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Palaeoecology and palaeoenvironments of *Glossopteris* forests from the heart of Gondwana: the Lambert Graben, east Antarctica

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Glossopterids overwhelmingly dominated the Permian post-glacial coal-forming vegetation of the Lambert Graben, East Antarctica, then situated in the core of the Gondwanan supercontinent. Decline of the glossopterids towards the close of the Permian is matched by reductions in both the thickness and frequency of coal seams and an increase in the proportion of inertinite macerals [1, 2]. The disappearance of glossopterids around the end of the Permian is matched by the stepwise appearance of new, drought-tolerant plants (especially peltasperms and pleuromeian lycophytes), and the development of red-bed facies [3, 4]. The palaeoecology of the Permian glossopterid forests can be particularly well interpreted via investigations of an extensive mid-Permian permineralized peat deposit within the Toploje Member of the Bainmedart Coal Measures. This peat bed hosts the remains of plants of variable stature representing a multi-storey forested mire community [5]. Matted, low-diversity leaf assemblages, together with broad but sharply defined growth rings in fossil woods indicate deciduous forests growing within a strongly seasonal climatic regime [6].

Notable variations within the permineralized peat profile are reflected by the presence of strongly root-, leaf- and charcoal-rich microfacies. The extensive representation of charcoal within the peat, and especially within discrete bands, indicates that fire was a regular feature of high-latitude Permian deciduous mire-forest ecosystems [7]. More broadly, the coal-forming vegetation of the Lambert Graben occupied a continental interior rift dominated by sandy braided fluvial systems that drained northward towards the Mahanadi Graben of India. Stratal cyclicity within the fluvial succession has been interpreted to reflect precessional Milankovitch-related oscillations in discharge, erosion and ponding within the basin [8]

Three-dimensionally preserved fossil plants and coprolites in the permineralized peat yield evidence for diverse guilds of insect herbivory (folivory, leaf mining, trunk and root wood boring, palynophagy, and mycophagy) and detritivory [9]. Fungal and peronosporomycete interactions are also extensively represented in plant leaves, wood and pollen [9, 10]. Evidence for invertebrate herbivory in glossopterid forest-mire ecosystems has greatly increased over the past decade. Invertebrates are likely to have been the main herbivores in high-latitude Permian communities, where either body and trace fossil evidence of terrestrial vertebrates, outside the Karoo Basin, is sparse.

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