RECENT MISSION DATASETS SHED NEW LIGHT ON THE CHARACTER AND FATE OF THE SOUTH POLE-AITKEN BASIN IMPACT MELT SHEET. B. L. Jolliff[1], N. E. Petro[2], C. K. Shearer[3]; C. M. Pieters[4], and J. W. Head[4], [1]Department of Earth & Planetary Sciences, Campus Box 1169, Washington University in St. Louis, One Brookings Dr., St. Louis, MO 63130; [2]NASA Goddard Space Flight Center, Greenbelt, MD; [3]University of New Mexico, Albuquerque, NM; [4]Brown University, Providence, RI (bjolliff@wustl.edu)

Introduction: South Pole-Aitken (SPA) basin, the largest and oldest confirmed lunar basin, represents a high-priority science target for current and future lunar and Solar System exploration [1]. The SPA impact event has been interpreted to have generated a huge volume of impact melt that was on order of tens of km to perhaps 50 km thick [2,3] and perhaps 7×10^7 km^3 volume [4]. That the age of this huge amount of rock was reset by the SPA event makes the age determination of SPA materials of critical importance for establishing the absolute chronology of giant impacts in the inner Solar System. The SPA basin "chronology," which includes ages of other basins and large craters within SPA, provides a crucial contrast to the nearside, Imbrium-dominated chronology.

Recent Results: The column of rock melted probably included a substantial portion of crust and also upper mantle material. A fraction of the upper crust may have been removed to other parts of the Moon, especially the thick, northern farside highlands [5]. The compositional contribution of relatively mafic deep-seated components contributes today to the mafic interior SPA composition as measured remotely. Recent modeling of the fate of this melt volume suggests differentiation [2, 3] to produce the rock types sensed remotely in central peaks, which are dominantly noritic (orthopyroxene- and plagioclase-dominated) in composition [6]. This noritic character does not necessarily reflect mainly crustal materials because a melt sea of tens of km thickness would differentiate, and ultramafic olivine and pyroxene cumulates could form a deep, unsampled keel whereas plagioclase-bearing norite would be expected in the upper parts of the melt sheet [2] or result from more complex interactions with an early, still evolving (overturning) mantle [3] or vigorously convecting impact melt [7]. The detailed composition of the impact melt (and impact-melt breccia) cannot be discerned from orbit, however. Samples of impact melt and entrained clasts are needed to unravel the mixing systematics.

Complicating the surface compositional and mineralogical signature is the mafic contribution from mare and cryptomare volcanics in the basin interior. However, new data are being used to distinguish these deposits and to ascertain their contribution to the basin floor [8-11]. One of the most enigmatic morphological and compositional features is the "Mafic Mound," near the basin center, for which recent results suggest an ancient volcanic origin possibly associated with the SPA impact-melt sheet [3,12], making this area of the basin interior of special interest. Locations exist where the regolith is expected to contain a mixture of Mafic Mound materials, mare and cryptomare volcanics, and yet still be dominated by SPA substrate [e.g., 13,14]. The chronology of samples from regolith in this part of the basin should contain a rich assortment bearing on the age of SPA, the ages of subsequent large impacts, and the age of volcanism both related to and subsequent to the formation of SPA.

New Data Sets: Data on composition, topography and surface roughness [10,11], subsurface density and porosity [15], and relative surface ages by impact crater size-frequency determinations [16] are critical to understanding the geologic history of this key and as yet unsampled terrane of the Moon. Analysis of mission data from Kaguya [17-20], Chandrayaan-1 M^3 [21], GRAIL gravity [15], and LRO [e.g., 10,22,23] are providing new insights to these issues and helping in the identification of potential sampling sites.

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