

MRD 130- Global Gravity Field Map

Data Product Overview

The "global gravity field map" data product lists the gravitational acceleration at the surface of Bennu as a function of latitude and longitude at the resolution of the shape model.

Overview

This data product is used for sample site selection, science value, and long-term science.

This product will be delivered as a data table that contains the latitude and longitude location on Bennu and the associated acceleration value. The resolution is required to be of a minimum of 1-m resolution.

Inputs:

Asteroid Shape Model

Mass Model

Gravity Field

Spin State

Mass Distribution Model

This product is derived purely from other data products, and as such doesn't directly use any observations. An initial version of this data product already exists in the DRA for the nominal Nolan model, thus it can be produced during all phases of the DRM whenever updates to the input data are received.

Time to produce varies from hours to days, depending on the specific algorithm used.

Product will be delivered once per phase after updated shape model is made available.

Data Product Structure and Organization

This data product is delivered as an Ancillary File (see [Proposed Map-making Tools for Creating and Editing 3D Maps](#)- Located in Science Team Wiki), a FITS-formatted ASCII table. There will be one file that is updated as new input data is made available and processed.

Data Format Descriptions

The data will be distributed as an Ancillary File tied to a shape model, as described in the RSWG [SIS](#).

The header information will detail which input products were used to generate this data product.

Data Product Generation

This data product is generated by the Radio Science Working Group.

Algorithms are being developed by the RS team. The latest state of the art in this approach is summarized in:

Y. Takahashi, D.J. Scheeres and R.A. Werner. “Surface Gravity Fields for Asteroids and Comets,” submitted to Journal of Guidance, Control and Dynamics, Vol. 36, No. 2 (2013), pp. 362-374. doi: 10.2514/1.59144

The inputs to this algorithm are listed above.

Multiple versions of the product will be generated as more/new inputs become available, and as time passes. At any given time, however, there will be one official version of the data product. The cadence will vary as it depends on when new data appears, and how long it takes to process said data.

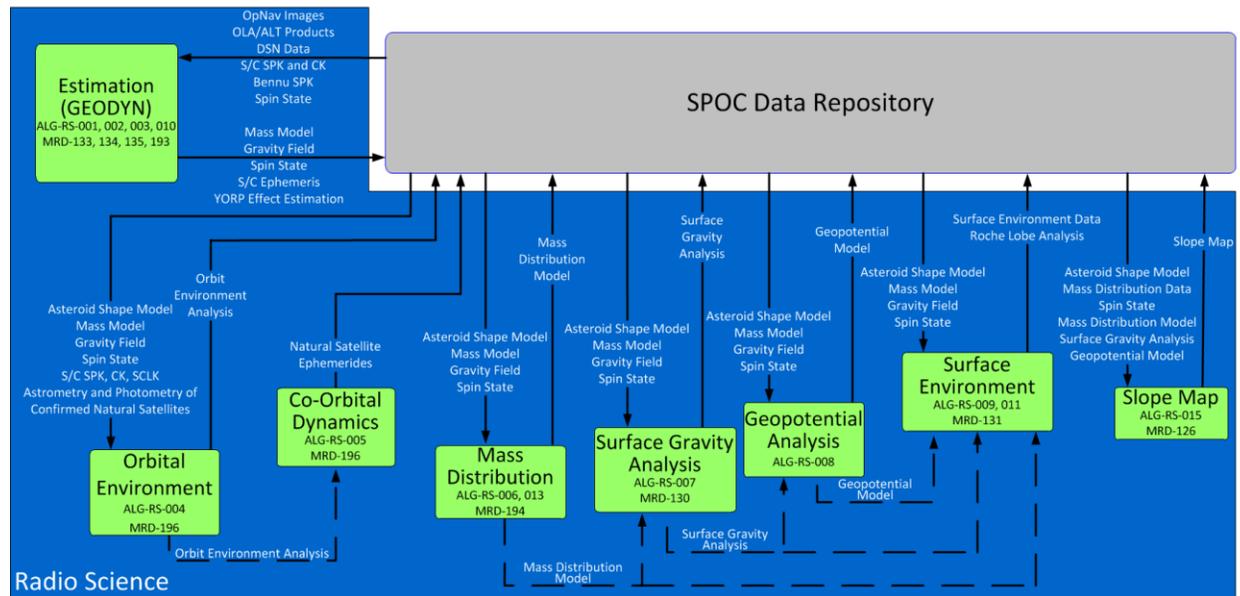
The process of generating this data product is discussed [here](#). (See MRD 126, 130, 131, 194)

Data Product Validation

Verification will be ascertained by comparison with legacy computations and analyses, with known models and analytically derived results.

Data Flow

In the current RSWG data flow diagram, shown below, the generation of this data product can be found in the fourth box from the right.



Data flow for this data product is simple: inputs come from the SPOC (or directly from other RSWG algorithms), go through our algorithm, and the data product is produced.

The file size for this product can be fairly large, but depends on the resolution at which the surface is computed. The minimum resolution is 1-m, which would correspond to a file of roughly 30 MB.

Standards used to generate data product

This data product assumes the reference frame which is the basis for the latitude-longitude definition.

Data is stored as a FITS ASCII table.