

**High resolution sequence stratigraphy of  
the Cenomanian successions in North  
Western Desert, Egypt, and its impacts on  
hydrocarbon reservoirs**

A THESIS SUBMITTED TO THE FACULTY OF SCIENCE,  
FAYOUM UNIVERISTY,  
EGYPT

IN PARTIAL FULLEFILMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF SCEINCE

IN  
GEOLOGY

BY

FARAG SHABBAN AHMED SOLIMAN

B.SC. CAIRO UNIVERISTY

2011

Thesis advisors:

Dr. Sobhi Ahmed Helal

Ass. Prof. of Geology, Faculty of Science,  
Geology Department, Fayoum University.

Dr. Mohamed Said Abu Elghar

Ass. Prof. of Geology, Faculty of Science,  
Geology Department, Fayoum University.

## *Summary and Conclusion*

The present thesis deals with the lithostratigraphic analysis, sedimentology, cyclicity and sequence stratigraphy and environmental interpretation of surface and subsurface Cenomanian rock successions in the northern part of the Western Desert.

The study area covers Cenomanian successions in surface outcrops at Bahariya Oasis and subsurface sections from three main oil fields (Qarun, Wadi El Rayan and Beni Suief) located in the north-eastern part of the Western Desert.

The surface sections involved in the study are located at Naqb El Harra, El Harra Dome, Gebel El Dist and Naqb El Selim outcrops and the three selected wells representing the oil fields are Qarun 2-1well (Qarun oil field), Wadi El Rayan 2X well (Wadi El Rayan oilfield) and Beni Suief 6X well (Beni Suief oil field).

The ultimate objective of the study is to highlight and identify the cyclicity nature and sediment build-up of the Cenomanian sequences in order to construct a

cyclostratigraphic framework for the hydrocarbon bearing reservoirs (the Bahariya Formation and the G Member of Abu Roash Formation) in the study area.

The examined surface sections from bottom to top are represented by the Bahariya Formation in Naqb El Harra, El Harra Dome and Gebel El Dist and by the Bahariya and El Heiz Formations in Naq El Selim section. In the subsurface wells the studied Cenomanian successions are belong to the Bahariya Formation and G Member of Abu Roash Formation.

The lithostratigraphic analysis led to the subdivision of the Albian?-Early Cenomanian Bahariya Formation in surface sections into two members:

- The Lower Bahariya Member (Albian?-Early Cenomanian) mainly composed of medium to coarse-grained sandstone

- The Upper Bahariya Member (Early Cenomanian) mainly consist of claystones/shales, siltstone and sandstones and could be distinguished into two subunits A and B separated by a truncation surface.

In the subsurface sections the Albian to Early Cenomanian Bahariya Formation could lithostratigraphically be differentiated

into Lower Bahariya Member (Albian) and Upper Bahariya Member (Early Cenomanian).

The Upper Cenomanian El Heiz Formation is represented in the studied surface section is mainly composed of highly calcareous claystones and dolostone beds and is equivalent in the subsurface to the lower part of the G Member of Abu Roash Formation composed of limestone, shale and sandstone interbeds.

The surface sections were studied from the petrographic point of view. Two types of microfacies were identified in the Lower Bahariya Member:

- Quartzwacke
- Quartzarenite

Nine types of microfacies were identified in the Upper Bahariya Member:

- Silty pelletal ironstone<sup>1370</sup>
- Quartzarenite grading to pelletal ironstone
- Ironstone
- Green sand
- Quartzarenite
- Pelletal ironstone
- Sandy pelletal ironstone
- Glauconitic litharenite
- Silty quartzarenite

The petrographic investigation of the Upper Cenomanian El Heiz Formation revealed two microfacies types

- Sandy Dolostone
- Dolostone

For the subsurface penetrated successions the wireline logs, especially the Gamma Ray logs were used in the application of the Cyclog software to build a cyclicity pattern of the studied wells. The penetrated sections could be distinguished into four main 3<sup>rd</sup> cycles: 2.1 representing the Lower Bahariya Member, 2.2 representing the Upper Bahariya Member and 2.3 and 2.4 cycles representing the G Member of Abu Roash Formation. These 3<sup>rd</sup> order cycles could further be differentiated into 4<sup>th</sup> cycles, as follows:

- Cycle 2.2 was subdivided into cycles 2.2.3? and 2.2.4? (cycles 2.2.1? and

2.2.2? are possibly missing)

- Cycles 2.3 was subdivided into cycles 2.3.1 and 2.3.2
- Cycles 2.4 was subdivided into cycles 2.4.1, 2.4.2, 2.4.3 and 2.4.4

Through correlating the subsurface and subsurface successions, the corresponding cycles could be identified in the subsurface sections, where the Bahariya Formation was

distinguished into cycles 2.1, 2.2.3? and 2.2.4? with a major truncation surface between the Lower Bahariya Member and the Upper Bahariya Member marking the missing of cycles 2.2.1? and 2.2.2?.

On other hand El Heiz (surface) Formation was found to be equivalent to cycle 2.3.1.

The depositional setting of the studied successions was interpreted to be fluviomarine for the Bahariya Formation characterized by meandering streams, swamps, floodplains, oyster banks and paleosols. El Heiz Formation was interpreted to be marginal marine while the G Member of the Abu Roash Formation is shallow marine probably inner to middle neritic zone.