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Lithospheric domains of the West and Central African rift system based on Terracing and Cluster analysis

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We present results of cluster analysis and geophysical modelling of the West and Central African rift system, where we integrate seismological and satellite data. For a description of lithospheric domains, two different methods based on seismic tomography and satellite gravity data have been used. First, the terracing method using the shape index, has been applied to the gravity field in order to enhance the signal of the large-scale tectonic units. In addition, the K-means cluster method (which is an unsupervised machine learning algorithm) has been applied to a seismic tomography model over the area.

Both models are compared and interpreted towards similarities and differences. The preliminary analysis based on K-means clustering of seismic tomography shows that the West and Central African rift system and its surroundings can be divided into at least three clearly distinct tectonic domains: The Northern part of the Congo craton, the Eastern part of the West African craton and an area in between. In addition, the preliminary analysis of the terracing of satellite gravity data, confirms the location of both the Congo and the West African craton, but also splits the area in between into two known tectonic units, the Southern part of the Saharan meta-craton and the West and Central African rift system in the center.

The cluster analysis is also pointing to differences at crustal and upper mantle level and is the first step towards the evolution of a lithospheric scale model. In the model, we integrate our tectonic domain analysis with the existing seismic Moho depths estimate and other information.