Kinematic reconstruction of the Caribbean plate since 50 Ma : the northern Lesser Antilles as a potential pathway for south American terrestrial fauna.

Leny Montheil*[1,2], Douwe Van Hinsbergen[3], Mélody Philippon[4], Franck Audemard[5], Lydian Boschman[3], Jean-Jacques Cornée[2], and Philippe Munch[2]

[1]Centre européen de recherche et d'enseignement des géosciences de l'environnement – Institut de Recherche pour le Développement, Aix Marseille Université, Collège de France, Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique, Institut National de Recherche pour l'Agriculture, l'Alimentation et l'Environnement – France

[2]Géosciences Montpellier – Institut National des Sciences de l'Univers, Centre National de la Recherche Scientifique, Université des Antilles, Université de Montpellier – France

[3]Universiteit Utrecht – Pays-Bas

[4]Université des Antilles (Pôle Guadeloupe) – Guadeloupe

[5]Funvisis – Venezuela

Résumé

The northeastern Caribbean plate consists of a tectonic corridor cramped between the Caribbean plate interior, and the North American plate. This corridor distributes relative plate motion over a trench, a transform, and a zone of intraplate deformation in which a mosaic of interconnected faults bounds tectonic blocks. The kinematic evolution of this zone, that controls the paleogeographical evolution of a region that hosted an enigmatic fauna dispersal during the Eocene-Oligocene transition, remains largely unreconstructed due to the scarcity of quantitative kinematic data. Here, we have reconstructed this kinematic evolution of the NE Caribbean plate from 50 to 0 Ma with Gplates based on the magnetic anomalies of the Cayman Trough, on displacement criterion on the major fault bounding the Northern Caribbean Tectonic Corridor (NCTC) blocks and on a recently published paleomagnetic data (Montheil et al., 2023) indicating major CCW rotation (up to 45○) of the northeastern Caribbean blocks during the Cenozoic. With this reconstruction, we test two end-member tectonic, oroclinal bending and sliver motion. Our reconstruction scenario indicates:
(1) that sliver motion and 600 to 800 km of left-lateral displacement accommodates at least _˜ 35○ of CCW rotation of the Puerto Rico – Virgin Island (PRVI) and Northern Lesser Antilles (NoLA) blocks.

(2) that synchronously with PRVI and NoLA block rotation, the Caribbean plate interior moved to the east and rotated clockwise (_˜ 10○).

(3) that oroclinal bending accommodate only _˜ 10○ of CCW rotation of the PRVI and

*Intervenant

NoLA blocks with shortening on the Muertos Trough from early Miocene to middle-late Miocene.
We propose that this intraplate deformation is a result of the combined action of slab rollback and Bahamas bank indentation. This reconstruction also successfully explains the intermittent magmatic evolution of the Lesser Antilles arc and invites to a reassessment of the Great Arc of the Caribbean concept with updated Cretaceous kinematic reconstruction. At 35 Ma, the sliver motion restores the Northern Lesser Antilles at the front of the Grenada-Tobago basin, right next to the South American continent and thus defined the Northern Lesser Antilles region as a potential pathway for South-American fauna dispersal, alternatively to the GAArlandia hypothesis.

Mots-Clés: Caribbean plate, kinematic reconstruction, sliver motion, fauna dispersal, GAArlandia.