GEOCHEMICAL SYSTEMATICS IN DARWIN IMPACT GLASS, K.T. Howard [1], [1] School of Earth Science, University of Tasmania, Box 252-79, Hobart, Tasmania, 7001, Australia. kthoward@utas.edu.au

Introduction: For the major elements this study significantly extends the compositional ranges previously reported for Darwin glass [1,2]. These data show large internal heterogeneity and between sample variations. Despite this heterogeneity compositional groups and systematic chemical variation between glass end members are defined.

Analytical method and results: More than 100 fragments of Darwin glass, collected from across the strewn field, have been analysed. Major elements were determined by electron microprobe. Trace elements were determined by laser ablation ICP-MS. For major and trace elements 2 spots were analysed on each glass fragment (216 analyses in total). A cluster analysis performed on the following major and trace elements data: Na_2O; MgO; Al_2O_3; SiO_2; K_2O; CaO; TiO_2; FeO; Sc; Cr; Co; Ni; Rb; Sr; Zr; and Ba results in 2 groups. Group 1 accounts for more than 80% of the samples and is close to 'average' Darwin glass in composition. The ranges in major element composition in group 1 are: SiO_2 (80.62 – 93.9%), Al_2O_3 (3.14 – 10.6%), TiO_2 (0.2 – 0.76%), FeO (0.8 – 4.23%), MgO (0.25 – 2.31%) and K_2O (0.7 – 2.7%). CaO and Na_2O are almost completely absent in all analyses. Group 1 glass is predominantly light to dark green, white or sometimes black. The second population has a more limited range (76.4 – 84.4 %) and lower average abundance of SiO_2 (81.16%). The average MgO (2.2%) and FeO (3.8%) content in this group is significantly higher than in group 1 glasses and Al_2O_3 is also slightly enriched. Most trace element data are similar between the groups. The exceptions are average Cr (162 ppm), Co (31ppm) and Ni (416 ppm) that are significantly enriched in group 2, relative to group 1 glasses. Group 2 glass is predominantly black to dark green and rarely light green in colour.

A principal components analysis (PCA) performed on the major and trace data shows that 97.5% of the total variation across the entire sample is explained by a single vector. Ratio plots show that this variation is between high SiO_2, low MgO, FeO and low SiO_2, high FeO, MgO end members (Fig. 1). The scatter of data points in group 1 glasses define 2 fields that suggest the presence of 2 high SiO_2 end members - 1 with less Al_2O_3 relative to FeO (Fig. 1 dashed line). Repeat analysis on a single glass fragment can fall in different Al_2O_3 fields and this reflects internal heterogeneity and incomplete mixing in group 1. Figure 2 also shows the variation between end members in the high silica group 1 (high Zr, low MgO, Co) and low silica group 2 (high Co, MgO, low Zr) glasses. MgO and the transition elements Ni, Cr and Co control the remaining geochemical variation on axis 2 of the PCA. This suggests another distinct end member rich in MgO, Ni, Co and Cr contributed to group 2 glasses. Studies in progress will determine if this end member is of extraterrestrial origin.

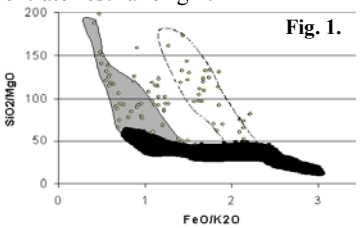

Fig. 1.

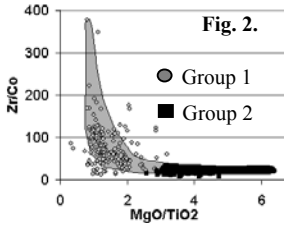

Fig. 2.

References: [1] Taylor, S.R. and Solomon M. (1964) *Geochim. Cosmochim. Acta, 28,* 471-494. [2] Meisel T. et al. (1990) *Geochim. Cosmochim. Acta,* 54, 1463 – 1474.