

MRD 131- Roche Lobe

Data Product Overview

The "Roche lobe" data product describes the 3-dimensional surface inside of which a particle can be guaranteed to be bound.

Overview

This data product is for science value and long-term science.

This product will be delivered as a data table that contains a list of points in space that describe the 3-dimensional surface at a minimum of a 1-m resolution.

Inputs:

Asteroid Shape Model

Mass Model: [Asteroid Mass Model \(MRD-133\)](#)

Gravity Field

Spin State

Mass Distribution Model

Gravity Surface Model

Geopotential 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 is on the order of minutes.

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 ASCII file. There will be one file that is updated as new input data is made available and processed.

Data Format Descriptions

The data file will be formatted as a shape as a set of vertices and facets in Wavefront (.obj) format. The full data file description is in the RSWG [SIS](#).

Data Product Generation

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

There are a wide range of different algorithms and approaches used to determine the surface environment. An introduction to, discussion of, and citations to relevant papers is found in the citation:

D.J. Scheeres, *Orbital Motion in Strongly Perturbed Environment: Applications to Asteroid, Comet and Planetary Satellite Orbiters*, Chapter 10, Springer, 2012.

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.

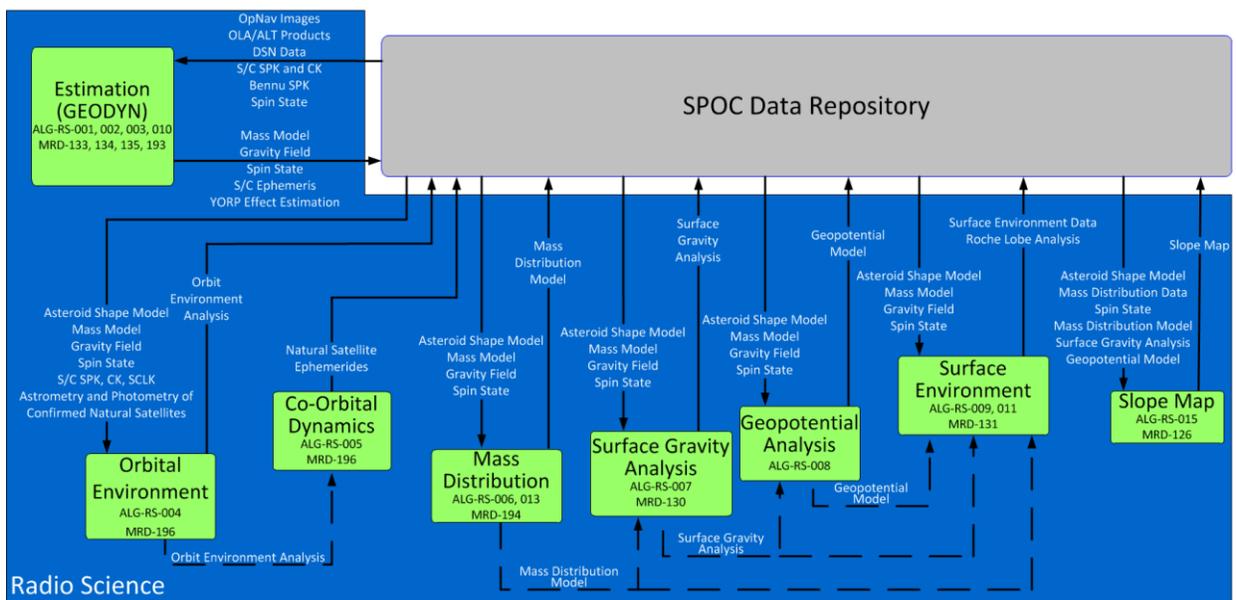
The process of creating this data product is described [here](#). (See MRD- 126 130, 131, 194)

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 second 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

The main standard is the reference frame used to define each 3-dimensional point, which will be listed explicitly in the file header.

Data is stored as ASCII.