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Late Jurassic-Early Cretaceous carbon isotope stratigraphy of Arctic Canada

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A new carbon isotope record from two sedimentary successions that span the Jurassic-Cretaceous interval exposed on Axel Heiberg Island, Canada, are presented. This study, combined with other published Arctic data, shows that there is a large negative isotopic excursion of organic carbon (δ13Corg) up to 4‰ (VPDB) and to a minimum of -30.7‰ in the Boreal Tithonian (early or mid-Volgian) part of the Deer Bay Formation. This is followed by a return to more positive values of ~ -27‰Å smaller positive excursion in the Valanginian of $\sim$2‰ and reaching maximum values of -24.6‰ is related to the Weissert Event. The Tithonian isotopic trends are consistent with other high latitude records but are decoupled from Tethyan δ13Ccarbonate records. The Sverdrup Basin and other Arctic areas may have experienced compositional evolution away from open marine δ13C values during the Tithonian due to low global sea levels and later became effectively coupled by Valanginian time when global sea level rose. A geologically sudden increase in volcanism may potentially explain the large negative δ13Corg values seen in the Tithonian Arctic records. An increase in volcanism sufficient to perturb atmospheric pCO_2 levels could drive down the carbon isotopic value in the ocean–atmosphere system. However, any trend in δ13Ccarbonate would be relatively quickly countered as burial of anomalously depleted organic matter would overcompensate for additional input of depleted volcanic CO_2. This study provides improved age constraints based on invertebrate paleontology and a refined C-isotope curve for the Boreal region throughout the Late Jurassic and Early Cretaceous.