

The East African Rift: a geological guide

Continental rifting is the process by which a continent is tectonically pulled apart to form a new ocean basin. This extension is achieved by breaking, weakening and thinning Earth's thick continental crust by creating fractures (**faults**) and intruding molten rock (**magma**).

The 6,000 km-long **East African Rift** system is the largest active continental rift system on Earth. Here the **Somalian Plate** of East Africa is separating from Central Africa at 10-50 mm/yr. Continental rifting evolves into seafloor spreading from the south of the Rift to the north; the northernmost parts of the East African Rift showcase these final stages of the continent-to-ocean transition.

The East African Rift connects with the Red Sea Rift and Aden Ridge at the **Afar triple junction**. These two other rift systems push the Arabian Plate away from Africa.

Subsidence from extension forms **rift lakes**, homes to a vast variety of animal life.

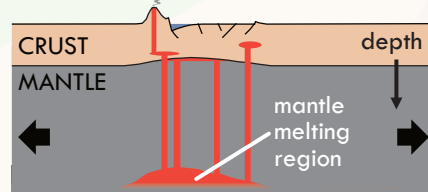
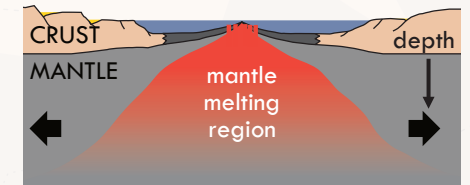
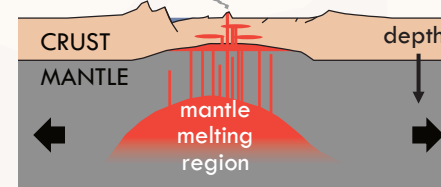
The Kenyan Rift and Ethiopian Rift meet at **Turkana**. It is a low-lying region cut by many faults.

The **Western Rift** is the arm of the East African Rift that runs through central Africa. There are fewer volcanoes along this rift arm, as it is mostly non-magmatic.

The **Ethiopian Rift** is a later stage of rifting. Most faults and volcanoes now occur in the centre of the rift; the large faults and volcanoes present on the rift flanks in Kenya are now inactive. Mantle melting is now closer to the Earth's surface than in the Kenyan Rift. The crust remains thick, but subject to constant intrusions of hot magma.

In **Afar**, the crust is very thermally weakened by magma, making extension much easier. It is now thinned significantly and mostly made of volcanic rock instead of continental basement material. Within a few million years the mantle melting region beneath the Rift will become very shallow, and a new mid-ocean spreading ridge will be formed along with a new ocean basin.

The **Kenyan Rift** (or **Eastern Rift**) is an example of an young continental rift. Thick African crust is broken apart at the sides of the rift by large faults. Melting of Earth's mantle deep under the rift creates magma, which uses these faults as passageways through the crust to the surface, erupting to form volcanoes.



The chemistry of volcanic rocks and minerals from the Ethiopian Rift can tell us more about how magma is generated and transported to the surface, helping us to understand how the Rift develops.

This is of interest to geologists studying the processes behind the final stages of continental breakup, and to the large subpopulation of Ethiopia who live in the cities present within the seismically and volcanically active Rift.



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