

# An Iapetus origin for a layered eclogite complex in the northern Western Gneiss Region, Scandinavian Caledonides

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The Western Gneiss Region (WGR) is a Precambrian basement domain in the Scandinavian Caledonides and one of the world's largest high- and ultrahigh-pressure terranes. The south-central WGR underwent regional eclogite-facies metamorphism 415–400 Ma ago when Baltica subducted beneath Laurentia, during the Scandian orogeny. Eclogites in the WGR group into two traditional types: 1) Precambrian mafic intrusions metamorphosed *in situ* during Scandian continental subduction and 2) eclogites, garnet peridotites, and garnet pyroxenites within ultramafic complexes derived from the subcontinental mantle beneath Laurentia. We document, using field relations, petrography, whole-rock geochemistry, and SIMS zircon geochronology, a hitherto unrecognised third type of eclogite in the WGR that places new constraints on its tectonic architecture: an eclogitised fragment of oceanic crust from the Iapetus Ocean. The Kråkfjord eclogite complex is a km<sup>2</sup>-sized body with an interior consisting of kyanite eclogite (meta-troctolite) and subordinate layers and lenses of garnet peridotite, garnet websterite, and kyanite–garnet leucotonalite. This interior is capped by Fe-Ti-rich eclogite, which locally contains subordinate pockets of migmatitic aluminous gneiss. The elemental abundances and isotopic compositions of the Fe-Ti-rich eclogites resemble those of Mid-Ocean Ridge Basalt (MORB). In contrast, the interior kyanite eclogites, peridotites, and pyroxenites have compositions similar to the gabbroic cumulates in the lower oceanic crust of slow-spreading ridges. U–Pb SIMS dating of igneous zircon cores from a leucotonalite pod in the interior of the Kråkfjord complex yield Cambro-Ordovician igneous ages of 500–440 Ma, with the ~500 Ma age interpreted as the isotopically undisturbed age. This age matches those of Iapetan oceanic rocks exposed elsewhere in the mountain belt. Metamorphic zircon from a Fe-Ti-rich eclogite in the carapace of the Kråkfjord complex dates the eclogite-facies metamorphism at 421.9 ± 2.2 Ma, synchronous with the continental collision. Zircon from a leucosome in Fe-Ti-rich retro-eclogite indicates an age of 408.5 ± 2 Ma for the crystallisation of partial melt following the decompression. Detrital zircon core ages from a pocket of aluminous migmatitic gneiss in the carapace indicate derivation of sediment from the Baltic crust. Collectively, the data show that the eclogite complex (1) originated at an Iapetus spreading centre near the continent Baltica, (2) subducted to eclogite conditions during Scandian continental collision, and (3) was tectonically intercalated with the Precambrian Baltica basement of the WGR.