U/Th dating of uplifted coral terraces in Sumba Island (Indonesia)

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Uplifted coral reef terraces, possibly spanning the last one million years, are extensively exposed along the northern coast of Sumba Island, Indonesia. Until now, terraces have not been well investigated except for the ones at Cape Laundi, where uplift rates however were estimated in great discrepancies (ESR dating and U/Th alpha-counting methods, uplift rate ~0.5mm/yr [1]; U/Th mass spectrometric dating method, uplift rate ~0.2mm/yr [2]). Here we present a total of 102 U/Th dates, including 22 replicates, on fossil coral samples spreading from the eastern to western coasts in Sumba Island. Of them, 12 dates show $\delta^{234}U_{initial}$ values within the range of 147±8‰, suggesting that only a small portion of the samples have likely remained closed to chemical exchange. Two open-system models were then used to recalculate the ages of samples with elevated $\delta^{234}U_{initial}$ values. We observed broad linear trends among the samples from a same terrace in the plot of measured $\delta^{234}U$ versus $(^{230}Th/^{238}U)_{activity}$, and U/Th ages increase in concert with initial $\delta^{234}U$ values. We hence adopted the coral diagenetic criterion proposed by Gallup *et al*. [3] and regressed individual "terrace ages" assuming continuous additions of ^{234}U and ^{230}Th to the corals from the same terrace. We additionally used the model proposed by Thompson *et al*. [4] to determine each sample's open-system age, which is based on the α-recoil-dependent redistribution of ^{234}U and ^{230}Th in coral skeleton. We found that the ages of terraces at Cape Laundi, northern coast of Sumba, are consistent between the two open-system calculations. They can be grouped and correspond to the previous sea level highstands during time periods such as MIS5c, 5e, 7, and 9. Our results indicate an uplift rate of ~0.5 mm/yr at Cape Laundi for the last 130,000 years, higher than the rate of ~0.2 mm/yr estimated by Bard *et al*. [2].

[1] Pirazzoli *et al*. (1993) *Mar. Geol*. **109**: 221-236. [2] Bard *et al*. (1996) *Geophys. Res. Lett*. **23**(12): 1473-1476. [3] Gallup *et al*. (1994) *Science* **263**: 796-800. [4] Thompson *et al*. (2003) *Earth Planet. Sci. Lett*. **210**: 365-381.