An Archean Submarine Pyroclastic Flow: The Hurd Volcaniclastic Deposit, Harker Township, Ontario, Canada.

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The Hurd Volcaniclastic Deposit lies within the Kinojevis assemblage, a group of submarine volcanic rocks dominated by Mg and Fe- rich metabasalt. Volcano-sedimentary rocks of intermediate to felsic composition are uncommon. Exposures within the region are remarkable in that they have only undergone mild metamorphism (prehnite-pumpellyite to greenschist facies) and locally very little strain, such that primary textures and in some cases primary minerals (e.g. forsterite) are preserved. The Hurd deposit which dips almost vertically is underlain by a sequence of thin mafic-intermediate lava flows including pillowed facies that contain a 10cm thick interflow chert horizon. It is overlain by a poorly exposed massive basalt flow.

The volcaniclastic deposit has a strike length of over 400m and is approximately 30m at its thickest. It can be subdivided into two units, a lower disorganized massive unit and an upper laminated unit. The lower unit is approximately 15 m thick and has a sharp but undulatory basal contact with the underlying dacitic lavas. It is composed of 10 cm-to-m-scale flow banded lobate dacite blocks interspersed with angular to-curved-to-blocky and equant mm-to-cm-scale fragments of altered glass. Some blocks are partly composed of in-situ breccia, and agglomerations or curvilinear arrays of spherulites. Linear porous zones oriented normal to lithological contacts are interpreted to be gas escape structures. This lithofacies contains well-developed columnar joints that terminate at the sharp contact with the 2m thick upper laminated unit. With the exception of numerous large imbricated platy clasts the laminated unit is dominated by blocky to angular mm-to-cm-scale fragments. These clasts are tabular, typically 4-5 cm thick, and up to 1m in length. Based upon their high aspect ratio and mineral habits they appear to represent the solidified margins of a lava body. They are consistently imbricated 25o to 30o with respect to bedding.

At the microscopic scale a pervasive silicification floods all the intergranular porosity and has likely destroyed any mm or smaller clasts that may have been deposited. Some evidence of plastic deformation of clasts exists, particularly those sampled from within the columnar joints. Altered glass fragments having perlitic fractures, and cuspate fragments are common. We interpret the presence of pillows, chert and imbricated clasts to be evidence of subaqueous emplacement. Similarly the existence of columnar joints, plastically deformed clasts and possible gas escape structures are evidence of hot emplacement. We

envisage that together, the disorganized unit and the laminated unit make up one flow unit that was quickly emplaced. The lower unit was likely dominated by plug flow, whereas the organization of the upper unit was likely caused by the ingestion of water.

Hypotheses that account for the development of the pyroclastic flow most likely can not include explosion due to exsolution of a volatile phase as the vesicularity of the altered glass fragments is nil and there are very few pumice fragments. However, the exact nature of the fragments produced remains an open question because we suspect that a small-scale fraction may have been obliterated by the silicification. Nonetheless, we surmise that the granulation was due to magma-water interaction possibly initiated by the collapse of a submarine dacitic edifice.