Tectonic evolution of the Kédougou Kéniéba Inlier

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The Kedougou-Kenieba Inlier (KKI) represents the westernmost part of the Paleoproterozoic domain of the West African Craton. It is built of the Mako volcano-plutonic belt in the west and the Diale-Dalema and Kofi series in the east. The Mako belt, the Diale-Dalema, and Kofi sedimentary series are intruded by a large number of Eburnean magmatic rocks of variable ages and geochemical signatures. The most voluminous are the plutons of the Saraya batholith and the Faleme volcano-plutonic belt. The Mako belt comprises the oldest lithologies found, such as tholeiitic basalts, the Badon granodiorite and Sandikounda tonalite gneiss dated at 2213-2194 Ma (Dia et al., 1997; Gueye et al., 2007; Theveniaut et al., 2010). The Diale-Dalema series is made of metagreywackes, metapelites, and metacarbonates intercalated with volcanic units. The Kofi series contains metagreywackes and metapelites and minor metacarbonates. The precise deposition age of the protoliths of the metasediments is unknown due to the lack of systematic detrital zircon geochronology; however some units are as old as 2165 Ma (Hirdes and Davis, 2002). The Faleme volcano-plutonic belt straddles the Senegalo-Malian boundary and was emplaced at ca. 2100-2080 Ma (Hirdes and Davis, 2002; Labert-Smith et al., 2016). Plutons of the Saraya batholith, dated at 2079 ± 2 Ma, intrude the Diale-Dalema-Kofi series in the south (Hirdes and Davis, 2002).

Previous studies are focused on different parts of the KKI either in Senegal or Mali and propose a polyphase tectonic evolution (e.g. Ndiaye et al., 1989; Gueye et al., 2008; Diene et al., 2015; Masurel et al., 2017; Diatta et al., 2017). The only work working at the scale of the whole KKI is that of Ledru et al. (1991). This work proposes an original tectonic synthesis at the scale of the KKI based on a new lithologic-structural map at 1:500,000 constrained by airborne geophysical data and field observations. Five major deformation events were documented in the KKI. The first deformation D_1 is characterized by E-W oriented steeply dipping penetrative metamorphic foliations and isoclinal folds, scarcely found in the field across the whole KKI and well visible in the airborne magnetic data. This deformation event affects the Mako belt and Diale-Dalema series but not the Faleme belt nor the Kofi series suggesting that it operated before ~2100 Ma. The second deformation phase D2 affects all volcanic and sedimentary units in the KKI and is characterized by NNE-SSW trending steeply dipping penetrative foliation, thrust faults, and tight to isoclinal folds refolding at places the E-W structures, suggesting an E-W shortening under a pure shear dominated regime. This phase is also responsible for tectonic burial of metasediments of the Diale-Dalema series and it occurred at ca 2090-2080 Ma as constrained by geochronological data (Kone et al., this abstract volume). The following deformation D_3 is characterized by NE-SW trending dextral subvertical shear zones operating under ductile to brittle ductile conditions. The D_3 is interpreted as a continuum of D_2, representing a switch to predominant transcurrent deformation under simple shear regime. This phase also marks the beginning of the tectonic exhumation of the high grade metamorphic rocks found in the Saraya pluton surroundings along the faults and/or due to the erosion of the thickened orogen. NS to NNE-SSW oriented steeply dipping sinistral shear zones reactivate at places the pre-existing structures and suggest a progressive anticlockwise rotation of the shortening direction in a continuum of deformation during the D_4. During this phase occurred the final exhumation of the metasediments and their heating, which is contemporaneous and slightly post-date the Saraya pluton emplacement. The exhumation is associated with an extension in a NE-SW direction. Metamorphic ages on monazite and garnet suggest that this happened at ca 2060-2050 Ma (Kone et al., this abstract volume). Many plutons, including the Saraya granite, show syn-kinematic deformation features and/or penetrative magmatic foliation. The regional-scale shear zones associated with the D_3 and D_4 are well visible in the airborne magnetic data. The last deformation observed at regional scale, D_5, is characterized by NE-SW, NW-SE and E-W oriented brittle faults found in the field and also in magnetic data.

The polyphase tectonic evolution documents a transition from an early collision of a volcanic arc towards the continental collision and build-up of the Eburnean orogenic belt by tectonic thickening and magma input until final stages of orogenic maturation and collapse, marked by tectonic exhumation of high grade metamorphic rocks.

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