# $^{230}$Th/$^{234}$U dating of fossil mollusc shells from Jeju Island, Korea by multiple collector inductively coupled plasma mass spectrometry

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The $^{230}$Th/$^{234}$U ages of fossil mollusc shells collected from Jeju volcanic island, Korea were estimated using multiple collector inductively coupled plasma mass spectrometry. Six calcite and aragonite shells from the early Pleistocene (Khim et al., 2001) Seoguipo Formation, and two aragonite shells from the Holocene (Sohn et al., 2002) sedimentary deposits (the Shinyangri and Hamori Formations) were analysed for $^{230}$Th/$^{234}$U dating.

The Holocene shells show $^{230}$Th/$^{234}$U ages of 5231±150 ($2\sigma_m$) yr for the Shinyangri Formation, and 4777±83 ($2\sigma_m$) yr for the Hamori Formation, which are 10 – 20% older than reported radiocarbon ages. Such difference may be attributed to selective addition of $^{230}$Th, because their $^{234}$U/$^{238}$U activity ratios (1.12, 1.09) are lower than the seawater value. The ages of six samples from the Seoguipo Formation are not attainable because their $^{230}$Th/$^{234}$U activity ratios (1.34 – 2.20) exceed 1.0. Furthermore, their variable $^{234}$U/$^{238}$U activity ratios (0.97 – 1.77) are mostly discordant with seawater value, denying the robustness of their U-Th system.

Generally, uranium-series dating of molluscs has not provided encouraging results mainly because their closed system is so frequently violated (Kaufman et al., 1971). Our data, however, imply that the $^{230}$Th/$^{234}$U method can be a potentially useful tool for dating Holocene molluscs, provided that shells have relatively little experienced diagenesis and proper correction for the additional nuclides can be made. The variation of initial $^{234}$U/$^{238}$U ratio, if any, is actually independent on the $^{230}$Th/$^{234}$U age of the Holocene samples.

## References

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# Decoupling of the Os isotopic system during crust-mantle interaction in continental arc volcanic systems

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Understanding magma genesis in continental arcs is difficult because contamination in the mantle source area, and contamination of asthenospheric mantle-derived magmas by assimilation of lithospheric mantle or crustal rocks during ascent and emplacement produce similar geochemical characteristics. Recognising the source of contamination is essential to models for subduction-related volcanism and the chemical evolution of continental crust over time.

Samples representing a range of lithologies and compositions were analysed from across the Miocene to Quaternary age Trans-Mexican Volcanic Belt (TMVB). Major, trace elements, $^{87}$Sr/$^{86}$Sr, $^{187}$Os/$^{188}$Os and Pb isotopes were measured to differentiate the importance of source contamination from assimilation in continental arc magmatism.

There are distinct chemical and isotopic differences within a single volcanic field, however, the different volcanic fields all show similar trends of $^{187}$Os/$^{188}$Os vs. Ba/Nb, Sr and Pb isotopes. Samples from the TMVB show two distinct trends: 1) a wide variation in Ba/Nb (50-200), $^{87}$Sr/$^{86}$Sr and Pb isotopic ratios associated with minor variations in $^{187}$Os/$^{188}$Os (~0.135-0.145); and 2) increasing $^{187}$Os/$^{188}$Os (0.145-0.40) associated with restricted Ba/Nb (35-70) and $^{87}$Sr/$^{86}$Sr and Pb isotopes.

These trends are best explained through a dynamic multi-component process whereby the Os isotopic system is decoupled from the other trace elements and isotopic systems. Fluids are released from the subducting slab resulting in melting of the overlying asthenospheric wedge. The pristine fluids have high Ba, Sr, Pb and other incompatible elements and low Re and Os concentrations. Superimposed upon these melts are both assimilation and fractional crystallization processes, which affect primarily the $^{187}$Os/$^{188}$Os system, but have little affect on Sr and Pb isotopic systems. These results suggest that the Os isotopic system is decoupled from the other isotopic systems and is an excellent record of crust mantle interaction, whereas Sr, Nd and Pb primarily indicate evidence of subduction zone contamination.