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Large strike-slip fault - small displacements: The Enriquillo-Plantain Garden Fault Zone – northern Caribbean

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The northern Caribbean region is a complex mosaic of microplates and tectonic blocks. The 500km long left-lateral Enriquillo-Plantain Garden Fault Zone (EPGFZ) is part of the seismogenic plate boundary that separates the Caribbean plate in the south from the Gonâve microplate in the north. From Jamaica in the west to the Dominican Republic in the east, the structural style along the fault zone changes and becomes progressively dominated by transpressive tectonics.
We have investigated the onshore displacement along the active trace of the EPGFZ and our result show that the displacement appears to be significantly smaller than commonly observed for fault zones with a similar length.
For this study we have combined offshore bathymetry and seismic data, structural and sedimentary data from extensive field campaigns, satellite imagery interpretation, DEM maps, geomorphological observations, geological maps, cross sections, shortening estimates, and GPS data. The bathymetry and DEM maps show that the EPGFZ is strongly segmented, both onshore and offshore. Although morphologically well expressed on satellite data, field evidence and geological mapping do not reveal any significant recent offset of geological contacts across the fault trace. Two alternative approaches are therefore used to determine the displacement. The first one involves mapping the offset of river channels, which indicates around 12 – 15 km of displacement along the active trace of the EPGFZ onshore Haiti. The second one is to estimate shortening from cross sections across the thrusts that accommodate the eastern termination of the EPGFZ. Shortening in this area is in the order of a few km only. Displacement calculated using the latter approach is best viewed as a minimum, since additional displacement can be usurped by blind or unobserved strike-slip faults in the region, and the amount of shortening calculated could be underestimated due to structural complexities not captured in the cross sections, especially offshore.
Our results do however show that onshore displacement along the active trace of this 500 km long strike-slip fault zone does not exceed 15 km, which is an order of magnitude smaller than what is commonly observed on strike-slip faults with similar lengths. Additional displacement along this strike-slip plate boundary is probably partitioned on satellite faults over a wider transfer zone. The young age of strike-slip initiation on the EPGFZ (<7.5 Ma) and the strongly segmented character of the fault system as shown by the bathymetry and DEM data, could signal that the system is still developing and predominantly growing by the linkage of individual, smaller fault segments.