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Dynamics of an End-On Collision, Interpreted from SeaMARC II Swath Mapping and Migrated Seismic Reflection Data on North Margin of Panama

We have imaged nearly the entire North Panama thrust belt (NPTB) to determine the dynamics of the Panama arc colliding end-on with South America. Observations support a simple flexural beam model in which eastward collision of the arc against the continent is transformed into northward relative motion of the NPTB. Fold axes and thrust faults within the NPTB show remarkable uniformity in strike (075°), changing only on the east margin across a major fault and on the west margin across a sharp flexure. The belt increases in width (and presumably convergence) eastward, as predicted by the beam model. Displacement along the Uraba fault zone separated a thin sliver of the NPTB, and two earthquake focal mechanisms on the fault show right-oblique slip. Vergence of thrust sheets within the accretionary wedge is dominantly landward in much of the central part of the thrust belt, indicating

low basal shear stresses and high fluid pressures along the decollement. Mud volcanoes within the accretionary wedge attest to elevated fluid pressures. Because of an exceptionally well-developed and widespread gas hydrate layer, we suggest that pore fluids are a mixture of water and methane. However, near the central part of the thrust belt, a concentrated zone of mud volcanoes has breached the crests of seaward-verging anticlines. We propose that the zone of anomalous seaward-verging thrust sheets results from widespread release of pore fluids from the decollement, leading to increased basal friction.