Shock Attenuation within the Manicouagan Impact Structure. Jessie J. Brown, John G. Spray and Lucy M. Thompson, Planetary and Space Science Centre, University of New Brunswick, 2 Bailey Drive, Fredericton, New Brunswick E3B 5A3, Canada. Email: <jessie.brown @unb.ca>

Introduction: This work presents the preliminary results of a shock attenuation survey of the Manicouagan impact structure. Located in Quebec, Canada, Manicouagan is a large (~80 km), complex impact structure situated in multiply-metamorphosed rocks of the Canadian Shield. This study augments the available radial attenuation data [1] and provides new data on shock attenuation with depth for the first time at this structure. We compare our results with theoretical shock profiles produced using the iSALE hydrocode, thus providing a test of iSALE's ability to predict shock distribution in large complex craters.

Shock attenuation study: The availability of drill core at Manicouagan provides an opportunity to examine the relationship between depth and the degree of shock. Samples have been examined at roughly 100 m intervals, down to the maximum depth available (~1.8 km). We also examine samples from surface, in order to construct a radial shock attenuation profile. The level of shock in a given sample is based on the number and orientation of planar deformation features (PDFs) identified in quartz [2]. Evidence for isotropization and melting is also noted. While the majority of samples examined closer the melt sheet (within a few km) comprise allochthonous breccia and are thus heterogeneous in terms of peak shock pressure experienced [3], we emphasize the transition from assorted, wideranging to regularly-decreasing levels of shock at a radial distance between roughly 25 and 35 km, corresponding to a transition from breccia to shocked basement.

Comparison with iSALE modelling: iSALE has been used to model the formation of the Manicouagan impact structure. Shock attenuation profiles versus depth and radial distance for three representative models are shown in Figs. 1 and 2. All three models generate a structure analogous to Manicouagan. The shock attenuation profile presented distinguishes between possible impact scenarios. As can be seen in Fig. 2, iSALE predicts a sudden decrease in shock level at a given radial distance, different for each of the proposed impactors. This distance has been estimated as ~30 km for the Manicouagan structure, based on Murtaugh's [4] report of kink bands in biotite located 33 km from the centre of the structure, as well as the mapped location of collapsed rim material [5].

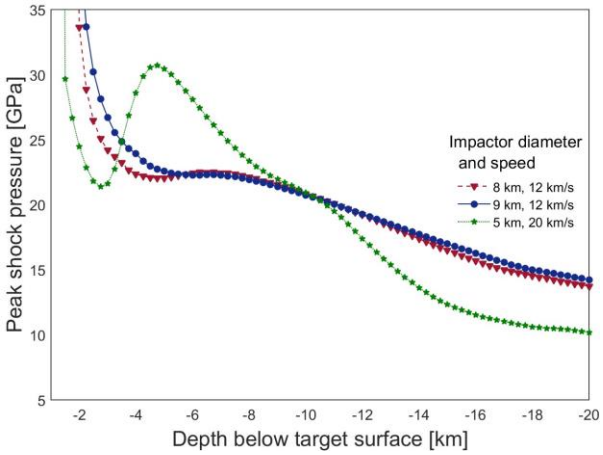

Figure 1: Theoretical shock attenuation with depth below target surface for three modelled impact events. Profiles are all 7 km from the centre of impact. The deepest available drill cores are situated ~5-10 km from the geometric centre of the impact structure.

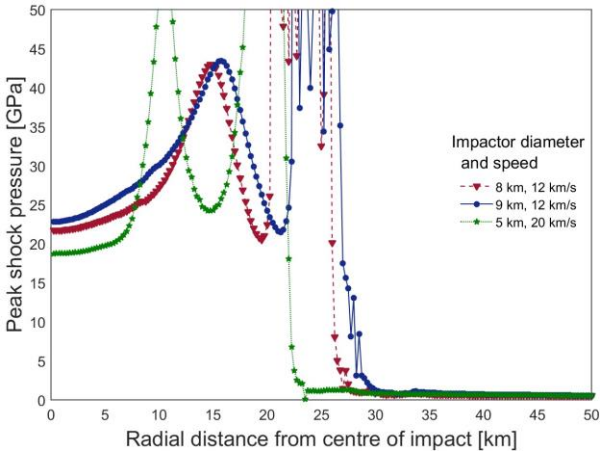

Figure 2: Theoretical shock attenuation with horizontal distance from impact centre for three modelled impact events. These profiles are all taken 3 km beneath the original target surface.

Acknowledgements: We gratefully acknowledge the developers of iSALE-2D, including Gareth Collins, Kai Wunnemann, Dirk Elbeshausen, Boris Ivanov and Jay Melosh.

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