MRD 125- Asteroid Coordinate System

Data Product Overview
The location of the prime meridian for Bennu. The angle in longitude will be relative to the orientation of the largest moment of inertia of the asteroid derived from its shape. The location of the geological feature that will be associated with the prime meridian will be determined by the OSIRIS-REx team during the encounter with Bennu. We will attempt to define a most suitable prime meridian from approach imaging that we intend to maintain throughout the entire rendezvous with Bennu so as to minimize re-processing of all the data products produced during the encounter. We might re-adjust the geological feature associated with the given prime meridian (without altering the prime meridian) after the encounter if a more suitable geological feature is found. For exceptional conditions, we will change the location of the prime meridian after we have sampled the surface. The rotation angle in longitude that defines the separation between the prime meridian and largest moment of inertia of the asteroid will be applied to all the shape model and topographic maps produced by the ALTWG so as to align these data with mission approved asteroid-axes.

Overview
Simple text file describing the longitude of the prime meridian relative to the axis defining the largest moment of inertia of the asteroid.

The only data required to determine the prime meridian angle is a shape model and the location of the geological feature that defines the prime meridian on Bennu.

Data Product Structure and Organization
A simple ASCII file of the rotation in degrees needed to rotate Bennu's axes from those defined by its moments of inertia, to those defined by the geological feature associated with the prime meridian.

Data Format Descriptions
An attached ASCII label file describing the vintage of the shape model, and what other AL data were used to compute the location of the prime meridian.

Detailed Description of data format

Data Type – ASCII file with one number.

Field:
Rotation angle needed to go from axes defined by Bennu's moment of inertia, to Bennu's prime meridian.

Data Product Generation
This product is generated automatically after each shape model is produced by the ALTWG, as soon as the OSIRIS-REx science team identifies a geological feature that is suitable for designation as a prime meridian.

The rotation from axis defined by the larger angle of momentum will change with each shape model. However, once chosen, the feature that will be used to define the prime meridian will not move, even as it resolution will increase.

The identification of a suitable geological feature to be used as the prime meridian will be proposed by the ALTWG and then vetted by the science executive committee and the mission PI very early during the Approach phase of the mission. It will also need to ultimately approved by the IAU. This process has already been exercised when Nolan published his recent Bennu manuscript.

Data Product Validation
This data product will be validated during software development, by using known telemetry data, and known validation data sets that we reproduce in our analysis. Much of our algorithms have heritage from Hayabusa and MESSENGER.