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From the Transantarctic Basin to the Ferrar Large Igneous Province—New palynostratigraphic age constraints for Triassic–Jurassic sedimentation and magmatism in East Antarctica

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ABSTRACT

We present new palynological data from the Transantarctic Mountains that clarify the timing of sedimentary and magmatic processes in the transition from continental deposition of the Beacon Supergroup to emplacement of the Ferrar Large Igneous Province. Samples were collected from twenty-three Triassic and Jurassic sections in the southern area of north Victoria Land (NVL), East Antarctica. Recovered palynomorph assemblages are correlated with the widely used, although informal palynostratigraphic framework established for eastern Australia by Price. The associated Late Triassic–earliest Jurassic zone, APT5, is modified here with a proposed new subdivision: Lower APT5 ("APT5L"; middle–late Norian), Middle APT5 ("APT5M"; Rhaetian), and Upper APT5 ("APT5U"; Hettangian–earliest Sinemurian). We further propose a modification unifying the relevant formal eastern Australian and New Zealand palynostratigraphic zones, with a new *Polycingulatisporites crenulatus* Association Zone (new zonal status) that includes the *P. crenulatus* Association Subzone (new subzone; equivalent to APT5L) and the following *Foveosporites moretonensis* Association Subzone (new subzonal status; equivalent to APT5M). Our palynostratigraphic dating of the NVL assemblages demonstrates that the onset of sedimentation was diachronous in this part of the Transantarctic Basin, ranging from at least the Rhaetian to, in places, early Sinemurian. By lack of evidence for rocks containing APT5U assemblages and by analogy with the few coeval sections in Australia, we infer that the Hettangian interval in NVL is probably consumed by unconformity. Deposition of ashes from distal silicic volcanism commenced in the early Sinemurian and reached a peak phase beginning in middle Pliensbachian (ca 187 Ma), coinciding with the first major magmatic interval of the silicic Chon Aike Province in Patagonia and West Antarctica. Two major episodes of phreatomagmatic activity, driven by shallow-level sill intrusion into sandstone aquifers, occurred during the middle Pliensbachian and during the late Pliensbachian–early Toarcian. The latter episode was closely followed by the first pillow extrusion and local lava effusion. Contrary to some previous studies, we further conclude that all available palynological evidence is compatible with a short-lived emplacement of the plateau-forming Kirkpatrick Basalt at around 180 Ma during the early Toarcian.

1. Introduction

The Transantarctic Basin developed at the Panthalassan margin of eastern Gondwana during the mid-Palaeozoic and persisted until the initial stage of Gondwana break-up in the Early Jurassic (see, e.g., Barrett, 1991; Elliot, 2013). The basin contains a succession of Devonian to Jurassic deposits referred to as the Beacon Supergroup. Today, exposures of this supergroup occur in north and south Victoria Land (NVL and SVL), in the central Transantarctic Mountains (CTM), and in isolated outcrop areas along the perimeter of the East Antarctic craton, including the Ellsworth, Pensacola, and Theron mountains (EM, PM, TM) (Barrett, 1991; Collinson et al., 1994) (Fig. 1). The central parts of the Transantarctic Basin (encompassing EM, CTM, and SVL) contain thick mid–late Palaeozoic sequences, including Devonian marine deposits and Carboniferous–Permian glacigenic and fluvio-lacustrine

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