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Carbon cycle perturbations recorded by δ^{13}C of bulk organic matter: the Carnian Pluvial Event in the Dolomites, northern Italy

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A period of increased rainfall occurred in the Carnian (Late Triassic), known as Carnian Pluvial Event (CPE), which is evidenced by major lithological changes in continental and marine successions at tropical latitudes. Increased continental weathering and erosion led to the supply of large amounts of siliciclastics into the marginal basins of the Tethys. Seawater anoxia is also observed locally in semi-restricted basins. Simultaneously, microbial factories on high-relief carbonate platforms were replaced by metazoan factories, forming low-relief carbonate ramps and mixed low-gradient shelves.

This environmental change has been shown to be closely associated with a negative carbon isotope excursion. A negative δ^{13}C shift is recorded by bulk organic matter in the Milieres section (central Dolomites) and parallels a coeval excursion in carbon-isotope records of higher plant and marine algal biomarker, thus testifying a global change in the isotopic composition of carbon dioxide in the atmosphere and of dissolved inorganic carbon (DIC) in the ocean. This isotopic excursion was identified in organic carbon records throughout the western Tethys, but so far could not be reproduced convincingly using carbon isotope records from carbonate.

A long carbon isotope record was produced from bulk organic matter of the early to late Carnian Milieres - Dibona section in the Dolomites, northern Italy. Carbon isotope analyses of carbonate (limestone and dolomite) were also obtained. This new carbon isotope record illustrates the structure of this complex carbon cycle perturbation related to the CPE. But while sharp carbon isotope oscillations are evident in the bulk organic carbon record, there is no evidence of a similar pattern in carbonate record. It can be shown that the carbon isotope record of carbonates is influenced by fractionation and diagenetic processes that completely obliterated the original δ^{13}C signal.

We conclude that the Carnian carbonates of the Dolomites do not record the δ^{13}C of marine DIC. We suggest that the identification of the Carnian carbon isotope excursion in carbonate records may only be possible if the isotopic analyses are coupled with petrographic screening that prove a minimal diagenetic overprint.