GENERATING PHOTOMOSAICS OF SMALL BODIES IN PREPARATION FOR THE OSIRIS-REx ENCOUNTER WITH ASTEROID BENNU. D. N. DellaGiustina\(^1\) C. A. Bennet\(^1\), D. R Golish\(^1\) and N. Habib\(^1\),
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**Introduction:** The primary objective of the Origins, Spectral Interpretation, Resource Identification, and Security-Regolith Explorer (OSIRIS-REx) mission is to return a pristine sample of carbonaceous material from the surface of primitive asteroid (101955) Bennu. Understanding the geological context of this sample is critical to linking the nature of the sample to the global properties of Bennu and the broader asteroid population [1]. This abstract presents image mosaicking of small bodies that is being conducted to support the primary objective of OSIRIS-REx. Image processing techniques will be used to generate panchromatic image mosaics that will serve as basemaps for several higher-level thematic maps of Bennu, including geological maps. These products will be essential for mission planning and evaluating the most scientifically valuable site for eventual sample collection.

**Methodology:** The longitude-latitude-radius system is suitable for larger planetary bodies with sufficient convexity. Small bodies, however, are often irregularly shaped with regions that cannot be uniquely addressed with longitude and latitude [2]. Using the Integrated Software for Imagers and Spectrometers (ISIS) 3 [3], the image processing team will develop global and site-specific controlled mosaics using photometrically corrected panchromatic and color images of Bennu. To support this work, ISIS3 has recently implemented several new applications that better perform image projection for small irregular bodies. These applications allow direct use of 3D tessellated shape models in place of an ellipsoid or rasterized digital elevation model (DEM), providing a more accurate projection of the image and estimate of the pixel size. In preparation for encounter of OSIRIS-REx with asteroid Bennu, we are testing these improved capabilities along with recent enhancements to ISIS3 image matching routines, such as *findfeatures* using NEAR MultiSpectral Imager (MSI) data of Asteroid 433 Eros.

The photomosaic of 433 Eros mosaic described in this abstract uses a Digital Shape Kernel (DSK) with >3 million facets. A DSK is a tessellated plate model format developed by NASA’s Navigation and Ancillary Information Facility (NAIF), which allows SPICE (Spacecraft, Planet, Instrument, Camera-matrix, Events) geometry calculations to be performed on irregular bodies to a high degree of accuracy [4]. The DSK used in this work was derived from the 2008 Gaskell shape model of Asteroid 433 Eros [5]. Using the ISIS3 tool *isisminer*, images of Eros are culled from the global dataset. Only data with favorable resolution and illumination were selected as input to the mosaic. Images are then globally controlled using the image matching capabilities provided by *findfeatures*. Finally, all data is photometrically corrected using the Hapke model derived by Li 2008 [6] (Figure 1).

![Figure 1. Simple cylindrical photometrically corrected global basemap of Eros produced using recent improvements to ISIS3.](image1)

After production, the mosaic of Eros can be viewed in 3D using Small Body Mapping Tool (SBMT). A utility written by the OSIRIS-REx imaging team will translate an ISIS3 cube into a file format compliant with SBMT. Viewing the mosaic draped over a 3D shape model provides a powerful tool for visualization and subsequent thematic mapping (Figure 2).

![Figure 2. Photometrically corrected image mosaic on the 3D shape model displayed using the SBMT.](image2)