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Original article

Pollen analysis of coal-bearing Miocene sedimentary rocks from the Seyitömer Basin (Kütahya), Western Anatolia

Palynostratigraphie des sédiments Miocènes contenant du charbon dans le bassin de Seyitömer (Kütahya), Anatolie occidentale

Seyitömer Havzası (Kütahya) Batı Anadoludaki kömür içeren Miyosen sedimanter kayaçlarının polen analizi

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Abstract

The late Early–Middle Miocene sequences of the Seyitömer Basin (western Anatolia) were palynologically investigated. Fifty-five taxa belonging to seven gymnospermous and 48 angiospermous pollen genera were identified in the 19 productive samples. Two pollen zones were recognised based on the changing abundance of individual tree taxa. Zone 1 is characterized by predominance of *Pinus* and *Cedrus*. Zone 2 is characterized by predominance of deciduous *Quercus* and evergreen *Quercus* and a marked reduction in representation of Taxodiaceae. The differences in the pollen spectra between Zone 1 and Zone 2 may reflect the global Middle Miocene cooling. These results are largely comparable to pollen data derived from the neighbouring areas. The vegetation of the Seyitömer Basin was dominated by trees. This palynological analysis reveals the existence of a swamp-forest developed in a subtropical to warm-temperate humid climate.

Résumé

Une analyse palynologique a été réalisée sur des séquences sédimentaires d'âge Miocène Inférieur à Moyen du bassin Seyitömer (Anatolie occidentale). Cinquante-cinq taxa dont sept gymnospermes et 48 angiospermes ont été identifiés dans 19 échantillons riches en pollens. Deux zones ont pu être différenciées à partir des pollens, basées sur les variations de la concentration des pollens d'arbres. La zone 1 est caractérisée par l'abondance de *Pinus* et *Cedrus*. La zone 2 est caractérisée, en revanche, par l'abondance de *Quercus* de type décidu et sempervirent et une forte diminution des Taxodiacées. Les différences des spectres polliniques entre ces deux zones sont probablement le reflet du refroidissement climatique du Miocène moyen. Ces résultats sont comparables à ceux des études polliniques réalisées dans des régions voisines. Une végétation arborée dominait l'ensemble de la végétation du bassin de Seyitömer. L'analyse palynologique indique l'existence d'une forêt marécageuse développée sous un climat tempéré–subtropical humide.

Anahtar kelimeler

Seyitömer Havzasındaki (batı Anadolu) Erken-Orta Miyosen yaşlı istif palinolojik yöntemlerle incelenmiştir. Palinomorfça zengin 19 örnekte 7 gymnosperm ve 48 angiosperm pollen cinsine ait 55 taksonun varlığı saptanmıştır. Ağaç taksonların bolluk değerlerinin değişimine dayanarak iki pollen zonu tanımlanmıştır. Zone 1 *Pinus* ve *Cedrus*un egemenliği ile temsil edilmektedir. Zone 2 herdem yeşil *Quercus* ve yaprak döken *Quercus* egemenliği yanında Taxodiaceae yüzdesindeki önemli düşüş ile temsil edilmektedir. Zone 1 ve Zone 2'nin pollen spektraları arasındaki fark Orta Miyosen'deki küresel soğumayı yansıtmaktadır. Bu çalışmada elde edilen sonuçlar komşu alanlar ile oldukça büyük benzerlikler sunmaktadır.

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Seyitömer Havasındaki bitki örtüsünde ağaçların hakim olduğu görülmektedir. Palinolojik analizler kömürleri oluşturan bataklık ormanının yarı tropikal-nemli ılıman bir iklimde geliştiğini göstermektedir.

Keywords: Palynostratigraphy; Early–Middle Miocene; Seyitömer Basin; Western Anatolia; Paleoclimate; Paleoecology

Mots clés : Palynostratigraphie ; Miocène inférieur-moyen ; Bassin du Seyitömer ; Anatolie occidentale ; Paléoclimat ; Paléoécologie

Palabras clave : Palinostratigrafi; Erken-Orta Miyosen; Seyitömer Havzası; Batı Anadolu; Paleoiklim; Paleoekoloji

1. Introduction

Palynological studies dealing with Neogene sediments in Turkey have been carried out from 1960s to present. At the beginning, these studies were focused on economic coal layers (Ağralı et al., 1966; Ağralı and Akyol, 1967; Akyol, 1968) but later they were extended to characterize clastic sequences, especially for Neogene deposits in western Turkey, improving knowledge of vegetation and climate during this time (Ediger, 1990; Akyol and Akgün, 1990; Akgün and Akyol, 1992; Yavuz et al., 1995; Ediger et al., 1996).

The purpose of this study is to investigate the paleopalynology of the Neogene clastics of the Seyitömer Basin, western Anatolia (Fig. 1). The Seyitömer Basin is one of the biggest coal-producing areas of western Turkey. The geology of the basin was studied by Nebert (1960) and Baş (1983). A palynological study was previously carried out by Nakoman (1968) in the Seyitömer deposits but it is difficult to determine botanical affinity of pollen since he used form-generic names for most of pollen and spores. In the current study, first Neogene pollen zones have been established, then pollen data have been compared to results from some neighboring areas and finally their climatic and vegetation implications have been inferred.

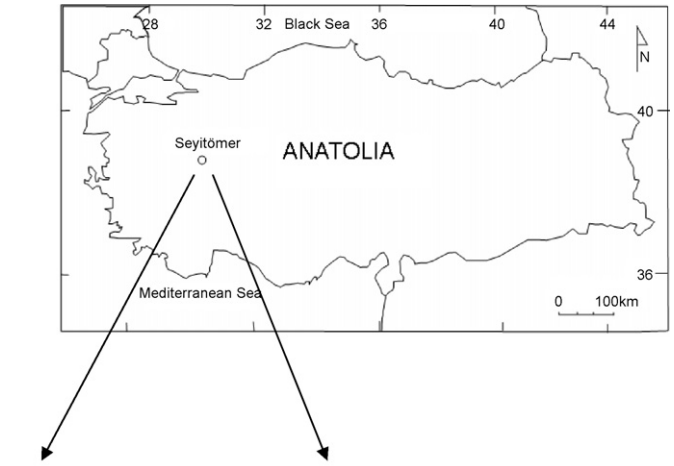
2. Geological setting

Neogene deposits outcropping in the Seyitömer basin, Kütahya province, western Anatolia (Fig. 1) are divided into the Beke, Tunçbilek, Saruhanlar, Çokköy and Emet Formations in ascending order (Baş, 1983).

The Beke Formation, maximum 150 m in thickness, consists of conglomerate at the bottom, sandstone and claystone at the top. The Tunçbilek Formation, which is *ca*. 400 m thick, divided into the Yeldeğirmeni, Gürağaç and Demirbilek Members. This study focuses on the Demirbilek Member since it includes commercial coal seams of the Seyitömer basin.

The Demirbilek Member consists of interbedded marl, claystone, and coal with limestone and tuff intercalations. Sandstones and siltstones are sporadically present. Coals occur at the base of this member with a thickness ranging from 2 to 15 m. The main coal seam usually has thin claystone, coaly claystone, siltstone and mudstone interlayers. Samples of our study mainly come from these interlayers and also from the upper parts.

The Saruhanlar Formation, about 250 m in thickness, consists of conglomerate and sandstone. The Çokköy Formation, which is *ca*. 170 m thick, characterised by sandstones at the bottom and limestones dominate upwards. The Emet Formation, over 100 m thickness, made up of almost entirely siliceous limestone. The first two formations are intercalated with tuff layers.



AGE	LITHOLOGY	
PLIOCENE	EMET FORMATION	
	ÇOKKÖY FORMATION	
	SARUHANLAR FORMATION	
MIOCENE	Demirbilek Member	TUNÇBİLEK FORMATION
	Gürağaç Member	
	Yeldeğirmeni Member	
	BEKE FORMATION	

Fig. 1. Location and summarized stratigraphic section of the Neogene rocks in the Seyitömer Basin.
Fig. 1. Situation géographique et coupe synthétique du Néogène du bassin de Seyitömer.