

The lower Triassic anachronistic carbonate facies in space and time

Aymon Baud ^{a,*}, Sylvain Richoz ^a, Sara Pruss ^b

^a *Geological Museum, UNIL_BFSH2, CH-1015 Lausanne, Switzerland*

^b *Department of Organismic and Evolutionary Biology, Harvard University, 26 Oxford Street, Cambridge, MA 02138, USA*

Received 15 September 2005; accepted 30 June 2006

Available online 8 September 2006

Abstract

The end-Permian mass extinction greatly affected the sedimentary record, but the sedimentary response was not limited to the Permian–Triassic boundary interval. This transformation extended to sedimentation that spanned the entire Early Triassic. Calcimicrobialites play an important role throughout this time interval, and at least four main events of anomalous carbonate deposition can be shown. A post-extinction calcimicrobial unit occurs above the extensive Permian skeletal carbonate platform exposed in the Taurus Mountains (southern Turkey), in south Armenia, north-west north and Central Iran along the Zagros Mountains. The calcimicrobial unit formed during the flooding of the platform that took place during the earliest Triassic. A similar calcimicrobialite formed during late Griesbachian to Dienerian time atop the shallow Permian skeletal carbonate platform largely exposed in south China. A third event occurred during the Early Olenekian on the first Mesozoic isolated pelagic plateau (Baid seamount, Oman Mountains). Here the change in carbonate sedimentation is reflected in the occurrence of thrombolites and carbonate seafloor fans. Near the end of Early Triassic time, unusual carbonate deposition is recorded both on an isolated pelagic plateau of the Western Tethys (Halstatt limestone of Dobrogea, Romania) and on the eastern Panthalassa margin of the western United States. In the western United States, the event is represented by stromatolites and thrombolites in the Virgin Limestone of the Moenkopi Formation and by seafloor fans in the middle and upper members of the Union Wash Formation. These unusual episodes of anomalous carbonate deposition illustrate a fundamental change in sedimentation that occurred in the aftermath of the end-Permian mass extinction.

© 2006 Elsevier B.V. All rights reserved.

Keywords: Early Triassic; calcimicrobialites; seafloor fans; thrombolites; stromatolites

1. Introduction

In the aftermath of the end-Permian mass extinction, a major crisis occurred in Phanerozoic carbonate systems that likely reflected a large-scale change in oceanic chemistry. The carbon cycle of the Early Triassic experienced large-scale perturbations over the course of millions of years (Payne et al., 2004; Richoz, 2004; Corsetti et al., 2005). The prolific upper Paleozoic skeletal carbonate factory was abruptly

replaced by a non-skeletal carbonate factory (Baud, 1998; Baud and Richoz, 2004). When preserved between the two carbonate systems, the boundary is marked by a post extinction clay (boundary clay) of latest Permian age (Preparvus–Meishanensis zone). Microbial communities affected sedimentation in a variety of normal marine areas (Baud et al., 1997) and the recovery of metazoans was largely delayed until Middle Triassic time (e.g. Hallam, 1991; Schubert and Bottjer, 1992, 1995). The Early Triassic is characterized by a low diversity of skeletonized organisms and trace fossils (Pruss et al., 2004; Pruss and Bottjer, 2004b; Twitchett and Wignall, 1996).

* Corresponding author.

E-mail address: aymon.baud@unil.ch (A. Baud).

During the Early Triassic, the Paleo- and the Neotethys seaways were separated by the Cimmerian blocks which were covered by extensive carbonate platforms, bordered to the north by Eurasia and to the south by Gondwana (Fig. 1). The shallow equatorial carbonate platforms covered the Neotethyan margins and the Cimmerian blocks, which constitutes much of present day Hungary, northern Italy, Slovenia, Croatia, Albania, western Greece, Turkey, Armenia, Iran, and Oman (Baud et al., 1997, 2001, 2002). The eastern Neotethyan realm also contained broad carbonate shelves, such as the Yangtze platform of South China and the rimmed Ghizou Bank with carbonate strata that span from Permian to Middle Triassic time (Lehrmann, 1999; Lehrmann et al., 2003). At many Neotethyan localities, strata record the extinction event thus preserving the transition from the Permian to the Triassic.

2. The first event

The first episode of anomalous deposition occurred during latest Permian–earliest Triassic time concurrent with a very rapid and large-scale transgression on the large carbonate platforms of the Cimmerian blocks (northern margin of the Neotethys and southern margin of the Paleotethys) and of northern Gondwana (Arabian margin of the Neotethys). This microbial episode was the most extensive of all of these microbial events described

here (Pruss et al., in press). Recorded in Lower Triassic sediments in the Bukk Mountains, Hungary (Hips and Pelikan, 2002; Hips, 2005), in the southern Alps (Italy and Slovenia), in the Taurus region (southern Turkey, see below), in south Armenia, in north-west north and Central Iran in Zagros and in northern Oman.

The calcimicrobial unit represents the first microbial event and has been described in detail in the western Taurus mountains (calcimicrobial “caprock” of Baud et al., 2005a,b,c). This microbial unit, 20 to 40 m thick, consists of thrombolitic and stromatolitic build-ups at the base and mainly oolitic grainstones in the upper part. In some Taurus sections, these grainstones have been called “disaster oolites” (Groves, 2004). Four main microbial and precipitated structures have been illustrated in Baud et al. (2005a,b,c): the stromatolite, the thrombolite mounds, the tufa-like microbial build-ups and the carbonate crystal lithoherms (e.g., seafloor fans). The domal, columnar and conical stromatolites and the abundant botryoidal and fanning aragonite crystal pseudomorphs are anachronistic facies, or features not seen in such abundance since Precambrian–Early Paleozoic time (Sepkoski et al., 1991).

In a more distal open marine setting, anomalous deposition occurred on the pelagic carbonate ramp of southern Armenia (Baud et al., 1997). The carbonate ramp is exposed at the Sovetachen (Zakharov et al., 2005) and Vedi localities, situated about 45 and 60 km

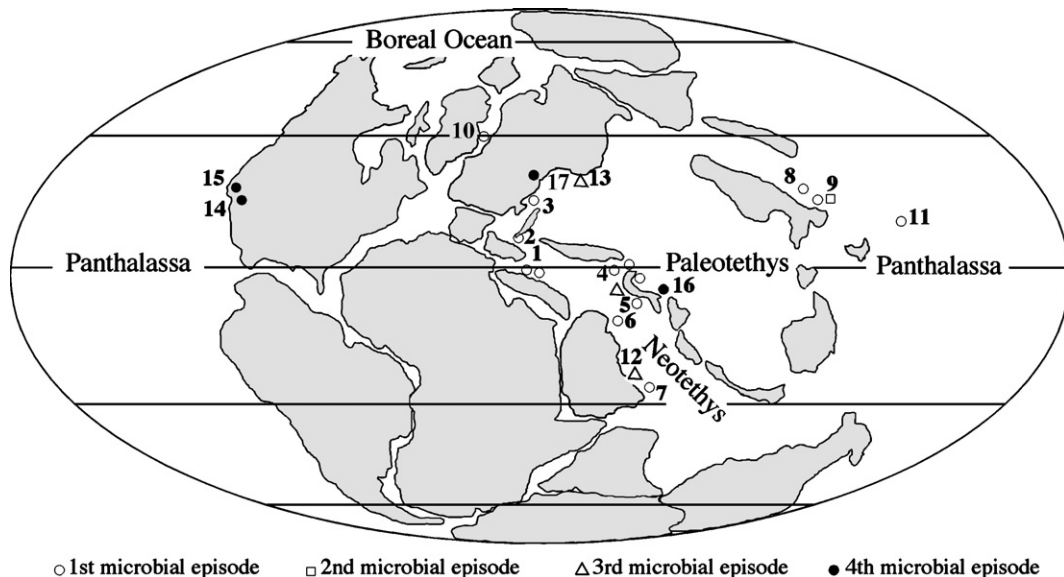


Fig. 1. Paleogeographic sketch during the Permo-Triassic transition. Approximate position of microbial episodes: 1—Taurus (Turkey), 2—south Alps, 3—Bukk Mts (Hungary), 4—Armenia and north-west Iran 5—Central Iran, 6—Zagros (south Iran), 7—Oman shelf, 8—south Sichuan (China), 9—Guizhou (China), 10—Jameson Land (Greenland), 11—Chichibu terrane (Japan), 12—Sumeini slope and Baid exotic (Oman), 13—Pre-Caucasus (Azerbaijan), 14—Virgin Member (south-west Nevada), 15—Union Wash Formation (south-east California), 16—Aghdarband (east Iran), 17—Dobrogea (east Romania).

Download English Version:

<https://daneshyari.com/en/article/4464417>

Download Persian Version:

<https://daneshyari.com/article/4464417>

[Daneshyari.com](https://daneshyari.com)