

# Data Product Description

The Photometric Correction “data product” is an algorithm and a piece of software that can be used to correct the OVIRS spectra or the OCAMS images to a common reference viewing geometry. The algorithm is determined by the results of the Photometric Modeling “data product”, and will consist of a function and its numerical coefficients. The function will be used to calculate scaling factors for each wavelength of each OVIRS spectrum, or OCAMS image, to correct it to a common reference viewing and illumination geometry. Because the reference viewing geometry may vary depending on the use of the data, the algorithm will allow different possibilities. It is understood that the most common reference viewing and illumination geometry for the spectral data is that of a standard reflectance laboratory, where incidence = 30 degrees, emission = 0 degrees, and phase angle = 30 degrees.

## Overview

### *Data Type*

Images or Spectra will be retrieved from the SPOC Data Repository database and multiplied by scaling factors that photometrically correct the input data to a common reference viewing and illumination geometry.

FITS Files of Images or Spectra (stored in logical collections, organized per mission phase and per mission observational station) - multiplied by scaling factors that photometrically correct the input data to a common reference viewing geometry.

### *What MRD does this data product satisfy or contribute to satisfying?*

Image Processing: MRD-116, MRD-121, MRD-119, MRD-141, MRD-190, MRD-380, and PSFD Regions of Interest MAPS.

Spectral Analysis: MRD-118, MRD-140, MRD-143, MRD-147, MRD-154, MRD-159, MRD-542.

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

OCAMs MapCam images and OVIRS spectra

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

MapCam observations: Approach, Detailed Survey, Reconnaissance

OVIRS observations: Detailed Survey, Reconnaissance

For a detailed view of the schedule, this figure shows the main periods of activity:

### Photometric Modeling Schedule

V9

Beth Ellen Clark

	Instrument / Data	Downlink of Data	Staffing Plan	Delivery of Photometric Model	Delivery of Phot Corrected Data	Delivery of Associated Data Products	Comments
<b>Approach</b>	OVIRS	10/31/18	BEC, XDZ			11/7/18	Global Scale Factor for 1064nm/860nm
	MapCam	11/5/18	JYL, DT	11/22/18			Disk-integrated model update only
<b>Preliminary Survey</b>	MapCam	11/29/18	XDZ, BEC				
	PolyCam	11/29/18	DT, JYL				
<b>Orbital A</b>	OVIRS	12/24/18					
	NavCam	1/9/19					
<b>Detailed Survey</b>	PolyCam	1/29/19					very limited viewing geometry in Baseball Diamond: 10am & 2pm - will provide MapCam panchrom model when available for photometric correction of these data.
	MapCam Pan	2/25/19	DT, XDZ	3/18/19	3/21/19		
	MapCam X	2/25/19	DT, BEC	3/25/19	3/28/19	4/5/19	1064nm Map
	OVIRS	2/25/19	JYL, XDZ	3/18/19	3/21/19	3/28/19	Bond Albedo Map
	MapCam Color	2/25/19	BEC, JYL	4/2/19	4/5/19	4/14/19	Space Weather Map
<b>Orbital B</b>	PolyCam	5/1/19					
	NavCam	5/12/19					
<b>Reconnaissance</b>	PolyCam	5/28/19 - 8/26/19					Recon Data will be corrected with the Photometric Models developed from Detailed Survey Data. There are 6 RECON data downloads, spread over 3 months. (Note: Because of the limited lighting geometry available in the PolyCam dataset, it is not possible to photometrically model the PolyCam data. Instead, the MapCam panchrom filter model will be used.)
	MapCam	5/28/19 - 8/26/19				1 day after each downlink	
	OVIRS	5/28/19 - 8/26/19				1 day after each downlink	
DRM Rev C	Data Downlinked and shaded grey will not be photometrically modeled in the Baseline plan.						

How long does it take to produce the data product?

Once the Photometric Model is available, we will need just a few days (~3) to photometrically correct all relevant observations.

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

Yes, all of the above.

Sample site selection

Science value

Long term science.

## Data Product Structure and Organization

*What is the structure of the data product (e.g. FITS file with 4 extensions)?*

Same as input (FITS) or Database format. Whatever the incoming data format, the outgoing will match it.

## Data Format Descriptions

*Header information (metadata) included with data product:*

- Name of person performing photometric correction
- Date of correction processing
- Model name used for photometric correction
- Model parameters used
- Correction reference viewing angle geometry (e.g.  $i=0, e=0, a=0$  OR  $i=30, e=0, a=30$ )
- List file name of data selected and used for Model determination

## Data Product Generation

*By whom is the product generated?*

Beth Ellen Clark is responsible, and she will work with Driss Takir and Jian-Yang Li.

*What are the input products needed to produce the product?*

BEST FIT photometric models for each channel (or wavelength) of the Observations (OVIRS) dataset.

Each image (and each spectrum) must be photometrically corrected before it can be mosaicked (compared) with other images (spectra). We perform the photometric correction according to the following algorithm (shown for the case  $i=30, e=0, a=30$ ):

$$r\_correct(i\_30,e\_0,a\_30) = r\_measured(i,e,a) * [r\_model(i\_30,e\_0,a\_30)/r\_model(i,e,a)]$$

where  $r_{\text{measured}}(i,e,a)$  is the observation at incidence (i) degrees, emission (e) in degrees, and phase angle (a) in degrees.

*Are there format expectations for the input products?*

Fits files with header information that defines the viewing geometry of the input pixels (for image data) and of the input spectra (for spectral data)

OR

Data retrieved from the SPOC Data Repository using a structured query that grabs the data, the uncertainties, and all the associated metadata that is necessary.

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

Photometric Models (Lommel-Seeliger, ROLO, and Minnaert models) that are created with the Photometric Modeling software (see the [Global Photometric Model Data Product Descriptions](#)).

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

Beth Ellen Clark will work with her team: Driss Takir and Jian-Yang Li.

*Will multiple versions of the product be generated?*

Possibly. However, the baseline plan is to produce one version before sample site selection.

## Data Product Validation

*How will the product be validated to ensure contents and formats are correct?*

We will check the following plots: (I/F)modeled vs. (I/F)measured; phase\_angle vs. (I/F)measured/(I/F)modeled; emission\_angle vs. (I/F)measured/(I/F)modeled; incidence\_angle vs. (I/F)measured/(I/F)modeled, (I/F)measured vs. pixel\_row, and (I/F)modeled vs. pixel\_row to make sure there are no systematic trends that would compromise the effectiveness of the model in performing the photometric correction.