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Focal mechanism compilation for updating the African stress map

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The current stress field for the African plate is still incompletely known due to the relatively small number of earthquake focal mechanisms and a still very small number of in-situ measurements. In the last few years, there has been a strong effort to revise the existing focal mechanisms and to determine new ones, using systematic approaches. These data have been obtained by different authors and also by the Harvard catalogue. They have been used for investigating the crustal structure, but they have not yet been used with the view to improve the African stress map. In 2010, Delvaux and Barth (Tectonophysics 482, 105-128) compiled 332 focal mechanisms for Central, Eastern and Southern Africa. We now compiled 690 mechanisms for the entire African plate. The significant increase in number is not only due to the integration of the North and Western African region but also, and in a large part, to the determination of new mechanisms from old seismological data and from the new events occurring during the last 3 years.

The distribution of the mechanisms on the African plate is still heterogeneous, but larger regions are now well covered. These allows to better image the first- and second-order stress fields across the continent, and provide locally third-order details. The intraplate stress outside the East African rift system is largely compressional and the maximum horizontal principal stress directions (SHmax) correlate well with the minimum ones (Shmin) from the closest portion of the mid-oceanic ridge (data from the World Stress Map). The stress field in the regions of high elevation in East and Southern Africa are associated to extensional stresses, with the Shmin directions radiating away from the topographic highs. The western flank of the Kivu rift segment in the DRC is a nice example of the transition between E-W extension in the western rift of the East African rift, to E-W compression in the Congo Basin, with progressive change in stress regime and horizontal stress directions.