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The extent, thickness and erosion of the Jurassic continental flood basalts of western Dronning Maud Land, East Antarctica: a low-T thermochronological approach

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The Dronning Maud Land Mountains form a c. 1500 km long, coast-parallel escarpment resulting from the Jurassic rifting between East and West Gondwana. Contemporaneous to the rifting, considerable amounts of continental flood basalts (CFB), associated with the Karoo mantle plume, were emplaced at c. 183 Ma. While the basalts are still widespread in South Africa, making up elevated topography, they are only preserved as smaller remnants in western Dronning Maud Land. To quantify the original thickness, extent and erosion of the Jurassic CFBs in western Dronning Maud Land, low-temperature thermochronological methods have been applied to 40 samples. This has resulted in 34 new apatite fission track ages, ranging from c. 310 to 90 Ma, 31 apatite (U–Th)/He ages spanning from c. 400 to 50 Ma and, and 9 zircon (U–Th)/He ages between c. 650 and 200 Ma.

Thermal modelling of 26 samples indicates variable thickness of the Jurassic basaltic cover. The greatest basaltic thicknesses are recorded in Heimefrontfjella, Gjelsvikfjella and H.U. Sverdrupfjella, where c. 1.5-1.8 km are estimated. Thicknesses at Kirwanveggen, Hochlinfjellet, Midbresrabben and Ahlmannryggen range from c. 100 m to 800 m. Thickness variations are attributed to the proximity to the emplacement zone, possible pre-existing topography and syn-volcanic rift flank uplift.

Two phases of post-CFB enhanced cooling have been documented: 1) A Jurassic-Cretaceous cooling phase is attributed to the initial rifting and opening of the South Atlantic and enhanced chemical weathering and deep erosion due to a Jurassic temperate-subtropical climate. 2) The Late Paleogene cooling is attributed to the transition from green house to ice-house conditions at the Eocene-Oligocene boundary. Post-Jurassic denudation of at least 1.8 km is suggested.