



## **Increase in earthquake swarm activity in the southern Red Sea, Afar and Gulf of Aden**

Joël Ruch (1), Derek Keir (2), Ghebrehan Ogubazghi (3), Domenico di Giacomo (4), Renier Ladron Viltres (1), and Sigurjón Jónsson (1)

(1) King Abdullah University of Science and Technology (KAUST), Saudi Arabia, (2) Southampton University, (3) Department of Earth Sciences, Eritrea Institute of Technology, Asmara, Eritrea, (4) International Seismological Centre

Rifting events periodically occur at divergent plate boundaries, consisting of magmatic intrusions, seismic swarms, surface faulting and in some cases volcanic eruptions. While earthquake swarms also occur at other types of plate boundaries, the swarms that have been observed in inland rift zones (e.g., in Afar and Iceland) and in a few offshore cases show an unambiguous relation with magmatic intrusions. These swarms typically last for a few days to a few weeks, lack a clear mainshock-aftershock decay pattern.

Here we present a new study on earthquake swarms in the southern Red Sea, Afar and Gulf of Aden. We provide the first earthquake swarm catalogue for the region, which we compiled by integrating reexamined global and local earthquake catalogues with historical observations from 1960 to 2016. We find that in several cases in all the three areas, swarms have been re-occurring at the same locations every few decades (e.g., in the Bada area in Eritrea and Port Sudan region in the southern Red Sea in 1967 and 1993, and in the western Gulf of Aden in 1979, 1997 and 2010-2012). This suggests the existence of active spreading centers that are more active than previously thought. The swarms show different families of earthquake magnitudes, with clusters of Mw4 and Mw5 events (southern Red Sea and Aden) and occasional larger than Mw6 events, primarily in the southern Afar region (the Serdo and Dobi areas). Of the three areas, Gulf of Aden shows the highest swarm activity, followed by the Afar area and the southern Red Sea. Despite seeing the least amount of activity and lower magnitudes, the southern Red Sea has experienced multiple earthquake swarms and three volcanic eruptions (two of which resulted in new volcanic islands) during the past 10 years. We show that the three areas have been subject to an almost simultaneous increase of earthquake swarm activity during the last 10 years. This period (2005-2014) was much more active compared to the preceding decades (1960-2005) and might indicate an increase of magma supply in the region.