

## Description

This algorithm takes input data in units of I/F (RADF) as a function of incidence, emission, and phase angle, and converts to photometrically corrected reflectance at a common (desired) reference viewing geometry.

0. Collect OVIRS FITS file data that need to be photometrically corrected.
1. Find the BEST FIT model recorded in the FITS file keyword "MNBEST".
2. Using the BEST FIT model, calculate a photometric correction scaling factor for each spectrum above

according to the following algorithm:

$$r\_model[i(desired),e(desired),a(desired)] / r\_model(i,e,a).$$

This factor divides the model reflectance at a common reference viewing geometry by the model reflectance at the input viewing geometry.

3. Multiply each spectrum by the scaling factor according to the following algorithm:

$$r\_correct[i(desired),e(desired),a(desired)] = r\_input(i,e,a) * r\_model[i(desired),e(desired),a(desired)] / r\_model(i,e,a).$$

This takes the input values and corrects them to a common (desired) reference viewing angle geometry, no matter how they were originally observed.

4. The values obtained for  $r\_correct[i(desired),e(desired),a(desired)]$  are the photometrically corrected spectra.
5. Set the keyword "SPECTYP" in the header of "Bennu\_Corrected\_Spectra.fits" to 'Phot\_corr\_IOF'.
6. Write the new spectrum values (corrected RADF) out to the FITS file: Bennu\_Corrected\_Spectra.fits

Key Word	Value	Description
SIMPLE	T	Conforms to FITS Standard
BITPIX	-32	8 unsigned int, 16 & 32 int, -32 & -64 real
NAXIS	2	Number of axes
NAXIS1	1400	Fastest changing axis (x) Channels
NAXIS2	16.100	Next fastest changing axis (y) spectra
EXTEND	T	FITS dataset may contain extensions
Comment	Mission Information	
MISSION	'OSIRIS-REx'	Mission: OSIRIS-REx
HOSTNAME	'OREX'	PDS Terminology
INSTRUM	'OVIRS'	Instrument: OSIRIS-REx Visible Infrared Spectrometer
TARGET	'101955 BENNU'	Target Object
ORIGIN	'OREXSPOC'	University of Arizona Science Processing and Operations Center
Comment	Observation Information	
MPHASE	'Detailed Survey'	Mission Phase
ACTIVITY	'Instrument Data Collection'	Activity is equivalent to PDS4 'Primary Results Summary'
ATLTGTID		ATL Target ID (Target spacecraft is moving toward?)
SCISEQID		Instrument Phase Activity Description Rev
SEQDESC		From Description field of Science Sequence ID
OBSID		From Telemetry
Comment	Timing Information	
OBSSTART		Observation sequence start time (YYYY-MM-DDTHH:MM:SS.asssZ)
OBSEND		Observation sequence end time.
SCLKSTRT		TICKS
SCLKEND		TICKS
Comment	Processing Info	
GEOFILE		Name of associated GEOGEN FILE
PXTOWAV		Name of pixel bin to wavelength file (changes with time)
WVLNGTHS		Name of file containing the wavelengths (does not change with time)
MNBEST	'Lommel-Seeliger'	Name of Photometric Model (Lommel-Seeliger, Minnaert, ROLO)
PHTMODFL	'Phot_Mod_LS_Bennu_Global_DS'	Name of Best Fit Photometric File containing the Model above, that was used to Photometrically correct the data (if blank, then the data have not been photometrically corrected)
SPDIF	'Bennu_Global_DS_SPDIF.FITS'	Name of file containing the spectra used to derive Photometric Models
SPECTYP		Type of Spectrum (i.e Subsampled to Standard Grid (GRID), Thermal excess removed (NOTHERM), I over F (I_O_F), Phot_corr_IOF, Bond albedo (BOND), or SPDIF )

## References:

Clark, B.E., Helfenstein P., Bell III J.F, Peterson C., Veverka J., Izenberg N., Domingue D., Wellnitz W., and

McFadden L. (2002) NEAR Infrared Spectrometer Photometry of Asteroid 433 Eros. Icarus 155, 189-204.

Clark, B.E., J. Veverka, P. Helfenstein, P.C. Thomas, J.F. Bell III, A. Harch, M.S. Robinson, S.L. Murchie, L.A.

McFadden, C.R. Chapman (1999) NEAR Photometry of Asteroid 253 Mathilde. Icarus 140, 53-65.

Helfenstein, P., J. Veverka, P. Thomas etc. B.E. Clark etc. (1994) Galileo Photometry of Asteroid 951 Gaspra. Icarus 107, 37-60.