



Palaeotemperature evolution in the Carnian-Norian transition (Late Triassic): conodont oxygen isotope evidence from the Canadian Cordillera

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The Carnian-Norian (C-N) transition of Late Triassic has long been postulated as an interval of major climatic changes, though the nature of such changes remains a matter of intense debate. In this study, we use oxygen isotopes derived from conodont biogenic apatite ($\delta^{18}\text{O}_{\text{PO}_4}$) from the Canadian Cordillera to trace seawater temperature evolutions in the western margin of Pangea and the Wrangellia Terrane. $\delta^{18}\text{O}_{\text{PO}_4}$ values were measured on monogeneric conodont assemblages and ichthyoliths from Black Bear Ridge, British Columbia (a GSSP candidate for the C-N boundary) and range from 17.9 to 20.1 ‰ VSMOW, indicating a palaeotemperature range of ~23 to 35 °C. Conspicuous offsets in $\delta^{18}\text{O}_{\text{PO}_4}$ are registered amongst different conodont genera. *Quadralella* and *Norigondolella* show heavier $\delta^{18}\text{O}_{\text{PO}_4}$, indicating cooler temperatures, and are interpreted as deeper water dwellers. *Carnepigondolella*, *Epigondolella*, *Mockina* and *Parapetella* have comparably lighter $\delta^{18}\text{O}_{\text{PO}_4}$ values and probably lived in near-surface waters. Thus, sea surface temperatures (SST) in the C-N transition using conodont $\delta^{18}\text{O}_{\text{PO}_4}$ should be evaluated carefully using a genus-specific data calibration. Given that the Triassic was an ice-free world, our calibrated data from Black Bear Ridge indicate a warm low latitude ocean with estimated SSTs ranging from ~28 to 35 °C, favouring a general warm late Carnian to Norian climate scenario. A sharp temperature drop from ~34 to ~28 °C is registered from the *parvus* Subzone to the *asymmetrica-Norigondolella* Zone, representing the most significant climatic perturbation in the studied interval. This brief cooling was followed by a warming trend towards the mid-late Norian.

Limited $\delta^{18}\text{O}_{\text{PO}_4}$ data from Frederick Island, Haida Gwaii are more depleted in ^{18}O compared to coeval samples from the Williston Lake region. The divergence in $\delta^{18}\text{O}_{\text{PO}_4}$ suggests that the Frederick Island seawater was ~3-5 °C warmer, supporting the hypothesis that the Wrangellia Terrane was likely at a more southern, possibly equatorial position.