# Deep lithosphere processes recorded for the West Antarctic Rift System

M. COLTORTI[1]*, C. BONADIMAN[1], B. FACCINI[1], M. MELCHIORRE[1], S. O'REILLY[2], W. GRIFFIN[2] AND N. PEARSON[2]

[1]Department of Earth Sciences, Ferrara University, Ferrara, Italy (*correspondence: clt@unife.it).
[2]GEMOC, Macquarie University, Sydney, Australia

Two suites of mantle xenoliths from Baker Rocks (BR) and Greene Point (GP) from Northern Victoria Land (Antarctica) were investigated. These two localities are less than 100 km apart, but the respective xenolith suites show very different petrographic and geochemical features.

Amphibole-bearing lherzolites occur at BR showing amphibole both as disseminated grains and in veins, commonly associated with glass, and growing at the expense of clinopyroxene (cpx). Accordingly, cpx compositions become richer in $TiO_2$, $Al_2O_3$ and REE contents and poorer in $SiO_2$, approaching the amphibole boundary. A Na-alkaline Ti-Nb-HREE-rich melt is inferred to be responsible for this metasomatic reaction. Thermobarometric data indicate a T-P range between 800°C and 1000°C and from 5 to 16 kb, respectively. Anydrous lherzolites and harzburgites are equally represented at GP. Orthopyroxene is the most reactive phase, possibly producing the abundant $SiO_2$-alkalies-rich and Ti-Nb-HREE-poor glass. GP primary cpx appears more depleted, sometime recording re-equilibration from a garnet stability field. Thermobarometric data indicate a slightly higher T (1000-1100°C) at similar P (8-16 Kb).

*In situ* Re–Os age determinations, together with Rb-Sr, Sm-Nd and Lu-Hf pseudo-isochrons, show that at BR, several main events were recorded from Archean to Mesozoic, in contrast to those from GP that are mainly Proteorozoic.

Petrological features and isotopic data suggest that BR and GP represent two different mantle domains which evolved separately and were most probably justaxposed during the Ross Orogen through the Tinker-Campbell Discontinuity. These two domains were finally re-activated and percolated by different fluids during the development of the West Antarctic Rift System (WARS). This complex history emphasises the likely role and the evolution of subcontinental lithospheric mantle during rifting processes.

# Water speciation in Anatolian Obsidian: Quenched magmatic Water vs low temperature hydration

G. CONDE[1], P.D. IHINGER[1]* AND E.E. FRAHM[2]

[1]University of Wisconsin-Eau Claire, Eau Claire, WI 54701, USA (condeg@uwec.edu)
(*correspondence: ihinger@uwec.edu)
[2]University of Minnesota, Minneapolis, MN 55455, USA (frah0010@umn.edu)

Rhyolitic volcanism in present-day Turkey, Azerbaijan, Armenia, Georgia, and Iran document widespread felsic magmatic activity throughout the last 10 My. Understanding the role of water in these systems is critical for deciphering the origin and eruptive history of these magmas. In addition, the rhyolite flows were the source of obsidian glasses that were manufactured into flaked stone tools as well as carved items like bowls and beads from hunter-gatherer times into the metal ages. Obsidian has long been utilized by archaeologists for the study of ancient trade networks for two important reasons: (1) their geochemistry identifies the particular volcanic flow from which they came, and (2) the amount of time that has elapsed since the glass was re-worked can be determined by measuring the rim thickness associated with the diffusion of water into knapped surfaces.

We have conducted micro-FTIR analyses on a suite of 30 obsidian flows from Anatolia. Our measurements delineate two series of glasses which reflect that two distinct processes were involved in hydrous species equilibration. One series, with total water contents > 5 wt% and $H_2O$mol > OH, shows equilibration temperatures ranging between 150-250°C. The second series, all with $H_2O$mol < OH and total water < 2.5 wt%, show an average equilibration temperature of 490°C. These data are consistent with the high-water glasses having experienced low-temperature hydration and the low-water glasses having experiences little, if any hydration after eruption; their water contents reflect the quenched magmatic water content. Future H and O stable isotope measurements will test our conclusions. Our results have implications for both sourcing and hydration rim dating of obsidian artifacts.