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Dolerite dykes and sills of the Ngoma Graben, northern KwaZulu-Natal, South Africa

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The Archean inliers of the south-easternmost Kaapvaal Craton in northern KwaZulu-Natal from southern Africa are one of the best explored regions in southern Africa in terms of Precambrian mafic dyke swarms and sill provinces. It is also one of the regions with the densest concentrations of such mafic units, of various generations. However, the Archean Nongoma graben in this region is a deeply buried structure underneath the Karoo Supergroup. It preserves remnants of Meso- to Neoarchean Pongola Supergroup, that was explored by Anglo American in the 1960's to 1970's for its gold-bearing potential. Within the Pongola Supergroup in the Ngoma Graben are numerous unstudied mafic units, logged in drill core, which are the focus of this study. These mafic units are variably fresh and altered. Fresh units are usually interpreted as being part of the Jurassic Karoo large igneous province (LIP), which is composed of flood basalts, dykes and sills, which are widespread across southern Africa. Altered units in this region are interpreted as being metamorphosed in either the Ediacaran to Cambrian Pan African Orogeny or the late Meso- to early Neoproterozoic Namaqua-Natal Orogeny. Therefore, these altered rock mafic units are likely Precambrian. These altered mafic units have been sampled for petrography, geochemistry and U-Pb geochronology, with two samples bearing both baddeleyite and apatite, and which has been separated for ID-TIMS and LA-ICPMS analyses. Geochemically, these mafic units have variable geochemistry, and can be compared with other well-known LIPs on this region of the Kaapvaal Craton, including the ca. 2.87 Ga Hlagothi LIP, the ca. 2.73 Ga Klipriviersberg LIP, the ca. 2.66 Ga White Mfolozi LIP, the ca. 2.43 Ga Ongeluk LIP and the ca. 2.17 Ga Ulundi LIP. Unfortunately, most geochemistry suggests crustal influence, and is not diagnostic to fingerprint a comparison with a particular event, with these various geochemical signatures widespread amongst LIPs on the Kaapvaal Craton.