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TITLE: What drives microplate motion and deformation in the northeastern Caribbean plate boundary region?

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ABSTRACT BODY: The north Caribbean plate boundary zone is a broad deformation zone with several fault systems and tectonic blocks that move with different velocities. The indentation by the Bahamas Platform (the "Bahamas collision") is generally invoked as a cause of this fragmentation. On the basis of upper mantle structure we propose that a second driver of deformation may be the western edge of the south-dipping slab along the northern Caribbean plate boundary; the westward motion of this slab edge results in a push on the Caribbean plate further west. We refer to this second mechanism for deformation as "Slab Edge Push". The motion of the North America plate relative to the Caribbean plate causes both drivers to migrate from east to west. Bahamas collision and Slab Edge Push have been operating simultaneously since the Miocene. The question is: What is the relative importance of the two mechanisms? We use mechanical finite element models that represent the two mechanisms from the Late Oligocene (30 Ma) to the Present. For the Present, both models successfully reproduce observed deformation, implying that both models are viable. Back in time the Slab Edge Push mechanism better reproduces observations. Neither mechanism successfully reproduces the observed Miocene counter-clockwise rotation of Puerto Rico. We use this rotation to tune a final model that includes fractional contributions of both mechanisms. We find that the Slab Edge Push was the dominant driver of deformation in the north Caribbean plate boundary zone since 30 Ma.

KEYWORDS: 8150 TECTONOPHYSICS Plate boundary: general, 8164 TECTONOPHYSICS Stresses: crust and lithosphere, 8170 TECTONOPHYSICS Subduction zone processes.

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