A NEW MAPPING APPROACH FOR HIGHLAND MATERIALS IN THE SOUTH POLAR REGION OF MARS. E. J. Kolb[1], K. L. Tanaka[2] and J. A. Skinner[2], [1]Arizona State University, Dept. of Geological Sciences, Tempe, AZ 85287, eric.kolb@asu.edu, [2]Astrogeology Team, U.S. Geological Survey, 2255 N. Gemini Dr., Flagstaff, AZ 86001.

Introduction: Previously, we have reported on preliminary geologic mapping results for south polar specific map units, including the Dorsa Argentea Formation and the south polar layered deposits and other associated units [1]. Now, our attention is focused on completing a 1:5,000,000-scale map covering latitudes 60°-90°S. including ancient highland rocks. Viking-based geologic mapping at 1:15,000,000 scale [2] and other earlier work utilized mapping approaches that we now feel require revision.

As discussed in [3], planetary surfaces can properly be fitted into either (1) rock-stratigraphic units based on rock type (e.g., lava flows, impact breccia, and sedimentary deposits) and/or (2) allostratigraphic units that consist of event/episode related rock assemblages. These types of units are used in terrestrial geologic mapping. Previous planetary mapping has strayed beyond these unit types and have included secondary tectonic or erosional structures or other features not related to primary materials and/or events (e.g., see discussion in [4]). Our mapping approach therefore is more conservative in that fewer map units are delineated. In addition, it is more informative as we institute new contact types [3] to document more fully the types of changes occurring across contact boundaries. We feel that this more careful approach is robust and provides a meaningful expression of the geologic history of the martian highlands, yet flexible enough to accommodate the inherent challenges of geologic complexities and data limitations.

Several contact boundary symbols from [5] were used to best display the relationships between adjacent material units: they include certain (solid), approximate or inferred (dashed), scratch (no line), and gradational (thick hachured line). Secondary structures such as ridge features or fractured terrains do not represent primary rock characteristics and have been delineated using various stipple patterns.

Geologic Mapping: Noachian materials within the study area consist of the cratered highland plateau sequence (Npl). These materials have been divided by [2] into units Npl_1 and Npl_2 based largely on density of craters >10-km-diameter and <10-km-diameter respectively. Secondary modification features observed within areas of units Npl_1 and Npl_2 were used by [2] to further subdivide the highland plateau materials into the dissected unit (unit Npld), ridged unit (unit Nplr) and etched unit (unit Nple). Because these features are unrelated to the primary formation of the highland materials, we have reassigned outcrops previously mapped as units Npld, Nplr, and Nple to either unit Npl_1 or unit Npl_2. At the same time, we have been careful to map in appropriate detail the structures and morphologic features that had been previously used to separate the Noachian units. Since the main criteria in delineating units of Npl_1 and Npl_2 are crater density and modification state, in theory and practice where the two units are adjacent to each other, the nature of the contact is gradational. We also see local evidence of hiatuses between the units, such as in the emplacement of local deposits and the formation of tectonic and erosional structures (Figure 1a). Therefore, where the highland units are in contact, our use of gradational contact lines is proving to be an effective tool in representing the event/episode relationship between the two units.

Another example of this mapping approach is of the Sisyphi Planum region shown in Figure 1b. Within this region, highland terrain exhibiting closely spaced flat-bottomed troughs and knobs several kilometers in size or larger were mapped previously by [2] as unit Nple. MGS-based mapping indicates that the trough and knob features are related to secondary modification of the ancient materials. Moreover, the secondary features overprint adjacent early Hesperian materials. In both examples we have used a red stipple pattern to represent the secondary features as well as several contact lines that include scratch, gradational, approximate, and certain.

References: [1] Tanaka K. L. and Kolb E. J. (2001) *Icarus, 154,* 3-21. [2] Tanaka K. L. and Scott D. H. (1987) *USGS Map I-1802-C.* [3]

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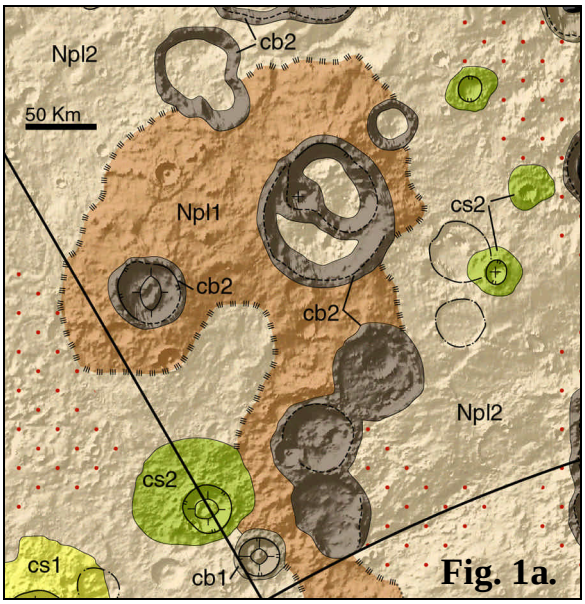

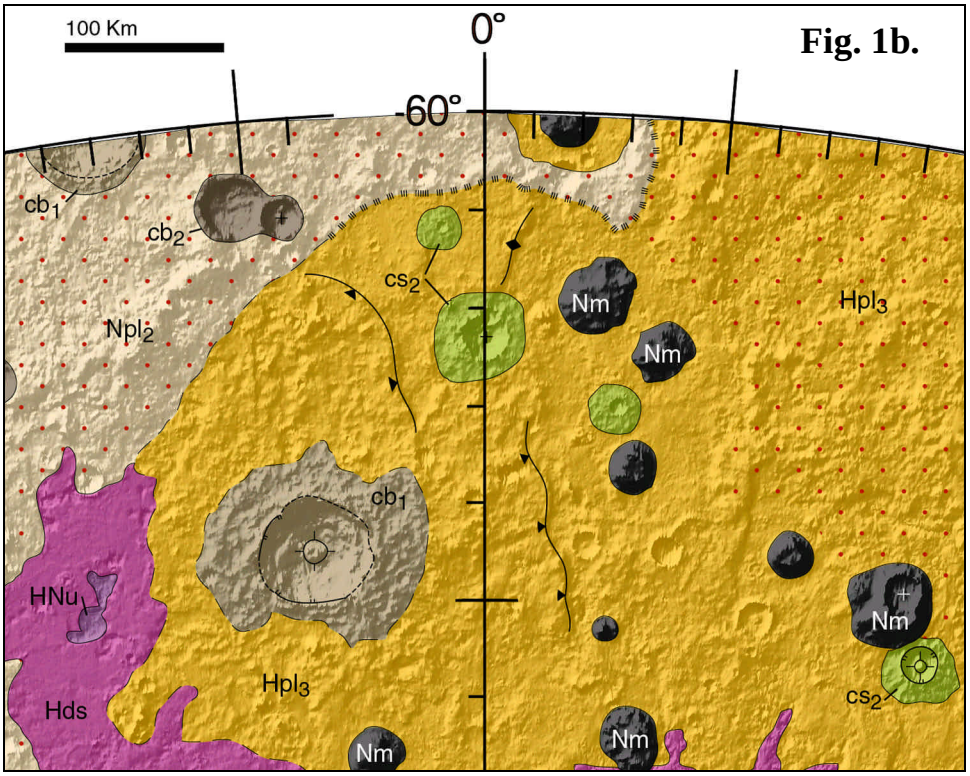

Figure 1a-b. Both figures highlight the use of several contact boundary symbols as well as stipple patterns. Figure 1a shows an area of highland terrain directly west of Sisyphi Planum. Figure 1b shows Noachian and Hesperian terrain within Sisyphi Planum. In both figures, the dashed contact line represents approximate contact boundary locations. The thick hachure contact line represents a gradational contact. Note the morphologic stipple pattern and use of scatch contacts (red dotted area) showing trough and knob highland terrain and erosional features.