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Spatio-chemical analysis of dykes in the Etendeka Large Igneous Province, Namibia: Insights into the magmatic processes associated with continental break-up



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The continental flood basalts and associated rocks of the Paraná-Etendeka Large Igneous Province (LIP), exposed today on both the South American and African margins, formed in the early Cretaceous (~134 Ma) in an extensional setting related to the opening of the South Atlantic Ocean and the activity of the Tristan mantle plume. Most of the foregoing regional-scale studies of magmatism in the province and all evidence for the correlations of units and magma types across the ocean basin are based on data from the volcanic sequences: flood basalts and interlayered silicic units. However, there are also intrusive components in this province, in the form of the compositionally-diverse subvolcanic ring complexes, as well as extensive, mostly mafic, sills and dyke swarms, which have a wider coverage than the lavas and preserve important information on the sites of magma ascent. The intrusive association has not been viewed before in a regional context.

The dyke suite has a crucial role to play in linking the volcanic succession and the intrusive complexes. We review all the published and available unpublished information for Etendeka mafic dykes and sills and compare this with equivalent data from the volcanic succession and intrusive complexes, to provide a comprehensive overview of the composition of mafic intrusive magmatism in the Etendeka Province, and examine its variation in space and time.

Our results show that the mafic dykes sample a complete, semi-continuous spectrum of compositions and can therefore be used to examine the petrogenesis of the system as a whole. We propose that the previous discrimination of magma groups and subgroups based on the lava compositions can be greatly simplified. We suggest that the diversity of compositions in the whole Etendeka mafic magma system can be explained by mixing between 4 major end-members approximately representing components of the plume mantle, depleted MORB mantle and ancient subducted sediments, as well as a crustal contaminant of variable composition.

