Constraining The Uplift History of The Banda Arc

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The uplift history of the Banda Arc provides a unique insight into processes acting deeper in the crust and upper mantle. An extraordinary record of uplift is evident in the widespread occurrence of Quaternary reefal limestone (Los Palos, Baucau, Atauro, Sumba etc.). The detailed chronology of uplift is poorly understood at present as only the youngest terraces, representing a small fraction of this uplift record, have been numerically dated. Uplift has been measured on many islands of the Banda Arc most thoroughly in the Holocene and back to ~150 ka from U-series, radiocarbon, and electron spin resonance (ESR) dating methods of unrecrystallised coral from the raised reefs. Early work was problematic due to the difficulty in obtaining adequate amounts of unrecrystallised aragonitic coral or shell material and also the lack of precision of dating methods. Dating was restricted to the lower terraces where recrystallisation is less pervasive and ages of the higher terraces were extrapolated assuming that uplift rate has been constant and that each terrace may represent a transgression peak in sea level. Aragonitic *Tridacna* shells are more resistant to recrystallisation than coral species. They have been collected for U-series dating from various areas in Timor and Atauro to elevations from over 500 m and thin section petrology shows that the older samples have remained aragonite. Pleistocene age *Globorotalia truncatulinoides* in outer-shelf/upper-slope (estimated depth ~200+ m) sediments found on the inner arc island Atauro at an elevation of 400 m asl complement uplift rates obtained by younger overlying reefs.

Previous workers have used Ar/Ar and apatite fission track chronology to provide long term uplift and exhumation rates. Apatite (U/Th)-He analysis on samples collected within the Aileu complex on the north coast of Timor provides a further constraint on the denudation. Preliminary results suggest that between 16.4my and 4.6my the complex cooled slowly at 0.0728 mm/year, but has not been significantly denuded since the late Miocene/early Pliocene. Compared to estimated Late Quaternary uplift rates of 0.5 mm/year from lower coral reef terraces this suggests that present-day topography has emerged due to recent changes in geodynamic process such as slab detachment. Projecting uplift rates further back into the Quaternary using improved U-series dating techniques on coral terraces is important in understanding the dynamic processes that support the surface topography and will in turn provide a basis for understanding the processes that cause deformation in the early stages of arc-continent collision. ■

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