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Early-Middle Jurassic Mafic Dykes from the H.U. Sverdrupfjella, Antarctica

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The Early to Middle Jurassic break-up of Gondwana produced large-volume magmatic events, resulting in large igneous provinces (LIPs) such as the Karoo LIP in southern Africa and Ferrar LIP in East Antarctica. The Early-Middle Jurassic mafic dykes from Sverdrupfjella located in western Dronning Maud Land (WDML), Antarctica, are regarded as part of the Karoo LIP [1]. These dykes intrude both the Grunehogna Province (an Archean basement fragment in WDML thought to have been a pre-breakup constituent of the Kalahari Craton) and the Maud Province (broadly co-eval with the Mesoproterozoic Namaqua-Natal metamorphic province in southern Africa). The dykes intruding the Grunehogna Province are considered on-craton, whereas those intruding the Maud Province are considered off-craton.

The geochemistry and geochronology of these dykes and basalts found in the Grunehogna Province and the Maud Province (Vestfjella, Heimefrontfjella and Kirwanveggen) have been studied by previous workers [e.g., 1) and have been categorized into two groups: low-Ti (TiO_2 <2.5%) and high-Ti (TiO >2.5%) groups. Based on $^{40}Ar/^{39}Ar$ age of mafic dykes intruding the Grunehogna Province (on-craton), dyke emplacement occurred at ~178 Ma and ~190 Ma [1]. The Vestfjella basalts (off-craton) have K-Ar ages between 170-230Ma, and plagioclase KLecturerAr ages at ~180 Ma [2]. The Kirwanvergen basalts (off-craton) yielded a K-Ar age of 172 ± 10 Ma [3]. Mafic dykes in Sverdrupfjella that intrude Early Jurassic alkaline intrusive bodies (Straumsvola, Tvora and Jutulröra) show two $^{40}Ar/^{39}Ar$ age peaks: one at 178-175 Ma (Straumsvola) [4] and another at 206-204 Ma (Jutulröra) [5]. These dykes from the H.U. Sverdrupfjella are characterized by low TiO_2 and Zr contents. The dykes from Sverdrupfjella (off-craton) strike dominantly NNE-SSW, with dip angles ranging from 60° to 90°. The strike trends are similar to equivalent dykes from the on-craton region of WDML (Grunehogna Province, Almannryggen area) [1].

Samples collected from the Sverdrupfjella are fine to medium grained; the groundmass consists of plagioclase, augite and minor amounts of magnetite and ilmenite. Phenocrysts consist of plagioclase, olivine (with inclusions of Cr-spinel) and augite, and pseudomorphs of euhedral olivine and augite.

Unaltered dyke samples have been age dated using $^{40}Ar/^{39}Ar$ data. Rb-Sr and Sm-Nd isotopic systematics have been used to evaluate mantle sources and crustal contamination. Initial $^{87}Sr/^{86}Sr$ ratios and Nd epsilon values from Sverdrupfjella support models involving derivation from heterogeneous mantle sources and melts affected by crustal contamination, with $^{87}Sr/^{86}Sr$ ratios ranging from 0.703361 to 0.711183, and $^{143}Nd/^{144}Nd_{180}$ epsilon values ranging from 1 to -13 [6]. Geochemical and

geochronological data for the Early-Middle Jurassic dykes from Sverdrupfjella overlap with such data from the Karoo and Ferrar LIPs.

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