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Conference or Workshop Item

THE STAC FADA "IMPACT EJECTA" LAYER: NOT WHAT IT SEEMS.

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Introduction: The Stac Fada Member (SFM) forms part of the Stoer Group of the Torridonian of NW Scotland. The SFM is unique in the Torridonian, being characterized by the presence of greenish altered glass clasts. Its origin has been debated for decades with several hypotheses being proposed but all invoking some connection with volcanic activity in the region (e.g., [1]). More recently, Amor et al. [2] suggested that the SFM represents "a chord section through the continuous ejecta blanket surrounding an impact crater". Here, we confirm the presence of shocked material within the SFM and then discuss its origin.

Methods: Fieldwork was carried out in August 2008 and June 2009. We performed optical microscopy on 26 polished thin sections using an optical microscope and a four-axis universal stage. Quantitative analyses and investigation of textures were carried out on a JEOL JXA-8900 L electron microprobe.

Confirmation of shocked material within the SFM: The investigated breccia samples display a large heterogeneity of shock effects in quartz grains; including grains with PFs and/or PDFs (mostly 1-2 sets; up to 4 sets per grain). It is notable that some samples contain no shocked quartz grains. The crystallographic orientations of 90 PF and PDF sets in 59 quartz grains were measured by U-stage. A large proportion of the measured PDFs show orientations parallel to $\omega\{10\bar{1}3\}$ and ~12% of the measured PDFs are parallel to the $\pi\{10\bar{1}2\}$ orientation. Amor et al. [2] identified possible PDFs in 25 quartz grains from 9 thin sections. Our observations confirm the presence of PDFs in quartz in the SFM; although several discrepancies are notable.

Impact origin? We have confirmed that the SFM contains shocked material. However, based on a review of all terrestrial impact ejecta deposits and considerations of impact ejecta emplacement [3] we find several observations and properties of the SFM that are *not* consistent with it being a "continuous ejecta blanket" as proposed by [2]. Most importantly, it contains an order of magnitude less shocked material than other proximal impact melt-bearing ejecta layers (e.g., "suevite" from the Ries impact structure Germany [4]); and it is very well sorted compared to other impact ejecta deposits. In this latter respect, it shares many similarities to the Onaping Formation of the Sudbury impact structure, Canada, which has been recently reinterpreted as hot impact melt that interacted with seawater [5]. As such, we propose that the SFM is not of primary impact origin but is more akin to volcaniclastic rocks, which represent volcanic materials that have been *transported* and *reworked* by wind or water. This has implications for the recognition of impact ejecta deposits and their emplacement in H_2O-rich environments.

References: [1] Young G.M. 2002. *Trans. Earth Sci.* 93:1-16. [2] Amor K. et al. 2008. *Geology* 36:303-306. [3] Osinski G.R. et al. 2011. *EPSL* in press. [4] Engelhardt W.v. 1997. *MAPS* 32:545-554. [5]. Grieve R.A.F. et al. 2010. *MAPS* 45:759-782.

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