PRESERVATION OF SPACE WEATHERING PRODUCTS IN REGOLITH BRECCIAS. S. K. Noble[1], L. P. Keller[2] and C. M. Pieters[1], [1]Brown University, Providence, RI 02912, noble@porter.geo.brown.edu, [2]NASA JSC, Houston, TX 77058.

Introduction: Our understanding of the processes and products of space weathering comes almost exclusively from studies of lunar soils [1]. However, space weathering is highly dependent on the environment in which it occurs, and thus its products are expected to vary from body to body. How does space weathering manifest itself on asteroids, and how does that effect our remote sensing data? Unlike the Moon, we unfortunately have no direct asteroidal regolith to study surface processes. We do however have regolith breccia meteorites, which begs the question: what happens to space weathering products when regolith is fused into rock? Are the products of space weathering, such as rims of nanophase iron on grains, preserved? Are other products produced which are unique to regolith breccias? To answer these questions and to gain insight into the regolith breccia forming process itself, we have examined a suite of lunar regolith breccias of varying degrees of friability/compaction and weathering extent.

Breccias vs. soils: Important differences were observed between ordinary lunar soil and regolith breccia grains. The biggest difference was the amount of glass present in the breccia in the form of glass splashes and coatings on grains (Fig. 1) [2]. Distinct from the vapor/sputter deposited coatings present in both the soils and breccia grains, these glass coatings appear to have been acquired just moments before the breccia was lithified. The composition of the glass rims is variable, but generally similar to that of agglutinate glass, and like agglutinates, they contain ubiquitous nanophase iron.

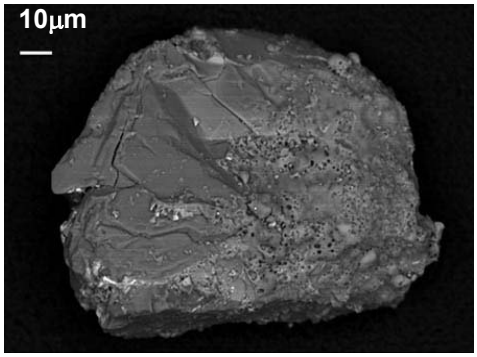

Figure 1. SEM BSE image of a grain from lunar regolith breccia 10068 with an extensive glass coating on the right hand side. The grain was separated using a freeze-dry technique [3]

Preservation of weathering products: A range of regolith breccias have been studied including 79035 (friable), 10068 (friable to coherent), 15505 (moderately coherent/shocked), and QUE93069 (highly compacted and shocked). As was expected, weathering products became increasingly difficult to identify with increasing degrees of shock and compaction. Decreased porosity makes lunar agglutinates difficult to recognize as vesicules are closed. Often the only evidence of weathering products are regions containing, and grains surrounded by, high concentrations of metallic iron blebs. On the other hand, even in the most shocked and compacted sample (QUE93069) space weathering products, though rare, were still observed. These observations suggest that it will be difficult, but not impossible to find evidence of space weathering preserved in regolith breccia meteorites. Their physical form, however, depends on the degree of compaction experienced by the individual breccia.

References: [1] Hapke B (2001) *JGR* **106** E5, 10039-73. [2] Noble S. K. *et al.* (2003) *LPSC XXXIV*, #1626. [3] Basu A. *et al.* (1999) *LPSC XXX,* #1850.