CHARACTERIZATION OF SHOCK-METAMORPHIC EFFECTS IN QUARTZ FROM SANDSTONES AT THE HAUGHTON IMPACT STRUCTURE, CANADA. L. Ferrière and G. R. Osinski. Departments of Earth Sciences/Physics & Astronomy, University of Western Ontario, 1151 Richmond Street, London, ON, N6A5B7, Canada. E-mail: ludovic.ferriere@uwo.ca.

Introduction: The 23 km diameter and ~39 Ma Haughton impact structure, located on Devon Island, Canada, was formed in Cambrian to Silurian sedimentary rocks and Precambrian crystalline basement gneissic rocks [1]. Previous studies show that Haughton sandstones ("Hs") have undergone melting at low pressures (<20 GPa; [2]). However, even though the presence of planar deformation features (PDFs) in quartz grains has been recognized in relatively less shocked samples [e.g., 2], the distribution and crystallographic orientations of the PDFs in quartz grains from Hs has not been studied in any detail. Here, we report on preliminary petrographic and universal-stage microscope investigations of planar fractures (PFs) and PDFs orientations in quartz grains from Hs samples from the central uplift.

Results: Haughton sandstones are typically fine-grained, well sorted, grain-supported, sub-angular to rounded quartz arenites, generally with authigenic quartz overgrowths. A cement of calcite is visible in some Hs; rare detrital K-feldspar was also noted. Quartz grains show sharp to slightly undulatory extinction and contain abundant fracturing, such as concussion fractures and PFs. Poorly developed, non-decorated planar deformation features (PDFs), generally only 1 set per grain, are visible. Several quartz grains also display grain mosaicism. A few grains contain open PFs with c(0001) orientation and with incipient, possible PDF sets that branch off of the PFs. Very similar features have been described from the Rock Elm structure [3]. Our initial U-stage measurements show that ~35% and ~80% of the PFs and PDFs, respectively, have indexed Miller-Bravais crystallographic orientations equivalent to c(0001). Approximately 17% and 12% of the PFs are oriented parallel to $\xi\{11\bar{2}2\}$ and $r\{10\bar{1}1\}$ orientations, respectively. A few PFs and PDF sets are oriented parallel to other typical crystallographic orientations in quartz; however, better statistics are needed to confirm that these measurements are relevant [4]. Note that only ~4% of the PDF sets remain unindexed, when ~17% of the PF sets are unindexed.

Discussion and Future work: On the basis of the abundant grain fracturing, the abundance of PFs, and the limited number of poorly developed PDFs with characteristic c(0001) orientations, we estimate that the studied Hs samples experienced peak shock pressures of up to ~10 GPa [5]. The present results will be compared with PDFs orientations in quartz grains from Hs cobble-size clasts that were collected from the crater-fill impact melt breccias; we plan also to compare our observations with similar low-pressure shock effects in samples from other known impact structures to further evaluate the influence of target lithology on the resulting shock effects.

Acknowledgments: The present work was supported by the Government of Canada with a PDRF (to L.F.) and an NSERC Discovery Grant (to G.O.).

References: [1] Grieve R. A. F. 1988. *Meteoritics* 23:249–254. [2] Osinski G. R. 2007. *MAPS* 42:1945–1960. [3] French B. M. et al. 2004. *GSA Bull.* 116:200–218. [4] Ferrière L. et al. 2009. *MAPS* (In Press). [5] Stöffler D. and Langenhorst F. 1994. *MAPS* 29:155–181.