Chemostratigraphy of the lower Toarcian Sachrang section (Eastern Alps) and paleoenvironmental changes associated with the Jenkyns Event

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Abstract

The early Toarcian Jenkyns Event (_˜183 Ma) was a series of environmental changes including global warming, carbon cycle perturbations, and marine anoxia, which were associated with large volume greenhouse gas emissions during the main phase of activity of the Karro-Ferrar large igneous province. Although considerable evidence, such as the widespread deposition of black shales and various geochemical anomalies, supports the hypothesis of global expansion of oxygen-depleted marine environments during the early Toarcian, our knowledge of this event is overwhelmingly derived from very well-studied, albeit hydrographically restricted NW European epicontinental basins. Thus, additional data from localities that were in paleogeographic proximity to oceanic environments, where biasing effects may have been smaller, is highly desirable. Here, we present new geochemical (δ13Corg, δ13Ccarb, TOC, HI, T*max*, major elements, redox-sensitive trace elements) and biostratigraphic data (based on calcareous nannofossils and ammonites) from the Sachrang section (Eastern Alps). During the early Toarcian, the study section was deposited in a trench on the northwestern continental margin of the Neotethys Ocean, at a location proximal to the open ocean. The section exposes a _˜42-m-thick hemipelagic succession consisting of manganiferous shaly marls (lower _˜25 m) and black shales (upper _˜17 m) of the Sachrang Member of the Middle Allgäu Formation. Our biostratigraphic data confirm the presence of the lower

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Toarcian NJT5c, NJT6a and NJT6b nannoplankton zones, and ammonites document the Serpentinum Zone in the lower black shale. δ13Corg data exhibit low and fluctuating values (_˜–31 ± 0.5‰), with a prominent negative carbon isotope excursion (CIE) that is the characteristic hallmark of the Jenkyns Event. Redox-sensitive trace element data suggest that dysoxic/suboxic conditions existed at the seafloor during deposition of the manganiferous marls, followed by a shift to euxinic conditions during deposition of the black shale. Declining concentrations in the upper part of the black shale, despite persistence of high TOC values, reflect drawdown of aqueous trace-metal reservoirs. Our findings contribute to an improved understanding of the nature and extent of oceanic oxygen depletion on continental margins during the Jenkyns Event.

Keywords: Toarcian, Jenkyns Event, anoxia