



## Deep structure of the Grenada Basin from wide-angle seismic, bathymetric and gravity data

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Studying back-arc basins, where sedimentation is less deformed than in the forearc, provides complementary information about formation and tectonic evolution of subduction zones. At the Lesser Antilles subduction zone, the North and South American plates are subducting underneath the Caribbean plate at a velocity of 2 cm per year. The crescent-shaped Grenada back-arc basin is located between the Aves Ridge, which hosted the remnant Early Paleogene "Great Caribbean Arc", and the Eocene to present Lesser Antilles Arc. In this study, based on wide-angle data, we provide constraints about lateral variations in basement thickness and velocity structure in the Lesser Antilles back-arc, and to a lesser extent in the arc and forearc domain, constraining for the first time the extent of oceanic crust in the Grenada Basin and shed light on the structure and compositions of the basin's margins.

Three combined wide-angle and reflection seismic profiles, together with gravity and bathymetric data, were acquired in the Lesser Antilles back-arc basin. Direct modeling techniques were applied to the wide-angle seismic data in order to include shallow structures imaged by the coincident reflection seismic data. The resulting velocity models were additionally constrained by gravity modeling and synthetic seismogram calculation. The final models from direct modeling image variations in thickness and velocity structure of the sedimentary and crustal layers to a depth of up to 35 km. The sedimentary cover has a variable thickness from less than a kilometer on top of the ridges to nearly 10 km in the basin. North of Guadeloupe Island, the crust is ~20 km thick from back-arc to forearc, without significant change between the Aves Ridge, the Eocene and present Lesser Antilles volcanic arc. While based on the seismic velocities, the southern part of the basin is underlain by a 6.5-7 km thick crust of mainly magmatic origin over a width of ~80 km, the northern part is underlain by thinned continental crust. At the western flank of the Lesser Antilles Arc, the crust is 17.5-km thick, about 5 km thinner than north of Martinique island. The velocity structure is typical of volcanic arcs or oceanic plateaus. Between Aves Ridge and the Grenada basin the crust thins in a 80-100 km wide transition zone. No anomalous high velocities indicating

the presence of exhumed upper mantle material were detected at the transition zone. This narrow E-W arc-ocean transition zone suggests that opening might have proceeded in a direction highly oblique to the main convergence.