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A multistratigraphic approach to pinpoint the Permian-Triassic boundary in continental deposits: The Zechstein–Lower Buntsandstein transition in Germany

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ABSTRACT

The Central European Basin is very suitable for high-resolution multistratigraphy of Late Permian to Early Triassic continental deposits. Here the well exposed continuous transition of the lithostratigraphic Zechstein and Buntsandstein Groups of Central Germany was studied for isotope-chemostratigraphy ($\delta^{13}C_{org}$, $\delta^{13}C_{carb}$, $\delta^{18}O_{carb}$), major and trace element geochemistry, magnetostratigraphy, palynology, and conchostracan biostratigraphy. The analysed material was obtained from both classical key sections (abandoned Nelben clay pit, Caaschwitz quarries, Thale railway cut, abandoned Heinebach clay pit) and a recent drill core section (Caaschwitz 6/2012) spanning the Permian-Triassic boundary. The Zechstein–Buntsandstein transition of Central Germany consists of a complex sedimentary facies comprising sabkha, playa lake, aeolian, and fluvial deposits of predominantly red-coloured siliciclastics and intercalations of lacustrine oolitic limestones. The new data on $\delta^{13}C_{org}$ range from −28.7 to −21.7 ‰ showing multiple excursions. Most prominent negative shifts correlate with intercalations of oolites and grey-coloured clayey siltstones, while higher $\delta^{13}C_{org}$ values correspond to an onset of palaeosol overprint. The $\delta^{13}C_{carb}$ values range from −9.7 to −1.3 ‰ with largest variations recorded in dolomitic nodules from the Zechstein Group. In contrast to sedimentary facies shifts across the Zechstein-Buntsandstein boundary, major element values used as a proxy (CIA, CIA*, CIA-K) for weathering conditions indicate climatic stability. Trace element data used for a geochemical characterization of the Late Permian to Early Triassic transition in Central Germany indicate a decrease in Rb contents at the Zechstein-Buntsandstein boundary.

New palynological data obtained from the Caaschwitz quarry section reveal occurrences of Late Permian palynomorphs in the Lower Fulda Formation, while Early Triassic elements were recorded in the upper part of the Upper Fulda Formation. The present study confirms an onset of a normal-polarized magnetozone in the Upper Fulda Formation of the Caaschwitz quarry section supporting an interregional correlation of this crucial stratigraphic interval with the normal magnetic polarity of the basal Early Triassic known from marine sections in other regions. Based on a synthesis of the multistratigraphic data, the Permian-Triassic boundary is proposed to be placed in the lower part of the Upper Fulda Formation, which is biostratigraphically confirmed by the first occurrence date of the Early Triassic *Euestheria gutta-Palaeolimnadiopsis vilujensis* conchostracan fauna. Rare records of conchostracans reported from the siliciclastic deposits of the lower to middle Zechstein Group may point to its potential for further biostratigraphic subdivision of the Late Permian continental deposits.

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