POSSIBLE SOURCE DIRECTIONS FOR THE MESOPROTEROZOIC EUCARRO RHYOLITE, GAWLER RANGES: EVIDENCE FROM PHENOCRYST LINEATIONS

Fernando Della Pasqua[1], Jocelyn McPhie[1], Sharon Allen[1], Ron Berry[1], Mark Lackie[2] and Garry Ferris[3]
[1] *School of Earth Sciences, University of Tasmania, Australia*
[2] *Department of Earth and Planetary Sciences, Macquarie University, Australia*
[3] *Primary Industries and Resources South Australia, Australia*

The Gawler Range Volcanics (GRV), South Australia, comprise predominantly felsic lavas and ignimbrites of Mesoproterozoic age. Many units of the lower GRV occupy relatively small areas that broadly indicate source locations. The upper GRV includes units with significantly larger coverage and theeir sources remain unknown. The Eucarro Rhyolite is an extensive lava that outcrops along the southern margin of the GRV and extends east-west as a narrow band (<14 km) for over more than 200 km distance. The large extent of the Eucarro Rhyolite is remarkable, considering the relatively small areas covered by most modern rhyolitic lavas.

Statistical analysis of the preferred orientation of elongated phenocrysts as a measure of flow lineation direction provides a useful tool to constrain the position of volcanic sources. In this study, we present preliminary results on the use of this technique to assess likely source vent directions for the Eucarro Rhyolite. Near-vertical columnar joints throughout the Eucarro Rhyolite act as guides to the cooling surface orientation, and thus give a first-order approximation of bedding. Phenocryst lineation measurements were taken from both in situ outcrop surfaces perpendicular to column axes, and slabs cut from oriented samples. Sampling was carried out throughout the entire length of the Eucarro Rhyolite, and included basal, interior and upper parts of the unit. All measurements were made on tabular, elongate plagioclase and K-feldspar phenocrysts that range up to 10 mm in length and that have length:width values >2.

Preliminary results of 18 in situ and five oriented sample sites yield lineation trends in a sector between NW (290¡) and NE (060¡). The results show no radial distribution pattern nor relationship to distance along strike. Lineations of 12 sites define a distinct NE-SW trend between 020¡ to 060¡ (averaging 041¡). Phenocryst lineations of all other sites appear to be randomly oriented. This distinct NE-SW lineation persists along the entire 200 km E-W extent of the Eucarro Rhyolite and is inconsistent with a single point source vent. Previous studies of the Eucarro Rhyolite proposed on the basis of subtle lateral textural and chemical variations that the Eucarro Rhyolite could have come from multiple vents on an east-trending fissure. The preliminary lineation results presented here are consistent with this fissure-vent source model, and lava flow propagation perpendicular to the fissure axis.