SIZE DISTRIBUTION OF SPHERULES IN THE PARABURDOO SPHERULE LAYER. N. G. Swartz[1] , A. E. K. Davatzes[1], S. W. Hassler[2], [1]Department of Earth and Environmental Science, Temple University (1901 N. 13th St. Philadelphia, PA, 19122; nicholas.swartz@temple.edu), [2]The Wilderness Society (250 Montgomery St. San Francisco, CA 94104)

Introduction: The Paraburdoo Spherule Layer (PSL), a recently discovered spherule layer close to the Archean-Proterozoic boundary in the Paraburdoo Member of the Wittenoom Formation (Hamersley Basin, Western Australia,) presents an excellent opportunity to study and understand the temporal and spatial evolution of impact plumes [1]. The PSL is ideal for study because it is composed almost entirely of spherules, includes well preserved primary spinel and primary crystal textures, and lacks indications of post depositional reworking [1]. Analysis of the physical and chemical properties of PSL spherules may yield insights into the formation and evolution of the impact plume in which they formed and provide constraints for models of plume formation [2,3].

The focus of this study is on the distribution of spherule diameters in the PSL. Spherule size is controlled by temperature, viscosity, and velocity of materials in the vapor plume. Variation in spherule size will likely represent temporal and thermal heterogeneity within the plume [3]. A total of 762 spherules were identified, classified based on texture, and measured to establish size distributions, volumetric abundance, and the overall textural composition of the spherule bed.

Spherule Types: The PSL contains six types of spherules based on textures and current composition (Table 1). Although diagenetically altered, primary textures and spinel minerals are preserved in some spherules.

% Abundance	Spherule Types Descriptions
1.4	**Barred** texture, likely a relict texture of olivine; now a sheet-like phlogopite texture
44.9	**Fibrous** textures with no distinct orientation of K-feldspar crystallites
32.0	**Clay-rich** spherules with small inclusions of opaque materials
8.7	Massive **carbonate** replacement
2.2	Inward-directed **radial** fibrous fans of K-spar
10.8	**Miscellaneous**

Table 1: PSL spherule textures and abundances.

Methods: We made thin section samples along the vertical thickness of PSL sampls from two locations and petrographically identified, classified, and measured spherule diameters and textures. A 20g sample from the PSL was acidified in a 10% HCl solution to remove carbonate matrix and isolate spherules. Size distribution of the spherules was obtained with a CAMSIZER®.

Results and Discussion: Previous research has shown a large range in the diameters of spherules with different textures [3]. The PSL spherules, however, display relative uniformity of spherule sizes. The six spherule types all show peaks near the diameter range of 0.6mm and predominantly range from 0.2mm to 1mm (Fig 1). These sizes represent minimum values as 2D thin sections rarely transect the exact center of a spherule. CAMSIZER® results show a tight peak centered at 0.8mm, though this represents the long axis of the spherules. The second broad hump in the CAMSIZER® results represents joined spherules. In contrast, Barberton greenstone belt (BGB) S3 layer spherules have diameters (defined petrographically) ranging from 0.25mm to 4mm with values peaking from 0.5mm to 1.5mm for different types [3]. This suggests that the PSL spherules have a cumulatively smaller size population and do not show as much differentiation by spherule types.

The PSL is a fallout layer deposited in a deep water setting; it has a bed thickness of 2cm [1]. The BGB S3 layer is also likely a fallout layer in some sections, but has a bed thickness of 30cm. The smaller size distribution of the PSL spherules is likely indicative of a smaller impact. Unlike the BGB, which displays a distinct difference between sizes of different lithologic types, there is a relatively uniform size within the PSL despite clear variation in texture and composition.

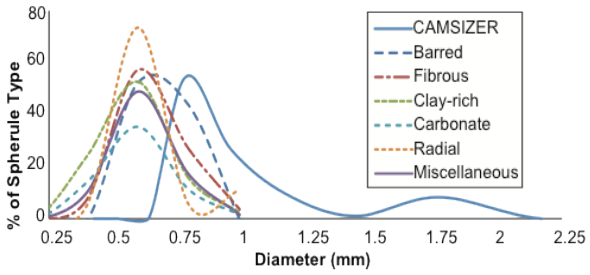

Figure 1: CAMSIZER® distribution and petrographic distribution of spherule sizes by textural type.

References: [1] Hassler, S. W., Simonson, B. M., Sumner, D. Y., Bodin, L. (2011) *Geology* 39, 307-310. [2] Johnson, B.C., Melosh, H.J. (2012) *Icarus* 217, 416-430. [3] Davatzes, A. E. (2011) *42nd LPSC Conference*.

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