

## **Tectonics Timor-style: Episodic, early-stage orogenesis at a young collision plate margin and implications for orogenic and petroleum fluids**

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Timor Island, in the Outer Banda Arc, preserves the orogenic product of an arc–continent collision between the Australian Plate and the Banda Arc that commenced after 9.8 Ma GTS2004 but emerged above sea level only 3.1 Ma ago. The orogenic pile includes large tracts of material from the Australian margin, including the Permian to Middle Jurassic Gondwana Megasequence and the Late Jurassic to early Late Miocene Australian-Margin Megasequence, as well as stratigraphic sequences indicating a Gondwanan terrane with an oceanic affinity. In addition, material from the Banda Arc side of the plate margin, referred to as the Banda Terrane, occurs throughout the island and includes both seafloor metamorphosed igneous material and cover sediments.

We document four distinct stages to this young orogeny, based largely on detailed and robust stratigraphic and biostratigraphic analyses. An early shortening, between 9.8 Ma and 5.5 Ma reflects the early collision. However, somewhat unexpectedly we found that this early collision was followed by a period of tectonic quiescence, 5.5 Ma to 4.5 Ma, during which time pelagic sedimentation occurred across much of Timor, reflecting locking of the subduction zone. Since 4.5 Ma deformation has been manifest as late, high-angle strike slip faults that dominate the topography and dismember the early-formed thrust sheets, and a more recent phase of broad doming causing uplift relate to the rapid rise of the island. Early deformation, manifest as south- to southeasterly directed thrust nappes, is now preserved in only a handful of locations.

Oil and gas seeps and hot springs that occur across East Timor reflect control by underlying structural zones parallel to the strike of the island. These linear zones parallel plate-boundary scale strike-slip faults that exhume the Australian-derived (oldest) rocks on Timor.

Recent strike-slip deformation, manifest as linear tectonic melange zones parallel to major, late, high-angle faults controls the location of gas seeps from within dominantly shale-rich lithologies. Chains of documented oil and gas seeps and hot springs occur along these structural zones, a relationship that can be seen across the island. Melange zones across East Timor always occur in close proximity to young, high-angle faults, manifest as vertical cliffs of competent limestones (in some cases greater than 600m high), and in many cases are accompanied by other evidence of structural control, including hot springs and associated deposits.

This presentation will present evidence for the episodic orogenesis in East Timor and controls on orogenic and petroleum fluids.