## Earliest Triassic postapocalyptic greenhouse

RETALLACK, G.J., and KRULL, E.S. Department of Geological Sciences, University of Oregon, Eugene, Oregon, U.S.A.

Studies of fossil soils and plants, and of their carbon isotopic composition in southeastern Australia and the Transantarctic Mountains reveal abrupt paleoclimatic warming at high southern paleolatitudes following mass extinction at the Permian-Triassic boundary. Late Permian paleosols formed in swamplands with limited chemical weathering and permafrost features, comparable with swamplands of Siberia and northern Canada today. Early Triassic paleosols in contrast are deeply weathering chemically, and include Ultisols, not currently found at latitudes higher than 52°. Yet paleomagnetically determined paleolatitudes were 65-85° for Antarctica and Australia during the Permian and Triassic. By Middle Triassic time coal-bearing paleosols of cool climatic affinities return to both Australia and Antarctica. Non-calcareous paleosols are evidence for humid paleoclimate through both Permian and Triassic time.

Paleobotanical studies of this portion of the Gondwana supercontinent show southward migration of quillworts (*Isoetes*) and peltasperm and corystosperm seed ferns into southeastern Australia and Antarctica from India, replacing glossopterids everywhere by the earliest Triassic.

The carbon isotopic composition of organic matter across the Permian-Triassic boundary in Australia and Antarctica shifts from normal values ($\delta^{13}C_{org}$ -24 to -27 ‰$_{PDB}$) to very low values (as low as -46 ‰$_{PDB}$), indicating increased concentrations of isotopically-light $CH_4$ and its oxidation product $CO_2$ in the post-extinction greenhouse. Early Triassic isotopic fluctuations include some unusually heavy values (-19 ‰$_{PDB}$) that may reflect CAM physiology in local, early-successional, quillwort communities.