Global Correlations of Organic Matter Carbon Isotopes at Eccentricity Timescales throughout the Valanginian Stage

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Résumé

High-resolution paleoclimatic reconstructions require precise temporal correlations, a goal that remains unachieved at orbital timescales in the Mesozoic. In this study, we aim to establish orbitally-paced correlations across 3 geographically distant basins spanning the Valanginian Stage (Early Cretaceous). This interval is characterized by large-amplitude organic carbon isotope excursions concomitant with a neritic carbonate production crisis. A total of 350 samples were analyzed for organic-carbon δ13C from 3 sites: DSDP Site 534 (western Atlantic Ocean), Vergol-Morénas in the Vocontian Basin (GSSP of the Valanginian Stage; SE France), and Cerro La Parva (western Argentina). The values of δ13Corg values range from -30.1‰ to -23.8‰ in DSDP Site 534, -29.7‰ to -27.1‰ in the Vergol-Morénas section and -24.4‰ to -21.5‰ in Cerro La Parva. The trends in the δ13Corg show common features in between the different sites and several negative peaks within the Weissert Event, identified in the Somanakamura group in Japan (Tomura et al., 2025), are also observed in the Vocontian and Neuquén basins (Moreau-Ledegen et al., 2025). The correlation of the different sites using these common features show a pacing of the δ13Corg by the 405-ka eccentricity cycle. This highlights the potential of δ13Corg as a reliable proxy for recording orbital forcing and demonstrates it as a robust tool for chemostratigraphic correlation at a global scale in order to align paleoclimatic signals at an unpreceded time resolution for the Early Cretaceous.

Mots-Clés: organic carbon isotopy, valanginian, correlation, vocontian basin, neuquén basin, dsdp 534

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