DIGITAL GLOBAL GEOLOGIC MAP OF THE MOON AT 1:5,000,000-SCALE: GLOBAL UNIT CONCATENATION, BOUNDARY RECONCILIATION, AND LINEAR FEATURE MAPPING. C. M. Fortezzo[1], P. D. Spudis[2], and S. L. Harrel[3]; [1]U.S. Geological Survey, Astrogeology Science Center, 2255 N. Gemini Dr., Flagstaff, Arizona 86001 (cfortezzo@usgs.gov); [2]Lunar and Planetary Institute, Houston, Texas; [3]Northern Arizona University, Flagstaff, Arizona.

Introduction: In 2013, we completed an initial digital renovation of the six 1:5,000,000-scale lunar geologic maps [1] (near, central far, east, west, north, and south sides) [2-7]. This renovation allows the older geologic maps to be overlain on newer, higher resolution datasets including the Lunar Reconnaissance Orbiter Camera Wide Angle Camera mosaic and the Lunar Orbiter Laser Altimeter digital terrain model. The renovations involved redrafting the line work from the previously published maps, with only minor reinterpretations.

We are currently in year one of a two-year project to create a seamless, globally consistent, 1:5,000,000-scale geologic map, a global correlation of map units, and their description of map units derived from the six digitally renovated geologic maps. The goal of this project is to create a resource for science research and analysis, future geologic mapping efforts, be it local-, regional-, or global-scale products, and as a resource for the educators and general public interested in lunar geology. Here we present the progress to resolve inconsistencies in geologic units and structures across the map boundaries and the consolidation for the correlation of mapped units.

Methodology: Using geographic information system (GIS) software, we are matching the boundary areas of the east side, central far side, and west side maps and cleaning the overlapping areas between the poles and near side maps. The east, central far and west maps abut each other allowing units to simply be matched across the boundary (**Figure 1**). The polar maps overlap the boundaries of east, central far, west, and near side maps by 5 degrees (**Figure 1**). And finally, the near side map overlaps the two poles and the east and west side maps to varying degrees given its irregular shape. Within these overlaps, we are creating a seamless boundary between the maps that respects the original authors interpretations and fits the concatenated global unit scheme.

There are 203 units across the 6 maps with some units exactly the same, some similar, and some completely unique. We have devised a global unit scheme that will allow us to more consistently stitch together the maps, display the units within the final global product, and correlate the units with respect to time and to each other. The first attempt for this scheme includes 43 established units leaving 18 unresolved outliers. As we progress, these outliers will either be lumped in with other units or be incorporated into the global scheme.

A NASA Space Grant student is mapping all surface features in a consistent manner, something the original maps did not do (Table 1). These features are being mapped using ArcGIS and include crater rim crests, buried crater rim crests, basin rings, fissures, grabens, scarps, mare wrinkle ridges, faults (generic unless type can be determined), troughs, rilles, and lineaments.

Table 1: Linear features mapped (X) in the original map.

Map\Symbol	Near	East	West	Central	North	South
Certain Contact	X	X	X	X		X
Approximate Contact					X	
Queried Contact		X				X
Crater Rim Crest						
Buried Crater Rim Crest		X	X	X	X	X
Basin Ring Structure	X	X		X	X	X
Basin Ring Structure, Inferred		X				
Fissure or Narrow Graben						X
Sinuous Ridge						X
Sinuous Scarp						X
Mare Ridge			X			
Fault			X			
Large Trough			X			
Rille			X			
Slope				X		

Datasets: The Lunar Reconnaissance Orbiter (LRO) Wide Angle Camera (WAC) global mosaic in the visible range provides 100% coverage, at 100 m/pix [8]. The LRO-Kaguya digital terrain model covers from 60°N – 60°S, -180°E – 180°E at 60 m/pix [9]. The Lunar Orbiter Laser Altimeter digital terrain model covers the north and south poles at 20 m/pix [10]. All of these data are used in the stitching and mapping processes.

Year 1 progress: The two abutting boundaries between the east and central far side and west and central far side maps have been reconciled with contacts between units. The unit polygons have been built and the east, central far and west side maps are merged into a single GIS database, heretofore referred to as the far side. The far side map units are still separated by the original map boundaries so that if changes need to be made to the boundary area, as the global schema evolves, it will be easy to locate individual units from the original maps.

All of the units that currently fit into the updated global unit scheme have been updated within the attribute tables of the individual maps. A GIS layer file

with colors corresponding to the abbreviated unit names in the scheme has been generated and applied to all of the individual maps. This application allows us to determine how many discrete unit polygons are affected by the outliers, and helps us decide whether or not to lump them into another unit or incorporate the unit into the global schema. The chosen color scheme is closely linked to the original maps, but some discrepancies exist where shades differed significantly between maps for same or similar units, or where shades were applied to another unit in the same group. Using typical cartographic conventions, the smaller area units preserved in the maps, mostly tied to certain stratigraphically significant features, are generally brighter shades because of their limited areal extents.

Linear features mapped during the renovation of the original maps totaled ~1500 individual features, with over one-third coming from the west side map. Thus far, we have mapped ~1800 features across the east, central far and west side maps. This consistent mapping will allow for analysis of feature types with geologic units, as well as with raster data sets. For LPSC, we will present the far side map with linear features, and the table of unit correlation.

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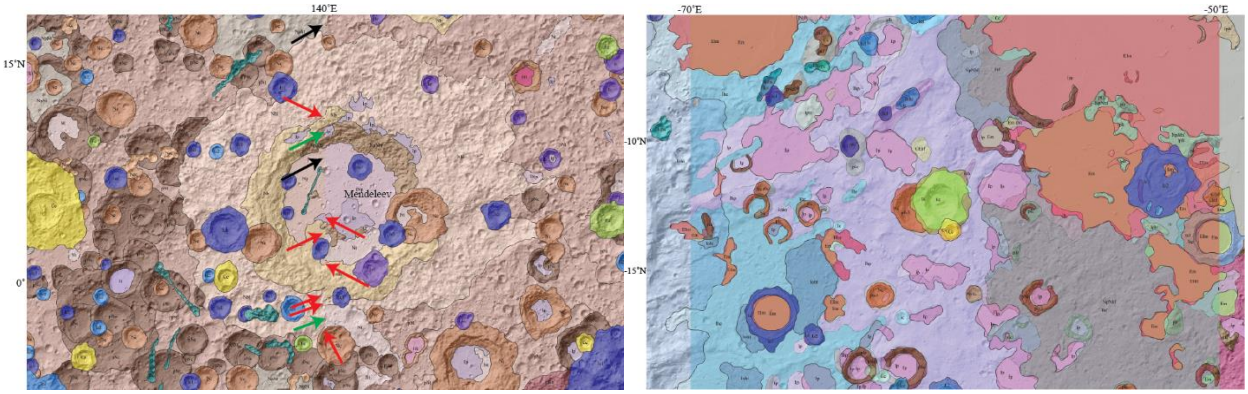

Figure 1: (Left) An example of the abutting boundary, arrows point to misaligned contacts and unit discrepancies. This is the boundary abutment between the central far side and the east side maps. (Right) An example of the overlapping boundary between the west side map and the near side map showing the discrepancies in contact placement, which will corrected and reconciled.