PRELIMINARY COMPARATIVE ANALYSIS OF SHOCK METAMORPHISM OF CRYSTALLINE BASEMENT CLASTS IN THE HAUGHTON IMPACT EJECTA LAYER, CANADA. A. C. Singleton[1], G. R. Osinski[1,2], and D. Moser[1], [1]Dept. of Earth Sciences, University of Western Ontario, 1151 Richmond St., London, ON N6A 5B7 asingle2@uwo.ca, [2]Dept. of Physics and Astronomy, University of Western Ontario, 1151 Richmond St., London, ON N6A 5B7

Introduction: The extreme pressure and thermal conditions attained during shock metamorphism at sometimes very limited spatial and temporal scales [1] result in unique microscopic features that remain to be fully explored in some common crustal phases (e.g., garnet, amphibole). This has prompted our comparative analysis of variably shocked and exceptionally preserved crystalline basement assemblages of the Haughton impact structure, Canada.

Methodology: Minerals commonly used as shock metamorphic indicators include quartz, feldspar, and biotite [1,2]. Of these minerals, quartz shows the widest variety of shock effects [1,3]. For this study, samples of Precambrian crystalline rocks were collected from 36 sites within the impact melt breccia unit of the 23 km diameter, 39 Ma Haughton impact structure. These samples have a wide range of density [1.0 to 3.2 ± 0.1 g/cm^3] and physical appearance resulting from shock decompression. The shock metamorphic state of reference minerals, primarily quartz, was determined in representative polished thin sections and compared wherever possible to coexisting phases.

Results: The following is a summary of the shock effects identified in various minerals from this sample suite.

Quartz, Feldspar and Mica: Quartz shows the full range of shock features including fracturing, PDFs, decrease in birefringence, diaplectic melting, full melting with loss of grain boundaries and finally flow banding. As the shock level increases, feldspar displays fracturing, decrease in birefringence, diaplectic melting, full melting with loss of grain boundaries and finally flow. No clear PDFs were observed in feldspar. The majority of the mica grains show kink banding. Mica is absent in samples exhibiting higher shock levels.

Mafic Phases: This sample suite includes many samples containing garnet. Grains become more fractured with increasing shock intensity. No planar features or diaplectic glass has been observed to date. Hornblende and pyroxene in these samples show fracturing and then complete melting and flow at higher shock levels.

Zircon: A small number zircons have been examined in these samples. Overall there seems to be some fracturing at the edges of the grains as the level increases.

Summary: The shock effects identified in these samples range from shock level 1 to level 7 indicating pressures ranging from 2 to 80 GPa. This result agrees with previously published estimates for Haughton samples [4]. The progression seen in quartz and feldspar is in keeping with other studies, and detailed SEM and spectroscopic analyses will follow to further investigate less studied mafic phases and accessory minerals across the well preserved shock and/or density gradients in the ejecta layer clast suite.

References: [1] Langenhorst, F. 2002. *Bulletin of the Czech Geo. Survey*, 77, (4): p. 265–282. [2] Stöffler, D. 1966. *Contributions to Mineralogy and Petrology*, v. 12, p. 15-24. [3] Stöffler, D. 1971. *Journal of Geophysical Research*, 79, (23) [4] Bunch, T.E. et al. 1997. *Lunar and Planetary Science XXIX*.