

Overview

Interpolate Thermal Model Lookup Table to estimate desired output parameter (e.g., spot thermal inertia, temperature prediction) from given inputs.

History

Draft - 17 Aug 2013

Baseline - 30 Nov 2013

Algorithm Description

1. Read in required input information: OTES temperatures or input thermal inertia for a given spot
 1. OTES temperatures corresponding to a given spot
 - For the Global Map (Detailed Survey Phase data), there will be 7 temperatures per spot
 - For Site-Specific Maps (Orbit-B or Recon Phase), there will be a single temperature per spot
 - These temperatures must have location and time information associated with them
 2. Thermal inertia for a given spot - for calculation of predicted temperature
 - There will be a single value per spot, regardless of mission phase
2. Read in or set required information on all Lookup Table parameters to be interpolated (e.g., albedo, sub-pixel roughness, surface slope/tilt, position of Bennu in its orbit, position of spacecraft relative to Bennu, location of spot on surface).
3. Interpolate Thermal Model Lookup Table with given input parameters to estimate desired output value (thermal inertia or predicted temperature).
 - For Detailed Survey data, will be using all 7 time-of-day temperature estimates to determine a single thermal inertia value for that spot
 - For Recon or Orbit-B data, will be using a single time-of-day temperature. Will also somehow consider lower spatial resolution data in the solution, in case of degeneracy that may arise from trying to estimate thermal inertia from just one temperature
 - For predicted temperature, will be estimating a single temperature from a single thermal inertia input. Will likely be predicting temperatures at higher spatial resolution than the thermal inertia was determined for, taking into account the shape/topographic information at higher spatial resolution.
4. Assess uncertainty in output parameter.
5. Output parameter and uncertainty

Parameters

Input

- Primary inputs will be dependent on output quantity
 1. Thermal inertia from Detailed Survey data
 - Spot temperatures for 7 times of day
 - Time of each temperature measurement
 - Location of each temperature measurement spot on shape model

2. Thermal inertia from Orbit-B or Recon data
 - Spot temperature for 1 time of day
 - Time of this temperature measurement
 - Location of this temperature measurement on shape model
 3. Predicted temperature
 - Thermal inertia
 - Time of desired temperature prediction
 - Location on shape model for temperature prediction
- User inputs for other parameters in Lookup Table ((e.g., albedo, sub-pixel roughness, surface slope/tilt, position of Bennu in its orbit, position of spacecraft relative to Bennu, location of spot on surface).

Output

- Desired output quantity (temperature or thermal inertia) and associated uncertainty. Include a flag that indicates some measure of the quality of the solution as well.
- Header data
 - Record of OTES measurements used as inputs (in the case of thermal inertia determination)
 - Input thermal inertia (in the case of temperature prediction)
 - Version/calibration set of OTES observations
 - Bennu position relative to the Sun (distance, ecliptic longitude and latitude)
 - Bennu position relative to the spacecraft (distance, ecliptic longitude and latitude)
 - Bennu rotational state (ecliptic coordinates of spin-pole, rotation period)
 - Name/location of shape file used in model
 - Name/version of thermal model used
 - Average albedo used for model, or name/location of albedo map
 - Bolometric emissivity used for model

Keywords

Selection of desired output quantity