Pristine mantle xenoliths from the active Bismarck Arc

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Peridotites samples were recovered during the Marine National Facility Voyage (SS06-2007; WeBiVE) from three volcanic cones northwest of Ritter Volcano, New Britain-West Bismarck Arc system of Papua New Guinea. Wedge-derived peridotites are extremely rare even in well-explored subaerial arcs; the Ritter suite is the first global occurrence of peridotites recovered from an active submarine volcanic arc front edifice.

The peridotites occur as rounded (≤15cm diameter) and angular blocks and fragments. The host basalt is a Cr spinel-olivine-diopsidic augite-bearing, medium-K tholeiite. It is the most MgO-rich basalt (~15wt%) reported in the West-Bismarck-New Britain Arc system; the high-MgO might derive in part from the cumulative and/or xenocrystic nature of some olivine.

The xenoliths are pristine (serpentine-free), predominantly harzburgitic but also include lherzolite, orthopyroxenite, and a single gabbro. Preliminary petrological analysis shows complex textural relationships between the constituent minerals olivine ($Fo_{94.4\text{-}86.3}$), orthopyroxene, clinopyroxene, and spinel. The spinel is highly refractory with Cr/(Cr+Al) > 0.9 accompanied by high Mg/(Mg+Fe^{2+}) consistent with quenching from high-temperature. Deformation textures include olivine kink-banding and wavy exsolution lamellae in the pyroxene. Secondary clinopyroxene reflects some metasomatism. Bulk trace element charateristics include relatively unfractionated rare earth element abundances (0.6 to 1*chondritic), elevated Pb/Ce (>1), and negative Nb, Ta, Zr, Hf, and Ti anomalies.

Temperatures range from ~900 to 1100 °C; fO_2 ranges from ΔFMQ -2 to +0.5. These samples show extremely refractory, relatively reduced harzburgites are present in the mantle section beneath a modern subduction system. Ongoing detailed mineralogical and petrological studies will provide important insight into the mantle below the New Britain-West Bismarck Island Arc.

Arsenic in Ground Water

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Arsenic in groundwater presents a hazard to health globally [1]. In the Bengal Basin, one of the regions worst affected by such pollution [2, 3], the distribution of pollution reflects the geological evolution of the basin during the past 125,000 years [3], and the same explanation, with local modifications, must apply to As-polluted deltaic aquifers worldwide. The As-pollution is confined largely to sediments laid down after the last glacial maximum, a fact that explains the vertical inhomogeneity in As-pollution. The lateral inhomogeneity in As-pollution reflects, in part, the distribution of As-polluted palaeo-channel aquifers and As-free palaeo-interfluvial aquifers [4].

Flow of As-polluted palaeo-channel water into As-free palaeo-interfluvial aquifers has been ongoing since sea-level stabilized around 6 ka. The flow has been accelerated by abstraction of water for irrigation since the 1970s. Natural and enhanced flows explain the development of a strong redox gradient at the palaeo-interfluvial margins. Flows enhanced by abstraction for irrigation explain rising concentrations of As in marginal palaeo-interfluvial wells, especially where the flow is counter to the natural hydraulic gradient. In this talk, some of these aspects will be explored.

[1] Ravenscroft, P. *et al*. (2009) .*Arsenic pollution: a global synthesis*. Wiley-Blackwell [2] Frisbie SH, *et al*. (1999) The nature and extent of arsenic-affected drinking water in Bangladesh. *In*: *Metals and Genetics* (Sarkar B, ed). New York: Plenum Publishing Co,; 67–85. [3] DPHE; (1999) *Groundwater Studies for Arsenic Contamination in Bangladesh. Final Report, Rapid Investigation Phase*. Department of Public Health Engineering, Government of Bangladesh. Mott MacDonald and British Geological Survey (6 vols), Dhaka [4] McArthur J.M. *et al*. (2011). Palaeosol control on groundwater flow and pollutant distribution: the example of arsenic. *Environ. Sci. Technol*., **45**, 1376–1383. dx.doi.org/10.1021/es1032376.