Science Weekly Debrief

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Data processing status – Sanford Selznick

Several updates to the data calibration/validation pipelines are under way. OCAMS data will have minor changes to headers (CR-376), with no impact on science content or data usability. OVIRS has two CRs in process (363 and 369) to address instrument anomalies and the dark background subtraction bug fix, respectively. The former requires further testing. The latter is necessary for data usability and was deployed to reprocess Approach today. The output of code run with new OTES calibration files (CR-373) awaits IS review. Deployment is expected within ~1 week of validation. Output from a new branch to correct OLA pipeline errors (CR-351) is ready for IS review. The code used version 11 of the Frames Kernel; CR-364 will integrate version 12. A new branch is in the SAWG repository but has no associated CR. Action item: Beth Clark will review and follow up with Sanford.

Working group updates

- AltWG – Olivier Barnouin

The 11/15 limb-derived shape model was released earlier this week, with an uncertainty of ~2.5 m. Artifacts persist in the mid-latitudes because of our viewing geometry thus far. We expect these artifacts to clear as we observe higher latitudes. Until then, users avoid over-interpreting mid-latitude topography.

At AGU, we will show the 11/25 shape model, which is higher-fidelity than the 11/15 model but still has minor artifacts. Per the PI, it should be presented with quantitative comparisons to the radar shape model.

The AltWG will soon select a prime meridian in consultation with the Science Team Chief. The Small Body Mapping Tool has been released.

- SAWG – Vicky Hamilton

The reprocessed OTES and OVIRS datasets should be available within a few days to a week. There are some lingering issues at L2 for OTES and L3 for OVIRS; users should interpret with caution and consult with the IS. The team will reveal the detection of the 2.7-micron band at AGU.

- TAWG – Josh Emery and Ben Rozitis

The TAWG used the 11/15 shape model and the Advanced Thermophysical Model to reanalyze Spitzer observations of Bennu. The reanalyzed thermal inertia is on the upper bounds of that

reported in Emery et al. 2014, and the reanalysis found less variation in thermal inertia with rotation.

OTES thermal lightcurves (in relative intensity—allowing us to ignore calibration issues) agree well with the curves predicted by the 11/15 shape model, except in one instance, which corresponds to when the Ben-Ben boulder was rotating from the night side to the day side of the asteroid.

- IPWG – Dani DellaGiustina

The IPWG provided new lunar-based calibrations to SPOCflight for MapCam and PolyCam (SamCam calibrations are in progress). Approach data are being reprocessed. EGA data are excluded because they are in preparation for PDS delivery; these data will be reprocessed and resubmitted to the PDS after Preliminary Survey. Caveats for the calibrated Approach data include the filter-to-filter uncertainty of ~3%, absolute uncertainty of up to 10%, and observational repeatability to within 1%. We expect to have high confidence in whether terrains on Bennu are redder or bluer than each other, but less confidence in how absolutely red or blue they are.

The radiance factor determined from the reprocessed data confirms that the whole disk is bluer and brighter than the dark spot. There appears to be streaking of dark material from the dark spot toward Ben-Ben. We discussed preliminary interpretations, including that Ben-Ben is a captured satellite that scraped across the surface on its way down, or that Ben-Ben broke off the top of the dark spot, as suggested by linear fractures (however, in that case, Ben-Ben would have moved against the typical equatorial transport direction). The dark spot could be an exhuming object that is less space-weathered than its surroundings. The dark streaking appears to fall along a ridge, supporting the connection between darker material and more recent exhumation. Bright objects on Bennu may represent a different class of material and/or a greater degree of space weathering than the surroundings.

The latest global mosaic is still at relatively low phase angles. IPWG will reprocess it with higher-phase-angle data ahead of AGU.

- Astronomy – Carl

Aliasing issues continue to prevent conclusive analysis of point source images. A stellar calibration planned for February 2019 is expected to address this. In addition, Carl will submit a SOCR for a Jupiter-based calibration in September 2019, which will cover PolyCam and all MapCam filters. For resolved images, calibrations based on Jupiter or the Moon produce results that are internally consistent but have a 0.36-magnitude gap between them, which is under analysis.

The PolyCam phase function using all disk-resolved observations has a slope of about 0.034 magnitudes per degree, falling between the slopes measured from the ground (~0.04) and during Approach (~0.03). Relative photometry of disk-resolved MapCam images shows a slight blueing at low phase angles.

Instrument team updates

- OCAMS – Bashar Rizk

Anaglyph and free-view stereo rotation movies, showing the full asteroid or mosaic pieces, are available on ODOCS and via DropBox (see the slides).

- OTES – Phil Christensen

A recently identified modulation issue with the OTES interferometer was discussed in detail during this morning's SAWG meeting (slides will be posted to the Science Team Wiki).

- OVIRS – Amy Simon

Calibration/validation reprocessing is under way (see the updates from Sanford above). Users should inform the IS of any oddities in L2 data and note that the thermal tail won't be removed in L3 data. The instrument will be warm at the start of Preliminary Survey observations (because the decon heater will be operational during maneuver M0P), which may lead to noisy data.

DRA scorecard status – Mike Nolan

An update to the Bennu ephemeris was recently delivered. The new uncertainties in Bennu's absolute position are smaller (~1.5 sigma change in value). We have not detected any large non–principal axis rotation; there are possible signatures at the half-degree level, but they could be modeling error.

Data product status – Jon Cutts

OCAMS L1 and L2 products have been blessed through DOY 316. MRDs 157 and 158 are past baseline owing to slippage in data blessing but are progressing. SOCR-100, soon to be incorporated into the forecast, avoids a slippage risk to the Safety and Sampleability Map by providing the necessary data sooner. Delays in Preliminary Survey products will not affect our ability to proceed to Orbital A, but teams should inform Jon of any slips from baseline so that we understand what is taking longer and why.

The Bennu lightcurve data currently do not fulfill the intended goal (MRD-157) owing to point-source calibration issues. Per the Science Team Chief, we will decide whether to accept them as they are, try to achieve the goal another way, or punt until later.

See the slides for the data product completion forecast, MRD roll-up, major milestones, and this status period's completions and slips. Forecasted completion dates are also available on the OREX Wiki.

Upcoming meetings

The Science Weekly meeting is canceled next week owing to a conflicting meeting.