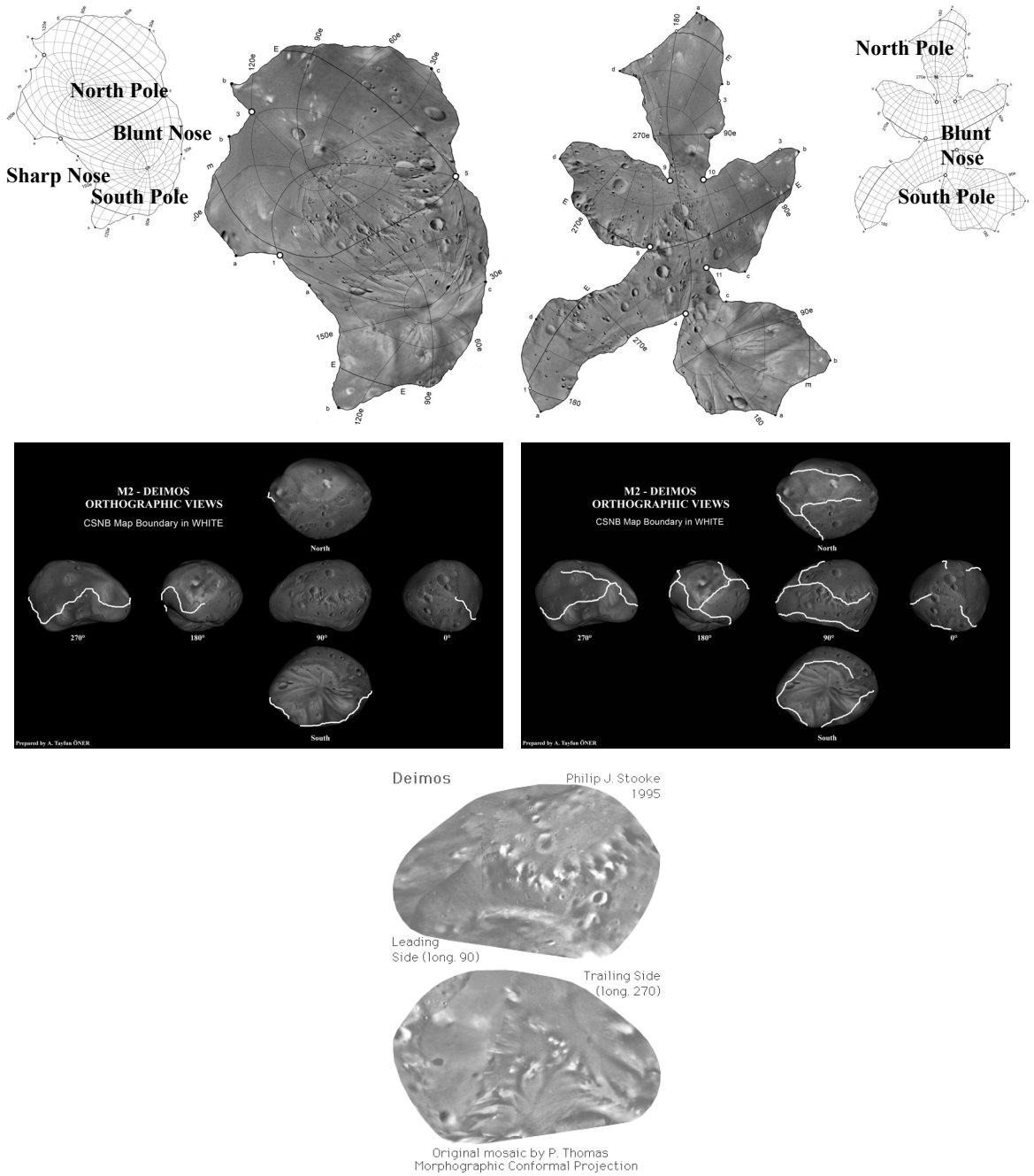
USING BOUNDARY-BASED MAPPING PROJECTIONS FOR MORPHOLOGICAL CLASSIFICATION OF SMALL BODIES. P.E. Clark[1],C.S. Clark[2], and P. Stooke[3]. [1]Catholic University of America, at NASA/GSFC, Greenbelt, MD 20771 (pamela.e.clark@nasa.gov); [2]Chuck Clark architect, 1100 Alta Avenue, Atlanta, GA 30307 (leftbasicbuilding@yahoo.com); University of Western Ontario, London, Ontario, CA N6A-5C2 (pjstooke@uwo.ca)

Purpose: We are continuing to explore the utility of Constant Scale Natural Boundary (CSNB) map projection [1,2,3,4] systematically applied for revealing surface morphology [5,6,7,8,9] of small, irregular bodies.

Comparison of CSNB to other Map Projections: We are now applying the CSNB projection to Deimos, using topography and shaded relief maps as background. We are using the most prominent feature, a near-equatorial ridge, as the external boundary. Shown in figure below are the more traditional looking minimized CSNB projection, with the poles in the center, as well as the less traditional segmented projection, indicating the extent and distribution of topographic facets, bounded by the most prominent equatorial feature with the blunt end in the center, as an indicator of morphology. Compare Mercator plot of topography (T. Oner) [8], 3D Mosaics (P. Thomas) [5], and Conformal Projection (P. Stooke) [9] (shown in the figure as well). As in the case of Eros, the mercator map, although familiar and thus allowing instant orientation, maintains neither proportion nor resolution, producing great distortion at higher latitudes [10]. 3D mosaics require more than one view to illustrate what CSNB and conformal projections show in flat maps. Understanding morphological patterns requires minimizing the distortion in important features. CSNB maps are designed to be conformal for antipodal areas and to preserve proportions in map interiors. The CSNB map shows the crater distribution, relative to the most prominent feature, as well as the radial distribution of albedo features relative to the south pole, on one map. The albedo feature associated with the nose is also clearly visible. The 'Segmented' CSNB projection preserves resolution as well. A disadvantage in use of the less traditional segmented CSNB projection is the vigilance required to keep track of features to allow orientation.

Implications for Understanding Asteroid Morphology: As in previous studies, CSNB maps allow relationships between noses, saddles, and poles to be observed without areal distortion. Local maxima and minima in topography, representing bombardment history, are clearly aligned with map boundaries and thus emphasized on the CSNB segmented map. The mercator projection does indicate a topographic boundary in the equatorial region, as well as sharp and blunt ends, but distorts the proportional extent for these features due to north south and east west asymmetries in the shape of Deimos. The CSNB segmented map yields the least distorted distribution of feature coverage and patterns in their distribution relative to facet edges. The distribution of structural (crater) and albedo features along prominent ridges oriented radially or concentrically to the map edge 'boundary' are clearly illustrated, as well as the asymmetry in the distribution of structural boundary-forming and albedo features, in opposite hemispheres.

References: [1] Clark C.S. (2002), LPS XXXIII, #1794; [2] Clark C.S. (2003) ISPRS, 34, XXX; [3] Clark C.S et al (2006) (in this publication) ; [4] Clark P.E and Clark C.S. (2005) LPS XXXVI, #1423; [5] Thomas P. et al (2002) Icarus, 155, 1, 18-37; [6] http://near.jhuapl.edu; [7] Cheng A. and Barnouin-Jha O. (2002), LPS XXXIIII, #1522; [8] Oner A.T., http://www.solarviews.com/eng/asteroid.htm; [9] Stooke P., http://www.ssc.uwo.ca/geography/ space-map/contents.htm; [10] Krantz S. (1999), American Scientist, 84, 436.



Map Projections of Deimos. Top Row: CSNB Projections with most prominent feature, an equatorial ridge, as external boundary, with shaded relief of compressed version indicated on left, lines of latitude and longitude for this projection indicated in middle, and segmented (along prominent facets, with blunt end in the middle) indicated on right . Middle Row: 3D mosaics in 6 orientations with boundaries drawn for compressed projection on left, and segmented projection on right. Bottom Row: Conformal projections of east and west hemispheres on right.