

BIBLIOGRAPHIE LETTRE 28

1- PUBLICATIONS DES MEMBRES DE L'AGPT

Bibliographie Aymon Baud, 2008:

Baud, A., 2008, In Memoriam -Jean Philippe Marcoux (1940-2008): *Albertiana*, v. 37, p. in press.

La riche carrière de Jean Marcoux, x qui nous a quitté trop tôt, est évoquée dans ces quelques pages avec l'accent porté sur ses recherches triasiques et ses contributions sur la géologie de la Turquie, du Sultanat d'Oman, du Ladakh et du Tibet.

Baud, A., 2008, Induan-Olenekian Boundary correlations, new proposal, or how to calibrate a Carbon isotope curve: *Albertiana*, v. 36, p. 50-53.

Avec l'exemple de corrélations "hâtives" entre les couches continentales du Buntsandstein et les couches marines sudalpines (Bulla), himalayennes (Spiti) et chinoises (Chaohu), l'auteur met en garde le lecteur sur la manière de travailler et de publier de l'équipe Bachmann et Kozur.

Baud, A., Nakrem, H. A., Beauchamp, B., Beatty, T. W., Embry, A. F., and Henderson, C. M., 2008, Lower Triassic bryozoan beds from Ellesmere Island, High Arctic, Canada: *Polar Research*, v. 27, in press

De manière détaillée, les auteurs illustrent la réapparition de bryozoaires au Trias inférieur (dès le Dienerien) après la grande extinction de la fin du Permien.

Woods, A. D., and Baud, A., 2008, Anachronistic facies from a drowned Lower Triassic carbonate platform: Lower member of the Alwa Formation (Ba'id Exotic), Oman Mountains: *Sedimentary Geology*, v. 209, p. 1-14.

Les calcaires rouges à ammonoides du Smithien de l'exotique de Ba'id en Oman montrent de nombreuses et diverses textures algo-microbiennes qui illustrent la migration de ces communautés vers les plateaux sous-marins au cours du Trias inférieur.

Yin, H., Feng, Q., Lai, X., Baud, A., and Tong, J., 2008, The protracted Permo-Triassic crisis and multi-phase extinction around the Permian-Triassic boundary, 33rd international geological congress: Oslo, IGC.

La grande extinction de la fin du Permien comprend différentes phases qui sont analysées.

Publications des chercheurs italiens réunies par G. Cassinis

Cassinis G. & Perotti C.R. (2008) – *Ricerche stratigrafiche e paleogeografiche su successioni carbonifere – triassiche del Mediterraneo centro-occidentale*. *Rend. Online, Soc. Geol. It.*, 3 (1), 192- 193,

Cassinis G. (Guest Editor) (2008) – *Stratigraphy and palaeogeography of late- and post-Hercynian basins in the Southern Alps, Tuscany and Sardinia (Italy)*. *Boll. Soc. Geol. It. (Italian Journal of Geosciences)*, Special Section, 127 (3), 497-737, Roma.

Cassinis G., Cortesogno L., Gaggero L., Perotti C.R. & Buzzi L. (2008) – *Permian to Triassic geodynamic and magmatic evolution of the Brescian Alps (eastern Lombardy, Italy)*. In G. Cassinis (Guest Ed.), Special Section: Stratigraphy and palaeogeography of late- and

post-Hercynian basins in the Southern Alps, Tuscany and Sardinia (Italy). *Boll. Soc. Geol. It. (Italian J. of Geosciences)*, 127 (3), 16 figs., 501-518, Roma.

Cassinis G., Ronchi A., Gretter N. & Durand M. (2008) – *The Val Daone Conglomerate: A Middle Permian key unit from the Central Southern Alps (western Trentino, Italy), and regional stratigraphic implications*. In G. Cassinis (Guest Ed.), Special Section: Stratigraphy and palaeogeography of late- and post-Hercynian basins in the Southern Alps, Tuscany and Sardinia (Italy). *Boll. Soc. Geol. It. (Italian J. of Geosciences)*, 127 (3), 11 figs., 519-532, Roma.

Cassinis G., Lazzarotto A. & Pittau P. (2008) – *Report on the Siena Continental Meeting, September 2006*. In G. Cassinis (Guest Ed.), Special Section: Stratigraphy and palaeogeography of late- and post-Hercynian basins in the Southern Alps, Tuscany and Sardinia (Italy). *Boll. Soc. Geol. It. (Italian J. of Geosciences)*, 127 (3), 16 figs., 501-518, Roma.

Perotti C.R. & Cassinis G. (2008) – *La tettonica tardo-paleozoica delle Alpi Meridionali e delle regioni limitrofe: implicazioni paleogeodinamiche*. *Rend. Online della Soc. Geol. It.*, 3 (2), 626-627, 1 fig., Roma.

Pittau P., Del Rio M., Cotza F., Ronchi A., Santi G. & Gianotti R. (2008) – *Pennsylvanian miospore assemblage from the Bèdero section, Varese, Italian Southern Alps*. *Revue de Micropaléontologie*, 51 (1), 133-166, 6 figs., 8 pls., Paris.

Ronchi A., Cassinis G., Durand M., Fontana D., Neri C., Oggiano G. & Stefani C. (2008) – *Stratigrafia e analisi di facies della successione continentale della Nurra: confronti con la Provenza e ricostruzione paleogeografia*. *Escursione E06. Società Geologica Italiana. 84° Congresso Nazionale. Sassari 15-17 Settembre 2008*, 32 pp., 12 figg., Roma.

Ronchi A., Manni R., Sacchi E., Nicosia U., Citton P., Coppola T., Romano M., Bortoluzzi E. & Trenini L. (2008) – *First large vertebrate find in the Permian deposits of Nurra (NW Sardinia)*. *Rend. online, Soc. Geol. It.*, 3 (2), 686, Roma.

Ronchi A., Arche A., Cassinis G., López-Gómez J. & Spadaccini S. (2008) – *Correlation between Permian-Middle Triassic continental sequences in the Western Mediterranean area (SE Iberian Range, Sardinia and Provence)*. *Rend. Online, Soc. Geol., It.*, 3 (2), 687, Roma

Santi G. (2008) – *The reality of the “Batrachichnus ichnofacies”: proof from the Lower Permian of the Orobic and Trompia basins (South-Alpine region, Northern Italy)*. In G. Cassinis (Guest Ed.), Special Section: Stratigraphy and palaeogeography of late- and post-Hercynian basins in the Southern Alps, Tuscany and Sardinia (Italy). *Boll. Soc. Geol. It. (Italian J. of Geosciences)*, 127 (3), 16 figs., 533-544, 8 figs, 1 tab., Roma.

Articles Sous Presse

Cassinis G., Durand M. & Ronchi A. (2008) – *A reply to the discussion by R. Posenato, D. Sciunnach, E. Garzanti on the article “Remarks on the Permian-Triassic transition in the Central and Eastern Lombardy (Southern Alps, Italy)*. Journal of Iberian Geology.

Perotti C.R. (2008) – *Assetto tettonico ed evoluzione strutturale delle Prealpi bresciane dalla fine dell’orogenesi varisica ad oggi*. Istituto Lombardo – Regione Lombardia. Volume in onore di M. B. Cita.

Santi G. & Nicosia U. - *The ichnofacies concept in vertebrate ichnology*. Studi Trentini Sci. Nat., Acta Geologica, 83, 187-193, 3 tabs. Trento.

Palaeobiodiversity and palaeoenvironments in Permian playas

Guest Editor: Georges Gand

Journal of Iberian geology N°34, Vol.1 Special Issue

Éditorial

Some precisions on the use of the terra playa in the geologic literature

Algunas precisiones sobre el uso del término playa en la bibliografía geológica

A. Arche

Research Papers

Permian and Quaternary playas, a discussion based on climatic, tectonic and palaeogeographic settings

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The Permian-Triassic transition: Historical review of the most important ecological crises with special emphasis on the Iberian Peninsula and Western-Central Europe.
La transición Permo-Triásica: Revisión histórica de la crisis ecológica mas importante con especial énfasis en la Península Ibérica y Europe Central y Occidental
C. Virgili

2 – QUELQUES PUBLICATIONS RELEVÉES SUR INTERNET

[Palaeogeography, Palaeoclimatology, Palaeoecology](#)
[Volume 262, Issues 3-4](#), 4 June 2008, Pages 140-156

Lacertoid footprints from the Upper Triassic (Santa Maria Formation) of Southern Brazil

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Received 12 January 2007;

revised 31 January 2008;

accepted 18 February 2008.

Available online 6 March 2008.

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Abstract

The Triassic of Southern Brazil is well-known for its rich tetrapod body fossils. However, trace fossils such as tetrapod trackways and trails were discovered only recently from the Predebon outcrop (upper part of the Alemoa Member, Santa Maria Formation), providing new information on small-sized animals. The trackways can be identified as *Rhynchosauroides retroversipes* isp. nov., *Rhynchosauroides* isp., *Rhynchosauroides?* isp. and drag marks produced by swimming animals of lacertoid affinity. The preservation of the tracks and

trackways was influenced by the water level whilst they were being made and subsequent subaerial exposure. The trackmaker of *R. retroversipes* isp. nov. corresponds to a lacertoid quadruped tetrapod with primitive autopodia, a sprawling gait and possibly a long tail, whilst the pes was directed postero-laterally. The trackmaker may have been a climbing animal, with adaptations that include curved claws and reversion of the pes. On the ground this animal would have had a slow, lumbering locomotion, although it could attain higher speeds over short distances using a bipedal gait. These trackways can be attributed to lacertoid reptiles, possibly sphenodontids, whose skeletons are encountered in the Caturrita Formation, which overlies the Santa Maria Formation.

Keywords: *Rhynchosauroides retroversipes* isp. nov.; Lacertoid footprints; Swimming traces;

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Paraná; Basin; Triassic

[First record of stereospondyls \(Tetrapoda, Temnospondyli\) in the Upper Triassic of Southern Brazil](#)

Gondwana Research, In Press, Corrected Proof, Available online 24 July 2008
Sérgio Dias-da-Silva, Eliseu Vieira Dias, Cesar Leandro Schultz

Abstract

Stereospondyls survived the Permo-Triassic extinctions in a refuge probably located in the landmass that nowadays comprises Australia. Subsequently, they radiated to other parts of Pangaea, reaching their highest distribution and diversification during the Early Triassic. An incomplete interclavicle from the Caturrita Formation represents their first record in the Upper Triassic of Brazil. Previously, Upper Triassic South American stereospondyls were restricted to Argentina. This new record reinforces a former hypothesis that suggests the presence of a more diverse stereospondyl fauna in South America during the Late Triassic than previously assumed. Additionally, the presence of a stereospondyl and a phytosaur in the Caturrita Formation reinforces the hypothesis of a change to more humid climatic conditions in the Paraná Basin during the Upper Triassic. The record of Early Triassic stereospondyls in South America suggests that they first colonized Brazil and/or Uruguay, spreading from South Africa during the Early Triassic, subsequently reaching Argentina. Up till now, there is no record of Middle Triassic stereospondyls in either Argentina and Brazil, probably due to either taphonomic bias or insufficient prospecting. Despite the lack of direct evidence, one should not dismiss an earlier stereospondyl colonization of Argentina still during the Early or Middle Triassic.

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A giant skull of the temnospondyl *Xenotosuchus africanus* from the Middle Triassic of South Africa and its ontogenetic implications

RossDamiani

Acta Palaeontologica Polonica 53 (1), 2008: 75-84

A previously unreported large skull of the mastodonsaurid temnospondyl *Xenotosuchus africanus*, from the *Cynognathus* Assemblage Zone (Early to Middle Triassic) of the Beaufort Group, Karoo Basin of South Africa, is described. The species is plesiomorphic in most aspects of its cranial anatomy, and only one autapomorphy is tentatively identified herein, namely contact between the left and right exoccipitals posterior to the parasphenoid. The new specimen permits recognition of a growth series for *X. africanus* from sub-adult (all previously known specimens) to fully adult (new specimen) stages. Ontogenetic changes associated with this include changes in skull proportions, and changes in the morphology of the lacrimal flexure, frontal, postfrontal, cultriform process and body of the parasphenoid, and the transvomerine tooth row.

Key words: Temnospondyli, *Xenotosuchus africanus*, ontogeny, variation, Triassic, South Africa.

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Presented in 33. IGC, Oslo, symposium EUR 18 (POSTER):

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Late and post-Variscan paleogeographic and tectonic evolution of the ALCAPA-region

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ALCAPA (Eastern Alps/Austria; Central West Carpathians/Slovakia; basement of the northern Pannonian Basin with isolated outcrops of the Pelső Composite Terrane/Hungary) is one of the megaterranes of the Circum Pannonian domain that was amalgamated from the Middle Jurassic till the Early Miocene. Significantly, the Late Paleozoic units of ALCAPA are affected differently by the Variscan orogeny suggesting that they were derived from individual areas. Regarding Devonian – Permian sedimentation and Variscan metamorphism and deformation the following zones had been distinguished (Ebner et al. 2008; Vozárová et al. 2008):

- (1) Variscan metamorphic zones in the Eastern Alps and Western Carpathians.
- (2) Veitsch-Nötsch-Szabadbattyán-Ochtiná Zone, with beginning of the sedimentation in foreland/remnant basins in the front of zones (1) during the Early Carboniferous.
- (3) Oceanic and volcano-sedimentary units in parts of the Eastern Alps and W-Carpathians affected by the Mid-Carboniferous event and with the unconformable continental cover.

(4) Siliciclastic turbiditic or pelagic carbonate environments without Variscan deformation and metamorphism (parts of the Graz Paleozoic; Szendrő, Uppony Mts.) until the Bashkirian.

(5) Late Pennsylvanian – Permian shallow marine sediments concordantly following (4) in the Bükk and Uppony Mts.

(6) Continental molasse environments above (1-3).

The pre-orogenic units (1, 3) were accreted to the active Laurussian margin during the Variscan orogeny and derived from Paleozoic oceanic domains between Laurussia and Gondwana. Parts of the Pelső C.T. are characterized by 4 and 5. During the Late Paleozoic they were connected with the Dinaridic Sana-Una and the Serbian Jadar Paleozoics. This Bükk-Jadar zone had a somehow equatorial position westwards of the ending of the Carboniferous Paleotethys, which remained an open oceanic segment at the end of the Variscan period (Karamata 2006).

References:

Ebner F. et al. 2008: Devonian-Carboniferous pre-flysch and flysch environments in the Circum Pannonian Region. – Geol. Carpathica 59/2. - Karamata S. 2006: The geological development of the Balkan Peninsula related to the approach, collisional and compression of Gondwana and Eurasian units.- Geol. Soc. Spec. Publ. 260, 155-178. – Vozárová A. et al. 2009: Late Variscan (Carboniferous to Permian) Environments in the Circum Pannonian region. – Geol. Carpathica (submitted).

Sponsored by Projects: Austrian Science Fund (FWF) due to Grant P 10277, the Slovak Science Fund (APVV) due to Grant no. APVV-0438-06 and APVT – 51-002804 and Grant VEGA 2/0072/08

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[Smithian and Spathian \(Early Triassic\) ammonoid assemblages from terranes: Paleooceanographic and paleogeographic implications](#)

Journal of Asian Earth Sciences, **In Press, Corrected Proof**, Available online 25 May 2008
Arnaud Brayard, Gilles Escarguel, Hugo Bucher, Thomas Brühwiler

Abstract

Early Triassic paleobiogeography is characterised by the stable supercontinental assembly of Pangea. However, at that time, several terranes such as the South Kitakami Massif (SK), South Primorye (SP) and Chulitna (respectively, and presently located in Japan, eastern

Russia and Alaska) straddled the vast oceans surrounding Pangea. By means of quantitative biogeographical methods including Cluster Analysis, Non-metric Multidimensional Scaling and Bootstrapped Spanning Network applied to Smithian and Spathian (Early Triassic) ammonoid assemblages; we analyze similarity relationships between faunas and suggest paleopositions for the above-cited terranes.

Taxonomic similarities between faunas indicate that primary drivers of the ammonoid distribution were Sea Surface Temperature and currents. Possible connections due to current-controlled faunal exchanges between both sides of the Panthalassa are shown and terranes such as SK, SP and Chulitna played an important role as stepping stones in the dispersal of ammonoids. SK and SP terranes show strong sub-equatorial affinities during the Smithian, thus suggesting a location close to South China. At the same time, the Chulitna terrane shows strong affinities with equatorial faunas of the eastern Panthalassa. This paleoceanographic pattern was markedly altered during the Spathian, possibly indicating significant modifications of oceanic circulation at that time, as illustrated by the development of a marked intertropical faunal belt across Tethys and Panthalassa.

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Journal of Paleontology

Article: pp. 555–564 | [Abstract](#)

[Volume 82, Issue 3 \(May 2008\)](#)

TAXONOMY AND PHYLOGENY OF THE TRIASSIC BIVALVE FAMILIES MYSIDIELLIDAE COX, 1964 AND HEALEYIDAE NEW FAMILY

M. HAUTMANN



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The Mysidiellidae are morphologically isolated among Triassic bivalves but share important characters with Late Paleozoic Ambonychioidea. Apart from a great similarity in the general shape of the shell, the most primitive mysidiellid genus *Promysidiella* resembles ambonychioids in the presence of a duplivincular-opisthodontic ligament system. Within the Mysidiellidae, this ligament type evolved into the transitional ligament system that characterizes Late Triassic *Mysidiella*. The phyletic polarity indicates that this evolution probably took place by pedomorphosis. New examinations of the shell microstructure of *Mysidiella* demonstrate the presence of simple prismatic and possibly foliated structures in the calcitic outer shell layer, which further supports an ambonychioid affinity. Therefore, the

Mysidiellidae are removed from the Mytiloidea and assigned to the Ambonychioidea. The poorly known genus *Protopis*, which was originally included in the Mysidiellidae, probably had a parivincular ligament system and was hence a member of the Heteroconchia. *Joannina*, which was previously considered a junior synonym of *Protopis*, is re-established. The hinge margin of *Joannina* carries a well developed nymph but lacks teeth. These characters as well as its modioliform shape, anterior shell lobe, and pronounced diagonal carina link *Joannina* with the Late Triassic genus *Healeyia* (Modiomorphoidea). Both taxa are herein placed in the new family Healeyidae, which differs from the morphologically similar Kalenteridae in the absence of elaborated hinge teeth. *Protopis*, as well as the recently described genera *Leidapoconcha*, *Waijiaoella*, and *Qingyaniola*, are tentatively assigned to the Healeyidae.

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Oxygen isotope values from high-latitudes: Clues for Permian sea-surface temperature gradients and Late Palaeozoic deglaciation Christoph Korte^{a, , }, Peter J. Jones^b, Uwe Brand^c, Dorothee Mertmann^d and Ján Veizer^{a, e}

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Received 16 July 2007;

revised 4 May 2008;

accepted 16 June 2008.

Available online 27 June 2008.

Abstract

The Permian was a period of waning large-scale continental glaciations in the southern Hemisphere. The waning of these ice sheets during the Early Permian led to discharge of ¹⁸O-

depleted ice–melt water into the oceans. This, coupled with rising seawater temperatures, resulted in a concomitant decline of about 2.5‰ in the $\delta^{18}\text{O}$ of seawater, as recorded by brachiopod shells from low-latitude ($< 30^\circ$) habitats. The transition from ice- to greenhouse conditions is reflected also in the oxygen isotope data of unaltered brachiopods and bivalves from high high-latitudes. Moreover, the high-latitude specimens have consistently more positive $\delta^{18}\text{O}$, by about 2.5‰, than their coeval low-latitude counterparts, suggesting a Permian sea-surface temperature (SST) gradient of about 9 to 12 °C between tropical–subtropical ($< 30^\circ$) and high southern ($55 \pm 10^\circ$) latitude localities, apparently irrespective of whether in a greenhouse or an icehouse mode. This Permian SST gradient is comparable to the modern SST gradient of about 14 °C. The $\delta^{18}\text{O}$ seawater records suggest that the global warming that resulted in the waning of the Permo-Carboniferous ice sheets during the Sakmarian was followed by another cooling during the late Kungurian and by renewed warming during the Mid- and Late Permian.

Keywords: Permian; Oxygen isotopes; Brachiopods; Bivalves; Australia; Salt Range; Latitudinal sea-surface temperature gradient

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Marine incursions into the Middle/Late Permian saline lake of the Southern Permian Basin (Rotliegend, Northern Germany) possibly linked to sea-level highstands in the Arctic rift system

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Received 24 August 2007;

revised 8 May 2008;

accepted 16 June 2008.

Available online 26 June 2008.

Abstract

A huge saline lake existed in the Southern Permian Basin (SPB) of Northwest Europe during Late Wordian to Early Wuchiapingian. More than 2500 m thick continental siliciclastics and evaporites of the Upper Rotliegend II were deposited before the marine Zechstein transgression flooded the basin. Marine deposition took place in the Arctic rift system between East Greenland and the Fennoscandian Shield at that time interval. Sediments of the Foldvik Creek-Group reflect relative sea-level fluctuations. Short-termed pre-Zechstein incursions from the Boreal realm into the SPB are known by the marine lamellibranch *Liebea reichei*. However, sedimentological analysis of different saline lake horizons show, that the marine influenced saline lake horizon does not differ lithologically from other saline lake claystone layers in the Rotliegend succession. The $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of anhydrite (0.7089–0.7100) reflect deposition in a continental setting. In contrast to this, S-isotopic values (more than + 11.7‰ CDT) reflect marine pre-Zechstein incursions into the SPB in the middle Niendorf and Munster Members. S-isotopic values of anhydrite can be used as an indicator for marine influence in the SPB. The pre-Zechstein incursions superimpose the climatic triggered lake-level fluctuations of the Rotliegend saline lake. Two marine incursions can be integrated into a set of regularly recurring abnormalities in the depositional evolution. These important evolutionary steps, the saline lake formation, the Garlstorf incursion, the P, Ameland and Bahnsen lake level highstands, the Niendorf incursion, and the Zechstein transgression, show a periodicity of more or less 1 Ma. One million year cyclicity is also known from deposits of the Arctic rift system in East Greenland (Wegener Halvø and Ravnefjeld Formations). A correlation of the Upper Rotliegend II-deposits with the succession of East Greenland is proposed, based on the assumption that the marine incursions as well as the exceptionally intensive saline lake expansions could be linked to sea-level highstands in the Arctic rift system. The result is the first correlation of Upper Rotliegend II-deposits with marine strata.

Keywords: Arctic rift system; Marine incursion; Rotliegend; Southern Permian Basin; Stable isotope; Sulphur

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Stromatolites of the Lower Triassic Union Wash Formation, CA: Evidence for continued post-extinction environmental stress in western North America through the Spathian

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Received 6 June 2007;

revised 3 January 2008;

accepted 7 January 2008.

Available online 26 January 2008.

Abstract

Recent studies have documented the complexity of biotic recovery from the Permian–Triassic mass extinction by revealing that recovery began quickly in some regions while the biota in other areas continued to suffer as the result of widespread harsh environmental conditions throughout much of the Early Triassic period. Examination of Lower Triassic rocks from the southwestern U. S. has produced a variety of sedimentologic and biotic evidence that point to persistent environmental stress following the extinction (specifically anoxic, alkaline waters in the deep ocean, and possible high carbon dioxide levels in the surface ocean) and have also documented trends in the long-suffering biota present in that region. The shoaling facies of the upper member of the Union Wash Formation at the Cerro Gordo, CA USA locality contain stratiform stromatolites that suggest harsh environmental conditions in the area may have lingered until the late Spathian (latest Early Triassic). The stromatolites are laterally extensive (some layers persist for at least 1 km) and typically exhibit planar to wavy laminations with some development of small domes (up to 10 cm in height). A shallow subtidal depositional environment is suggested by evidence of eroded or planed surfaces within the stromatolites, as well as channelization of the stromatolites, and the occurrence of ooids and coated grains within the interval. The stromatolites documented here occur stratigraphically higher than previously documented inorganic calcium carbonate precipitates from the Union Wash Formation [e.g., Woods, A.D., Bottjer, D.J., Corsetti, F.A., 2007. Calcium carbonate seafloor precipitates from the outer shelf to slope facies of the Lower Triassic (Smithian–Spathian) Union Wash Formation, California, U.S.A.: Sedimentology and

palaeobiologic significance. *Palaeogeography, Palaeoclimatology, Palaeoecology* 252, 281–290; Woods, A.D., Bottjer, D.J., Mutti, M., Morrison, J., 1999. Lower Triassic large seafloor carbonate cements: Their origin and a mechanism for the prolonged biotic recovery from the end-Permian mass extinction. *Geology* 27, 645–648] and microbialites from the Virgin Limestone [e.g., Schubert, J.K., Bottjer, D.J., 1992. Early Triassic stromatolites as post-mass extinction disaster forms. *Geology* 20, 883–886; Pruss, S.B., Bottjer, D.J., 2004. Late Early Triassic microbial reefs of the western United States; a description and model for their deposition in the aftermath of the end-Permian mass extinction. *Palaeogeography, Palaeoclimatology, Palaeoecology* 211, 127–137]. Therefore, these stromatolites may represent the last-known occurrence of anachronistic facies and associated unusual palaeoceanographic conditions in eastern Panthalassa following the Permian–Triassic mass extinction.

Keywords: Stromatolites; Disaster forms; Biotic recovery; Lower Triassic; California

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Bulletin de la Societe Geologique de France; July 2008; v. 179; no. 4; p. 411-425; DOI: 10.2113/gssgfbull.179.4.411

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Nature and origin of the Triassic volcanism in Albania and Othrys: a key to understanding the Neotethys opening?

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Triassic volcanic rocks, stratigraphically associated with pelagic or reef limestones, are tectonically juxtaposed with Mesozoic ophiolites in the Tethyan realm. From the central (Dinarides, Hellenides) and eastern Mediterranean (Antalya, Troodos, Baër Bassit) to the Semail nappes (Oman), they occur either associated to the tectonic sole of the ophiolitic nappes or as a distinct tectonic pile intercalated between the ophiolites and other underthrust units. In the Dinaro-Hellenic belt, the Pelagonian units represent the lower plate, which is underthrust beneath the ophiolites. Middle to Late Triassic volcanic sequences are interpreted

as the eastern flank of the Pelagonian platform and are therefore considered as a distal, deep-water part of the Pelagonian margin.

The Triassic volcanics from Albania and Othrys are made up of basaltic pillowed and massive flows, associated locally with dolerites and trachytes. New elemental, Nd and Pb isotopic data allow to recognize four types of volcanic suites: (1) intra-oceanic alkaline and tholeiitic basalts, (2) intra-oceanic arc-tholeiites, (3) back-arc basin basalts, (4) calc-alkaline mafic to felsic rocks. Nd and Pb isotopic initial ratios suggest that the within-plate volcanic rocks were derived from an enriched oceanic island basalt type mantle source, devoid of any continental crustal component. The lower ϵ_{Nd} value of the trachyte could be due to assimilation of oceanic altered crust or sediments in a shallow magma chamber. Island arc tholeiites and back-arc basin basalts have a similar wide range of ϵ_{Nd} . The absence of Nb negative anomalies in the back-arc basin basalts suggests that the basin floored by these basalts was wide and mature. The high Th contents of the island arc tholeiites suggest that the arc volcanoes were located not far away from the continental margin.

Albania and Othrys volcanics contrast with the Late Triassic volcanism from eastern Mediterranean (SW Cyprus, SW Turkey), which displays solely features of oceanic within plate suites. The presence of back-arc basin basalts associated with arc-related volcanics in Central Mediterranean indicates that they were close to a still active subduction during the Upper Triassic, while back-arc basins developed, associated with within-plate volcanism, leading to the NeoTethys opening.

Key Words: Triassic volcanism • Albania • Greece • Geochemistry • Isotopes • Geodynamism

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**Ammonoids of the middle/late Anisian boundary (Middle Triassic)
and the transgression of the Prezzo Limestone in eastern Lombardy-
Giudicarie (Italy)**

CLAUDE MONNET 1, *, PETER BRACK 2, HUGO BUCHER 1 & HANS RIEBER 1

Key words: ammonoids, Anisian, Triassic, Southern Alps, correlation, palaeogeography

1661-8726/08/010061–24

DOI 10.1007/s00015-008-1251-7

Birkhäuser Verlag, Basel, 2008

Swiss J. Geosci. 101 (2008) 61–84

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Anisian ammonoids from Monte Guglielmo 61

ABSTRACT

This study documents ammonoids with a precise stratigraphic control at the middle/late Anisian (Pelsonian/Illyrian) boundary from a new locality in eastern Lombardy-Giudicarie (Monte Guglielmo) and from classical sections in Giudicarie. These ammonoid faunas allow revising the taxonomic interpretation of *Ceratites cimeganus* MOJSISOVICS 1882 and of the genus *Paraceratites* HYATT 1900. *Ceratites cimeganus* is here assigned to the North American genus *Rieppelites* MONNET & BUCHER 2005. In eastern Lombardy-Giudicarie,

R. cimeganus is diagnostic of a distinct biochronological unit (*cimeganus* Zone) bracketed between the older *Bulogites zoldianus* Zone and the younger *Judicarites euryomphalus*–*Paraceratites trinodosus* zones. The recognition of this *cimeganus* Zone significantly improves worldwide correlation since it is recognized in several other Tethyan basins (Dolomites, Northern Calcareous Alps) as well as in North America (Nevada). These new data allow a redefinition of the middle/late Anisian boundary in the western Tethys, which is here intercalated between the *zoldianus* and *cimeganus* zones. This limit is marked by a clear ammonoid turnover (e.g. disappearance of *Acrochordiceras* and *Balatonites*, appearance of *Rieppelites*). Finally, the presence of sections including the *cimeganus* Zone in eastern Lombardy-Giudicarie allow the establishment of local gaps in sedimentation, which may reflect the regional and important transgression of the pelagic Prezzo Limestone over the shallow water platform carbonates of a “Camorelli-Dosso dei Morti barrier”, as also underlined by the spatial distribution of brachiopod lumachellas.

RESUME

Cette étude décrit les faunes d’ammonites de la nouvelle coupe de Monte Guglielmo (Lombardie-Giudicarie, Italie) et les coupes plus classiques de la région couvrant la limite moyen/supérieur de l’Anisien (Pelsonien/Illyrien). Ces faunes d’ammonites permettent de réviser l’interprétation taxinomique de l’espèce *Ceratites cimeganus* MOJSISOVICS 1882, ainsi que le genre *Paraceratites* HYATT 1900. *Ceratites cimeganus* est attribué au genre nord-américain *Rieppelites* MONNET & BUCHER 2005. En Lombardie-Giudicarie, *R. cimeganus* est caractéristique de la nouvelle zone éponyme qui se situe entre les zones à *Bulogites zoldianus* et *Judicarites euryomphalus*–*Paraceratites trinodosus*. Cette nouvelle zone affine les corrélations à l’échelle mondiale car elle est connue dans plusieurs bassins téthysiens et au Nevada. Les faunes d’ammonites décrites dans cette étude permettent aussi de mieux définir la limite Anisien moyen/supérieur qui se situe donc entre les zones à *zoldianus* et *cimeganus*. Cette limite se caractérise par un important renouvellement des faunes d’ammonites avec notamment la disparition des genres *Acrochordiceras* et *Balatonites*, ainsi que l’apparition du genre *Rieppelites*. Enfin, la répartition de la zone à *cimeganus* dans les diverses coupes étudiées de Lombardie et Giudicarie, couplée à la répartition des facies sédimentaires et des faunes de brachiopodes, permet de mettre en évidence des lacunes sédimentaires. Celles-ci résultent probablement de l’ennoyage généralisé de la région, avec le dépôt des calcaires pélagiques du Prezzo surmontant les barres peu profondes des formations carbonatées de Camorelli et Dosso dei Morti.

Volume 268, Issues 3-4, Pages 123-310 (24 October 2008)




The late Paleozoic Earth system

Edited by Gerilyn S. Soreghan and Isabel P. Montanez




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[Global correlations of mid Early Triassic events: The Induan/Olenekian boundary in the Dolomites \(Italy\)](#)

Earth-Science Reviews, **In Press, Corrected Proof**, Available online 7 October 2008

Renato Posenato

Abstract

The Dolomites (Southern Alps, Italy) are a reference-area for research on the end-Permian mass extinction and its Early Triassic aftermath. The effects on shallow marine benthic biota are recorded in the Werfen Formation, a thick mixed carbonate-siliciclastic sedimentary succession. Only in its lower (Griesbachian) and upper (Spathian) parts, this formation is bio-chronologically constrained by means of conodonts and ammonoids, whilst no significant bioevent occurs in its middle part. This represents an impediment to the biochronologic recognition of the Induan/Olenekian boundary (IOB).

The Bulla/Pufels (Val Gardena) succession is a key-section for the P/T boundary and Early Triassic for global correlation due to the abundance of studies on biostratigraphy (mostly on conodonts), magnetostratigraphy and chemostratigraphy carried out there by stratigraphers of various nationalities. Recent chemostratigraphic studies have permitted the recognition of some carbon isotope positive peaks, the strongest of which is considered to approximate the IOB. However, various authors have reached different conclusions on the position of the maximum peak and thus on the IOB location. This leads to important stratigraphic consequences for the calibration of conodont biostratigraphy. The critical revision of the traditional stratigraphic units (litho- and biostratigraphy), under-evaluated in most of the recent literature, and magneto-, chemo- and sequence stratigraphic units allowed herein an integrated stratigraphic scale for the Bulla/Pufels section to be proposed. This contribution highlights the mid Early Triassic Dolomites record for regional and global correlations.

The most significant results attained herein regard the different lithostratigraphic subdivisions of the middle Werfen Formation and its consequences on the position of the IOB with respect to the conodont and bivalve biostratigraphy and sequence stratigraphic units. The upper part of the section is attributed herein to the Gastropod Oolite Member, which is represented by the lithozone A, a predominant supratidal episode, and the lower part of the subtidal lithozone B. Between the lithozones A and B, a sequence boundary of 3th order (Sc2/Sc3) is located. The maximum carbon isotope excursion is near this boundary, which therefore approximates the IOB in the Dolomites. This proposal suggests a Dienerian age for the FO of the conodont

Pachycladina obliqua, which occurs about 60 m below the stage boundary. No significant biotic event, either for molluscs or conodonts, occurred across this stage boundary.

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Patterns of bivalve biodiversity from Early to Middle Triassic in the Southern Alps (Italy): Regional vs. global events

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Received 20 September 2007;

revised 10 December 2007;

accepted 11 January 2008.

Available online 19 January 2008.

Abstract

The Triassic records the severe effects of the end-Permian mass extinction and the beginning of the Mesozoic/modern adaptive radiation of marine invertebrates. As far as bivalves are concerned, a group which was relatively unaffected by the extinction, diversification started in the Middle Triassic, more particularly during the Anisian. Thus, the interval between the basal Triassic (Induan) and Anisian is crucial in analysing the biodiversity changes and diversification patterns of these molluscs. This analysis is discussed at genus level and based on the regional records of the Southern Alps. Biodiversity changes are examined in connection with palaeogeographic evolution, the conquest of vacated ecologic niches, and climatic changes.

The lowest point of generic richness, as an immediate aftermath of the *P/T* mass extinction, is recorded in the Induan units (Mazzin and Siusi Mbs) of the Werfen Formation, which include only five genera, numerically dominated by *Claraia* and *Unionites*. Twelve genera are represented in the Olenekian Campil, Val Badia and Cencenighe Members. Such an

increasing richness is mostly connected with the recovery of pectinids and endobysate bivalves; typical marine biota such as ammonoids (*Tirolites* and *Dinarites* fauna) and crinoids also appear in this time. The richness and structure of the Early Anisian (Bithynian) bivalve assemblages contained in the Gracilis Formation (and equivalent units of Southern Alps) do not significantly change (15 genera) in comparison with those from Olenekian. The most relevant increase in bivalve genera (31 genera) occurs in the late Anisian, mostly in the Pelsonian Calcare di Recoaro and equivalent units, when a strong tectonic phase considerably differentiated the marine habitats and ecological niches in the Southern Alps. However, bivalve Pelsonian radiation is recorded in other Tethyan and peri-Tethyan areas, and coincides with the reappearance of marine stenotopic hard bottom dwellers and reef communities, including scleractinian corals. Therefore, it represents a global bioevent which indicates the fully recovery of the physical and chemical limiting factors of the sea water. In the Southern Alps, the diversification of bivalves after the end-Permian extinction occurred in two steps: at the end of Smithian (early Olenekian), when their recovery began, and in the Pelsonian (late Anisian) when their radiation parallels with the recovery of hard bottom communities and metazoan reefs. Both the events occurred at the end of humid phases.

Keywords: Early and Middle Triassic; Southern Alps; Bivalves; Biotic recovery; Macroevolution

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Journal of Paleontology

Article: pp. 778–789 | [Abstract](#)

[Volume 82, Issue 4 \(July 2008\)](#)

FOSSIL INSECT EGGS AND OVIPOSITIONAL DAMAGE ON BENNETTTITALEAN LEAF CUTICLES FROM THE CARNIAN (UPPER TRIASSIC) OF AUSTRIA

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Two types of evidence for insect ovipositional activity (i.e., actual egg chorions and ovipositional damage) occur on *Nilssoniopteris* (bennettitalean foliage) leaf cuticles from the Carnian of Austria and provide a rare direct insight into insect egg morphology and oviposition in the Late Triassic. The egg chorions have exclusively been found on *N. haidingeri* leaves, where they are attached to the outer surface of the abaxial cuticle; one specimen suggests that the eggs were arranged in circles. It is impossible at present to determine the affinities of the eggs; possible producers may be beetles, dragonflies, sawflies, or other allied basal Hymenoptera. Ovipositional damage occurs on *N. angustior* leaves in the form of lenticular egg impressions surrounded by a narrow, elevated margin. The impressions are visible on the ad- and abaxial cuticle, and coincide when both cuticles are superimposed, which indicates that the eggs producing these impressions were injected into the interior of the leaf. Producers of eggs that may have caused these damages are perhaps dragonflies or damselflies. The restricted occurrence of the two types of ovipositional activity suggests that some kind of host specificity existed, perhaps related to specific preferences in larval diet.

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Journal of Paleontology

Article: pp. 362–371 | [Abstract](#)

[Volume 82, Issue 2 \(March 2008\)](#)

DIVERSITY AND DISTRIBUTION OF TRIASSIC BRYOZOANS IN THE AFTERMATH OF THE END-PERMIAN MASS EXTINCTION

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Seventy-three species of stenolaemate bryozoans are documented worldwide from the Triassic. Stage-level diversity and paleogeographical analyses reveal that the recovery of bryozoans following the end-Permian mass extinction was delayed until the Middle Triassic. Early Triassic bryozoans faunas, dominated by members of the Order Trepostomida, were depauperate and geographically restricted. Bryozoan diversity increased during the Middle Triassic and diversity peaked in the Carnian (early Late Triassic). High extinction rates throughout the Late Triassic led to the extinction of all stenolaemate orders except the Cyclostomida by the end of the Triassic. Comparisons between global carbonate rock volume, outcrop surface area, and bryozoan diversity indicate that the documented diversity pattern for bryozoans may have been related, in part, to the availability of carbonate environments during the Triassic.

Accepted: 14 July 2007

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Mantle plume: The invisible serial killer — Application to the Permian–Triassic boundary mass extinction

Palaeogeography, Palaeoclimatology, Palaeoecology, Volume 264, Issues 1-2, 7 July 2008, Pages 147-162

Ezat Heydari, Nasser Arzani, Jamshid Hassanzadeh

Abstract

The Earth experienced a severe mass extinction at the Permian–Triassic boundary (PTB) about 252 million years ago. This biological catastrophe was accompanied by major changes in geochemical composition of the atmosphere and ocean and the appearance of sedimentary features which had not occurred since the Precambrian time. The eruption of the largest continental flood basalt, the Siberian Traps, overlapped this mass killing. Many hypotheses have been proposed but no definitive conclusion currently exists. Here we present characteristics of three sections from Iran and China and propose that an active mantle plume initiated a series of processes which led to the mass mortality and produced major sedimentological, mineralogical, and geochemical changes observed in the transition from the Paleozoic to the Mesozoic.

The injection of mantle plume-related igneous dike swarms into the continental margin facilitated the release of massive amounts of CH₄ primarily from the dissociation of marine gas hydrates and secondarily from the maturation of organic-rich sediments and fracturing of hydrocarbon reservoirs. The bulk of the CH₄ was aerobically oxidized in the water column producing dissolved CO₂ with low $\delta^{13}\text{C}$ values. This CO₂-saturated seawater became acidic to the point of dissolution of shelf carbonates promoting precipitation of siliciclastic-rich strata in the transition from the Permian to the Triassic. Methane-derived CO₂ also lowered carbon isotopic composition of seawater leading to the observed decline in $\delta^{13}\text{C}$ composition of organic and inorganic marine carbon at the PTB.

Gas-charged oceans released large volumes of CO₂ and CH₄ into the atmosphere which created a severe global warming (the end-Permian inferno) causing the release of additional CH₄ from the dissociation of polar gas hydrates. These events lowered $\delta^{13}\text{C}$ compositions of terrestrial carbon. Simultaneously, feeder dikes from the mantle plume formed the Siberian Traps flood basalt.

Marine mass extinction was the result of a change in seawater composition due to the injection and oxidation of CH₄ in the water column causing low pH, high concentrations of CO₂, Ca²⁺ and HCO₃⁻, and low CO₃²⁻ values. Combined with a hot seawater temperature, these changes made calcification of marine organisms difficult and produced major physiological crisis including reduced metabolic rates, high sensitivity to environmental stress, and hampered growth and reproduction. Terrestrial mass extinction can be attributed to severe global warming and soil acidification produced by increased atmospheric CO₂, acid rain that was generated by SO₂ derived from the Siberian trap eruption, and loss of habitat.

Cessation of the plume activity during Early Triassic stopped the release of CH₄ into the ocean and terminated continental flood basalt eruption ending the environment of death on land and in sea. The cut off of CO₂ production in the ocean instantly increased carbonate saturation of seawater resulting in extensive seafloor cementation. It also resulted in the deposition of marine carbonates by microbial activities in the hostile post-extinction environment. From the trigger to recovery, the perturbation which included the end-Permian mass mortality could have lasted for at least 2 Myr.



Several major mass extinctions of the Phanerozoic are temporally accompanied by flood basalt eruptions. So far, these two events have been interpreted in a cause-and-effect relation: flood basalt eruption causes mass extinction. This study proposes that flood basalts and their time correlative biological crises are themselves the consequence of a complex perturbation caused by mantle plume activities. If so, major disturbances in the near surface of the Earth are ultimately controlled by changes in the mantle.

The physical sedimentological observations presented here combined with previous paleontological evidence cast doubt on other interpretations which use geochemical variables, numerical modeling, biomarkers, and Ce anomaly to suggest that Late Permian ocean was anoxic all the way to the photic zone.

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Orbital control on Upper Triassic Playa cycles of the Steinmergel-Keuper (Norian): A new concept for ancient playa cycles

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Received 31 October 2007;

accepted 18 December 2007.

Available online 26 January 2008.

Abstract

The Norian Steinmergel-Keuper (SMK) represents a low-latitude cyclically-bedded playa system of the Mid-German Basin. We investigated a drilling site (core Morsleben) and sections from marginal positions. Dolomite/red mudstone beds form rhythmic alternations that were associated with varying monsoon activity. Hence, low K/Al ratios of dolomite beds suggest increased chemical weathering of the crystalline hinterland and therefore increased monsoonal rainfall. High K/Al ratios in red mudstone beds reflect increased physical weathering of the hinterlands during dryer periods. Dolomite layers reflect the lake stage (maximum monsoon) while red mudstones indicate the dry phase (minimum monsoon) of the playa cycle. We distinguished five major types of cyclic facies alternations, representing specific facies zones in the playa system.

We have implemented spectrophotometry as a tool for high-resolution cyclostratigraphy. The dense sampling increment (up to 1 cm) allows for the recognition of all orbital frequencies. Sediment colour profiles reveal striking hierarchical cycles from semi-precession (SP, 99 kyr) over precession (P, 19.8 kyr) and obliquity (O, 36 kyr) to eccentricity (E1-2 109 kyr; E3, 413 kyr). A significant ~ 2 Myr-signal is attributed to the longer-term eccentricity E4.

One monsoonal (precession) cycle includes two carbonate precipitation events. We propose that stratified mudstone and red mudstone are associated with maximum and minimum

monsoon during the transition of the solstices in perihelion and aphelion, respectively. The two carbonate precipitation events were most likely created when equinoxes were in perihelion and aphelion, respectively. A sedimentary semi-precession response cycle is a novel finding for the Norian strata.

The obliquity signal is attributed to incoming atmospheric moisture from the northeast of the SMK basin. The E4 cycle controls lake-level changes over long times. Apparently, E4 is responsible whether or not a threshold value is crossed. Bundles of 109 kyr and 413 kyr in red mudstones suggest a dry system with reduced monsoonal activity. In contrast, humid periods reveal thick layers of dolomite beds, indicating that during those intervals the monsoonal activity was strong enough to prevent the playa system from drying out completely.

Keywords: Orbital cycles; Cyclostratigraphy; Playa; Monsoon; Upper Triassic