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Isotopic evidence for progressive contamination to magmas generated during arc-continent collision in the Banda arc and the relationship to gold-rich massive sulphide deposit formation

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Whole-rock ^{87}Sr/^{86}Sr and δ^{18}O data from fresh volcanic rocks on Wetar Island in the Banda arc of Indonesia record distinctly 'continental' signatures from the Pliocene (Zanclian to Piacenzian) during two distinct magmatic events between 5 to 4 Ma and 2.4 Ma. During this time, ^{87}Sr/^{86}Sr ratios in unaltered lavas increases from $\sim$ 0.7075 to extreme radiogenic values of 0.7111. These data support a model of progressive sub-arc lava source contamination, documented elsewhere in the arc, but which on Wetar leads to the most extreme examples of crustal assimilation during melt generation seen in the region. The first of these discrete magmatic events is important for the development of hydrothermal systems responsible for the gold-rich polymetallic sulphide and barite mineralisation recorded on Wetar. The second magmatic event and extrusion of dacites (2.39 $\pm$ 0.14 Ma) coincides with the arrival and locking of the Australian Continental margin with the outer Banda Arc.

^{3}He/^{4}He data from both sulphides and sulphates in mineralised rock further supports a crustal source for components in the hydrothermal system. Samples collected from economic orebodies exhibit ^{3}He/^{4}He ratios of between 0.5-1.4 R/R$_{A,}$consistent with data reported from the nearby island of Romang. In all cases unaltered samples were used where complimentary whole-rock δ^{18}O data ranges between 5.7 and 9.6$\%_{,}$, consistent with data from fresh volcanic rocks reported from Serua, Nila, Teon and Romang. This data further confirms the relationship between the gold-rich massive sul-

phides and volcanic rocks sourced from crustally contaminated magmas which may have provided an enriched source of metals for the hydrothermal system.

This history of magmatic evolution of the Banda arc on Wetar is comparable to that for the Ambon region to the east, and supports a simple model where the Banda arc continues around the extreme curvature of the Archipelago through Seram and Ambon. This would then suggest that the current extreme curvature of the archipelago may therefore simply reflect later bending due to impinging of the north-moving Australian continental mass rather than representing a separate arc as previously proposed.