STRUCTURAL MAPPING OF THE TUNNUNIK IMPACT STRUCTURE, NWT, CANADA: INSIGHTS IN TO CENTRAL UPLIFT FORMATION. G. R. Osinski[1,2], R. Francis[1], J. Hansen[3], C. L. Marion[1], A. E. Pickersgill[1], and L. L. Tornabene[1], [1]Dept. of Earth Sciences & Centre for Planetary Science and Exploration, University of Western Ontario, London, ON, N6A 5B7, Canada, [2]Dept. Physics and Astronomy, University of Western Ontario, London, ON, N6A 5B7, Canada, [3]Canadian Space Agency, St. Hubert, QC, J3Y 8Y9, Canada (gosinski@uwo.ca).

Introduction: Complex impact craters are characterized by a structurally complicated rim or so-called terraced zone, a down-faulted annular trough containing a lens of impact melt rocks and/or breccias, and an uplifted central area. Based initially on observations of the Moon, there is an apparent progression with increasing crater size from central peak, central-peak basin, to peak-ring basins [1]. Despite the fundamental nature of central uplifts, there remains considerable debate as to the exact formation mechanisms, timing, weakening mechanisms, and the effect of target lithology. In this contribution, we report on structural mapping of central uplift of the newly confirmed Tunnunik complex impact structure in the Canadian High Arctic based on fieldwork carried out in summer 2012.

Tunnunik: The Tunnunik impact structure is situated adjacent to the Collinson Inlet on the Prince Albert peninsula on northwestern Victoria Island, NWT, Canada. It's impact origin has recently been documented through the presence of shatter cones [2, 3] and planar deformation features in quartz [4]. The age of Tunnunik is poorly constrained at >130 <450 Ma [2]. Based on mapping carried out in 2010 by our group, Tunnunik has an apparent crater diameter of 28 km [3]. The target rocks consist of flat lying sedimentary rocks. The youngest rocks currently exposed at the surface today are the Ordovician to Silurian Thumb Mountain and Allen Bay Formations. Younger Devonian-age rocks may have been present at the time of impact but no preserved evidence was found. Older target rocks include, from youngest to oldest, the Cambro-Ordovican Victoria Island Formation, the Cambrian-age Stripey Unit, Tan Dolostone Unit, and the Clastic Unit. The oldest rocks exposed in the centre of the present-day structure are of the Neoproterozoic Wynniatt Formation of the Shaler Supergroup. Neoproterozoic diabase dykes intrude the latter.

Structural geology: Mapping of the rim region of Tunnunik documented the presence of listric faults out to a radius of 14 km, providing the apparent crater diameter estimate of 28 km noted above. While exposure regionally is poor to moderate, one of the unique aspects of the Tunnunik impact structure is an ~2 km long canyon cut through the edge of the central uplift (Fig. 2), thus providing an unprecedented view in to the internal structure of mid-size complex impact structure.

Fig. 1. Originally flat-lying rocks deformed by inwards-directed thrust faulting in the centre of the structure. The cliff face is ~100 m high.

Detailed structural mapping of the canyon revealed the generally outward-dipping nature of the target rocks; however, orientations range from ~20^{o} to nearly vertical. In some regions, large several 100 m-size blocks are upturned and maintain their internal bedding structures (Fig. 1). In other regions, target rocks are oriented less steeply and bedding parallel thrust faults are exposed. Overall, the central uplift of this structure comprises a series of imbricated blocks of variable thickness bounded by thrust faults. Kinematic indicators show that movement is in towards the centre of the structure, consistent with the inwards and upwards motion during central uplift formation. Internally, the blocks display no obvious signs of deformation, except shatter cones, and large zones of breccia that seem to be required by the acoustic fluidization model for weakening [5], are notably absent.

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