# Dynamic Topography Across Overthickened Oceanic Lithosphere from a Gravity-Constrained Crustal Model of the Caribbean

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## Abstract

The Caribbean region has been proposed as a candidate for outflow of asthenospheric mantle, from a shrinking Pacific region to an expanding Atlantic region. Here, we attempt to observe a dynamic topography gradient across the region from the flow by producing agravity-constrained crustal model. Although dynamic topography within 'normal' oceanic lithosphere regions has been studied globally, areas of complex crustal structure such as the Caribbean with overthickened oceanic lithosphere have not been fully analyzed due to the challenges of estimating crustal thicknesses. Estimating dynamic topography requires constraining the thicknesses and densities of sediment, crust and lithosphere. Thanks to the wealth of seismic reflection, as well as borehole data, the basement relief and bulk sediment density in the Caribbean are well-constrained. A structural inversion of free air gravity anomalies, constrained by seismic refraction data, established an improved Moho surface and provides more detail than existing global models such as Crust 1.0.With the improved basement and Moho relief, we computed residual basement depth. We obtained a ~400-500 m dynamic topography high on the Pacific-side of the Caribbean, gradually decaying to 0 m to the east near the Aves ridge. This result supports the hypothesis of Pacific outflow through the Caribbean. Assuming the flow is channelized within a ~200 km thick asthenosphere with the viscosity of ~1019 Pa s, our results suggest a flow velocity about a few to a few tens of cm/yr. The basal shear induced by this flow on the overlying lithosphere is about one MPa.