

Determination of b-v, v-w and 0.7 μm Color Indices for Bennu and Natural Satellites (ALG-AP-010)

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History:

- o 2013-July-24 - Draft
- o 2013-Nov-05 - Baseline
- o 2016-Mar-28 - minor modifications

Description:

Asteroid Bennu and any natural satellites of Bennu will be observed in all four MapCam ECAS filters. The color indices (difference in magnitude and reflectance) between the ECAS b and v, ECAS v and x, and ECAS v, w and x filters will be measured. The color indices will be corrected for brightness variations due to changes in the distance of Bennu from the Sun and spacecraft, in Bennu's phase angle and in the rotational lightcurve of Bennu. The color index lightcurves will show if there are any longitude dependent color changes between the four MapCam ECAS filters. These results will be compared with ECAS colors and visible spectroscopy obtained with ground-based telescope.

Parameters:

infile – Bennu or natural satellite photometry data products [data product format is in UA-SIS-9.4.4-308 - OSIRIS-REx Astrometry and Photometry Derived Products SIS]

outfile – Color index photometry data product (b-v, v-x, 0.7 μm feature) and color index lightcurves [data product format is in UA-SIS-9.4.4-308 - OSIRIS-REx Astrometry and Photometry Derived Products SIS]

Algorithm equations:

$$\text{Color Index}_{(b-v)} = \text{Magnitude}_{(b)} - \text{Magnitude}_{(v)}$$

$$\text{Color Index}_{(v-x)} = \text{Magnitude}_{(v)} - \text{Magnitude}_{(x)}$$

$$\begin{aligned} \text{Color Index}_{(0.7\mu\text{m feature})} &= \text{Reflectance}_{(w)} - ((\text{Reflectance}_{(x)} - \text{Reflectance}_{(w)}) \times 0.4984) \\ &/ \text{Reflectance}_{(v)} \end{aligned}$$

where Color Index_(b-v) is the difference in magnitudes between the b and v magnitudes;

Color Index_(v-x) is the difference in magnitudes between the v and x magnitudes;

Magnitude_(b) is the magnitude in the b filter normalized to a distance of 1 AU from the Earth and Sun;

Magnitude_(v) is the magnitude in the v filter normalized to a distance of 1 AU from the Earth and Sun;

Magnitude_(x) is the magnitude in the x filter normalized to a distance of 1 AU from the Earth and Sun;

Color Index_(0.7 micron feature) is the difference in reflectance between the w-band reflectance and the mean v-band + x-band reflectance (the feature is an absorption feature so the w-band reflectance will be less than the mean v+x-band reflectance);

Reflectance_(v) is the reflectance in the v-band normalized to 1.00;

Reflectance_(w) is the reflectance in the w-band relative to the v-band reflectance;

Reflectance_(x) is the reflectance in the x-band normalized to the v-band reflectance.

Proposed software:

Asteroid Light Curve (ALC)

Additional references:

Henden, A.A. and Kaitchuck, R.H. 1990. Astronomical Photometry. Willman-Bell, Inc., Richmond, Virginia, 394 pps.