Science Weekly Debrief

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Status of WOY 45 OVIRS/OTES/OCAMS observations – Mike Nolan and Heather Enos

Redundant OVIRS-optimized full-disk integrated spectroscopy observations with ride-along OTES and OCAMS were scheduled to occur on DOY 310, but did not take place because they relied on DOY 307 sequences that had self-deleted. DOY 310 was a contingency plan for the possible loss of DOY 306 and 307 observations, which we were able to execute; thus, no critical data were lost. See the DOY 310 daily downlink summary for details.

AltWG updates – Mike Nolan on behalf of Olivier Barnouin

Per guidance from the IAU, we should formally use "positive pole" when referring to the right-hand-rule pole to avoid ambiguity with cardinal directions. It is not necessary to always orient Bennu the same way in figures, but we should be explicit about which way is up and what we mean when discussing poles, coordinates, and directions. Guidance on pole terminology will be developed by the AltWG ahead of AGU and will be added to the OREX Publication Guide.

The long axis of Bennu does not align with the Ben-Ben boulder, but this does not preclude us from using it as our reference point.

Bob Gaskell is working on an initial shape model using the context images collected with the recent spectroscopy observations. He has determined an improved pole that removes the apparent tilt. Mike's initial calculations indicate that the obliquity is only slightly different from that of the DRA.

IPWG updates – Dani DellaGiustina

The IPWG has developed a global mosaic, which they will deliver to Mike and the AltWG for prime meridian selection. They also plan to add it as a layer in J-Asteroid. A rotating GIF with a black outline along the limb adds further support to the interpretation of dark spots on Bennu as topographic highs.

Color composite analysis is on hold until a new calibration is in the pipeline, which is expected by the end of the month. All SPOC data will be reprocessed with this calibration and will then be considered ready for scientific use. Preliminarily, the dark spot on Bennu appears to be a genuine signature; Ed Cloutis previously noted a similar minor feature, potentially corresponding to magnetite.

OCAMS updates – Christian d'Aubigny

Christian reviewed recent OCAMS images and data. Brightness data since 30 October (DOY 303) generally fall along a linear phase curve, except that the most recent data point, which is associated with an outdated ephemeris, falls slightly below the line. Lightcurves from different dates overlay one another when corrected and scaled. PolyCam flux tracks exactly with the number of observed pixels in the disk, suggesting that the visible phase function is strictly geometric.

OTES updates – Phil Christensen

The OTES team is tracking five calibration effects: 1. Spectral ringing. An algorithm has been delivered to the pipeline to correct for this effect. 2. Radiation variation with detector temperature. A corrective algorithm, expected to be delivered in a week, produces consistent thermal infrared lightcurves for DOY 307 and 309. 3. Low response at short wavelengths. When Bennu is off-axis, modulation in the interferogram is reduced, and this effect is most pronounced at short wavelengths. The calibration takes care of this when Bennu fills the field of view, but during Approach, a correction is needed. The solution under development (estimated delivery, 2 weeks) is to apply a modulation factor depending on boresight angle. We may need to consider this correction for the proposed off-nadir thermal emission phase function observations. 4. Low-level systematic noise. A correction is yet to be determined. The systematic noise is less than the random noise by a factor of 5. 5. Boresight pointing. Sub-millimeter accuracy is expected when the pointing is corrected. An algorithm is in progress.

OVIRS updates – Amy Simon

All Approach data have run through the pipeline. Calibration checking is in progress. A deep-space calibration on DOY 307 ended with the instrument pointing at Bennu; PFR-32 has been opened to track this issue.

OVIRS visible and infrared lightcurves are different, raising the question of how shape versus spectral properties are reflected in the data. The OVIRS and PolyCam lightcurves correspond at visible wavelengths.

The calibration quality and L0-to-L2 processing issues will be addressed with small pipeline changes and new calibration files; a CR will be opened to document these updates. The noisiness of the pipeline calibration, due to the internal source still being on, can be addressed by subtracting more from the beginning and end of the deep-space calibration block, or by using a more advanced logic to judge whether spectra truly represent space. The PI prefers the latter solution, at least for final calibrated data to be delivered to the PDS. The observed mismatches in radiometry are expected and will be straightforward to fix.

Users should note that L2 data (and beyond) are not yet calibrated. Only data from 2 November (DOY 306) forward will be reprocessed. The working date for delivery of science-ready spectral data products is 22 November.

Astronomy update and blessing of NSS data products – Carl Hergenrother and Mike Nolan

PolyCam lightcurves from 2 to 5 November (DOY 306 to 309) largely overlay one another, but some maxima appear to change a little with phase angle.

The aliasing correction may have been too strong for point-source or marginally resolved MapCam v observations; well-resolved data do not present the same phase-function confusion. Considering all MapCam filters together indicates a phase slope of about 0.038, consistent with the DRA.

We have met the requirements for the natural satellite search (NSS; MRD-144). Carl will nevertheless analyze this weekend's redundant observations to be safe. No satellites were detected down to 8–10 cm diameter and ~200 m from Bennu (MapCam) or down to 15¬–20 cm diameter and tens of meters from Bennu (PolyCam). We did not reach 10-cm detection throughout the entire Hill Sphere, but we reached it everywhere that we would reasonably expect to find 10-cm satellites. Thus, the MRD-144 requirement is met by a combination of observations and analysis.

Data products AP-8 and AP-9 (null) were approved at the meeting with Radio Science abstaining; AP-11 is in review; and AP-12 should be ready for review soon. Jon Cutts will remove the NSS contingency products (MRD-146, -147, -148, and -196) from the data production schedule.

Data product status – Jon Cutts

See the slides for the forecast, MRD roll-up, major milestones, and this status period's completions and slips (current as of Monday 5 November). Forecast completion dates for each mission phase and approved data products for each week are available via the OREX Wiki.

Jon clarified the duration of the "validation" period for data products (defined as the time allotted for getting products to the blessable point). See the slides for details. The start of the validation period is based on when the data are downlinked, plus 1 or 2 days of padding (depending on mission phase)—but this does not necessarily reflect when the data are available to the instrument teams, if pipeline processing time exceeds the padding. Instrument teams should inform Jon if processing delays require the baseline finish date to be pushed back.

Action item:

- Amy Simon and Vicky Hamilton will provide new baseline finish dates to Jon for the OVIRS and OTES full-disk integrated spectroscopy data.

Other notes

CR-316 (OTES Library Delivery Cadence & Reserved Space for Library) has been closed.

Upcoming meetings

Next week (15 November) is a Science Monthly meeting. We will discuss the content of AGU presentations. The meeting is canceled the following week (23 November) for Thanksgiving.