# Why the Victoria Plate in Africa rotates

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The Olorgesailie Basin in the Kenya Rift Valley, part of the Eastern Branch of the East African Rift System. In the background the high topography of the Rift's border faults. Credit: Corinna Kalich, University of Potsdam

The East African Rift System (EARS) is a newly forming plate tectonic boundary at which the African continent is being separated into several plates. This is not a clean break. The system includes several rift arms

and one or more smaller so-called microplates. According to GPS data, the Victoria microplate is moving in a counterclockwise rotation relative to Africa in contrast to the other plates involved.

Previous hypotheses suggested that this rotation is driven by the interaction of a mantle plume—an upward flow of hot rock within the Earth's mantle—with the microplate's thick craton and the rift system. But now, researchers from the German Research Centre for Geosciences GFZ in Potsdam around Anne Glerum have found evidence that suggests that the configuration of weaker and stronger lithospheric regions predominantly controls the rotation of continental microplates and Victoria in particular. Their findings were published in the journal *Nature Communications*.

In the paper, the researchers argue that a particular configuration of mechanically weaker mobile belts and stronger lithospheric regions in the EARS leads to curved, overlapping rift branches that under extensional motion of the major tectonic plates induces a rotation. They used 3-D numerical models on the scale of the whole EARS to compute the lithosphere and upper mantle dynamics of the last 10 million years.

"Such large models run on high performance computing clusters," says Anne Glerum, main author of the study. "We tested the predictive strength of our models by comparing their predictions of velocity with GPS-derived data, and our stress predictions with the World Stress Map, a global compilation of information on the present-day crustal stress field maintained since 2009. This showed that the best fit was obtained with a model that incorporates the first order strength distributions of the EARS' lithosphere like the one we prepared."

There are many more continental microplates and fragments on Earth that are thought to rotate or have rotated. The lithosphere-driven mechanism of microplate rotation suggested in the new paper helps

interpret these observed rotations and reconstruct plate tectonic motions throughout the history of the Earth.

Clouds reflecting in lake Magadi, Kenya, located in the Eastern Branch of the East African Rift System. The high rising flanks of the Rift's border faults can be seen in the background. Credit: Corinna Kalich, University of Potsdam

**More information:** Anne Glerum et al. Victoria continental microplate dynamics controlled by the lithospheric strength distribution of the East African Rift, *Nature Communications* (2020). DOI: 10.1038/s41467-020-16176-x