New Views of the Moon 2 - Map Plates and Online Figure Archive
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I. Data Sets

The following assessment is based on the catalog of candidate datasets suggested by chapter leads in the NVM2 Google Doc (https://docs.google.com/document/d/1SUoMXLsiKBUErFgw9ADNikRt_pnD_m9hQrDUWKqmn3g/edit). In order to make our initial assessment of which datasets should be presented as plates vs. those that will be provided only on the online archive, we focused on

A) new datasets acquired since the 2006 publishing of *New Views of the Moon* (NVM1),

B) datasets that could be easily and intuitively combined into a single figure, and

C) datasets that are integral to the science being presented in the individual chapters.

NVM1 had 24 plates, and our assembled list below currently has 22.

It is important to note that this list was compiled only from the Google Doc, and we are not sure how closely it reflects the data discussed in the relevant chapters**. If possible, we would like all the chapter leads to provide a list of figures planned for their chapters so that we can cross-correlate that list with the figure plates list.** For example, if a dataset is not discussed in any chapter, then it can be safely moved to the online archive (OA); conversely if in writing the chapter, a dataset is heavily referenced, but not listed here, we can add it for completeness.

Below, each map is designated (P) for suggested plate, or (OA) for online archive only. <u>Please note that all plates will also be included in the online archive.</u>

1) Elemental Maps

Ilmenite ~~Titanium oxide~~, LRO LROC WAC, Sato et al. (2017) ....(P)

Thorium, LP GRS, Wilson et al. (2018) ....(P)

Iron oxide, Kaguya GRS, Naito et al. (2018)...(P)

Calcium oxide, Kaguya GRS, Yamashita et al. (2012)... (P)

Potassium, Kaguya GRS, Kobayashi et al. (2010)...(P)

Thorium (low Thorium area at Farside), Kaguya, Kobayashi et al. (2012)…………………….........(P)

Uranium, Kaguya GRS, Yamashita et al. (2010)………………………………………………… (P)

Mg# of highland materials, Kaguya SP, Ohtake et al. (2012) ………………………………………(P)

Iron oxide and Titanium oxide map, Kaguya MI…………………………………………………(OA)

Fast neutron, Kaguya GRS, Hareyama et al. (2016) …………………………………………… (OA)

Iron oxide, LP GRS, Prettyman et al. (2006) ....(OA)

Potassium, LP GRS, Prettyman et al. (2006) ....(OA)

Titanium oxide, LP GRS, Prettyman et al. (2006) ....(OA)

2) Mineral locations/rock-type

Olivine, Spinel, Low-Ca px, High-Ca px, feature less rock, and Pure Anorthosite exposure locations.....(P)

> This combined figure would be a global basemap (suggested LROC-WAC global mosaic) with point locations shown for each of the listed mineral types.

Silicic areas, LRO Diviner ....(P)

> The base of this figure would be a Christiansen feature (CF) value map (Greenhagen et al., 2010, *Science 329*) with overlain boxes outlining the highly silicic regions identified in Glotch et al. (2010) (*Science 329*).

3) Maps of Volatiles

Polar Hydrogen, LP NS, Lawrence et al. (2006) ....(OA)

South Polar Hydrogen, LRO LEND, Mitrofanov et al. (2010) ....(OA)

Hydroxyl (OH), M^3, Pieters et al. (2009, *Science 326*, Supplemental Material Fig. 5) ....(P)

Hydroxyl (OH), Deep Impact, Sunshine et al. (2009, *Science 326*, Fig. 2) ....(OA)

Polar Hydrogen (water equivalent Hydrogen), LRO LEND, Sanin et al. (2017)---------------(P)

> *note for all these datasets, we will have to collaborate with the authors to ascertain how the data might be provided in a usable format for an online archive

4) Geophysical Maps

Topography, LRO LOLA, Smith et al. (2010) LDEM 512 px/dg ....(P)

Crustal Thickness, GRAIL, Wieczorek et al. (2012) ....(P)

Lunar Free Air Gravity Anomaly, GRAIL, Zuber et al. (2013) ....(P)

Lunar Bouguer Anomaly, GRAIL, Zuber et al. (2013) ....(P)

Magnetic Field, LP Magnetometer, Richmond and Hood (2008) Fig. 7 ....(P)

Magnetic Field, Kaguya LMAG+ LP Magnetometer, Tsunakawa et al. (2015) Fig. 2 or 4 ....(P)

Roughness map, LOLA, Kreslavsky et al. (2013)?...(OA)

5) Geological Features – shape files

Mare and Cryoptomare boundaries, USGS + Whitten and Head (2015) ....(P)

Lunar volcanic features (IMPs, pyroclastic deposits, sinuous rilles, FFCs, mare pits, domes) ....(P)

These features will all be presented as point data on a LROC-WAC basemap

Lunar tectonic features (lobate scarps, wrinkle ridges, graben) ....(P)

These features will all be presented as line data on a LROC-WAC basemap

Age of mare units, Hiesinger et al. (2011)+updates , Morota et al. (2011)..(P)

Outlines of Geochemical terrains, Jolliff et al. (2000) ....(P)

Geological map of SPA, Kaguya MI, Uemoto et al. (2017) .... (P)

OMAT map, Kaguya MI (?).. (OA)

6) Thermophysical maps

Rock abundance, LRO Diviner, Bandfield et al. (2011) ....(P)

Christiansen frequency – ....This is already covered in the mineralogy maps

H-parameter (thermal inertia), LRO Diviner, Hayne et al. (2017) Fig. 7 ....(P)

Regolith temperature, LRO Diviner, Bandfield et al.(2011) ....(P)

Microwave brightness temperature, Chang'E-1, Zheng et al. (2012, *Icarus*) ....(P)

7) Albedo and backscatter maps

Normal albedo at 1.06 µm, LRO LOLA, Lemelin et al. (2016) ....(P)

Reflectance at low phase angle, LRO LROC WAC, Sato et al. (2014)...(P)

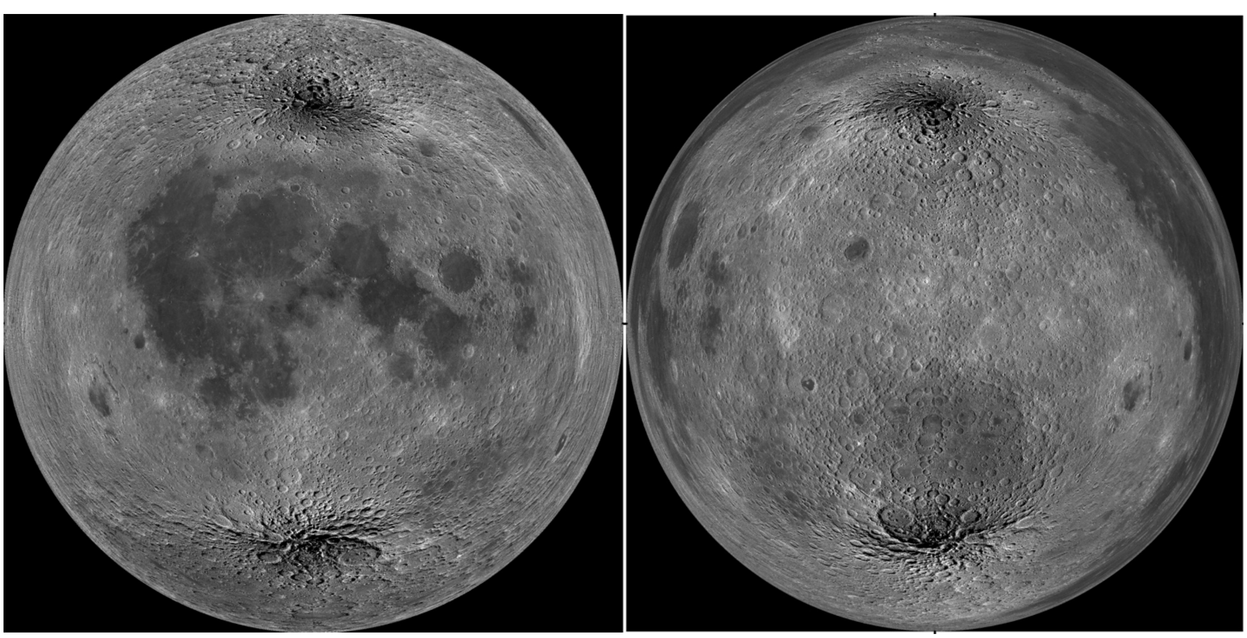
12.6-cm radar backscatter, LRO Mini-RF, Cahill et al. (2014) ....(P)

8 Others

II. Map Projection

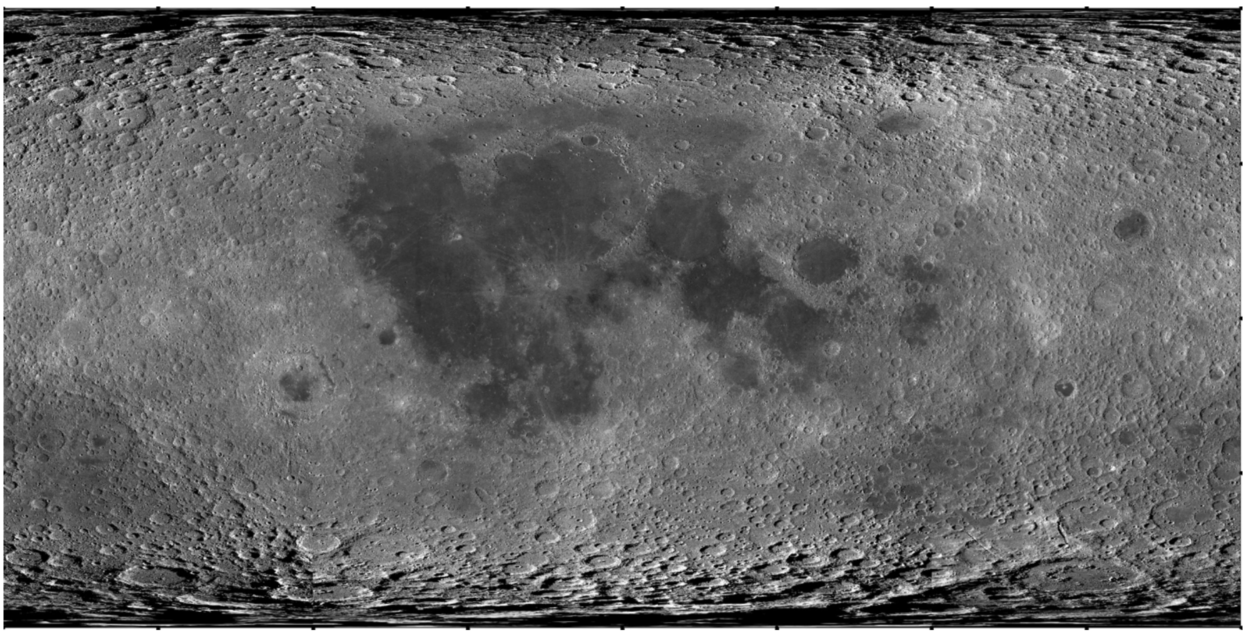
The plates in *New Views of the Moon* (NVM1) all utilize the Lambert Azimuthal Equal Area projection (shown below) with separate plates for the lunar nearside and farside. The projection accurately represents area, but does not accurately represent angles, and it heavily distorts features at the edges of the maps. Its main utility is representing the Moon as it is viewed from Earth. It would be our preference to not utilize this projection in NVM2 because of the distortions present in data at the eastern and western limbs of the Moon (including important regions such as the Orientale basin). As opposed to Lambert Azimuthal Equal Area, we suggest three possible other projections for use in the global map plates: Equidistant Cylindrical, Winkle-Triple, and Robinson, with strong preference given to Robinson. For polar maps, we suggest remaining with the standard polar stereographic projection.

See example maps on the following pages.



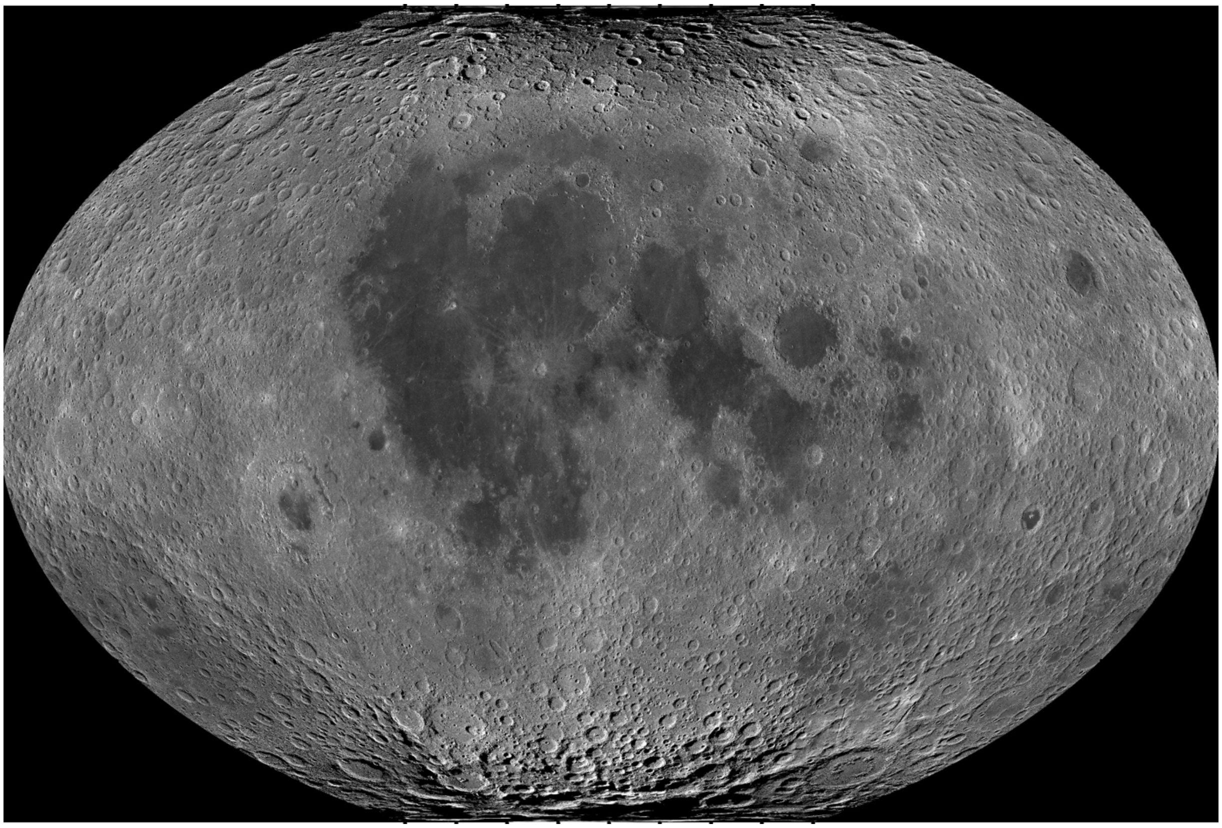
Lambert Azimuthal Equal-Area Projection

1) Equidistant Cylindrical projection: This is the simplest projection and enforces straight, equally spaced parallels and meridians while preserving neither area nor conformation. It is useful for presenting an entire global dataset, but the areal distortion at the poles can be misleading. This is the least preferred option of the three suggested projections.



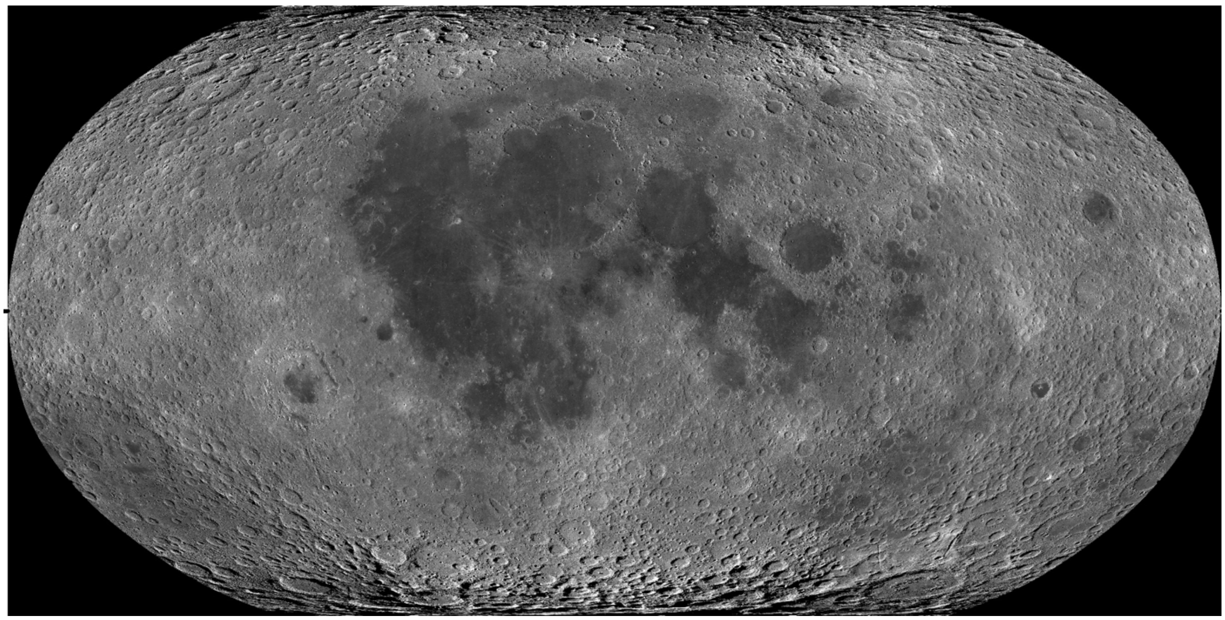
Equidistant Cylindrical Projection

2) Winkel-Triple projection: This is the projection of choice for the National Geographic Society, and minimizes distortions in area, direction, and distance. The meridians and parallels are not straight lines; however, distortion is minimal for all areas except for directly at the poles, which are elongated. This is the most academic of the three suggested projections, and our second preferred projection for the NVM2 maps.



Winkle-Triple Projection

3) Robinson projection: This projection was specifically designed to display an entire globe in a visually appealing way while, at the same time, minimizing distortion. The parallels are straight lines, however, the meridians are not. Distortion is minimal between ±60° latitude, however, distortion increases slightly at higher latitudes, and is distorted at the poles, which are elongated similar to the Winkle Triple. This is a compromise projection, but its visual appeal and minimal distortion make it our preferred projection for the NVM2 maps.



Robinson Projection