Paleoenvironmental modeling and paleogeography of the Upper Senonian- Paleogene sequences, North of the Gulf of Suez, Egypt with especial emphasis on the red beds

By

Selim Saber Selim Aly
M.Sc. Cairo University

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Brief abstract

The stratigraphical and sedimentological framework study of the Upper Senonian-Middle Eocene sequences at northwest Gulf of Suez and the surrounding areas lead to the distinction of the study area into two sedimentary basins: southern and northern. The Upper Senonian-Middle Eocene succession is subdivided into five transgressive-regressive (T-R) cycles: Maastrichtian- Pre-Selandian, Selandian-Late Thanetian, Late Thanetian/Early Ypersian-Middle Ypersian, Late Ypersian-Middle Lutetian, and Late Lutetian-Late Bartonian. These T-R cycles are correlated with the scheme of Ogg, et al. (2008). The prevailed climates during the Late Senonian-Middle Eocene times are deducted and correlated with the other climatic studies in Egypt and southeast Mediterranean region.

Key words

Paleoenvironment – Paleogeography – Stratigraphy – Cyclicity – Gabal Shabraweet - Gabal Ataqa – paleoclimate –sedimentary basins

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ABSTRACT

Detailed sedimentological and stratigraphic studies of the Upper Senonian-Middle Eocene sequences at the northern part of the western side of the Gulf of Suez and adjacent areas indicate the presence of two sedimentary basins: southern and northern being separated by a paleohighs represented by the inverted fold belts along the Abu-Hammad-1/Q-71-1/R69-1 wells (intra-shelf highs). The Upper Senonian-Middle Eocene sedimentary infill of the northern and southern basins is distinguished into six main sedimentary sequences as follows:

The **Post-Campanian** sequence is characterized by paleokarst, hardground, littoral to peritidal carbonates, lagoonal, inner shelf, middle /inner shelf grades to lagoonal, middle/outer shelf, and outer shelf assemblages at the southern basin while at the northern basin, basinal chalk and inner/middle shelf carbonates are the dominant assemblages with some intra-basinal highs.

The **Maastrichtian-Paleocene** sequence is characterized by fluvial channel, floodbasin assemblage, palustrine of DS-I (Maastrichtian-Paleocene?) at eastern sector of Gabal Ataqa-Kabrit belt. Westwards, it is laterally changed to peritidal at western sector of Gabal Ataqa, mixed siliciclastic/carbonate tidal to inner shelf (shoals and bars), and lagoonal assemblages at Al Dar-1, Ubur-1, and Ourabi-1 wells respectively.

The **Middle/Upper Paleocene** sequence includes amalgamated fluvial channels, distal fan/lake margin and aeolinites, palustrine of DS-II (Paleocene?) At east Gabal Ataqa-Kabrit belt. Westwards, it is changed laterally into peritidal, intertidal to supratidal, restricted inner shelf passes to outer shelf/slope, basinal marls, basinal to slope, slope grades to basinal /toe of slope, inner to outer shelf, restricted inner shelf to foreslope assemblages.

The **Ypersian** sequence includes eastern non-marine and western marine assemblages at the southern basin. The non-marine assemblages include mid alluvial fan, marginal lacustrine/distal alluvial fan, shallow lacustrine/mud flat, open lacustrine/mudflat assemblages of DS-III and lower distal alluvial fan /mud flat assemblage, middle mid-proximal alluvial fan and upper fluvial channels, flood-dominated distal floodbasin assemblages of DS-IV at eastern sector of Gabal Ataqa-Kabrit belt. The non-marine assemblages are changed laterally to the marine equivalent at the western part of the basin. They include peritidal, middle/outer to inner shallow shelf, outer shelf, slope, and basinal marls assemblages of the Early Ypersian (biozone P7) and outer shelf grades up to inner shelf, inner shelf grades up to lagoonal, and middle/outer shelf grades up to lagoonal assemblages of Late Ypersian (biozone P9). On the other hand, at the northern basin, the Ypersian sequence includes open shelf to basinal carbonates of Early Ypersian (biozone P7), outer / middle shelf, slope/toe of slope, and basinal muds of Middle Ypersian (biozone P8), and slope assemblage of Late Ypersian (biozone P9).

The **Lutetian** sequence consists of laterally interfingering non-marine/transitional and marine assemblages in the southern basin. This sequence shows transgressive upward trend as follows: alluvial fan grades to deltaic/estuarine), pond/sabkha topped by lagoon, mudflat/sabkha to lagoon, karst grades to marshes, distributary channel fill grades to near a distributary lagoon inlet, peritidal carbonate, inner shelf grades to outer shelf, restricted Inner shelf grades to open inner shelf, shelf shoals or edge, restricted inner shelf, and inner shelf grades to outer shelf assemblages of biozone P12 (Late Lutetian). At the northern basin, the Lutetian sequence is dominated by basinal carbonate of Middle Lutetian **(**biozone P11) and basinal carbonate /toe of slope, middle shelf, basinal carbonates assemblages of Late Lutetian (biozone P12).

The **Bartonian** sequence includes stream-dominated alluvial fan-fan-delta to estuarine/deltaic, alluvial fan/fan-delta fringes and mudflat, mudflat to lagoon, lagoon, restricted inner shelf, inner shelf, restricted lagoon (pond) and fluvio-deltaic, open to restricted lagoon, middle/inner shelf to lagoon, shelf shoals/restricted inner shelf, outer to inner shelf, and basinal carbonates to inner shelf assemblages. The alluvial fan/fan-delta assemblages of Gabal Shabraweet area are fed from the northern Abu Hammad-1 and Abu Sultan-1 inverted belts and its extension, while the fluvio-deltaic assemblages of Gabal Ataqa are probably fed from the southern Ayun Moussa-Sukhna inverted belts.

The Upper Senonian-Middle Eocene sedimentary succession shows five Trangressive-Regressive (T-R) cycles being recorded in the study area. These cycles are fitted with the the scheme of Ogg et al. (2008): Maastrichtian – pre-Selandian T-R cycle shows humid/warm climates with some rainy periods alternated with seasonally dry conditions. Selandian-Late Thanetian T-R cycle is of rainy periods with dominance of fluvial channels (subhumid climates) with seasonally semi-arid periods during which poorly developed paleosols at the channel tops. Late Thanetian-Middle Ypersian T-R cycle shows climatic shift to humid conditions with prevailing rainy climates. Late Ypersian-Middle Lutetian T-R cycle is characterized by arid to semi arid climates as confirmed by the dominance of the ephemeral streams and calcrete formation at the eastern margin of the southern basin (Ataqa-Kabrit belt). Late Lutetian-Late Bartonian T-R cycle is dominated by arid climates in the Lutetian and warm climate in the Bartonian.

The present study proves that the Bartonian sequence at the northern part of Shabraweet area is misidentified as Cretaceous-Tertiary contact by all the previous authors.

CONTENTS