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Original article

Palynology and age of the Early Oligocene units in Çardak–Tokça Basin, Southwest Anatolia: Paleoecological implications

Palynologie et âge des unités de l'Oligocène inférieur du Bassin de Çardak–Tokça, Anatolie du Sud-Ouest : contributions paléoécologiques

Palinologie und Alter der Früholigozänen Einheiten in Çardak–Tokça Becken, Südwest Anatolia: Paläoekologische Folgerungen

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Abstract

In this study, the lignite bearing sediments of Çardak–Tokça basin exposed in southwest Anatolia, were palynologically examined. A well preserved and diverse palynomorph assemblage indicating an Early Oligocene age was recovered from the Hayrettin and Tokça formations. The palynomorph assemblage is dominated by *Pinus*, Sparganiaceae, Juglandaceae and diverse tricolpate and tricolporate pollen. In addition a few species of marine dinoflagellate cysts were encountered as well. The Early Oligocene age is based primarily on the presence of stratigraphic markers such as: *Boehlensipollis hohli*, *Slowakipollis hippophaëoides*, *Aglaoreidia cyclops*, *Dicolpopollis kockeli*, *Compositoipollenites rhizophorus* ssp. *burghasungensis*, *Mediocolpopollis compactus* ssp. *ellenhausensis*, *Pentapollenites pentangulus*, *Subtriporopollenites simplex* and *Intratriporopollenites instructus*. Palynological data indicate a humid subtropical climatic conditions during the deposition of the Çardak–Tokça sediments. Ecological analysis of the palynomorph assemblage identifies several paleo-associations of montana, lowland and slope, swamp and water-edge and freshwater aquatic elements. In this study, Çardak–Tokça, Çankırı–Çorum, Thrace and southwest Anatolian molasse basins (Kale–Tavas and Denizli) were correlated in accordance with their palynostratigraphic content and the results show that the deposition took place during the Early Oligocene in the Çardak–Tokça basin. This basin is older than Thrace basin and southwest Anatolian molasse basins (Kale–Tavas and Denizli molasse) which were deposited during the Late Oligocene–Early Miocene.

Résumé

Dans ce travail, la palynologie des lignites du bassin de Çardak–Tokça, du Sud-Ouest de l'Anatolie, a été étudiée. Un assemblage de palynomorphes bien préservé et diversifié a été retrouvé dans les formations de Hayrettin et de Tokça, indiquant un âge Oligocène inférieur. Les palynomorphes dominants de cette population sont les pollens de *Pinus*, Sparganiaceae, Juglandaceae ainsi que les pollens tricolpés et tricolporés. En plus de ces formes on rencontre des kystes de dinoflagellés. On attribue à ces lignites un âge Oligocène inférieur en se fondant sur la présence de *Boehlensipollis hohli*, *Slowakipollis hippophaëoides*, *Aglaoreidia cyclops*, *Dicolpopollis kockeli*, *Compositoipollenites rhizophorus* ssp. *burghasungensis*, *Mediocolpopollis compactus* ssp. *ellenhausensis*, *Pentapollenites pentangulus*, *Subtriporopollenites simplex* et *Intratriporopollenites instructus*. Les données palynologiques permettent de confirmer que pendant la sédimentation dans le Bassin Çardak–Tokça, le climat était de type subtropical. L'analyse écologique des assemblages de palynomorphes montre la présence de régions montagneuses, de collines et d'un milieu marécageux dulçaquicoles. Dans le cadre de ce travail, en se basant sur les caractéristiques palynologiques, les bassins de Çardak–Tokça, Çankırı–Çorum, Thrace ont été corrélés avec les molasses de l'Anatolie du Sud-Ouest (Kale–

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Tavas et Denizli). Les résultats obtenus montrent que la sédimentation dans le bassin de Çardak–Tokça s'est effectuée pendant l'Oligocène inférieur. Ce bassin est plus ancien que les bassins molassiques de Thrace et d'Anatolie du Sud-Ouest qui se sont déposés de l'Oligocène supérieur au Miocène inférieur.

Keywords: Palynology; Early Oligocene; Paleoecology; Southwest Anatolia

Mots clés : Palynologie ; Oligocène inférieur ; Paléoécologie ; Anatolie du Sud-Ouest

1. Introduction

Palynological surveys of Oligo–Miocene basins are scarce in the southwest Anatolia. These basins are called from east to west Çardak–Tokça, Denizli and Kale–Tavas (Fig. 1A). The Çardak–Tokça area is located to the northeast of Denizli where there is a large Oligocene outcrops (Fig. 1B). Oligocene in this area essentially consists of clastic rocks. A few studies have been made in the past for stratigraphical and paleontological purposes in Çardak–Tokça basin (Nebert, 1956; Benda, 1971; Göktaş et al., 1989; Şahbaz and Görmüş, 1992). Benda (1971) studied the palynology of the coal-bearing Neogene sediments in the southwest Anatolia and separated seven palynological assemblages from bottom to top Tokça, Kurbalık, Kale, Eskihisar, Yeni Eskihisar, Kızılhisar and Akça. According to the author, Tokça sporomorph assemblage is Early Oligocene in age (Fig. 2). An unpublished report of Göktaş et al. (1989) have produced the first comprehensive stratigraphical studies on Tertiary sequence of Çardak–Tokça basin, using benthic foraminifers. In the area, the coal-bearing Oligocene sediments are represented only by two major formations named Hayrettin and Tokça. The authors suggested an Middle–Late Oligocene age for the Hayrettin formation and the Late Oligocene age for the Tokça formation based on the benthic foraminifers (Fig. 2).

Additionally there are numerous studies on Kale–Tavas and Denizli molasse basins based on the stratigraphical and paleontological aspects of the stratigraphic sequences (Tchihatchef, 1869; Nebert, 1956; Becker-Platen, 1970; Luttig and Steffens, 1976; Gökçen, 1982; Hakyemez and Örçen, 1982;

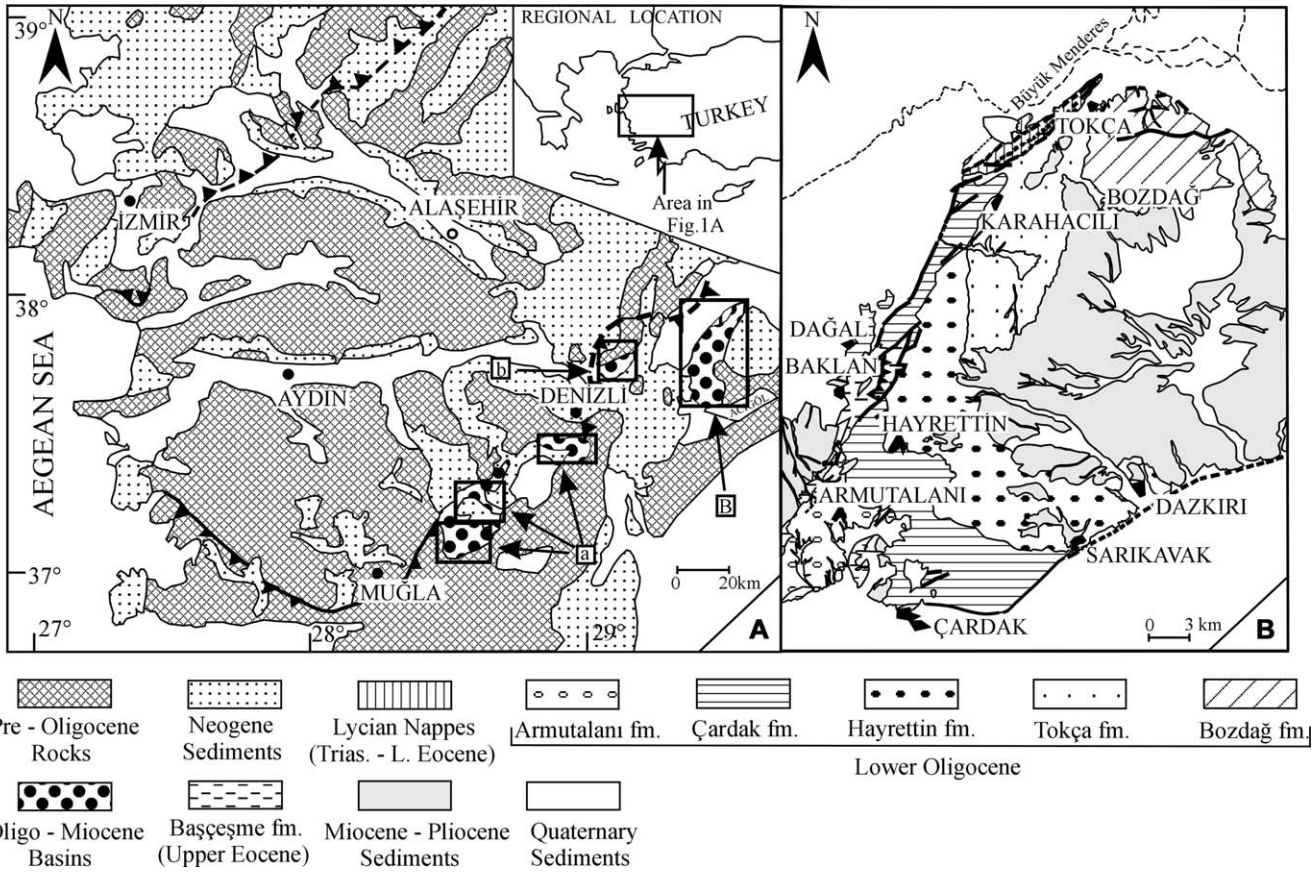

Fig. 1. (**A**) Map showing the locations of the Oligo–Miocene basins in the southwest Anatolia. a) Kale–Tavas. b) Denizli. (**B**) Simplified geological map of the Çardak–Tokça basin (modified from Göktaş et al., 1989).
Fig. 1. (**A**) Localisation des basins d'âge Oligo–Miocène dans l'Anatolie du Sud-Ouest. a) Kale–Tavas. b) Denizli. (**B**) Carte géologique simplifiée du Bassin de Çardak–Tokça (d'après Göktaş et al., 1989).