Geophysical Research Abstracts
Vol. 19, EGU2017-14309, 2017
EGU General Assembly 2017

Impact of the slab dip change onto the deformation partitioning in the northern Lesser Antilles oblique subduction zone (Antigua-Virgin Islands)

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Marine geophysical cruises Antithesis (2013-2016) investigate the impact of the variations in interplate geometry onto margin tectonic deformation along the strongly oblique Lesser Antilles subduction zone. A striking features of this margin is the drastic increase in earthquake number from the quiet Barbuda-St Martin segment to the Virgin Islands platform.
Wide-angle seismic data highlight a northward shallowing of the downgoing plate: in a 150 km distance from the deformation front, the slab dipping angle in the convergence direction decreases from 12° offshore of Antigua Island to 7° offshore of Virgin Islands. North-South wide-angle seismic line substantiates a drastic slab-dip change that likely causes this northward shallowing. This dip change is located beneath the southern tip of the Virgin Islands platform where the Anegada Passage entails the upper plate.
Based on deep seismic lines and bathymetric data, the Anegada Passage is a 450 km long W-E trending set of pull-apart basins and strike-slip faults that extends from the Lesser Antilles accretionary prism to Puerto Rico. The newly observed sedimentary architecture within pull-apart Sombrero and Malliwana basins indicates a polyphased tectonic history. A past prominent NW-SE extensive to transtensive phase, possibly related to the Bahamas Bank collision, opened the Anegada Passage as previously published. Transpressive tectonic evidences indicate that these structures have been recently reactivated in an en-echelon sinistral strike-slip system. The interpreted strain ellipsoid is consistent with deformation partitioning.
We propose that the slab northward shallowing increases the interplate coupling and the seismic activity beneath the Virgin Islands platform comparatively to the quiet Barbuda-St Martin segment. It is noteworthy that the major tectonic partitioning structure in the Lesser Antilles forearc is located above the slab dip change where the interplate seismic coupling increases.