

New Observations and Interpretation of the Caribbean Crustal Character Revealed

Kyle Reuber, James Pindell, Antara Goswami, Mattie Friday, Chuck Campbell, Brian Horn
ION E&P Advisors

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Abstract

Aspects of the complete tectono-sedimentary evolution of the Caribbean region are debated, in part, due to a lack of adequate seismic data. Seismic surveys across the Caribbean area are typically acquired over individual basins and do not incorporate a regional perspective across the Caribbean plate. Newly acquired 2D seismic data and recently reprocessed and merged pre-1995 ODP and DSDP scientific cruise seismic data have created a Caribbean-wide 3,500+ km composite seismic profile. This line crosses the entire Caribbean region from offshore Panama to the Barbados Accretionary Prism where Central Atlantic crust is subducted providing the ability to identify the distinct domains and details related to the two main pulses of magmatism that occurred in an age-progressive fashion across the Caribbean Large Igneous Province (CLIP) from east to west. Observation of the seismic character from interpreted volcanic features correlate to previously published geo-chemical signatures that indicates the type of magmatism. The eastern Venezuelan Basin hosts the site for the initial plume arrival on the CLIP (95- 83 Ma). In this area, seismic data and filtered magnetic data support the interpretation of dipping and fanning reflectors as multiple periods of flood basalts that were deposited atop the pre-existing oceanic crust of the eastern paleo-Pacific Ocean. Data from the Colombian Basin contain evidence of intrusions in the form of prominent seamounts and isolated basement lows, with evidence of wedging sediment fill, south of the Hess Escarpment. This region of single-layer structured basement is devoid of the massive flood basalts as previously described. The Panamanian and Colombian basins are divided by a prominent volcanic construct composed of intercalated volcanic flows as

observed on these data. This N-S ridge feature records flood basalt emplacement from the initiation of the second phase of magmatism (81-69 Ma). In the offshore Panama a 320 km wide zone of oppositely-dipping basement reflectors is analogous to magma-rich margin segments of the South Atlantic. It is likely that this new crust formed at an older "on-axis" volcanic spreading center (like Iceland) that was briefly active during a change in plate motion as the CLIP moved over the Galapagos Hotspot around 84 Ma. This correlates with published geochemical results that indicate an affinity of mid-ocean ridge basalt (MORB) signature of the uplifted, northern Panama isthmus. Sharp boundaries along tectonic provinces and structured regions correlate to anomalous zones in the filtered magnetic data and support mapping of regional features beyond seismic control.