THE "BASAL ONAPING INTRUSION": POTENTIAL ROOF ROCKS OF THE SUDBURY IGNEOUS COMPLEX.

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Introduction: The origin of the Sudbury Igneous Complex (SIC) as the remnant of the coherent impact melt sheet at the Sudbury impact structure is now generally accepted. Hindering its early recognition were the fact that is was differentiated, due to its great thickness, and is not flat-lying but somewhat funnel-shaped, due to almost immediate post-impact folding and thrusting. It also has no apparent foot and roof rocks, which are relatively finer-grained melt rocks, with high lithic and mineral clast contents, as observed at the base and top of coherent melt sheets at other impact structures. Here, we present the results of field, petrographic and geochemical studies of the so-called Onaping Intrusion, and discuss its relationship to the SIC.

Results: The so-called basal Onaping Intrusion occurs at ~ 50 % of the upper contact of the Granophyre of the SIC and the overlying breccias of the Onaping Formation [1] . Near Joe Lake, in the North Range of the SIC, this lithology has a fine-grained (0.2-0.5 mm) igneous-textured matrix, consisting mainly of interlocking intergrowths of plagioclase, quartz, K-feldspar, amphibole, clino-pyroxene and biotite. It also contains > 5 to ~ 50% mineral and lithic clasts, with corroded margins indicative of partial melting, corresponding to the lithologies of the original target area. Some quartz grains, usually within granitoid or quartzite clasts, exhibit partially annealed, decorated PDFs. Locally, clast content decreases and matrix grain-size increases towards the contact with the underlying Granophyre of the SIC. Samples closer to the Granophyre exhibit fine-grained granophyric matrix textures and the contact with the Granophyre can be described as gradation over a few meters. X-Ray fluorescence analyses of the Onaping Intrusion at Joe Lake show that it is average composition is more siliceous (~ 67 %) than the average of the currently exposed SIC (~ 63 %) and the North Range Offset dikes (~ 59.2-61.9 %) [2,3].

Discussion: The matrix texture and the presence of clasts with PDFs demonstrate that the basal Onaping Intrusion conforms to the descriptive definition of an impact melt rock. This, together with the geochemical similarities to the SIC and the field relations suggest that the basal Onaping Intrusion may be the roof rocks of the SIC. The early failure to recognize the basal Onaping Intrusion as the potential roof rocks of the SIC may be attributable to the fact that it only occurs at 50 % of the SIC's upper contact with the Onaping Formation. Its absence is likely due to its destruction as a coherent lithology and local removal by explosive melt-fuel-coolant interactions (MFCI) between incoming sea-water and the super-heated proto-SIC impact melt within the Sudbury impact structure [4]. These interactions led to the formation of the bulk of the lithologies of the Onaping Formation as a series of impact melt-related "phreatomagmatic" breccias, containing vitric proto-SIC clasts and only a minor component of impact-related shocked materials.

References: [1] Ames D. E. et al. 2008. *Economic Geology* 103: 1057-1077. [2] Ames D. E. et al. 2002. *Economic Geology* 97: 1541-1562. [3] Carter W. M. et al. 2009. *Geological Survey of Canada Open File* 6134. [4] Grieve R. A. F. 2010. *Meteoritics and Planetary Science* 45: 759-782.