# Tectono-thermal Evolution of the Sierra Leone Passive Continental Margin, West Africa: constraints from Thermochronology

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The Sierra Leone Passive Continental Margin is one of a very few passive margins formed as a result of continental break-up associated with the emplacement of a layered igneous body, viz: the voluminous (65 x 14 x 7 km) Freetown Layered Igneous Complex (FLIC). The margin is unique and of particular importance in understanding the Jurassic rifting of Pangea to form the Central Atlantic in that (i) it marks the transition between the Jurassic Central Atlantic (~170 Ma) and the Cretaceous South Atlantic (~130 Ma) and, (ii) it is located at the place where the West African margin shifts from N-S to E-W. With respect to the Atlantic Ocean, this implies a transition from orthogonal spreading (Central Atlantic) to spreading controlled by transform faulting (South Atlantic).

The goal of this project is to constrain the cooling and uplift history of the FLIC to understand the relationships between magmatic injection, uplift and exhumation in the formation and evolution of the Atlantic passive continental margins. State-of-the-art age dating and low-temperature geochronometry employing respectively high precision U-Pb and $^{40}Ar/^{39}Ar$ and, (U-Th)/He and Fission-track geochronothermometry on mineral separates from the FLIC, the surrounding Precambrian Basement, and the detrital on- and offshore sediments will constrain the syn- and post-rift magmato-thermal (T-t) evolution of the margin. The thermochronological data will be integrated with geothermobarometric and regional data and seismic profiling obtained from the literature (Jones et al., 1988) to produce a comprehensive dataset. A kinematic forward model based on a finite difference method [1] will then be used to calculate the thermal response to extension and/or erosion. The numerical model(s) on the thermo-kinematic and geotectonic evolution of the margin will provide (i) feedback that will enable the prediction of thermal histories related to passive margins and (ii) new insights into the initiation and evolution of continental break-up.

REFERENCES:

[1]. ter Voorde, M.; de Bruijne, C.H.; Cloetingh, S.A.P.L., Andriessen, P.A.M. (2004). Thermal consequences of thrust faulting: simultaneous versus successive fault activation and exhumation. *EPSL 223:* 395-413.