

## EARLY-MIDDLE MIOCENE PALYNOLOGY AND DINOFLAGELLATE CYSTS, GHARANDAL GROUP, GULF OF SUEZ, EGYPT

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A total of 104 samples have been palynologically investigated from the Kareem-30 and Shukheir-1 boreholes, Gulf of Suez, Egypt. Stratigraphically, the Nukhul and Rudeis formations unconformably overly thin deposits of Eocene age in Shukheir-1, whereas the Rudeis and Kareem formations unconformably overly thin Paleocene limestones in the Kareem-30 borehole.

Diverse assemblages of dinoflagellate cysts similar to those of the Miocene Mediterranean Realm were recorded. The diversity and assemblage composition of dinoflagellates are compared in the two boreholes. Most species were represented in the two borehole but with variable percentages. *Spiniferites/Achomosphaera* spp., *Lingulodinium machaerophorum*, *Operculodinium* spp., *Cleistosphaeridium* spp., *Hystriophphaeropsis obscura*, *Apteodinium* spp., *Cribroperidinium* spp., *Hystriocholpoma* spp., *Melitasphaeridium choanophorum* and *Tuberculodinium vancampoe* occur commonly. In addition to sporadic occurrence of *Barssidinium* spp., *Sumatradinium* spp., *Dapsilodinium* spp., *Labyrinthodinium truncatum* subsp. *truncatum/modicum*, and *Distatodinium paradoxum*. *Tectatodinium pellitum* and *Kallosphaeridium biornatum* are restricted to the Kareem-30 samples.

In Kareem-30 borehole samples, the terrestrially derived palynomorphs (miospores) and Fresh-water algae (*Pediastrum* spp.) are more abundant than in the Shukheir-1 samples, whereas fungal spores and the probable dinoflagellate cyst *Quadrina condita* are common in Shukheir-1 samples. *Cyclopsiella* spp., *Nannobarbophora gedlii* and *Nannobarbophora* sp. A are represented in the two boreholes.

Based on the HO of *Exochosphaeridium insigne* and the LO of *Sumatradinium soucouyantiae* and *S. druggii* an Early Burdigalian age is assigned to the Nukhul and Lower Rudeis formations. A Late Burdigalian-Langhian age is suggested for the Upper Rudeis and Lower Kareem formation based on the HO of the *Apteodinium spiridoides* and *Distatodinium paradoxum*. The Upper Kareem Formation is deposited in the Serravallian age based on the continuous presence of diagnostic species as *L. truncatum*, *H. obscura* and *Cleistosphaeridium* spp. These dates are supported by planktonic foraminifera and calcareous nannoplankton data.

The rare occurrence of protoperidiniacean (heterotrophic) genera such as *Lejeunecysta*, *Selenopemphix*, *Trinovantedinium* and *Brigantedinium* in the Kareem samples may indicate either a shortage of nutrient supply during this period, or poor preservation resulting from syn- or postdepositional oxidation. This contrasts with their common occurrence and fair to good preservation in the Shukheir-1 borehole. The dinoflagellate cyst assemblages indicates an inner-outer neritic environment. The dominance of *Polysphaeridium zoharyi* in the Kareem samples may indicates a hypersaline lagonal environment and it has an inverse relation to *L. machaerophorum*. The presence of the thermophilic dinoflagellates *P. zoharyi*, *T. vancampoe*, *M. choanophorum*, *Tectatodinium pellitum* and others in most samples indicates the dominance of tropical to sub-tropical climatic conditions during deposition of the Gharandal Group.

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