PERMIAN–TRIASSIC ECOSYSTEMS

IGCP572: Restoration of marine ecosystems following the Permian-Triassic extinction

LESSONS FOR THE PRESENT

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Abstract volume

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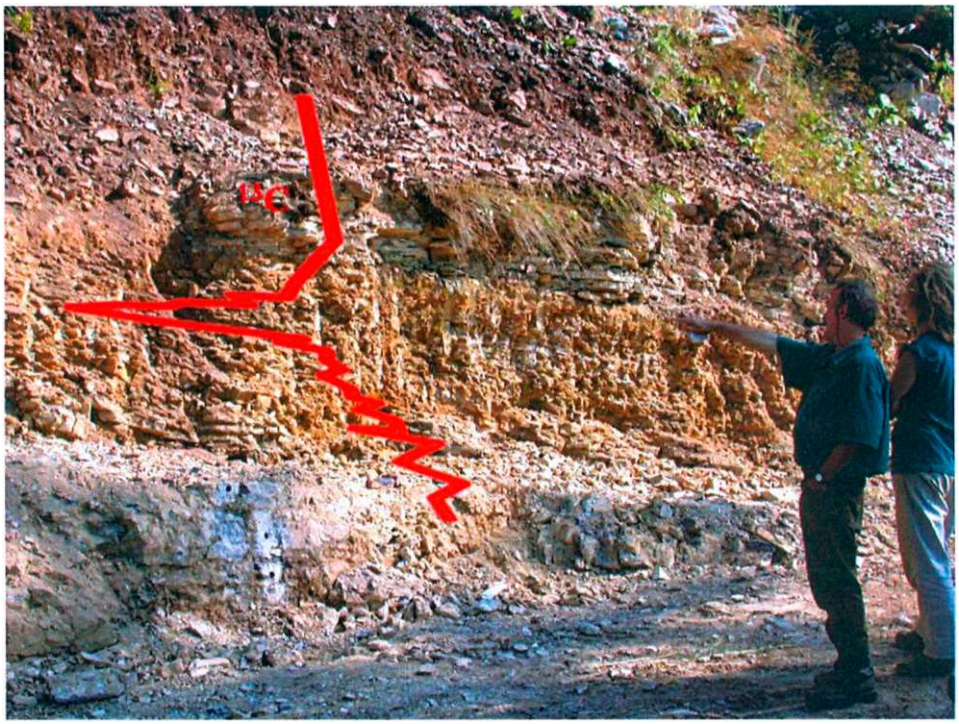
Field Guide - Bükk Mountains



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PALEOCLIMATIC IMPLICATIONS OF PALAEONTOLOGICAL AND GEOCHEMICAL DATA FROM THE UPPER PERMIAN AND LOWER TRIASSIC CARBONATES OF THE VELEBIT MT. (CROATIA)

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Poster

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Permian deposits in the Velebit Mt. area (Croatia) derive from the epeiric platform which existed in equatorial area along northern Gondwana. Late Permian is characterized by dolomites encompassing three relatively thin zones of dark limestones (together named as Velebit Fm., Flügel, 1977). Late Permian dolomites in the Velebit Mt. area are mostly early-diagenctic. The deposition took place in subtidal, intertidal and supratidal environments, as a result of global trends in sea level oscillations. Latest Permian Transitional Dolomite (TD) includes complete remains and bioclasts of algae (dasycladales, solenoporaceans, gymnocodiaceans), foraminifera *(Earlandia, Ammodiscus, Glomospira, Tuberitina, Pachyphloia, Globivalvulina, Permodiscus, Staffela, Hemigordius*, Lagenidae), with fragments of sponges, ostracods, gastropods, echinoderms and brachiopods. Conodont remains have not been found. The lithologic boundary between Transitional Dolomite and overlying Sandy Dolomite (SD) is marked by a sudden occurence of ooids and siliciclastic grains. Even though it was previously considered as the chronostratigraphic PTB, it represents latest Permian regressive phase marked by an enrichment in concentrations of most major, trace and rare earth elements, followed by the Last occurence of the Permian fossils (LPE) in the lower part of the SD unit (Fio et al., 2010). Chemostratigraphic Permian-Triassic Boundary (PTB) is set within the SD unit marked by the parallel negative carbon isotope excursions in carbonate and organic carbon and changes in element concentrations.

First fossil remains after the PTB belong to foraminifera *Earlandia* sp., which is found together with the pyrite framboids just above the chemostratigraphic boundary (Fig. 1), pointing to suboxic and anoxic conditions (Fio et al., 2010). Up in the column, only probable cyanobacterial mats and juvenile mollusc remains have been found within the SD.

Decreasing carbon isotope values through the latest Permian, with considerable negative shift in $\delta^{13}C_{carb}$ at the Permian-Triassic Boundary (PTB), demonstrate that the Earth was significantly warmer, and that oceans were in the latest Permian globally warmer than present (e.g., Kidder &Worsley, 2004; Kiehl and Shields, 2005). Stable isotopes of oxygen can be used for palaeoclimatic and palaeoecological estimations, but for reliable data this estimations have to be done carefully, since oxygen isotopes are easily prone to diagenetic changes. For Rizvanuša section (Central Velebit Mt.), Late Permian whole rock $\delta^{18}O_{carb}$ with respect to V-PDB, vary from -3.2 to -1,3‰ (average-2.6±0.4‰), and Early Triassic from -3.2 to -2.2‰ (-2.7±0.3‰). According to formula t (°C) = 16.1 - 4.64 (δ_C- δ_W) + 0.09 (δ_C- δ_W)^2 (Kim and O'Neil, 1997; Bemis et al., 1998), and assuming seawater $\delta^{18}O$(V-SMOW) = 0‰ (Korte et al, 2005), we presume that Late Permian temperatures ranged from 21 to 31°C, with average 27°C, while Early Triassic ranged from 25 to 31°C (average 28°C).

These results correspond well to determined fossil community, but also to palaeotemperature estimations made by Polšak & Pezdič (1978), suggesting Late Permian mean sea-temperatures in the Dinarids-Alps area to be up to 26°C Kiehl and Shields (2005) palaeotemperature models who proposed western Palaeotethys temperatures from 28-30°C, and results of Kearsey et al. (2009) estimating latest Permian temperatures between 26 and 29°C.

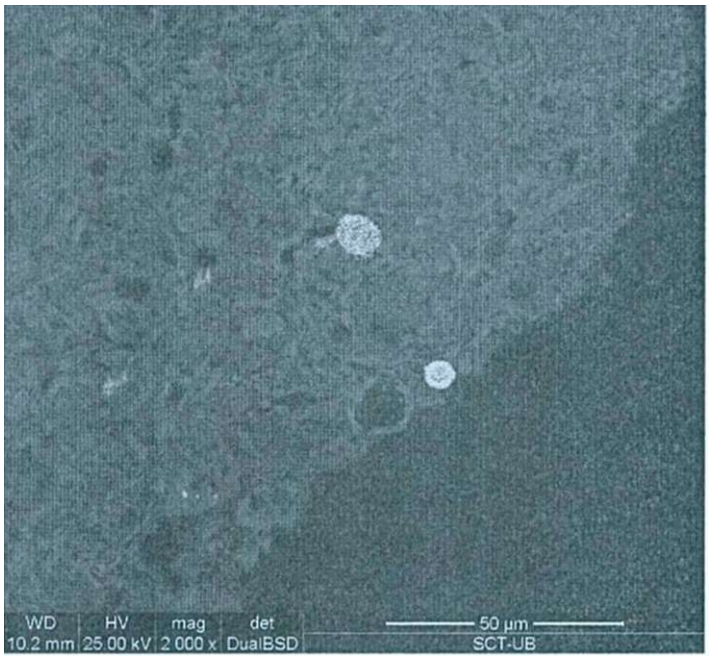

Fig. 1. First fossil remains after the PTB, probably *Earlandia,* found together with the pyrite framboids just above the chemostratigraphic Permian-Triassic Boundary

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