Magma-rich transform margins: example from the Limpopo transform fault zone between Mozambique and Antarctica

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Transform continental margins known across the Earth represent 31% of passive margins. Resulting from first-order plate tectonic processes, transform margins record a diachronous evolution mainly defined by three successive stages, including intra-continental transform faulting, active and passive transform margin. Due to their high complexity and a lack of large hydrocarbon discoveries (i.e. not a target for oil industry), they have only been sparsely studied, especially when compared with other margin types (i.e. divergent or convergent).

We present the structure and evolution of the NS-trending Limpopo Transform Fault Zone (LTFZ), corresponding to the main fracture zone from western part of the Africa-Antarctica Corridor (AAC). Here, we combine published and unpublished dataset (seismic reflection profiles, wells, multibeam bathymetry, gravity, magnetic data) in order to propose an interpretation of the LTFZ structure and adjoining segments and their evolution through time, from rifting to spreading.

The LTFZ is composed of two main segments: the East Limpopo segment and the Astrid conjugate one and the North and South Natal segment including the Dana-Galathea Plateau (Mozambique side) and the Maud rise/east of Grunehogna craton (Antarctica margin). The LTFZ offsets the segments of divergent conjugate margins (Southern Natal-off Grunehogna craton in the west and Beira High Angoche-Riiser Larsen Sea in the east) since 155 Ma (chron M25). We focus on the evolution of the transform fault zone from its initiation at chron M25 up to chron M0 (~126 Ma, Barremian). Oceanic spreading onset at chron M25 in the south of Beira High segment and Dana-Galathea Plateau triggered the uplift and erosion of the proximal parts of the margin and the formation of several seaward dipping reflectors wedges. Plate kinematic implies an NNW-SSE opening of the LTFZ. The oblique component of opening promotes the setting up of several volcanic wedges. These wedges rejuvenate southward trough time, which is consistent with the sliding of Antarctica with respect to Africa and thus confirm the diachronous evolution of the transform fault zone.