

Extreme Isotopic Heterogeneity in Impact Melt Rocks from Manicouagan

STEVEN J. JARET^{1,2}, E. TROY RASBURY², LUCY M.
THOMPSON³ AND JOHN G. SPRAY³

¹Department of Earth and Planetary Sciences, American
Museum of Natural History, sjaret@amnh.org

²Department of Geosciences, Stony Brook University

³Planetary and Space Science Centre, University of New
Brunswick

Impact melt rocks are frequently cited as being well-mixed, chemically homogenous bodies representing average compositions of target rocks [1-2]. We analysed feldspars from a single hand specimen of fine grained quartz monzodiorite from the melt sheet. Feldspars, which have very low U/Pb should represent the initial Pb isotope composition of the melt. Twenty-three individual feldspars, which were leached to remove extraneous Pb, show extreme Pb-isotopic isotopic heterogeneity with $^{207}\text{Pb}/^{204}\text{Pb}$ values ranging from 15.305 to 15.667 and $^{206}\text{Pb}/^{204}\text{Pb}$ values ranging from 16.716 to 19.163. This range is as great as the entire suite of target rocks at Manicouagan [2] and suggests that the melt is not well mixed at a very small scale.

To test if the heterogeneity is unique to impact melts we analyzed individual feldspars from a single hand sample of the Duluth Complex gabbro. The Duluth gabbro show a much smaller range of Pb isotope ratios. $^{207}\text{Pb}/^{204}\text{Pb}$ values range from 15.429 to 15.556 and $^{206}\text{Pb}/^{204}\text{Pb}$ values range from 17.005 to 17.37.

We suggest that extreme initial isotopic heterogeneity may be unique to impact melts and may aid identifying of large, now eroded melt sheets on Earth or other planetary bodies.

References:[1] Kettrup et al., 2003 MAPS;
[2] O'Connell-Cooper and Spray 2011, JGR.