**AN ANALYSIS OF REMOTELY SENSED DATA OF MARE AUSTRALE.** J. J. Gillis, B. L. Jolliff, Washington University, Dept. Earth & Planetary Science, Saint Louis, MO 63130 (gillis@levee.wustl.edu).

**Introduction:** In a continuing study of mare basalts and factors affecting their composition, volume, and eruption duration (e.g., incorporation of K-U-Th), we examine the compositions of mare basalts and nonmare units on the floor of Australe Basin. This pre-Nectarian basin is located on the southeastern limb of the Moon (52°S, 95°E) [1], far removed from Th-enriched proximal and possible antipodal Imbrium ejecta.

Australe, although one of the oldest basins, lacks younger superposed basins like those found in South Pole-Aitken Basin. Structurally, Australe exhibits two poorly preserved ring structures, an interior ring ~550 km and an exterior rim ~880 [1, 2]. Lacking well-defined ring structures, the Australe Basin is most readily apparent because of its quasi-circular collection of numerous separate basalt deposits. Basalt deposits within the Australe Basin cover about one-third of the basin surface area inside the main topographic rim.

**Mare Australe:** The basin floor is a collection of partly coalescing basalt deposits. This collection of disjointed mare deposits occurs in some cases within craters, but mostly, within intercrater regions of the basin floor. If volcanism had continued within the basin, it might have looked more like near-side maria. The lack of volcanic fill within the Australe Basin provides clues to the early stages of basin-filling volcanism that have been lost due to more extensive volcanism elsewhere.

*Basalt Composition:* Using 0.5º resolution data [3, 4], Th concentrations for 56 of the basalt ponds within Mare Australe average 0.7±0.1 ppm. This is similar to most Apollo and Luna basaltic soils. Clementine derived $TiO_2$ concentrations (250 m resolution [5]) span the lower end of the sample range, from very low to moderate, with most basalt ponds containing <1 wt.% $TiO_2$. The basalt ponds are compositionally different from the Apollo and Luna soils with respect to FeO. The average FeO content of regolith on the surfaces of basalt ponds within the Australe Basin is 11.5 wt.% (Fig. 1; 250 m resolution [6]). Ejecta deposits surrounding young, small craters, which have excavated fresh mare material, exhibit FeO concentrations slightly higher than the basalt surfaces themselves (14-16 wt.% FeO).

*Basin Floor Composition:* On the basis of its size, Australe would have excavated deep into the lunar crust and possibly exposed mid-crustal materials. The nonmare component of the Australe Basin contains 6.4±2.5 wt.% FeO, 0.4±0.3 wt.% $TiO_2$, and 0.6±0.3 ppm Th. The FeO content is slightly elevated with respect to the Feldspathic Highlands Terrane materials, whereas $TiO_2$ and Th contents are similar [7].

**Observations:** The original compositions of the basalt deposits in Australe have been contaminated by impact mixing with nonmare material. This is evident in Fig. 1 where iron increases from the edge to the center of a basalt pond and parallel to the basalt/highland contact. The original composition is estimated by measuring the FeO content of young craters that have excavated less-contaminated material. The basalt deposits with the highest Th content have the highest FeO and $TiO_2$ concentrations. These basalt deposits are found along the outer parts of the basin, tend to be the youngest mare deposits in the basin, and erupted into the topographically lowest parts of the basin.

**Interpretations:** The absolute difference in composition between basalts of Imbrium and Australe reflects the overall compositional difference of the mantle source regions. We suggest that the low concentration of Th in basalt deposits of Mare Australe is related to the low volume of volcanism that has occurred in the basin. Interestingly, the basalt ponds of Mare Australe exhibit a compositional trend whereby the youngest basalts erupted within the basin exhibit the highest $TiO_2$, FeO, and Th contents, a trend also observed in Mare Imbrium, reflecting similar dynamic processes that occurred within the mantle source region.

**References:** [1] Wilhelms, *U. S. Geol. Surv. Prof. Paper 1348*, 1987; [2] Spudis, *The geology of multi-ring impact basins: The moon and other planets*, 1993; [3] Lawrence et al., LPSC XXXIII, abstract #1970, 2002; [4] Gillis et al., LPSC XXXI, abstract #2058, 2000; [5] Gillis et al., *JGR*, in press; [6] Lucey et al. *JGR*, **105**, 20,297, 2000; [7] Jolliff et al., *JGR*, **105**, 4197, 2000.

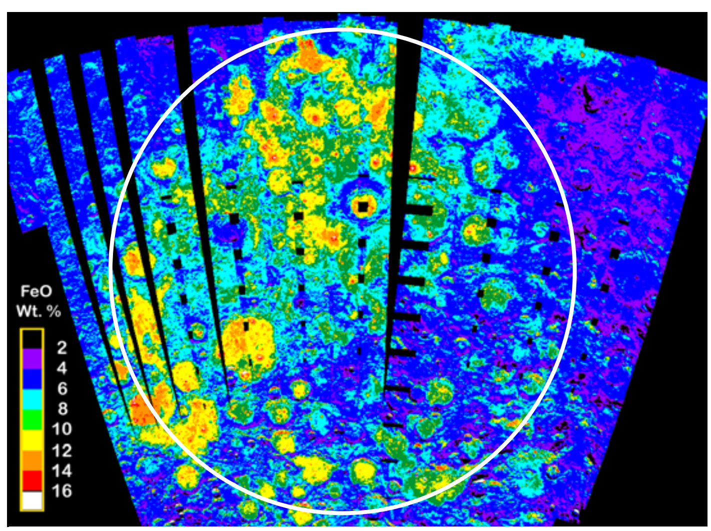


**Fig. 1**. Clementine derived FeO image of the Australe Basin. The white circle represents the 880 km topographic rim of Australe.