

EGU25-6434, updated on 12 May 2025

<https://doi.org/10.5194/egusphere-egu25-6434>

EGU General Assembly 2025

© Author(s) 2025. This work is distributed under the Creative Commons Attribution 4.0 License.



Fingerprints of necking domains at rifted margins: insights from the best documented examples worldwide

Pauline Chenin and Gianreto Manatschal

Université de Strasbourg, CNRS UMR 7063, Institut Terre et Environnement de Strasbourg, STRASBOURG, France
(chenin@unistra.fr)

Rifted margins mark the transition between a thick-crust (35 ± 5 km) continental domain and a thinner-crust (0–8 km) (proto-)oceanic domain. Yet, the mechanisms of crustal thinning during rifting are incompletely understood, especially the consequences and fingerprints of the so-called *necking phase* during which the continental crust is thinned from its initial thickness to ca. 10 km in only a few million years.

One major difficulty in studying *necking* arises from the necking phase being only transient in the timeframe of continental rifting and often followed by further extension and thermal relaxation. As a result, the structural, stratigraphic and thermal signatures of the necking process are partially dismembered and overprinted in present-day rifted margins. Hence, studying the necking process requires to identify and track its fingerprints in present-day rifted margins.

In this contribution, we synthesize data from the best calibrated necking domains worldwide to define general recognition criteria and hence clarify the definition of necking. We show that necking domains commonly display: (1) deformed (from cataclasites to black gouges) basement directly overlain by undeformed syn-rift sediments; (2) exhumation of deep continental crust; (3) syn-rift basement erosion and adjacent sandstone deposition; and (4) syn-rift and syn-tectonic shallow-water deposits rapidly followed by syn-rift but post-tectonic deep-water deposits. We argue that these fingerprints cannot be explained by high-angle normal faults by themselves and discuss the possible additional and/or alternative processes.