LUNAR GRANULITIC BRECCIAS: DIFFERENCES BETWEEN APOLLO AND METEORITE SAMPLES. J. A. Hudgins and J. G. Spray. Planetary and Space Science Centre, University of New Brunswick, Fredericton, New Brunswick E3B 5A3, Canada.

Breccias with poikiloblastic or granoblastic textures, indicative of high-temperature metamorphism, have been found at most non-mare Apollo sampling sites and within the lunar meteorite collection [1,2,3]. The so-called granulitic breccias (Gbx) were formed when impact breccias containing a mixture of clasts were heated to ~1000ºC [1]. They lack KREEP contamination but are moderately enriched in meteoritic siderophile elements, pointing to a near-surface crustal history dominated by impact events. Due to their ubiquitous nature, they represent a small but common fraction of the lunar crust. Here we present differences in chemistry, mineralogy, and age between the Apollo Gbx (represented by 60035, 77017, 78155, and 79215) and Gbx meteorites (represented by NWA 3163/4881).

Mineralogical differences include the absence of large Fe-Ni metal grains in the meteorites, which are common in the Apollo Gbx and the widespread presence of maskelynite, which is not common in the Apollo Gbx, indicating the meteorites were exposed to higher shock pressures (>28 GPa). Shock effects in the Apollo Gbx suggest shock pressures of <5 – 22 GPa.

In terms of bulk geochemistry, NWA 3163/4881 contains more Ca and Al and less Mg than the Apollo Gbx [2], suggesting higher plagioclase content. In terms of trace elements, NWA 3163/4881 contains lower concentrations of ITEs (e.g., 0.6-1.64 ppm Th for Apollo Gbx vs. 0.11 ppm Th for NWA 3163/4881 [2,3]). NWA 3163/4881 also contains lower concentrations of siderophile elements [2,3] (e.g., 3.6-15.8 ppb Ir for Apollo Gbx vs. 2.3 ppb Ir for NWA 3163/4881). Differences in trace and siderophile elements reflect distinctions in pre-metamorphic composition and impactor contamination.

$^{40}Ar/^{39}Ar$ data from this study reveal that 60035, 77017, and 78155 have peak metamorphic ages of 4.1 Ga, while 79215 has a peak metamorphic age of 3.9 Ga [4]. Ar release from NWA 3163/4481 is complex and Ar systematics have likely been disturbed by post-peak metamorphic events. Currently, one sample of NWA 3163 and one of NWA 4881 are being analyzed using $^{40}Ar/^{39}Ar$ IR step-heating and spot analysis to further evaluate the Ar systematics of the meteorites.

We believe that the parental impact breccias of the granulitic breccias were metamorphosed beneath thick (2-5 km), superheated (~2000ºC) impact-melt sheets or ejecta blankets for <10,000 years. The melt sheets and ejecta blankets must have been associated with large impact craters in order to generate superheated conditions and deposits thick enough to maintain high temperatures for thousands of years. In contrast with previous studies of NWA 3163/4881 [2,3], we believe that these samples were formed by contact metamorphism as opposed to deep burial in the lunar crust. The higher shock pressures registered by the lunar meteorites indicate that the lofting process may be responsible for this overprint.

References [1] Warner J. L. et al. 8th Lunar & Planetary Science Conference. pp. 2051-2066. [2] Fernandes V. A. et al. 40th Lunar & Planetary Science Conference. Abstract#2009. [3] Korotev R. L. et al. 2008. Abstract #1209. 39th Lunar & Planetary Science Conference. [4] Hudgins et al. 2008. Geochimica et Cosmochimica Acta 72. 5781-5798.