COMPONENTS OF DISTAL SUDBURY EJECTA.

M. S. Huber[1], and C. Koeberl[12]. [1]Department of Lithospheric Research, University of Vienna, Althanstrasse 14, A-1090 Vienna, Austria. E-mail: matthew.huber@univie.ac.at. [2]Natural History Museum, Burgring 7, A-1090 Vienna, Austria.

Introduction: The 1850 Ma [1] Sudbury impact is one of the largest meteorite impact events recorded in Earth history. The economic mineral deposits within the Sudbury crater that are related to the vast differentiated melt sheet are well studied, but the ejecta have not been thoroughly characterized. Impact ejecta have been found from approximately 500 km to 950 km from the crater center [2,3,4]. The most distal ejecta are located in the "Colerain" region of Minnesota, about 950 km from the crater center. Near the US-Canada border in Ontario, a drill core through the ejecta layer was taken near the Pine River ("PR") at a distance of approximately 650 km from the crater center. The nearest ejecta deposits are found south of Lake Superior in the Upper Peninsula of Michigan at the "Connors Creek" location, about 500 km from the crater center.

Different locations have varying thicknesses and compositions of ejecta. The deposits are located in slightly differing geological settings, but are generally similar near-shore continental shelf deposits with mostly thin bedded deposits both stratigraphically above and below the ejecta deposits [3]. Few surface exposures of the ejecta deposits have been found, but the Connors Creek location provides a small outcrop. Although part of the upper portions of the ejected material has been truncated by erosion, about two meters of ejecta are preserved, with glasses and accretionary lapilli as the main impact derived phases. The Colerain and PR samples preserve some of the fine textures lost to alterationand erosion at the Connors Creek location.

Samples have been characterized by petrographic and geochemical analyses. Samples from all sites have similar mineral content, including carbonates, shocked and unshocked quartz, various micas that appear to represent devitrified glass, pyrite, chalcopyrite, sphalerite, and some spherules of organic carbon (possibly locally derived, or possibly of similar origin to organic carbon observed in [5]). Samples are primarily silicates, with up to 23 wt. % Al_2O_3, and 3-4 wt. % MgO and Fe_2O_3. In addition, the trace elements V, Cr, Rb, and Zr are enriched.

From near to far, the main differences between the various deposits are:1) Accretionary lapilli are not present at the most distal locations; 2) Evolution of glass particles from angular towards rounded (spheroidal) shapes; 3) Decrease in the abundance of channel deposits; and 4) Decrease in locally derived detritus mixed with glasses (from ~20 vol% to <5 vol%). These features are consistent with decreasing energy at greater distance from the crater. Thicknesses of deposits are not consistent with the theoretical calculations of [6], likely a result of reworking and wave action following initial deposition. There is a relationship between underlying strata and local expressions of the ejecta layer.

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