Geochemical response to arc-continent collision on Alor, Sunda-Banda arc, Indonesia

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The island of Alor lies in the extinct sector of the Sunda-Banda arc, where collision with the Australian continent halted subduction-related volcanism. It provides us with an end member scenario of arc magmatism, where the geochemistry is dominated by input from the subducting plate.

Older lava flows and intrusives (2.5 Ma) have rather homogeneous geochemical characteristics, with only moderately 'crustal' signatures ($^{87}Sr/^{86}Sr$ = 0.7060-0.7066, $^{143}Nd/^{144}Nd$ = 0.51261-0.51252, $^{206}Pb/^{204}Pb$ = 19.1-19.2).

The youngest volcanic deposits (1.3 Ma) show extreme isotopic variability ($^{87}Sr/^{86}Sr$= 0.706-0.711, $^{143}Nd/^{144}Nd$= 0.5126-0.5122) with Pb isotope ratios among the highest recorded for an island arc ($^{206}Pb/^{204}Pb$= 19.0-19.6; $^{208}Pb/^{204}Pb$ = 39.3-40). The highest Pb isotope ratios are only found on the north coast (distal from the trench), and the extreme $^{208}Pb/^{204}Pb$ ratios reflect subduction of upper crustal material of Australian origin. Some south coast samples combine higher Sr with lower Pb isotopic characteristics, indicating that the isotopic composition of the youngest deposits cannot be explained by two component mixing of mantle and subducted sediments. The lower-Pb isotopic component resembles cordierite-bearing samples of the neighbouring island Wetar, suggesting an origin in the lower (?) continental crust.

Trace elements ratios such as Pb/Ce indicate that any influence of a fluid component in the source of the youngest volcanics is masked by the large amount of subducted continental material. High Th/Nb ratios for the high $^{206}Pb/^{204}Pb$ samples indicate that the slab to wedge transfer medium was a partial melt, but this may not be the case for the samples with lower Pb isotopic signatures.

Conclusions

Our results show that arc-continent collision results in isotopic signatures becoming more heterogeneous, reflecting subduction of continental crust and, in the case of Alor, addition of two types of crustal material to the mantle wedge. This situation contrasts with the active part of the Sunda-Banda arc where only one type of crustal material is added to the mantle wedge, and where a fluid component plays an important role in frontal volcanoes.

Foraminiferal Mg/Ca paleothermometry: expected advances and unexpected consequences

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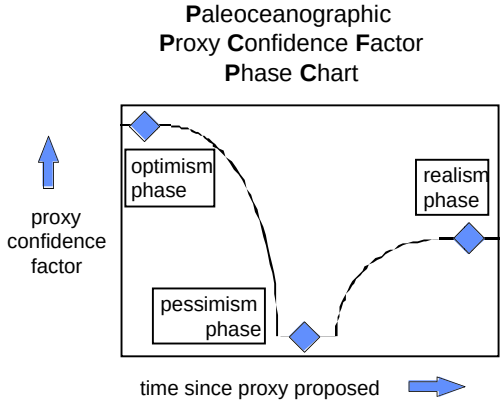
"The oxygen isotope method of determining paleo-temperatures (Urey H., *J. Chem. Soc*., 562, 1947) is widely regarded as a tool of unique potential in the investigation of past changes in the temperature of the earth's surface." (Shackleton N.J., *Colloq. Int. Cent. Natl.*, 219, 203, 1974). That potential was first realised by Epstein S., Bushsbaum R., Lowenstam H.A. and Urey H. *(Geol. Soc. Amer. Bull,* 62, 417, 1951; *ibid* 64, 1315, 1953) and its subsequent development has played an invaluable role in paleoclimate research. Among the newer methods for estimating paleotemperature (including faunal analysis and alkenones), Mg/Ca thermometry has the added potential, not yet realised, of providing an estimate of seawater $\delta^{18}O$. Like all proxies, it is moving through the PPCFPC (see graph). This development has the added benefit that more is being learned about $\delta^{18}O$ systematics as well as the factors controlling trace element incorporation and retention in marine biogenic carbonates. Amongst these, the influence of dissolution on Mg/Ca is a matter of current importance and has interesting links with recent ideas for



estimating deep-sea [CO_3^{2-}] as well as new studies of the response of biogenic calcification to carbonate ion concentration. This is leading to unexpected consequences.