



## **Influence of rifting episodes on seismic and volcanic activity in the southern Red Sea region**

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Rifting episodes cause large changes to the state of stress in the surrounding crust, both instantaneously (elastic stress transfer) and in the years following the episodes (viscoelastic stress transfer), and can significantly influence occurrence of future earthquakes and volcanic eruptions. Here we report on a new project that aims at studying the stress impact of rifting episodes and focuses on the southern Red Sea, Afar and Gulf of Aden region, which has seen a significant increase in rifting activity during the past decade. The Afar rift system experienced a major rifting episode (Dabbahu segment) in 2005-2010 and the southern Red Sea also appears to have had one, indicated by three volcanic eruptions in 2007, 2011-12, and 2013 (the first in the area in over a century), accompanied by several seismic swarms. In addition, Gulf of Aden had an exceptionally strong seismic swarm activity starting in late 2010 that was associated with intrusion of magma in a separate rifting episode. To explore the influence of these recent rifting episodes in the region we will use new geodetic observations, seismicity analysis and modeling. We have analyzed new GPS data collected in Eritrea, in Afar, and in southern Saudi Arabia. Comparisons with older surveys has not only resulted in better GPS velocities for the observed sites, but also revealed changes to velocities at some sites influenced by the rifting activity. We use the results along with seismic data to better constrain the timing, magnitude and duration of the rifting activity in the region. We will then apply elastic and visco-elastic stress transfer modeling to assess the associated stress changes, in particular at locations where volcanic eruptions or intrusions have occurred or where significant seismicity has been detected. The project should provide new information about the impact rifting events and episodes can have on regional volcanic and earthquake activity and how rifting episodes may influence one another.