

Holocene Marine Reservoir Correction (ΔR) Variability in the Eastern Bay of Bengal

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We present the regional marine reservoir corrections (ΔR) for the northeastern Bay of Bengal spanning two time periods, the past 300 years and the mid-Holocene. ΔR values were calculated using paired measurements of MC-ICPMS U-Th dating and AMS ¹⁴C dating on 6 pristine fossil corals from Ramree and Cheduba Islands, western Myanmar.

The results show an average ΔR of 126±43 yr (1 σ , n=3) for 175-278 years before AD 1950, which is significantly higher than the published modern values of 7±35 yr and 29±74 yr from the Andaman Islands [1] and the southeastern Bay of Bengal [2] separately. This ~100yr difference indicates that applying global marine reservoir age directly to younger-than-1000-years coral terraces might introduce errors to the calibrated ages. Our ΔR however is consistent with the mean of 158±68 yr from the western Indian Ocean [2]. It thus suggests the ¹⁴C-depleted deep Indian Ocean water can influence as far east as the western coast of Myanmar; although large amount of fresh water from the Ganges River is believed to greatly reduce the vertical mixture. Less variation in the past 300 yrs inferred no major change in large-scale circulation. In contrast, ΔR dramatically fluctuated during 8.0-6.9 ka BP, from as high as 553±34 yr down to -35±32 yr.

This interval coincided with the period of strong Asian summer monsoon in mid-Holocene. Thus we believe the fluctuated ΔR values are resulted from (1) the stronger upwelling induced by strong monsoon wind and (2) the enhanced ocean-atmosphere gas exchange due to heavy rainfall and surface runoff.

[1] Dutta *et al.* (2001) *Radiocarbon* **43**, 483-488. [2] Southon *et al.* (2002) *Radiocarbon* **44**, 167-180.

Isotopic signature of naturally Cr(VI) contaminated spring waters from Western Tuscany (Italy)

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Weathering of serpentinites produces soils and sediments with high Cr concentrations. High Cr (VI) contents (up to 50 $\mu\text{g/l}$) have also been found in some spring waters spilling out from serpentinite bodies that outcrop in Western Tuscany. A section of a multidisciplinary research program (RESPIRA) is aimed to enhance the understanding of serpentinite rocks weathering processes in order to assess the mobility and bioavailability of Cr. Petrographic and mineral-chemical analyses of both rocks and soil samples highlight the occurrence of minerals able to release Cr (III) containing significant Cr amounts, such as chlorites (Cr_2O_3 up to 8 wt%). The absence of Mn-oxides, permitting to rapid oxidise Cr(III), implies that local presence of Cr (VI) in waters have to be ascribed to other processes.

Sr-Pb isotopes of serpentinites suggest an interaction with recent, low-T, waters, whereas most soils display larger Sr-Pb isotopic ranges indicating a significant contribution of both elements from crustal sedimentary rocks. All spring waters display Mg-HCO₃ chemical composition and a Sr-Pb isotopic signature fitting within the serpentinites and soils range.

Cr isotopes are generally used to investigate Cr(VI) reduction occurred in contaminated ground waters, during biotic and abiotic processes, which produces a strong positive fractionation of residual unreduced Cr(VI) as well as a powerful tool for to reconstruct the redox state of ancient sea water. Nevertheless, little is know about fractionation effects accompanying Cr (III) oxidation although little positive fractionation has been experimentally demonstrated. The spring waters preliminary investigated for Cr isotopes are strongly positively fractionated ($\delta^{53}\text{Cr}$ values between +1 and +3‰) as observed in other naturally Cr (VI) contaminated ground waters [1]. The observed strong positive fractionation can be the result of both Cr oxidation and partial back reduction of soluble Cr (VI). Further investigations on serpentinite spring waters can contribute to better understand Cr isotopes behaviour during natural Cr redox reactions.

[1] Izbicki *et al.* (2008) *Appl. Geochem* **23**, 1325-1352.