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**Early Permian palaeotemperature values proposed for continental red-bed deposits of the Tambach formation at the Bromacker section**

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**Abstract**

A variety of formulas can be found in the literature to convert geochemical data into absolute palaeotemperatures. In the present study, we test a formula for calculating the Early Permian (Artinskian) palaeotemperatures based on major element values from continental red-bed deposits of the Tambach Sandstone Member (Tambach Formation, Rotliegend Group) in Germany. The geochemical data used herein were extracted from a previous study on the Bromacker section. Applying the literature-based dataset constitutes the first approach aimed to a better understanding of certain local palaeoclimate aspects (i.e., mean annual temperature) and can be easily expanded to wider stratigraphic and palaeogeographic ranges through future studies.

**Keywords:** Permian, Artinskian, Rotliegend, climate, temperature, red beds, Bromacker, Thuringian Forest

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Fig. 1. Present day outcrop situation of the Tambach Sandstone Member (middle part of the Tambach Formation, Rotliegend Group; Artinskian, Early Permian) in a quarry section at the Bromacker locality (Thuringia, Central Germany).

Fig. 2. Geographic position of the study area [28]. a – Map of Germany presenting Thuringia and the Tambach-Dietharz Basin in the Thuringian Forest Mountains. b – Geologic map of the Tambach-Dietharz Basin presenting the lithostratigraphic subdivision of the Tambach Formation into three units: the Bielstein Conglomerate Member (roTc1), the Tambach Sandstone Member (roTs), and the Finsterbergen Conglomerate Member (roTc2).

Fig. 3. Sedimentary structures and tetrapod trace fossils observed frequently in the Bromacker section (Tambach Sandstone Member; Artinskian, Early Permian): a – Horizontal mudstone drapes in the sandstone bed; a 30-cm long hammer for scale; b – tetrapod trace fossil identified as Ichthiotherium sphaerodactylum (Pabst, 1895); c – bottom view on the bedding plane showing desiccation cracks; 5-cm lens cap for scale; d – intraformational clay-/siltstone rip-up clasts in a sandstone bedding plane.

Fig. 4. Examples of the core boxes from the Bromacker FB2/2004 drill core section with fine-grained siliciclastics from the Tambach Sandstone Member (depths 4–5 m, 22–24 m; scale bar in the centre is 1 m in length).

Fig. 5. Sedimentary structures observed on lose blocks in the present day Bromacker section (Tambach Sandstone Member; Artinskian, Early Permian): a – scour marks on the bottom side of a sandstone bed; a 30-cm long hammer for scale; b – ripples on a fine-grained sandstone surface; c – numerous sub-centimeter small load casts on the bottom side of a fine-grained sandstone block, separated secondarily by desiccation cracks; d – raindrop marks of various diameters.

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