

Overview

Algorithm for making 2-D maps of thermal inertia determined from OTES temperatures using the thermal model.

History

Draft - 17 Aug 2013

Baseline - 30 Nov 2013

Algorithm Description

1. Read in output file(s) from thermal model algorithm that determines thermal inertia from OTES temperature data. These files will contain spot values and ancillary geometric data (e.g., latitude and longitude of each spot).
 - o Input data may be down-selected based on other quality parameters such as signal-to-noise, albedo, etc.
2. Bin data by desired spatial resolution latitude/longitude grid
3. Calculate average and standard deviation of thermal inertia in each bin. Also propagate measurement uncertainties.
4. Write output array: first channel of map element contains 2-D array with average thermal inertia using desired geometric projection; second channel stores standard deviation of the thermal inertia for each pixel using same geometric projection; third channel will contain final uncertainty, which folds together the standard deviation and the uncertainties of the individual spot thermal inertias.

Parameters

Input

- Thermal inertia files from thermal model algorithm that determines thermal inertia from OTES temperature data. It is assumed that the headers for these files will include pointing and timing information
- Desired spatial resolution / grid of map
- User inputs for constraints used to create a specific map. These include, but are not limited to: data quality, incidence angle, emission angle, surface temperature, albedo, surface tilt, latitude, longitude.

Output

- Map structure
 - o 2-D floating point array of binned averaged thermal inertia
 - o 2-D floating point array of standard deviation of thermal inertia in each element of the map
 - o 2-D floating point array of final uncertainty in thermal inertia, folding together standard deviation and original uncertainties.
 - o 2-D floating point array of the number of thermal inertia points included in each element of the map

- Number of x and y bins in the array
- Start longitude, latitude ([1,1] element) of the array
- Longitude/latitude bin size
- UTC Start/end time of OTESS observations used to produce the temperature data used in the map
- Version of OTESS Calibration algorithm used to create the temperature data from which thermal inertias are derived
- Version of OTESS Temperature/Emissivity separation algorithm used to create the temperature data from which thermal inertias are derived
- Version of thermal model used to calculate thermal inertia
- Bennu position relative to the Sun (distance, ecliptic longitude and latitude) when OTESS data were collected
- Bennu position relative to the spacecraft (distance, ecliptic longitude and latitude) when OTESS data were collected
- Name/location of shape file used to project the data and compute the latitudes and longitudes used in the map
- User inputs for the constraints (quality, local time, etc) used to create the map

Keywords

Proposed Software

The davinci software is the software package/programming language in which the binning, averaging, data quality constraining mapping software will be written. This software will be installed on the SPOC system for use on all OTESS data processing. Any reprojection of the maps to specific geometric projections will be done using the OSIRIS-REx geometric projection processing software (ISIS, TBD).