Geophysical Research Abstracts, Vol. 9, 03308, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-03308

Delimiting the Nubia-Somalia plate boundary on South Africa using GNSS solutions

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The boundary between the Nubian and Somalian plates has unique characteristics in the context of global tectonics. In the South Africa region, almost no deformation and seismic activity is observed, which has led several authors to question if this segment of the plate boundary is presently active or even exists. This work attempts to better constrain the Nubia-Somalia tectonic plate boundary on the South Africa region based on the regional velocity field derived from a network of continuously-operating GPS stations. Recently, the number of stations providing data in this region has increased significantly with the inclusion of 34 stations located in South Africa. Although the time-span for this extended network is still relatively short, the derived motions when integrated with the stations having longer time-series contribute to constrain the location and behaviour of the Nubia-Somalia plate boundary in Southern Africa.

A new angular velocity model based on ITRF2005 is presented for the stable parts of the Nubia and Somalia tectonic plates. This model is used as reference to analyze the motions of the GPS stations installed in South African territory. The derived relative velocity field suggests that the eastern part of South Africa is located on a different tectonic unit than the rest of the country. Although this result is largely based on only one station, Richards Bay (RBAY), which forces us to be cautious since local phenomena can influence the observed motion, the derived plate boundaries are not in contradiction with the boundary limits suggested by other authors based on independent geophysical evidence. The South African territory is distributed over a third major tectonic plate, Antarctica, as is shown by the derived motion for the GPS station located on Marion Island, which geodetically constrains the southern border of Nubia-Somalia with Antarctica.