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Tectonic evolution of the Oudalan-Gorouol greenstone belt in NE Burkina Faso and Niger, West African craton.

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The Oudalan-Gorouol Greenstone Belt (OGGB) forms part of the Palaeoproterozoic as the Baoulé-Mossi domain of the West African Craton (WAC) and hosts gold deposits at Essakane, Gossey, Korizena, and Falagountou in NE Burkina Faso, and Kossa goldfield in Niger.

The Birimian supracrustal sequences in the OGGB are dominated by meta-volcanoclastic greywacke intercalated meta-conglomerate, siltstone and shale, carbonate (dolomite) and volcanic units pillow basalts). The belt is surrounded by plutonic rocks including granite, TTG suite granitoids and granite gneiss. The sequences where subjected to two phases of deformation, and several phases of contact metamorphosed to hornblende-hornfels facies during emplacement of pyroxenite-gabbro-norite, granodiorite-tonalite and gabbro dykes and porphyritic sills.

The OGGB is bounded and/or crosscut by several major NNE to NE-trending shear zones including the steeply east-dipping Markoye Shear Zone (western margin of the OGGB), Tin Takanet-Bellekcire Shear Zone, Dori Shear Zone, Kargouna Shear Zone, Takabougou Shear Zone, and Bom Kodjelé Shear Zone (transects the centre of the OGGB). The structures were readily identified using LANDSAT, Aster, aeromagnetic and RTP magnetic data, with follow-up strategic mapping, highlighting the value of interpreting geophysical and remotely sensed data in regional mapping in Burkina Faso and Niger.

Structural studies completed in 2007 adjacent to the Essakane gold mine indicated that the NE-trending, first-order crustal-scale Markoye Shear Zone (MSZ) has undergone at least two phases of reactivation concomitant to two phases of regional deformation (Tshibubudze et al., 2009). The first phase of deformation, D1, resulted in the formation of NNW-NW trending folds and thrusts during dextral-reverse displacement on the MSZ. The deformation predates the Eburnean Orogeny is termed the Tangaean Event (meaning low hills in the Moré language of Burkina Faso) and is tentatively dated at ca. 2170-2130 Ma (Hein, 2009). D2 involved a period of SE-NW crustal shortening and sinistral-reverse displacement on the MSZ, and is correlated to the Eburnean Orogeny $\sim$2.1 Ga of Feybesse et al. (2006). Deformation in D2 is characterised by NE-trending regional folds (F2) and a pervasive NE-trending foliation (S2-C to S2).

Since 2007 an identical tectonic history has been established for a number of shear zones in the OGGB including the north-trending Kargouna Shear Zone, which is subtended by NW- and NE-trending shears. However the metamorphic grade and mineral assemblages vary from one shear zone to the next. Structural studies completed adjacent to the Dori batholith have indicated that the MSZ forms a shear complex that was active during pluton emplacement. However, the MSZ has two main branches that join at the location of a mylonite zone located north west of Essakane. Southwest of Essakane, a NW-trending mylonite zone crosscuts the Dori batholith and near the village of Kargouna, which is situated southeast of Essakane, the Kargouna shear crosscuts and deforms the Dori batholith. It is thus likely that the Dori batholith was emplacement prior to D1 in the OGGB.

Gold mineralization in the OGGB is generally hosted in the hanging-wall of NE-trending faults and or NW-trending folds in metasiltstone-sandstone-shale sequences. Nkuna (2009) concluded that the deposits can be classified as orogenic gold deposits under the sub-class of “intrusion related” due to their proximity to plutonic masses, which concurs with geophysical studies for the OGGB.

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