Geophysical Research Abstracts,
Vol. 11, EGU2009-4229, 2009
EGU General Assembly 2009
© Author(s) 2009

Arabia-Somalia plate kinematics and the opening of the Gulf of Aden

M. Fournier (1), N. Chamot-Rooke (2), P. Patriat (3), C. Petit (1), and P. Huchon (1)

(1) ISTEP, Laboratoire de Tectonique, CNRS UMR 7193, Université Pierre et Marie Curie - Paris 6, Paris, France (marc.fournier@upmc.fr), (2) Laboratoire de Géologie, CNRS UMR 8538, Ecole normale supérieure, Paris, France, (3) Géosciences marines, CNRS UMR 7154, Institut de Physique du Globe, Paris, France

New geophysical data collected at the Aden-Owen-Carlsberg triple junction (AOC survey) between the Arabia, India, and Somalia plates are combined with all available magnetic data across the Gulf of Aden and the NW Arabian Sea to determine the detailed Arabia-Somalia plate kinematics over the past 20 Myr. We reconstruct the history of opening of the Gulf of Aden, including the penetration of the Sheba Ridge into the African continent and the evolution of the triple junction since its formation. Ridge propagation occurred in three stages from east to west. Sea-floor spreading between the Arabia and Somalia plates initiated ca. 20 Myr ago, shortly before Chron 6 (19.7 Ma), along a 200 km long ridge portion located immediately west of the Owen fracture zone and southeast of the Socotra Island. A second 500 km long ridge portion developed westward up to the Alula-Fartak transform fault before Chron 5D (17.2 Ma). About 1 Myr later and before Chron 5C (16.0 Ma), a third 700 km long ridge portion was emplaced between the Alula-Fartak transform fault and the western end of the Gulf of Aden (45°E). Within a short time period bracketed between 20 and 16 Ma, the Sheba Ridge propagated into the Gulf of Aden over a distance of 1400 km at an extremely fast average rate of 35 cm yr 1. The ridge propagation resulted from the Arabia-Somalia rigid plate rotation about a relatively stationary pole located to the northwest of the Gulf of Aden. Since Chron 5C (16.0 Ma), the spreading rate of the Sheba Ridge decreased first rapidly until 10 Ma and then more slowly. Opening rate may still be slightly decreasing, although not as much as recently inferred from geodesy. The evolution of the Arabia-India-Somalia triple junction is marked by a major change of configuration around 10 Ma, with the formation of a new Arabia-India plate boundary including the newly discovered Beautemps-Beaupré Basin. Part of the Arabian plate was then transferred to the Indian plate. Reconstructions of the spreading axis at each anomaly time show a complex evolution of the segmentation with an important reorganisation of the eastern Sheba Ridge axis between chrons 4A (8.8 Ma) and 3A (6.0 Ma).