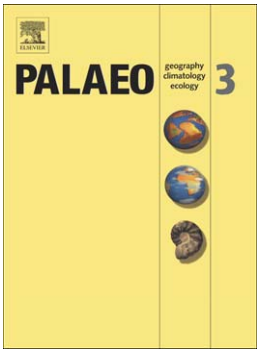

Early Jurassic carbon and oxygen isotope records and seawater temperature variations: Insights from marine carbonate and belemnite rostra (Pieniny Klippen Belt, Carpathians)

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Early Jurassic carbon and oxygen isotope records and seawater temperature variations: Insights from marine carbonate and belemnite rostra (Pieniny Klippen Belt, Carpathians)

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Abstract

New carbon and oxygen isotope records and discussion of the main variations in seawater temperature through the Sinemurian–Aalenian of the Pieniny Klippen Basin (northern Tethys Ocean) are presented herein. Comparison of the recorded changes in stable-isotope compositions of bulk carbonate and belemnite rostra from an open-marine environment with previously documented, predominantly restricted epicontinental data enables determination of major climatic events that were most likely of worldwide extent. A slight positive $\delta^{13}C$ shift is recorded in the lowermost Upper Pliensbachian. A significant positive excursion in carbonate carbon isotope values is documented in the Lower Toarcian Serpentinum Zone. Furthermore, the $\delta^{13}C$ values display a falling trend in the Lower–Upper Toarcian and relatively constant values in the Aalenian. Temperatures inferred from the $\delta^{18}O$ values of well-preserved belemnite rostra (10–13 °C) suggest rather cool seawater conditions in the Pieniny Klippen Basin during the Late Sinemurian, warming by 4 °C in the Early Pliensbachian and then cooling by 8 °C in the Late Pliensbachian. The seawater temperature rose once more in the Early Toarcian and began to fall again during the Middle Toarcian. In the Middle–?Late Aalenian, seawater temperatures oscillated between 10 and 13 °C.

Keywords: palaeoclimate, palaeoenvironment, stable isotopes, elemental ratios, Tethys Ocean

1. Introduction

Evolution of the Early Jurassic environment is of particular interest to palaeoclimatologists due to cyclic changes from icehouse to greenhouse conditions, striking carbon cycle perturbations, prominent mass extinction, the Central Atlantic and Karoo-Ferrar large igneous provinces activity and progressive disintegration of the

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