EGU25-13411, updated on 15 Sep 2025
https://doi.org/10.5194/egusphere-egu25-13411
EGU General Assembly 2025

Tectonic accommodation of the northern Antilles strike slip to subduction transition along the Porto-Rico – Anegada – Lesser Antilles Margin

Anne-Catherine Domoison[1], Jean-Frederic Lebrun[1], Boris Marcaillou[2], Franck Albert Audemard[3], Jean-Jacques Cornee[4], David Graindorge[5], Mireille Laigle[2], Serge Lallemand[4], Melody Philippon[1], and Laure Shenini[2]

[1]UMR Géosciences Montpellier - Université des Antilles, CNRS, Université de Montpellier, Point-à-Pitre, Guadeloupe
[2]UMR Geoazur - Université Cote d'Azur, CNRS, IRD, Observatoire de la Cote d'Azur Nice Sophia-Antipolis, France
[3]Central University of Venezuela, Caracas, Venezuela
[4]UMR Géosciences Montpellier - CNRS, Université de Montpellier, Université des Antilles, Montpellier, France
[5]UMR Geo-ocean - Universite de Brest, CNRS, Ifremer, Plouzané, France

Plate motion along concave (toward the upper plate) strike slip to subduction transition (SSST) where the down going plate does not tear, results over time in a lengthening of the subduction zone while the downgoing plate is transported along the transform margin. In the northern Antilles such a transition has developed since the late Paleogene while the Bahamas bank swept the northern Antilles margin and collided with Hispaniola westward. Tectonic record along the Puerto-Rico (PR), Anegada and the northern Lesser Antilles (NLA) margin reveals the modalities of the SSST evolution and gives insights into the interaction between the subducting North America oceanic plate and the overriding Caribbean plate.

We present a detailed structural map from eastern PR to southern Anguilla platform in the Lesser Antilles based on interpretation of multibeam bathymetry and multichannel seismic data.

- We confirm that plate motion partitioning between a trench parallel strike slip fault and thrusting along the interplate is exclusively restricted to the margin tip east of the Bunce Fault.

- Further upslope, the Virgin Islands northern margin is affected by trench-parallel, trenchward dipping normal faults. These faults accommodate the deepening of the margin interpreted as the result of basal tectonic erosion.
- From NLA westward to St Croix and southern Virgin Islands, the margin is dislocated by a cross cutting pattern of NE-SW and E-W normal fault systems, bounding elongated E-W throughs, rhomboidal basins and S-shaped ridges. Formally interpreted as either slip sense strike-slip system along the Anegada Passage, the structural pattern that we describe, supported by our seismic interpretation, reveals limited left lateral displacement restricted to the EW basins. Instead, the cross fault system appears to accommodate NW-SE extensional tectonics.

At a regional scale along the SSST, from the Lesser Antilles margin to Hispaniola collision zone, the strain pattern along the margin progressively evolves from NNW-SSE extension responsible for V-shaped basins open toward the trench, to NW-SE extension along the Anegada passage and increasing shortening along the Muertos through from Southeastern Puerto Rico westward. Such a pattern attests for a progressive bending of the margin in a context of low interplate coupling along the evolving SSST.

How to cite: Domoison, A.-C., Lebrun, J.-F., Marcaillou, B., Audemard, F. A., Cornee, J.-J., Graindorge, D., Laigle, M., Lallemand, S., Philippon, M., and Shenini, L.: Tectonic accommodation of the northern Antilles strike slip to subduction transition along the Porto-Rico – Anegada – Lesser Antilles Margin , EGU General Assembly 2025, Vienna, Austria, 27 Apr–2 May 2025, EGU25-13411, https://doi.org/10.5194/egusphere-egu25-13411, 2025.