MRD-148- b-v index, v-x index, and 0.7-μm color ratios of satellites

Data Product Overview
One sentence executive description of product

Asteroid color index data product is a measure of the color differences between the following filter bands: b-v, v-x, 0.7-micron feature.

Overview
Data type (image, spectrum, data table, map format etc.)

data table

What does it measure at what scale

unresolved/point source

What observations are required to provide the input data needed to make the data product?

MapCam images taken through all 4 ECAS color filters

When in the DRM are the observations that make the data product scheduled to be taken?

during the Approach phase

How long does it take to produce the data product?

data obtained during multiple 4.5-hour science observation windows. reduction to be completed after the delivery of the last Bennu lightcurve photometry observation. A week of time is required to reduce, analyze and produce this data product.

Is this product used of sample site selection, science value, or long-term science?

long-term science

Data Product Structure and Organization
What is the structure of the data product (e.g. FITS file with 4 extensions)

ASCII

How is the product organized (e.g. one data set per mission phase, one file per Earth Day, etc.)

two files (one contains color index photometry and the other contains color indices at different rotational phases and phase angles

Data Format Descriptions

Header information (metadata) included with data product. For example:

ASCII table including the following: rotation phase, phase angle, b-v color index, b-v color index error, v-x color index, v-x color index error, 0.7-micron color index, 0.7-micron color index error

Detailed Description of data format. For example:

Table

Data Type

ASCII

Field name, Field Description, Field Length, Field Format

for color index photometry file:
ASCII table including the following for the lightcurve photometry file: year of mid-point of observation (UT), month of mid-point of observation (UT), decimal day of mid-point of observation (UT), exposure length, filter, photometric flux, apparent magnitude, absolute magnitude normalized distances of 1 AU between the Bennu and Sun and Bennu and spacecraft, rotation phase, lightcurve photometric correction, phase angle, OREx-Sun distance, OREx-Bennu distance

for color index parameter file:
rotation phase, phase angle (degrees), b-v color index (magnitudes), b-v color index error (magnitudes), v-x color index (magnitudes), v-x color index error (magnitudes), 0.7-micron color index (magnitudes), 0.7-micron color index error (magnitudes).

Example format (for color index photometry file):

```
2018 10 11.123456 100.000 b 123456 10.123 20.123 0.1234 -0.123 123.456
0.12345 123456.123
```

Fortran format (for color index photometry file):

```
I4,1X,I2,1X,F9.6,1X,F7.3,1X,A1,1X,I6,1X,F6.3,1X,F6.4,1X,F6.3,1X,F7.3,1X,F7.5
```

Example format (for color index parameter file):

```
0.1234 123.456 +0.123 0.123 +0.123 0.123 +0.012 0.012 -0.198 0.102
```

Fortran format (for color index parameter file):

```
F6.4,1X,F7.3,1X,F6.3,1X,F5.3,1X,F6.3,1X,F5.3,1X,F6.3,1X,F5.3
```

Data Product Generation

How and by whom is the product generated?

What are the input products needed to produce the product?

OCAMS MapCam L2 images of Bennu, MapCam photometric calibrations, s/c ephemeris position, Bennu ephemeris position, MapCam image filter, MapCam image exposure time, MapCam image exposure duration, Bennu lightcurve parameters

Are there format expectations for the input products?

Yes. MapCam image headers need to use the standard FITS header format. A list of FITS keywords and their meanings is required for reading these values into the photometry software.

What algorithms and/or calibration data is used to generate products?

Rotation Period Determination (ALG-AP-008) and Color Index Determination (ALG-AP-010) are used to produce this data product.

Are there format expectations for the inputs?

No

Has a specific Science Team Member been assigned to produce this product?

Yes, Carl Hergenrother.

Will multiple versions of the product be generated?

No

How will they differ?

On what cadence will they be delivered?

N/A

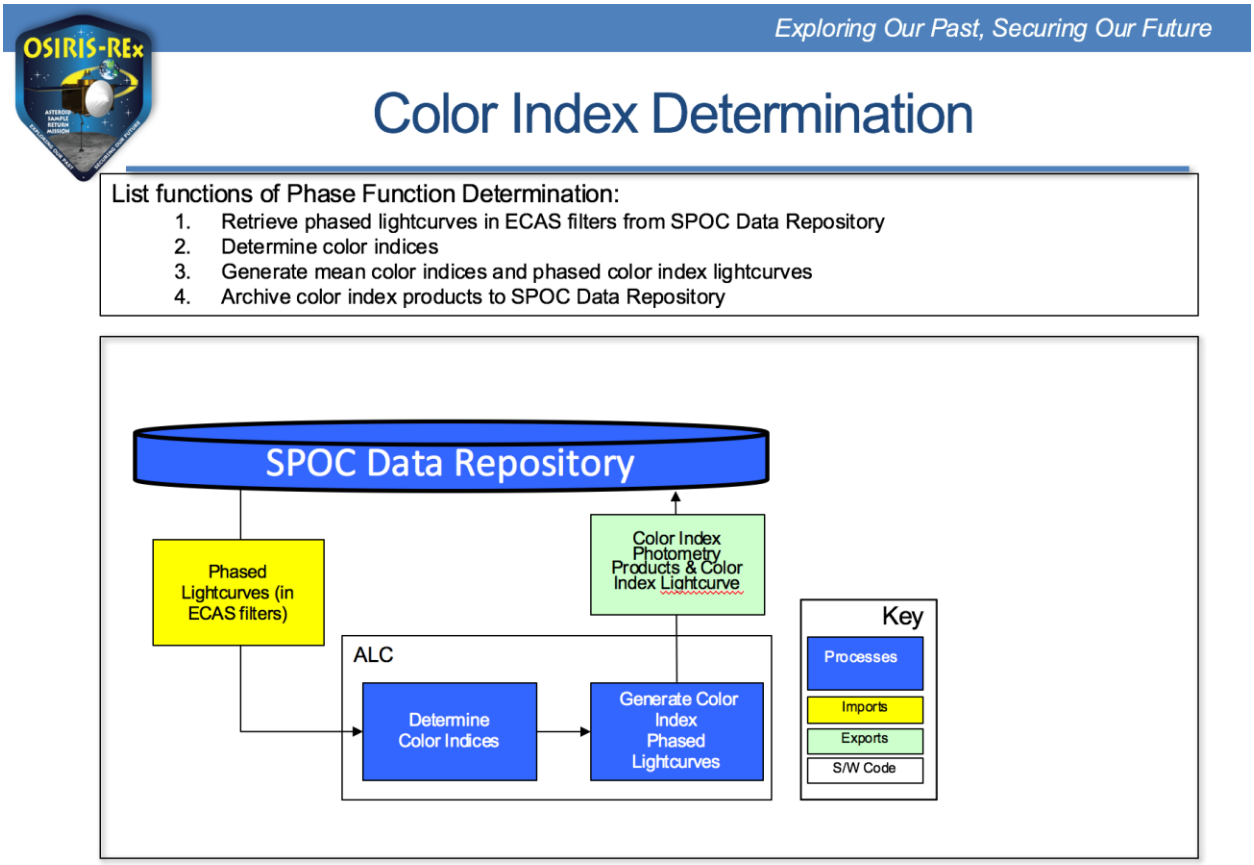
Data Product Validation

How will the product be vetted to ensure contents and format are correct?

Software to be tested on real ground-based color indices data of asteroids analogous to Bennu. Analogous asteroids will have “well determined” color indices parameters.

Data Flow

Update Data flow diagrams with more detailed based on current processing configuration.



Describe the sources, destinations, and transfer procedures for data products.

State the size of an individual data product and the total size of all the data products generated over the course of each mission phase. Can we have an estimate by Baseline?

Data products are relatively small ASCII text files (size < 1 MB)

State the time span covered by a product, if applicable, and the rate at which products are generated and delivered.

Data products to be delivered at the end of the Approach phase

Standards used to generate data product

Time (e.g. times are all converted to UTC)

UTC

Coordinate System

astronomical photometric system (b,v,w,x,monochrome v)

Data Storage Conventions (i.e. byte order, compression, machine dependence)

Product to be retrieved via WebQuery based on data product type (name) or date observation was made. For example, I do not foresee a request to download one photometric point but do foresee downloading all photometry taken on a single date.

Relevant ICD Data Products:

- Color Index Photometry Parameters (AP-16)
- Color Index Light Curve (AP-17)