Local Thermal Approach Map Algorithm Description Document

Overview

This data product supports the Safety Map requirement SM. ALG.08: "*SPOC shall generate a site-specific thermal map of Bennu indicating the temperature for each element in the thermal map for the projected TAG time (local time). The site-specific temperature map (4 m) shall include temperatures for both the local TAG site and approach corridor at the predicted local time-of-TAG and solar range for the TAG date.*" The temperature of each facet within the sampling site is calculated to determine spacecraft safety for TAG approach. This map calculates which areas within the approach corridor associated with a TAG site on the global shape model contain sufficiently low temperature facets at the local time flyover to satisfy the mission requirement for spacecraft safety. Algorithm SM_ALG_08 provides the evaluation of thermal safety within the TAG site.

Inputs

- Global Shape Model (GSM)
    - Nominally 1m resolution
- Bounding approach corridor ground tracks
- Global Bennu Thermal Model
    - Nominally 40m resolution
- Planned TAG date
- ERD-178: Bennu Nominal Temperature Distribution

Outputs

- Site-Specific Thermal Approach Safety Map
    - Referenced to the GSM

Global (Approach) Algorithm

For each GSM facet contained within the bounding trajectory ground tracks:

1. Calculate the temperature of the facet using the Global Bennu thermal model.
    a. The temperature must be calculated for the predicted TAG date and local solar time of TAG. The local solar time of TAG is defined by the TAG site latitude.
    b. The thermal map must be sub-sampled to the resolution of the GSM.

A color coded safety rating will be assigned to the each facet of the GSM:

a. Green if the value is less than or equal to the value of ERD-178 at the corresponding latitude and local solar time (solar longitude)
b. Red if the value is greater than the value of ERD-178 at the corresponding latitude and local solar time (solar longitude)