

Day of Year

Day 309 (11/5/18)

Status Summary:

All instruments are nominal. OCAMS, OVIRS, and OTES are powered on. Canberra uplink restrictions related to aircraft activity have been lifted.

AAM-3A took place earlier today. Doppler residuals preliminarily indicate very good performance by the spacecraft; further analysis is under way. This was a small burn, similar to maneuvers that the spacecraft will perform around Bennu.

Today we executed Full-Disk Integrated Spectroscopy optimized for OTES with ride-along OVIRS and OCAMS, and we collected OpNav and ride-along Daily Phase Function images.

An OCAMS alarm occurred when a time update packet from the spacecraft was not received within a specified window; this is not a concern unless it happens three times. OVIRS had several bad pixel parity alarms; the team will assess the significance of these when all the data have been received. NavCam had two correctable ECC alarms; the threshold for triggering this alarm may be updated soon. A tagelbmtrppo alarm appeared in SPOCflight on DOY 307 but not on the MSA ASIST; SPOC is looking into why it appeared on SPOCflight. See the slides for details.

The IPWG used rotational data from the weekend to create a complete global mosaic. They also produced a color composite from this weekend's MapCam images, which has some green fringing but appears to show true color variation.

OVIRS instrument performance and data quality were as expected for last week's full-disk observations. The instrument acquired ~180,000 spectra over 4.3 hours. So far, the data appear to be close to expectations for a black body. Single-pixel lightcurves appear to show the overall reflectance of Bennu changing as a function of rotational phase. The SNR is good and will improve as Bennu fills more of the field of view.

OTES commanding and data processing are working as expected. The signal is much lower than for OVIRS (in OVIRS-optimized data). Undulations in the calibrated radiance reflect oscillations in the instrument's temperature (not the rotation of Bennu), and these are being addressed with a correction. Trios of spikes in the data are associated with the zig-zag scan pattern; they suggest that Bennu is moving in and out of the field of view, but it should have been in the field of view throughout the observations, so further investigation is needed. Analyzing the data from the

spikes (i.e., when the asteroid was in the field of view), Bennu looks as expected (i.e., like a black body). Temperatures are relatively uniform across the disk even though the “time of day” differs, which may be consistent with a bouldery surface at 0 phase.

The OCAMS team showed defocused and in-focus images, super-resolution images and movies, and stereo pairs. Dark patches appear to be associated with topographic highs. Some issues with charge smear correction in the pipeline still remain.

Looking ahead: Tomorrow (DOY 310, Tuesday 6 November), we will collect OVIRS-optimized Full-Disk Integrated Spectroscopy observations with ride-along OTES and OCAMS, as well as the usual OpNav and ride-along Daily Phase Function. We do not expect to bring all of tomorrow’s data down during the pass.

Day 310 (11/6/18)

Status Summary:

All instruments are green. OCAMS, OVIRS, and OTES are powered on. DSN station 34 is red, but no OREX impacts are anticipated.

AAM-3A executed nominally yesterday. This was the first burn to resemble the maneuvers that the spacecraft will be performing around the asteroid.

Redundant OVIRS-optimized Full-Disk Integrated Spectroscopy observations with ride-along OTES and OCAMS were scheduled for today. This activity did not take place because the necessary sequences were not on board the spacecraft. The sequences were originally designed for DOY 307 and were not intended for reuse. They had been uplinked for the purpose of using them today, but that uplink took place before DOY 307, after which the sequences self-deleted, as non-reuse sequences are designed to do. The uplink should have taken place after DOY 307. An ISA will be opened. The missed observations were planned specifically to mitigate the possible loss of DOY 306 and 307, and we were able to collect data on those days as originally planned, so we have not lost critical data.

Today’s OpNav, MapCam Daily Phase Function, and TAGCAMS Natural Satellite Search observations were not affected by the above issue and executed nominally. The data have been received on the ground.

OCAMS alarms were triggered today related to the missing sequences noted above. The OVIRS bad pixel parity alarm noted yesterday has cleared, and the spectra collected while this alarm was occurring do not show any problems. A TAG arm-related alarm was triggered today, the significance of which is not yet clear; this is the second TAG arm-related alarm recently seen at SPOC (see yesterday’s downlink summary).

Amy Simon gave an update on OVIRS. Workarounds have been developed for pipeline issues that were holding up data processing. Single-pixel lightcurves for DOY 306 and 307 sit on top of one another when shifted to account for the difference in timing; thus, these are believed to be real lightcurves. Gaps are due to data that have not yet been processed. The DOY 307 lightcurve shows some drop-outs, associated with scanning off-asteroid, which is as expected. These data will help refine the instrument pointing.

Bashar Rizk showed the latest OCAMS data. Surface brightness in terms of relative magnitude has an apparently linear relationship to phase angle. A stereo anaglyph movie and image are available; Bashar has 3D glasses. The 10-degree change in the movie produces an extreme topography, whereas the smaller change in the image creates a gentler topography; the reality is probably somewhere in between.

Vicky Hamilton gave an update on OTES. A processing problem related to the write-out of the kernel has caused some data to be incorrectly tagged or not to be processed; a fix is under way, and the data will be reprocessed. The team is getting a better understanding of the DOY 306 and 307 data (see yesterday's summary) and expects to have an update on Thursday.

Looking ahead: Tomorrow (DOY 311, Wednesday 7 November), we will collect OpNav, Daily Phase Function, and Natural Satellite Search images as we did today; we will also perform the OVIRS solar calibration. On Thursday and Friday (DOY 312 and 313, 8 and 9 November), we will execute OTES-optimized Full-Disk Integrated Spectroscopy with ride-along OVIRS and OCAMS, followed again by OpNav, MapCam Daily Phase Function, and TAGCAMS Natural Satellite Search. After this, OVIRS and OTES will be powered off until WOY 48.

Day 311 (11/7/18)

Status Summary:

All instruments are green. OCAMS, OVIRS, and OTES are powered on. DSN station 55 is undergoing maintenance, but no OREX impacts are anticipated.

All OpNav (PolyCam and test TAGCAMS), Daily Phase Function (MapCam), and Natural Satellite Search (TAGCAMS) data collected yesterday and today are believed to be on the ground.

The Mission Planning Board today gave the official "go" to transition to Preliminary Survey, barring any off-nominal events.

The TAG arm alarms noted in the downlink tag-ups yesterday and Monday were determined to be caused by incorrect limit values on the SPOC side; these alarms were not triggered on the spacecraft side. How the limits got out of sync is under analysis. SPOC will no longer be alerting on non-instrument channels. ISA-6747 has been opened regarding the non-execution of yesterday's redundant Full Disk Integrated Spectroscopy observations.

Pipeline processing is now complete for OVIRS, and calibration checking is in progress. Amy Simon showed the OVIRS lightcurves, now with data gaps filled in. The infrared curve has a different shape from the visible curve, possibly indicating spectral variation; the team will continue to investigate. OVIRS and PolyCam lightcurves are identical in shape.

OTES data processing issues for DOY 309 have been resolved. OTES data show increasing radiance as we approach Bennu, as expected. Vicky Hamilton's eyeball check of the OTES lightcurves indicates consistency across DOY 306, 307, and 309. The 37 blips in DOY 307 data correspond to the 37 slews that were performed that day. The field of view was optimized for OVIRS, and there were moments when OTES was scanning off-asteroid. Boresight angle changes correspond perfectly with changes in calibrated radiance; however, boresight angle and radiance increase together, which is the opposite of what we'd expect. These data will be used to refine the instrument pointing.

Christian d'Aubigny added today's OCAMS data point to the phase curve. It is below trend, but the plot is based on phase angles from an old ephemeris. Three OCAMS lightcurves sit on top of one another when corrected for increasing brightness and scaled for best fit. Using a slightly shorter-than-canonical rotation period improves the fit.

Looking ahead: On Thursday and Friday (DOY 312 and 313, 8 and 9 November), we will execute the second and third instances of OTES-optimized Full-Disk Integrated Spectroscopy with ride-along OVIRS and OCAMS. This activity will be followed by OpNav (PolyCam and test TAGCAMS), Daily Phase Function with MapCam, and Natural Satellite Search with TAGCAMS. After the spectroscopy observations on Friday, OVIRS and OTES will be powered off until WOY 48, and the OVIRS decon heater will be set back to operational. On Saturday and Sunday (DOY 314 and 315, 10 and 11 November), we will perform redundant Natural Satellite Search observations with PolyCam and MapCam.

There will be a Science Weekly meeting tomorrow (Thursday 8 November).

Day 312 (11/8/18)

Status Summary:

All instruments are green. OCAMS, OVIRS, and OTES are powered on. No updates to DSN equipment status.

All of today's data have been received on the ground. Data volume estimates for OVIRS are still being refined because of subtleties related to drop-frame values, but the amount of data received appears to be about what was expected. It will take until Monday to bring down all of the data collected tomorrow and over the weekend.

PFR-32 was issued today relating to Bennu being in the OVIRS field of view during deep-space calibration on DOY 307.

Bashar Rizk showed the latest OCAMS images and animations. Stereo movies and anaglyphs are available on request.

Brent Bos showed images collected today by NavCam 1. A 5-second-exposure image shows a number of objects that are not present in 2-second-exposure images and that do not resemble anything previously observed with TAGCAMS. Some of the objects have tails. Carl Hergenrother's initial assessment is that these are secondaries from collision with a high-energy particle. Further investigation will follow.

Looking ahead: Tomorrow (DOY 313, 9 November), we will repeat today's activities, then power off OVIRS and OTETS. On Saturday and Sunday (DOY 314 and 315, 10 and 11 November), we will perform redundant Natural Satellite Search observations with PolyCam and MapCam. On Monday (DOY 316), we will perform AAM-4 and begin PolyCam Shape Model observations.

Day 313 (11/9/18)

Status Summary:

All instruments are green. OCAMS is powered on. OVIRS and OTES have been powered off and will remain off until the final day of Approach. No impacts are expected from the current DSN equipment status.

Today we wrapped up Full-Disk Integrated Spectroscopy with OTES-optimized observations. OTES and OVIRS data have been received on the ground. The OTES team is working to resolve data processing issues and hopes the data will be ready to look at tomorrow.

Bashar Rizk showed the latest GIF and anaglyph from OCAMS images.

Mark Perry previewed the initial draft shape model produced by the AltWG. It has a ground sample distance of 0.5 m and a vertical resolution of 1 to 2 meters. It will be formally released to the Science Team next week.

Looking ahead: On Saturday and Sunday (10 and 11 November, DOY 314 and 315), we will perform redundant Natural Satellite Search observations with PolyCam and MapCam, plus TAGCAMS Natural Satellite Search and PolyCam and TAGCAMS OpNav. On Monday (12 November, DOY 316), we will begin PolyCam Shape Model observations and execute AAM-4, a small burn. Wednesday (14 November, DOY 318) will be the first of two consecutive days of REXIS Crab calibration; we will also articulate the TAG arm and collect 189 images with SAMCAM. The release of CPE products from the SAMCAM imaging is targeted for Friday (16 November, DOY 320).

Upcoming meetings: Monday is a federal and UA holiday; the downlink tag-up will take place as usual, but the instrument check-ins will wait until Tuesday. There will be a Science Monthly meeting on Thursday (15 November, DOY 319).