

Original article

Microfloristic provincialism in the Upper Triassic Circum-Mediterranean area and palaeogeographic implication[☆]

Provincialisme microfloristique dans les régions circum-méditerranéennes et implications paléogéographiques

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Abstract

This study represents a contribution to the developing knowledge about the microfloristic provincialism affecting Upper Triassic palynoflora. The compositional differences existing between the Onslow and the Ipswich microfloras are mainly based on the presence, in the Onslow microflora, of a diverse and more varied group of gymnosperm pollen grains, including typical European elements. In this study, the palynological assemblages recovered from Carnian successions of the western Tethyan margin (Sicily, Tunisia, Albany, Libya and Israel) are compared with those of West Timor microfloral assemblages, which have been referred to the Onslow microflora of southern hemisphere. They contain several common taxa, mainly consisting of conifer miospores widely recorded in Carnian European successions and less frequently recovered in the Carnian of western and eastern Australia. The number of Circum-Mediterranean sporomorphs in the Onslow microflora assemblages is wider than previously thought, providing new evidences to extend the distribution of the Onslow microflora to include Carnian associations formerly assigned to the Circum-Mediterranean assemblages. These broad microfloral affinities seem to indicate the existence of a homogeneous microflora that maintains, with minor variations, its composition from western Tethys coasts to the northern Australian margin (West Timor). The parent plant community grew in a coastal environment, along the continental margins; the establishment of an equable climatic regime influenced by warm equatorial currents and suitable humid conditions probably conditioned its diffusion. It has long been recognised that the strong floral provinciality which characterised the Late Triassic world gave way to a more homogeneous flora in the Early Jurassic. The decrease in macrofloral diversity is associated with a less pronounced microfloristic provincialism, which in turn coincides with the rise, to strong dominance, of cheirolepidiaceus conifers (Circumpolles producers). This important microfloristic event occurs in the southern hemisphere during the Early Jurassic, however this study reveals their incipient diffusion during the Norian.

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Résumé

Cette étude contribue à la compréhension du provincialisme microfloristique qui a affecté la palynoflore du Trias supérieur. Les différences de composition entre la microflore de Onslow et celle de Ipswich sont principalement basées sur la présence, dans la première, d'un groupe bien diversifié de pollens de gymnospermes comprenant des éléments typiquement téthysiens. Les affinités entre les associations de la microflore de Onslow et celles de la Téthys occidentale ne sont pas surprenantes car leurs positions paleolatitudinales étaient très proches au Trias supérieur. Cette étude vise à comparer les associations palynologiques des séries carniennes de la marge occidentale de la Téthys (Sicile, Tunisie, Albanie, Libye et Israël) avec la microflore du Timor ouest, considérée comme appartenant à la microflore de Onslow de l'hémisphère Sud. Cette comparaison montre la présence de nombreux taxa communs aux deux associations, ainsi que d'un groupe de spores de conifères largement distribuées dans les coupes carniennes d'Europe, et faiblement présentes en Australie occidentale et orientale (Timor ouest). Le nombre de sporomorphes circum-méditerranéens repérés dans la microflore de Onslow permet ainsi d'étendre la distribution de cette dernière, et d'y inclure les associations du Carnien assignées jusqu'à présent à la microflore circum-méditerranéenne. Ces affinités microfloristiques démontrent l'existence d'une microflore homogène, caractérisée par une composition constante à partir des côtes de la Téthys occidentale, jusqu'à la marge

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septentrionale australienne (Timor). La communauté des plantes productrices croît dans un milieu côtier le long des marges continentales et sa diffusion a probablement été favorisée par des conditions climatiques stables (courants équatoriaux chauds et humidité favorable). Il est largement admis que le provincialisme floristique du Trias supérieur laisse place à une flore homogène pendant le Jurassique inférieur. La réduction de la diversité de la flore est associée au déclin du provincialisme microfloristique et à la large diffusion des Cheirolepidiaceae, une famille de conifères actuellement éteinte (plantes productrices de Circumpolles). Dans l'hémisphère Sud l'ample diffusion des Circumpolles commence au Jurassique inférieur, toutefois, cette étude démontre leur présence continue dans cet hémisphère dès le Norien.

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Keywords: Late Triassic; Palynology; Onslow Microflora; Palaeogeography; Tethys

Mots clés : Trias supérieur ; Palynologie ; Microflore d'Onslow ; Paléogéographie ; Téthys

1. Introduction: Carnian geography and climate

The aim of the present study is to contribute to the palaeogeographic and palaeoclimatic reconstruction throughout palaeophytographic data obtained from microfloristic assemblages. In fact the palaeophytogeographic differentiation is a direct result of climatic and physiographic barriers and corridors; the change of these parameters induces provincial boundary modifications, expansions and contractions, since phytogeographic provinces are dynamic through time.

The Late Triassic time was a period of rapid changes in the palaeogeographic outline. During the Triassic the landmasses were still bound together into the large Pangean continent surrounded by the huge Panthalassa Ocean (Fig. 1). The supercontinent Pangea represented a maximum of continental aggregation (Parrish and Curtis, 1982; Ziegler et al., 1983; Golonka et al., 1994; Golonka, 2004), being the area of exposed land great and extended from about 85°N to 90°S. At low mid-latitudes, a large exposed landmass constituted a single

continent with exception of small lands (Fig. 1). Global palaeogeography during early Mesozoic evolved to a period of maximum continental assembly, before the definitive break-up of Pangea during Late Triassic and Early Jurassic. During that period the geodynamic evolution is set in the context of progressive supercontinental break-up (Hesselbo, 2000; Golonka, 2004). Already by Middle Triassic, Pangea began to rift apart into the northern Laurasia (including the present-day North America, Europe and Asia) and the southern Gondwana (South America, Africa, Antarctica, India and Australia) supercontinents. In the western end a narrow shallow sea (Tethys Seaway) intruded into Pangea from the east as a result of the wedge between Laurasia and Gondwana.

Southward, the rifting of the elongate Gondwana-derived continental fragments (Cimmerian blocks, including the present day Turkey, Iran and Tibet), completely separated from the Australian craton and moved northward giving origin to a new back-arc basin (Neotethys). By Carnian time the Tethys Seaway continued to expand as Cimmerian blocks

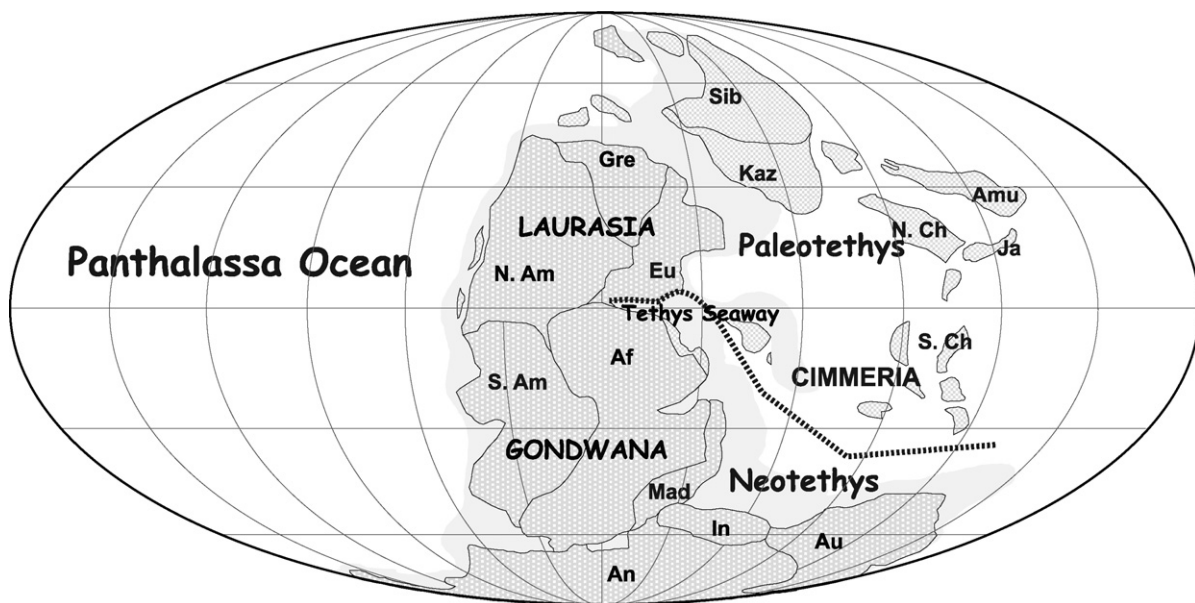


Fig. 1. Palaeogeographic map of the Carnian age (modified from the map on web site: <http://www.palaeos.com/Mesozoic/Triassic/Carnian.htm>). An: Antarctica; Mad: Madagascar; In: India; Au: Australia; S.Am: South America; N.Am: North America; Af: Africa; S.Ch: South China; Ja: Japan; N.Ch: North China; Am: Amuria; Kaz: Kazakh; Gre: Greenland; Si: Siberia. The dash line indicates the spreading axis of Pangea.

Fig. 1. Carte paléogéographique au Carnien (d'après la carte sur le site web : <http://www.palaeos.com/Mesozoic/Triassic/Carnian.htm>, modifiée). An : Antarctique ; Mad : Madagascar ; In : Inde ; Au : Australie ; S.Am : Amérique du Sud ; N.Am : Amérique du Nord ; Af : Afrique ; S.Ch : Chine du Sud ; Ja : Japon ; N.Ch : Chine du Nord ; Am : Amuria ; Kaz : Kazakhstan ; Gre : Groenland ; Si : Sibérie. La ligne hachurée indique l'axe d'expansion de la Pangée.

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