

## Imaging the past and present Owen transform fault: preliminary results from the VARUNA seismic cruise

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### Abstract

The Owen transform fault in the northwest Indian Ocean is a > 300 km-long active structure that constitutes the active plate boundary between Somalia and India. The first-order fault geometry was reached in the Early Miocene when the Carlsberg Ridge propagated westward into the African plate to open the Gulf of Aden. Presently, it accommodates  $\sim 23$  mm/yr of left-lateral strike-slip motion between the Sheba and Carlsberg spreading centers. The fault was recently surveyed in the Spring of 2019 during the VARUNA and CARLMAG cruises on BHO Beautemps-Beaupré, an oceanographic ship operated by the French Navy. Along with geophysical measurements (multibeam bathymetry, gravity and magnetic fields) a set of high-resolution seismic lines (> 5000 km) was acquired across both the active and fossil traces of the fault between 9°N and 15°N. The area is largely buried under the distal Indus turbiditic sediments and therefore offers a fairly unique continuous high-resolution stratigraphic record of past regional tectonic events. Here we present the first multibeam map of the Owen Transform system. A remarkable transpressive ridge borders the active trace of the fault along most of its length. At the intersection with the Carlsberg Ridge, the Owen Transform marks an 11° bend characterized by  $\sim 1200$  m of seafloor uplift. Our preliminary interpretation of the seismic lines brings to light the key unconformities related to Global Plate Reorganization Events. Off the main fault, new data reveal the magmatic nature of the Varuna Bank and similar partially buried highs. These have likely grown in the very early stage of formation of the oceanic crust carrying them, although tectonic emplacement cannot be completely ruled out. Some of the highs show internal structure, which can be interpreted either as carbonate caps or layered volcanic formations. This dataset, combined with previous cruises, offers unprecedented coverage of a 1500 km-long transform corridor along the Arabia-India and India-Somalia plate boundaries.