

MAPPING WATER AND HYDROXYL ON THE MOON AS SEEN BY THE MOON MINERALOGY MAPPER (M³).

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Introduction: In the recent discovery of water and hydroxyl on the Moon [1, 2, 3], near-infrared lunar spectra were shown to contain absorptions due to adsorbed water and hydroxyl.

We studied the shapes and positions of water and hydroxyl absorptions in the M³ data set using both global mode (85-spectral channels) and target mode (full spatial and spectral resolution) data. Some thermal emission was removed according to [4].

Results: Water and hydroxyl absorptions were analyzed for position and shape using the methods described in [5]. Figure 1 is based on the broad water plus hydroxyl absorption that starts around 2.6 μm and extending to 3 μm . The color code captures the diversity of the shape of the absorption. There are linear downturns from ~ 2.6 to 3- μm , concave curves, stair-step shapes and variations in those themes. The shapes are partially influenced by the strength of relatively narrower hydroxyl absorptions that occur from about 2.7 to beyond 2.8 microns. Different absorption

shapes appear to be associated with diverse geologic units. Some fresh craters show exposed water and hydroxyl absorptions, while other nearby craters show none. Similarly, some older craters exhibit water and hydroxyl, while others do not. Large regions, such as around Orientale, appear water and hydroxyl rich, while others, such as South Pole Aiken Basin, appear water and hydroxyl poor. Mare surfaces also appear to contain less water than the surrounding highlands.

These results point to amazing geologic diversity across the Moon, resulting from complex geologic processes that could involve endogenic water as well as interaction with the solar wind.

References:

- [1] Clark, R. (2009) *Science* **326**, 562-564.
- [2] Sunshine *et al.* (2009) *Science* **326**, 565-568.
- [3] Pieters *et al.* (2009) *Science* **326**, 568-572.
- [4] Clark *et al.*, (2011) *JGR*, In Press.
- [5] Clark *et al.*, (2003) *JGR* **108**, 5-1 to 5-44.

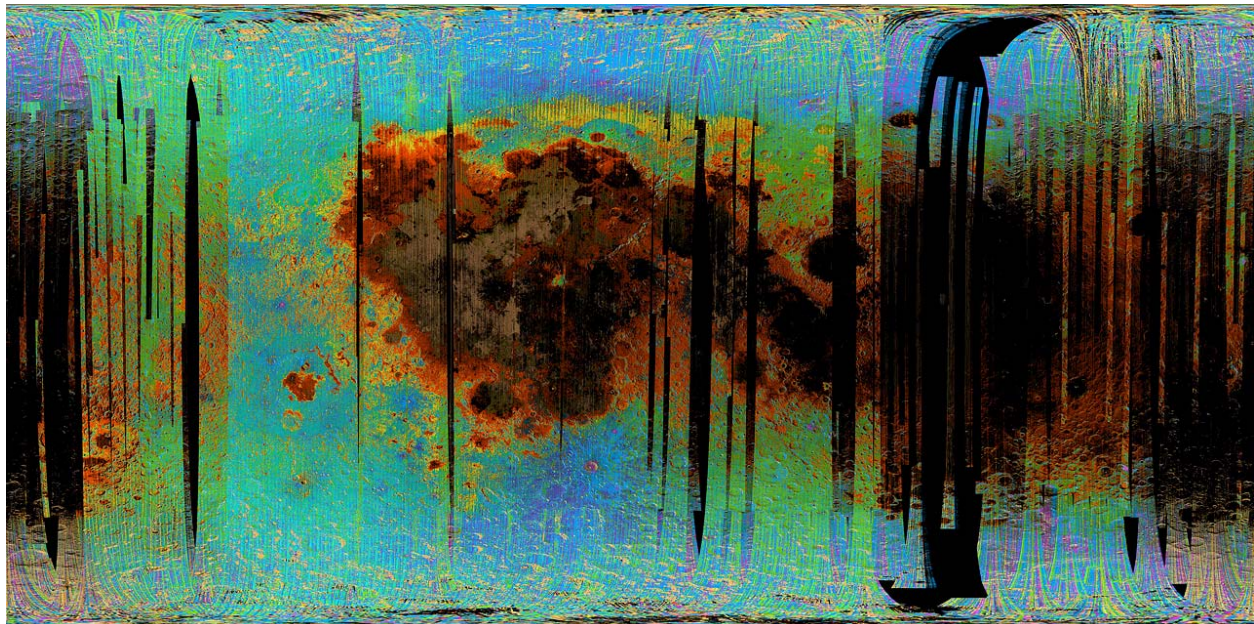


Figure 1. Water on the moon in a simple cylindrical projection. Different colors indicate different shapes for the 3- μm water absorption. The shape is influenced by the presence of narrower hydroxyl absorp-

tions and how water molecules are bound to the minerals and glasses in the rocks and soils.