Reassessing the geochemical evolution of the nakhlite meteorites as multiple martian lava flows.

S. Griffin[1], B. E. Cohen[1,2], and M. Lee[1] S. Kirby[1].[1]School of Geographical and Earth Sciences, University of Glasgow, United Kingdom; s.griffin.3@research.gla.ac.uk. [2] Isotope Geoscience Unit, Scottish Universities Environmental Research Centre (SUERC), United Kingdom.

The nakhlites comprise 19 of the 107 currently identified martian meteorites. These igneous rocks provide important information regarding the mantle and atmospheric composition, surficial materials, as well as former active processes on Mars. Exhibiting low degrees of shock metamorphism (5-20 GPa, ~5-40 °C), the nakhlites consist of varying proportions of augite, olivine and mesostasis, and originated from a depleted mantle source[1]. The minor geochemical variations within this meteorite group have previously been explained in terms of contrasting crystallisation depths within a thick igneous unit[2] or different magma reservoirs[3]. However, recent geochronological $^{40}Ar/^{39}Ar$ data[4] has shown that the nakhlites differ in age, spanning at least four eruption events from 1416 ± 7 to 1322 ± 10 Ma (2σ). This age data demonstrates that the nakhlites must represent a series of discrete magmatic events[5], and cannot be from a single unit. Here we have collated previously published analytical data with a focus on discerning how the different eruptive events vary geochemically. Preliminary investigations show variation within the nakhlites that can only be explained by different magma batches, e.g., differences in the slope of rare earth element data and analytically distinct isotopic compositions.

References: [1] Trieman A. H. 2005. *Chemie der Erde – Geochemistr* 65: 203-270 ; [2] Mikouchi T. et al. 2006. *37th Annual Lunar and Planetary Science Conference* 37: 1865-1866 ; [3] Shirai, N. and Ebihara, M. 2008. *Lunar and Planetary Science XXXIX* 39: A1643 ; Lentz R. C. F. et al. 2005. *68th Annual Meeting of the Meteoritical Society* 68: A5929