



## **Ecuador Fracture Zone – fluid flow, serpentinitisation and dynamic plate uplift in a mid-ocean ridge setting**

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Oceanic transform faults and fracture zones are a ubiquitous tectonic feature of the seafloor and are observed within lithosphere formed at the full spectrum of spreading rates. However, despite this ubiquity, and their critical role in the accommodation of spreading at the mid-ocean ridges, they are comparatively under-studied relative to their mid-ocean ridge neighbours.

The Costa Rica Rift (CRR) is an E-W oriented, intermediate spreading (30-36 mm yr<sup>-1</sup>) ridge system, bounded to the west by the Ecuador Fracture Zone (EFZ) and to the east by the Panama Fracture Zone (PFZ). The EFZ itself comprises three separate transform faults, isolating two short (~10 km) ridge segments which step southwards towards the Ecuador Rift. Like the CRR, these segments spread in a N-S direction, and over a distance of ~5 km perpendicular to the ridge the bathymetry shallows by 1 km. Within the two slices of crust bounded by the pairs of transforms, the seabed bathymetry dips in different directions, towards the west on the north of the ridge segment and to the east on the south. Together, these observations of very rapid and asymmetric uplift of the seafloor suggest that the crust in the vicinity of the EFZ may be subject to buoyancy forces, which may be related to the process of serpentinitisation in the inside corner regions.

We investigate the processes governing the structure of the EFZ using bathymetry, potential field, and high quality multichannel seismic reflection data collected along a number of profiles between 85°30'W-83°30'W and 0°45'N-2°00'N, aboard RRS James Cook (JC114). Shots were fired using a combined GI- and Bolt-airgun source at 20 s intervals, and recorded by a 4500 m streamer. From these data, it is possible to identify multiple generations of sedimentary fill and deformation structures, which can be used to constrain the uplift history. A forward modelling approach is applied to the shipboard free-air gravity anomaly to develop models of the crustal density structure, through which we distinguish if anomalous crustal densities and/or thicknesses can explain the features of the bathymetry and gravity anomaly, and from these we determine how geological processes, such as serpentinitisation of the crust, affect crustal structure and plate topography in the vicinity of mid-ocean ridges.

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