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Environmental change during the Late Berriasian - Early Valanginian: a prelude to the late Early Valanginian carbon-isotope event?

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The Valanginian period is well known for a positive excursion in marine and terrestrial δ^{13}C records, which has been interpreted as the consequence of a major perturbation in the global carbon cycle (Lini et al., 1992; Erba et al., 2004). In contrast to the positive δ^{13}C excursions of the Early Aptian and latest Cenomanian, marine organic-rich sediments have only been recognized from a few localities (van de Schootbrugge *et al*., 2003; Reboulet *et al*., 2003; Gröcke *et al.*, 2005; Westermann *et al.*, in press). The δ^{13}C excursion began in the late Early Valanginian (*campylotoxus* ammonite zone) and gradually ended during the Late Valanginian. It is associated with a phase of widespread carbonate-platform drowning on the shelf (Föllmi *et al.,* 1994) and a decline in calcareous nannofossils in the pelagic realm (Erba *et al*., 2004). As a triggering mechanism, numerous authors invoke the formation of the Parañà-Etendeka flood basalt. The correlation of this episode with the Valanginian δ^{13}C event depends, however, on the absolute ages attributed to the Valanginian stage. The recent geological timescale by Ogg *et al.* (2008) shows that the major eruptional phase occurred during the Late Valanginian. This may imply that the late Early Valanginian δ^{13}C event resulted from a combination of different factors.

Important paleoenvironmental change occurred already in the latest Berriasian and earliest Valanginian, prior to the positive δ^{13}C excursion. An increase in nutrient input near the onset of the δ^{13}C excursion (*campylotoxus* ammonite zone), which may be considered as a trigger of the carbon cycle perturbation, has been identified in different studies, (Hennig, 2003; Duchamp-Alphonse *et al.*, 2007; Bornemann & Mutterlose, 2008). Heterozoan faunal associations became dominant since the Early Valanginian on the northern Tethyan Helvetic platform and may indicate the beginning of sea-water eutrophication (Föllmi *et al*., 2007). Clay assemblages in the Tethys and Western European basins show that the climate became more humid during the Late Berriasian (Hallam *et al*., 1991, Schnyder *et al*., 2009).

The aim of this project is to precisely characterize and date paleoenvironmental and paleoclimatic change during the latest Berriasian-Early Valanginian time interval in order to decipher if they can be viewed as precursor events, linked with the late Early Valanginian δ^{13}C event. Three key sections have been studied: Capriolo (N Italy), Montclus (SE France) and Musfallen (E Switzerland) located in the Lombardian and Vocontian basins and on the Helvetic platform, respectively. Phosphorus and stable-isotope analyses have been performed, in addition to clay-mineralogy and facies determinations. The three sections show similar and comparable trends: The phosphorus content (in ppm) is higher in Late Berriasian sediments (compared to Early Berriasian and Valanginian deposits) and this period is also characterised by a decrease in δ^{13}C values. This is interpreted as the result of enhanced continental weathering, which would be coeval with a change to a more humid climate during the Late Berriasian (Schnyder *et al*., 2009).

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