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Earth's supercontinental climate control

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Supercontinent assembly and breakup can influence the rate and global extent to which insulated and relatively warm subcontinental mantle is mixed globally, potentially introducing lateral oceanic-continental mantle temperature variations that regulate volcanic and weathering controls on Earth's long-term carbon cycle for a few hundred million years. In this talk we explore some remarkable consequences of this class of mantle climate control consistent with varied observational constraints. Whereas the relatively unchanging and ice sheet-free climate of the Nuna supercontinental epoch (1.8–1.3 Ga) is an expected consequence of thorough mantle thermal mixing, the extreme cooling-warming climate variability of the Neoproterozoic Rodinia episode (1–0.63 Ga), marked by discontinuous periods of global glaciation (snowball Earth), is a predicted effect of protracted subcontinental mantle thermal isolation.