

Science Objective Summary and Science Weekly Debrief

Science Objective Summary

DOY 258–265: NavCam 1 will perform high-cadence monitoring of particles in the Bennu environment (~19 images per day).

Science Weekly Debrief

For slides and the WebEx recording on ODOCS, click [here](#) then follow the path: Folders \ Documents and Drawings \ OSIRIS-REx Bennu Proximity Operations \ Science Status \ Science Weekly \ 2020-09-17.

Announcements

- The final PolyCam albedo map (v5, for now) is available; see the slides for location. The map has a pixel scale of 6.25 cm/pixel, with absolute and relative radiometric uncertainties of ~5.5 and ~1%, respectively. Areas of null data, where boulders block the view of the surface, appear as shadows. The associated manuscript by Golish et al. is in revision with Icarus. [Dathon Golish]
- The six-paper Science/Science Advances special collection is tentatively scheduled for release on 8 October (back-up 15 October) 14:00 EST. The main results and associated global datasets will factor in the public outreach strategy leading into TAG. The collection will be published via “First Release” online, with a cover of Science to follow sometime after TAG. [Cat Wolner]
- Please be advised that PI Office review turnaround times may lengthen toward the end of this month, owing to a large expected influx of papers, as well as in the weeks immediately surrounding TAG, owing to PI unavailability. [Cat Wolner]

Global crater dataset and results – Beau Bierhaus

The global crater dataset is frozen for analysis (though it may not be final). It includes 1560 craters ranging in diameter from 0.8 to 215 m. The crater size-frequency distribution (SFD) shows a peak number density close to 2 m when plotted differentially. This diameter is well above the completeness limit, meaning that it is a real effect. The Bierhaus et al. paper in preparation proposes that at diameters above 2 m, cratering tends to occur into the “bulk” Bennu, whereas below 2 m, impacts tend to disrupt boulders (or, for millimeter- to centimeter-scale impactors, to form “bullet holes” on boulders per Ballouz et al.).

More craters occur in the northern than in the southern hemisphere. The northern hemisphere is systematically older (southern hemisphere is systematically younger) at small diameters. The equatorial region has the most craters and is the oldest region at large diameters.

On the basis of main-belt and near-Earth impactor fluxes, and taking into account the gravity regime, strength regime, and scaling by Tatsumi and Sugita 2018 (see slides or WebEx recording for details), crater-retention ages on Bennu could span almost three orders of magnitude, from ~0.1 to ~100 Myr. The retention age of the large craters is much less than the estimated billion-year lifetime of Bennu as an independent heliocentric object; the entire surface therefore may have changed since formation. This finding has relevance to the investigation of whether Bennu as we currently observe it is an nth-generation rubble pile. The peak in the SFD at ~2 m corresponds to ~0.5 Myr, compared with the ~2-Myr duration of Bennu's lifetime in near-Earth space, implying that all craters smaller than the scale of ~meters formed while Bennu was a near-Earth asteroid. Large craters likely formed when Bennu was still interacting with the main belt. The primary difference between this work and previous crater-based age estimates is that the strength of the target (Bennu) previously may have been overestimated.

Upcoming meetings

The next meeting is scheduled for two weeks from now, 1 October, pending availability of topics.

Daily downlink slides for Day 258 (09/14/20). Click to enlarge.

All subsystems and instruments are nominal. OD282 is onboard. Last week's OpNav and particle data were received nominally except for one image from today that failed checksum (to be investigated).

A change request to update all instrument kernels has been submitted by the Science Team Chief to address the instrument offset issue identified in Recon and Rehearsal data. It probably cannot be implemented before TAG. OTES pointing during TAG will have to be done manually.

Looking ahead: This week, NavCam will continue to collect 18 OpNavs and 19 particle monitoring images daily, with OpNav support from MapCam for the deltaDOR. We may see some gaps in downlinked data this week owing to some short passes and station change-overs, but there are expected to fill in with replays. A minor build-up of particle imaging data in the partition is predicted.

Planning for WOY 45 is underway; this week is currently being planned as OpNavs only but may involve a reboot if TAG is unsuccessful.

There may be a Science Weekly/Monthly meeting this Thursday, pending availability of topics. Downlink tag-ups will continue on a Monday-only basis for the next few weeks.