Degassing & preliminary assimilation histories of selected on- and off-axis EPR MORB glasses (8-10ºN, 12-14ºN, & 15-16ºN)

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MORB degassing characteristics can define pre-eruption, low pressure magma equilibration, leading to possible interaction with sea water-derived end-members. Selected EPR samples indicated that such interactions might be common along fast-spreading ridges, with well-defined axial magma chambers. Variable morphology, spreading rate, bathymetry, magma supply, magma chamber depth and on- vs off-axis eruptions could influence assimilation processes at the selected EPR sites.

	8-10ºN	15-16ºN
CO_2	99-342	115-361
H_2	0.06-0.68	0.11-0.61
O		
S	827-1798	870-1792
F	94-630	154-1984
Cl	4.56-1270	30-1683
Li	3.40-7.17	
Be	0.39-0.99	
B	0.78-1.63	0.46-2.89

EPR MORB from 8-10ºN and 15-16ºN range from vapor-saturated to supersaturated (<475bar & <540bar) at eruption (SIMS data in table; DTM). Cl/K_2O ratios increase with decreasing MgO (at ~6wt% MgO: 8-10ºN, mostly off-axis samples, Cl/K_2O <5000; 15-16°N, mostly on-axis samples, Cl/K_2O <2400) requiring ≤0.5wt% brine (NaCl 15-50wt%) addition to the magmas. Also, these samples were less vapor-supersaturated at eruption (<275bar). Data for 12-14ºN MORB will be discussed in full. The data are not anomalous, and no clear difference in assimilation or degassing have yet been detected between these EPR sites, despite physical differences.

The project aims to combine these results with $^{11}B/^{10}B$ data, indicative of magma-sea water interaction. *In situ* analysis of $^{11}B/^{10}B$ ratios in MORB glasses by LA-multiple multiplier-ICP-MS (no wet chemistry; increased potential sample base) is being developed at DTM. Presently, ^{11}B sensitivity for NIST612 (34.73ppm B) is ~350 000cps, and drift-corrected repeat analyses yield 2σ errors <1‰. ^{11}B sensitivity for a low B (0.39ppm) MORB glass is ~3500cps (~100x below NIST612), and present development aims to achieve <1‰ precision at this concentration level.

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Core-top depth transect from the South China Sea reveals dissolution control on Mg/Ca paleothermometry

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The effect of dissolution on planktonic foraminifer Mg/Ca appears to be the most significant artefact for Mg paleothermometry. Following on the work of Dekens et al., 2002 (G^3), we examine in greater detail the relationship between Mg/Ca, sea surface temperature (SST), water depth and seawater saturation in a core-top depth transect from the South China Sea. Specimens of *Globigerinoides ruber*, *G. sacculifer* and *Neogloboquadrina dutertrei* were separated from stained coarse fraction samples (L. Wang) taken from the sediment surface of 30 box cores. The depth range is 329 – 2980m; the overlying SST range is 26.4°C to 28.5°C. Stable isotope data is available from a previous study. Samples were analyzed for a suite of minor, trace and diagenetic elements using our standard isotope dilution sector ICP-MS technique. Mg/Ca data confirm the species ranking of Dekens et al. (2002): *G. ruber* has the highest Mg/Ca, *G. sacculifer* is 12-29% lower, and *N. dutertrei* is 52-70% lower, compared to *G. ruber*. Assuming *G. ruber* records true SST, *G. sacculifer* records temperatures 1-3°C cooler than the surface and *N. dutertrei* records temperatures ~6-8°C cooler.

The data for each species show a clear decline in Mg/Ca with increasing water depth and decreasing calcite saturation. The slopes (calculated as exponentials) for both *G. ruber* and *G. sacculifer* are relatively subtle; -7% per km water depth and -6% per km, respectively. These slopes equate to a paleothermometry bias of –0.7°C and –0.6°C per km, respectively, suggesting that a 500 m deepening of the effective foram lysocline would only bias Mg paleotemperature by ~+0.3°C. This is half of the dissolution bias Lea *et al.* (2000) originally estimated, indicating that the downcore bias for surface dwelling species is relatively minor and in fact considerably smaller than the overall standard error of Mg paleothermometry. The slope of *N. dutertrei* Mg/Ca data is considerably steeper (~21% per km, equivalent to –2.3°C per km), probably because this species contains both dissolution prone and dissolution resistant shell portions.