx spacecraft (Lauretta et al. 2017) to search for more potentially exogeneous material on the surface of Bennu

- We identified 50 bright boulders on Bennu with red spectral slopes and significant x-band (0.85 µm) absorptions, including the six bright boulders previously described in DellaGiustina et al. (2020)
II. New Candidate Exogenous Material on Bennu

• These bright boulders are distributed across Bennu’s surface, concentrated in rockier terrains (larger than average particle size)
Exogeneous candidates found by spectral slope and x-band absorption, blue also in DG et al. 2020.
Morphology of new bright spots in PolyCam Images

1. **Single homogeneous boulder**
   - ID15: 20190321T193559S706
   - ID12: 20190321T200130S508

2. **Single heterogeneous boulder**
   - ID4: 20190321T202702S484
   - ID18: 20190321T192125S551

3. **Part of a larger boulder (Breccia?)**
   - ID15: 20190321T193559S706
   - ID4: 20190321T202702S484

4. **Xenolith/Breccia**
   - ID12: 20190321T200130S508
   - ID18: 20190321T192125S551
II. New Candidate Exogenous Material on Bennu

• There is some correlation between their morphology and spectra
• Bright boulders with reflectance peaking at 0.55 µm have lower normal albedo than the other candidates, suggesting a different composition and possibly a different origin
• An initial comparison with Ryugu (Tatsumi et al. 2020) indicates that Bennu is more abundant in possible exogeneous material
V. Conclusions

- Exogenous materials identified on asteroids Bennu and Ryugu (Della Giustina et al. 2020; Tatsumi et al. 2020)
- Further analysis of MapCam and PolyCam images has revealed a wider diversity of potentially exogenous lithologies on Bennu, expanding on the findings of DellaGiustina et al. (2020).
- We continue our study of this diverse material on Bennu’s surface to constrain the asteroid’s origin, evolution, and collisional history (e.g., Ballouz et al. 2020)