

# THE TECTONIC SIGNIFICANCE OF THE SKELETON COAST DYKE SWARM AND ITS CORRELATION WITH THE FLORIANOPOLIS DYKE SWARM

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**ABSTRACT:** This paper examines the distribution and kinematics of the Skeleton Coast Dyke Swarm (SCDS) of northwest Namibia in comparison with its Brazilian equivalent, the Florianopolis Dyke Swarm (FDS) of Santa Catarina. Aeromagnetic data and satellite imagery have been used to map the distribution of generally coast parallel mafic dykes in northwest Namibia. These dykes are related to the Etendeka basalts of Namibia, which together with the Serra Geral basalts, associated felsic volcanics and mafic dyke swarms of south-east Brazil, form the Paraná-Etendeka magmatic province of early Cretaceous age (119-139 Ma). Dyke swarms possess a special tectonic significance as using the principals of kinematic analysis it is possible to estimate the conditions of stress active during their emplacement. The SCDS parallels the trend of the Pan-African Kaoko Belt, with the majority of the dykes orientated SSE-NNW (155-335). Dykes of this orientation can be observed up to two hundred kilometres inland, but are more frequent closer to the coast. The lack of asymmetrical features suggests that the direction of maximum extension was ENE-WSW (65-245) normal to the trend of SCDS. However, less common ESE-WNW and SE-NW orientated dykes display asymmetrical features, such as zigzags, en-echelon dykes and bridges between dyke segments, which are indicative of dextral shear sense suggesting NE-SW (30-210) extension. In contrast, WSW-ENE (65-245) trending dykes which are common along the coast, generally display a sinistral shear sense indicating a SE-NW (135-315) direction of maximum extension during their emplacement. However these ENE-WSW dykes appear to be cut by the dominant SSE-NNW trending dykes, raising the possibility of more than one generation of mafic dykes in northwest Namibia. It is hoped that ongoing geochemical studies and isotope dating will resolve this question. Best fit tectonic reconstructions of Western Gondwana, suggest that the South America continent was rotated some 40 degrees to the east (clockwise) during the break-up of Western Gondwana and subsequent opening of the South Atlantic Ocean. When the South American continent is restored to its pre-break-up position the principal (SW-NE) orientation of the FDS is similar to the orientation of the SCDS. Kinematic analysis of asymmetrical features suggests a predominant sinistral shear sense for the FDS, however it should be noted that a significant number of SW-NE trending dykes display dextral shear sense. Based on the analysis of 36 dykes from the FDS,  $\sigma_3$  was 105-285 (SEE-NWW) during dyke emplacement. This equates to ENE-WSW (65-245) extension when the rotation of the South American continent is taken into account, giving a result similar to the  $\sigma_3$  calculated for the SCDS. In conclusion, the FDS and SCDS are considered to be part of the same dyke swarm emplaced under ENE-WSW extension during the Early Cretaceous break-up of Western Gondwana.

**KEY WORDS:** KINEMATIC ANALYSIS, CONJUGATE MARGINS, WEST GONDWANA, PARANÁ-ETENDEKA