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ScienceDirect
Revue de micropaléontologie 50 (2007) 129–144
Revue de micropaléontologie
http://france.elsevier.com/direct/REVMIC/

Original article

Palynostratigraphy and palaeogeography of the Padeha, Khoshyeilagh, and Mobarak formations in the eastern Alborz Range (Kopet-Dagh region), northeastern Iran

Palynostratigraphie et paléogéographie des formations de Padeha, Khoshyeilagh and Mobarak dans l'est de l'Alborz (région de Kopet-Dagh), nord-est de l'Iran

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Abstract

A total of 113 surface samples collected from the Padeha, Khoshyeilagh, and Mobarak formations of Kuh-e-Ozum, northeast of Jajarm town were processed for palynomorphs, in order to determine age relationships. Well-preserved and abundant palynomorphs dominated by organic-walled-marine microphytoplankton (acritarchs and prasinophyte phycomata), miospores and subordinate chitinozoans, and scolecodonts were recovered. Seven species of prasinophyte phycomata (four genera), 19 acritarch species (14 genera), one species of chitinozoa, and 26 miospore species (19 genera) were recorded and assigned to eight local Assemblage Zones. Assemblage Zones I–IV occur in the Padeha Formation and suggest an Early Late Devonian (Frasnian) age whilst assemblages zones V–VII are present in the Khoshyeilagh Formation and indicate Late Devonian (Famennian) ages. Assemblage zone VIII, which occurs in the basal part of Mobarak Formation, suggests a Lower Mississippian (Tournaisian) age for this formation. Many of the palynomorph groups encountered are closely comparable with coeval assemblages recorded from Western Australia, southwest Ireland, England, Turkey, Saudi Arabia, North Africa, and South America, indicating the close relationship of the Iranian Platform to other parts of the northern Gondwana Domain during the time interval represented by these strata. The presence of marine palynomorphs (acritarchs/prasinophyte phycomata, chitinozoans, and scolecodonts), and shelly macrofauna (brachiopods, gastropods, and corals) in Member c of the Padeha Formation (as well as the Khoshyeilagh and Mobarak formations), together with associated miospores, indicate an open marine (moderately nearshore) depositional environment for the Upper Devonian and Lower Carboniferous deposits in northeastern Alborz Range (Kopet-Dagh region) of Iran.

Résumé

Un total de 113 échantillons palynologiques récoltés à l'affleurement dans les formations de Padeha, Khoshyeilagh et Mobarak, à Kuh-e-Ozum, au nord-est de la ville de Jajarm, ont été analysés afin de préciser leurs relations chronostratigraphiques avec la succession sus-jacente. Des palynomorphes abondants et bien conservés ont été recueillis. Les assemblages, dominés par les acritarches, les phycomata de prasinophytes (microphytoplancton) et par les spores, contiennent aussi quelques chitinozoaires et scolécodontes. Sept espèces de phycomata de prasinophytes (quatre genres), 19 espèces d'acritarches (14 genres), 26 espèces de miospores (19 genres) et une espèce de chitinozoaires ont été répertoriées. Elles ont été réparties en huit zones locales d'assemblage. Les Zones d'Assemblage I–IV se trouvent dans la Formation de Padeha et suggèrent un âge Dévonien Supérieur précoce (Frasnien). Les Zones d'Assemblage V–VII concernent la Formation de Khoshyeilagh et indiquent le Dévonien Tardif (Famennien). La Zone d'Assemblage VIII se place dans la partie basale de la Formation de Mobarak et suggère un âge Mississippien

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doi:10.1016/j.revmic.2007.01.004

Précoce (Tournaisien). Nombre des palynomorphes observés sont très proches de ceux des assemblages contemporains de l'Ouest de l'Australie, du Sud-ouest de l'Irlande, d'Angleterre, de Turquie, d'Arabie Saoudite, d'Afrique du Nord et d'Amérique du Sud. Ils indiquent les bonnes affinités de la plateforme iranienne et les autres régions du Domaine nord gondwanien à cette époque.

Keywords: Devonian; Miospores; Acritarchs; Palynostratigraphy; Palaeogeography; Eastern Alborz Range (NE Iran)

Mots clés : Dévonien ; Miospores ; Acritarches ; Palynostratigraphy ; Palaeogeography ; Est de l'Alborz (NE Iran)

1. Introduction

Palaeozoic strata are well exposed in Kuh-e-Ozum, which is located northeast of Jajarm town, approximately 180 km northeast of Shahrud city, northern Iran. The road from Shahrud to Jajarm is the principle link to the studied area (Fig. 1). This Palaeozoic sequence has been divided in ascending stratigraphical order into the Padeha, Khoshyeilagh and Mobarak formations. The Padeha Formation has always been the subject of major controversy since it lacks any diagnostic faunal evidence regarding its age at both its type locality and in other sections (Alavi-naini, 1972; Ghavidel-syooki, 1992, 1994, 2001; Rafighei-oskuei, 1992). The same is true for the Khoshyeilagh Formation since there is no agreement on the age relationships of this formation (Bozorgnia, 1973; Alavi-naini, 1972; Coquel et al., 1977; Ghavidel-syooki, 1994). Sections of both formations were therefore measured and sampled in order to determine their age relationships in the Kopet-Dagh region. The palynological data recovered will enable reconstruction of the relationship of these formations of the Kopet-Dagh region with those in the Central and Western Alborz Ranges as well as other parts of the world.

2. Stratigraphy

The Palaeozoic sequence of Kuh-e-Ozum is 854 m thick (only 622 m was investigated in this study) and it has been divided in ascending stratigraphical order into the Padeha, Khoshyeilagh and Mobarak formations (Afshar-harb, 1979).

The Padeha Formation is 492 m thick at its type locality in Ozbak-Kuh, but it is only 340 m thick in the studied area. The lower contact of this formation is disconformable with the Niur Formation in its type locality (Ozbak-Kuh), but this contact is not clear in the studied area where it is cut by a thrust fault. The upper contact of this formation is graditional with the Khoshyeilagh Formation (Fig. 2) in the studied area. The Padeha Formation consists of variably colored shales, sandstones, siltstones, dolomites, and gypsum. Using lithological criteria, the Padeha Formation has been divided into four members (a, b, c and d). Member a consists of purple shales and sandy siltstones (Afshar-harb, 1979) and is 205 m thick in the type locality (Ozbak-Kuh), but it is not exposed in the study area (Kuh-e-Ozum) since this member and older Palaeozoic rock units have been cut out by a fault. Member b, which comprises alternations of gypsum, dolomite and olive-gray shale, is 70 m thick in its type locality (Ozbak-Kuh), but increases to 202 m in thickness in the Kuh-e-Ozum study area. Member c is 49 m thick in Kuh-e-Ozum and consists mainly of fossiliferous limestones with brachiopods and corals. This member is 120 m thick in its type locality (Ozbak-Kuh) where it consists of alternations of dolomite and sandstone. Member d is 89 m thick in the study area (Kuh-e-Ozum) compared to a thickness of 80 m in its type locality (Ozbak-Kuh), where it is represented by gypsum and thinly-bedded gray shales. The Padeha Formation has its best development in Kuh-e-Ozum, where Member c of this formation contains important macrofauna (Afshar-harb, 1979). The Padeha Formation lacks any diagnostic macrofossils at its type locality (Ozbak-Kuh) and based largely on its stratigraphical position,

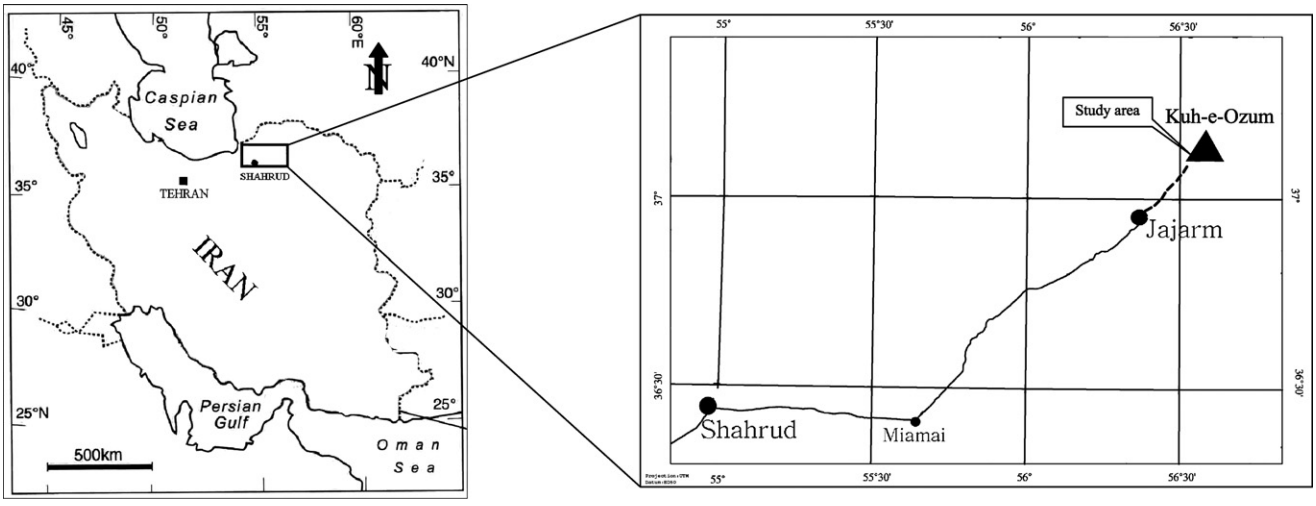

Fig. 1. Location map of studied area in the Kopet-Dagh region, northeastern Iran.
Fig. 1. Carte de localisation du secteur étudié dans la région de Kopet-Dagh, Nord-est de l'Iran.