

Stratigraphy, facies, and depositional environments of the Paleogene sediments in Cairo–Suez district, Egypt

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Abstract The study of eight stratigraphic sections along Cairo–Suez district, between Gebel Ataqa and Gebel Mokattam, reveals a thick Lower Eocene Ypresian carbonate section, approximately 210 m thick, at Gebel Abu Treifiya just to the west of Gebel Ataqa. It is represented by the Minia Formation rich in *Nummulites praecursor*, *Orbitolites pharaonum* Schwager, *Alveolina frumentiformis* Schwager, and one of the precursors of *Nummulites gizehensis* group. The Minia Formation is a fairly clear, warm, and shallow marine facies. The Middle Eocene Lutetian sediments are totally missing in all studied sections probably reflecting instability in deposition echoed in the active block movements the area witnessed since the Paleozoic. The Bartonian sea transgressed over the area depositing Gebel Hof Formation at the base, Observatory Formation in the middle, and Qurn Formation at the top. The Gebel Hof Formation was deposited in an open-marine environment, passed upward into shallow marine, neritic to reefal facies; for the Observatory and Qurn formations, the former changed laterally into a sheltered lagoon facies, Sannor Formation, rich in *Somalina stefaninii* Silvestri, *Dictyoconus aegyptiensis* Chapman, and *Idalina cuvillieri* Bignot and Strougo. The Upper Eocene sediments, Maadi Formation, are mainly represented by a carbonate–clastic section showing shallowing-upward cycles resulted by the retreating of the sea shoreline northward during the Late Eocene, with high supply of terrigenous sediments. The lower carbonate cycle of the Maadi Formation was deposited in a restricted platform and tidal flats, whereas the upper siliciclastic cycle containing *Carolia placunoides* banks was probably deposited in a winnowed platform edge. These

depositional environments were developed in grabens, ramps, and footslopes of the down-faulted Middle Eocene blocks, i.e., syn-tectonic deposition. The fluvialite Oligocene sediments were highly controlled by the structural and topographic lows, where a substantial thickness was deposited, Gebel Ahmer Formation, occupying several grabens and gently sloping areas between many synthetic faults.

Keywords Stratigraphy · Eocene · Oligocene · Correlation · Microfacies analysis · Depositional environments · Geologic history · Cairo–Suez district, Egypt

Introduction

The study area along Cairo–Suez district between Gebel Ataqa in the east and Gebel Mokattam in the west (Fig. 1) exposes a relatively thick sequence of Paleogene sediments. These sediments were greatly influenced by the events which prevailed over the Red Sea and Gulf of Suez regions during the early stages of the Eocene and continued to the Late Miocene (Patton et al. 1994). The most common event was the Gulf of Suez rifting, which resulted in the displacement of many blocks relatively to each other giving rise to a complex stratigraphic setting on both sides of the Gulf (Steckler et al. 1988; Issawi 2002, 2005; Osman 2003; Issawi et al. 2009).

The stratigraphy of the Paleogene sediments in Cairo–Suez district has been dealt with by many authors since Barron (1907) who first classified the Eocene strata in this district into different rock units. Some authors e.g., Barakat and Abou Khadrah (1971), Abdel Shafy and Ismail (1988), and Awad et al. (2002) used the formational names of the Greater Cairo Area facies: Minia, Mokattam, and Maadi formations to describe the Eocene rock units exposed in the area studied (Geological Map of Greater Cairo Area, scale 1: 100,000, 1983). Others, e.g., Strougo and Abdallah (1990), Morsi

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