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Interactions between environmental change and shallow-water carbonate build-up along the northern Tethyan margin and their impact on the early Cretaceous carbon isotope record

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During the early Cretaceous, the evolution of the northern Tethyan carbonate platform was not only influenced by changes in sea level and sea surface water temperature, but also by changes in trophic levels and dissolved CO_2 contents inflicted upon the platform by upwelling currents. We distinguish between phases of carbonate production dominated by oligotrophic photozoan communities (late Tithonian and Berriasian; late Barremian and earliest Aptian) and by mesotrophic and eventually colder water heterozoan communities (Valanginian to early Barremian, late early Aptian to late Aptian). Superimposed on this bimodal trend in platform evolution were long-lasting phases of platform demise for which we provide improved age control (early Valanginian to early Hauterivian, late early to early late Hauterivian, latest Hauterivian to latest early Barremian, late early Aptian to early late Aptian and latest Aptian to early Albian). In order to establish possible links between platform evolution and changes in the carbon cycle in the adjacent ocean, we compiled an early Cretaceous, ammonite-calibrated, δ13C record from the Vocontian Basin and surroundings. We suggest that the history of carbon fractionation along the northern Tethyan margin was not only influenced by the already well-established changes in oceanic carbon household such as in the rate of production and preservation of organic and carbonate carbon, and in the size of the oceanic dissolved inorganic carbon (DIC) reservoir, but also by the above-mentioned changes in the ecology and geometry of the adjacent carbonate platform. The photozoan platform was characterized by a confined geometry and may have operated as a sink of continental DIC and source of respired CO_2 to the

atmosphere, thereby reducing the throughput of continental and input of platform DIC to the adjacent basin. Furthermore, it may have represented a source of aragonite to the adjacent basin and the exportation of this mineral may have induced positive trends in the oceanic δ13C system. The heterozoan platform possessed a ramp-like structure with improved communication to the adjacent basin, thereby facilitating the transfer of respired CO_2 into the basin. The heterozoan platform may have pushed the δ13C system of the adjacent Vocontian basin towards more negative values. Platform drowning episodes implied reduced carbonate production, thereby facilitating the throughput of continental DIC. They are characterized by initial trends in δ13C towards more positive values, followed by longer-term trends towards more negative values. Finally, protracted periods of heterozoan dominance and repeated drowning phases likely induced a general increase in the oceanic DIC reservoir, which lessened the sensitivity of the oceanic δ13C system to short-term change. Such phases are recognized during the Valanginian-Barremian and Aptian.