

# **PS Egypt Beni Suef Basin Petroleum Systems from Oil Geochemistry and Basin Modeling\***

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## **Abstract**

The Beni Suef Basin lies approximately 150 km south of Cairo in north central Egypt and is bisected by the present-day Nile Valley. The oldest stratigraphy recorded is lower Kharita Formation shallow marine and deltaic sediments deposited on Pre-Cambrian granitic basement, followed by the major Cretaceous reservoir and seal sequences and Eocene Apollonia carbonates. This basin was elevated and underwent significant erosion because of pre-rift thermal uplift from the Miocene opening of Red Sea. Late Cenozoic sediments are limited to the ancestral Nile Valley and along its margins. Geochemical interpretation of Beni Suef Basin oils suggests they have originated from source rocks of two different organofacies: a terrestrial facies (organofacies D/E) and a marine facies (organofacies B). Source rock geochemistry data confirmed the presence of organofacies D/E source within the Aptian/Early Albian Lower Kharita section and organofacies B source within the Turonian Abu Roash F section. Differences for these two groups of oils are clear among many oil geochemical parameters such as Pr/Ph, S%, and sterane indices. Also notable is that terrestrial oils from the older source form accumulations in deeper reservoirs such as Upper to Lower Bahariya and Kharita sands, while marine oil group from the younger source are found mostly in shallower reservoirs: Cenomanian Abu Roash A, E and G. This work aims to understand the petroleum systems of the Beni Suef basin through the integration of geochemical data and basin modeling.

## **Reference Cited**

Bosworth, W., and D.F. Stockli, 2016, Early Magmatism in the Greater Red Sea Rift: Timing and Significance: Canadian J. of Earth Sciences, v. 53, p. 1158-1176.



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## ABSTRACT

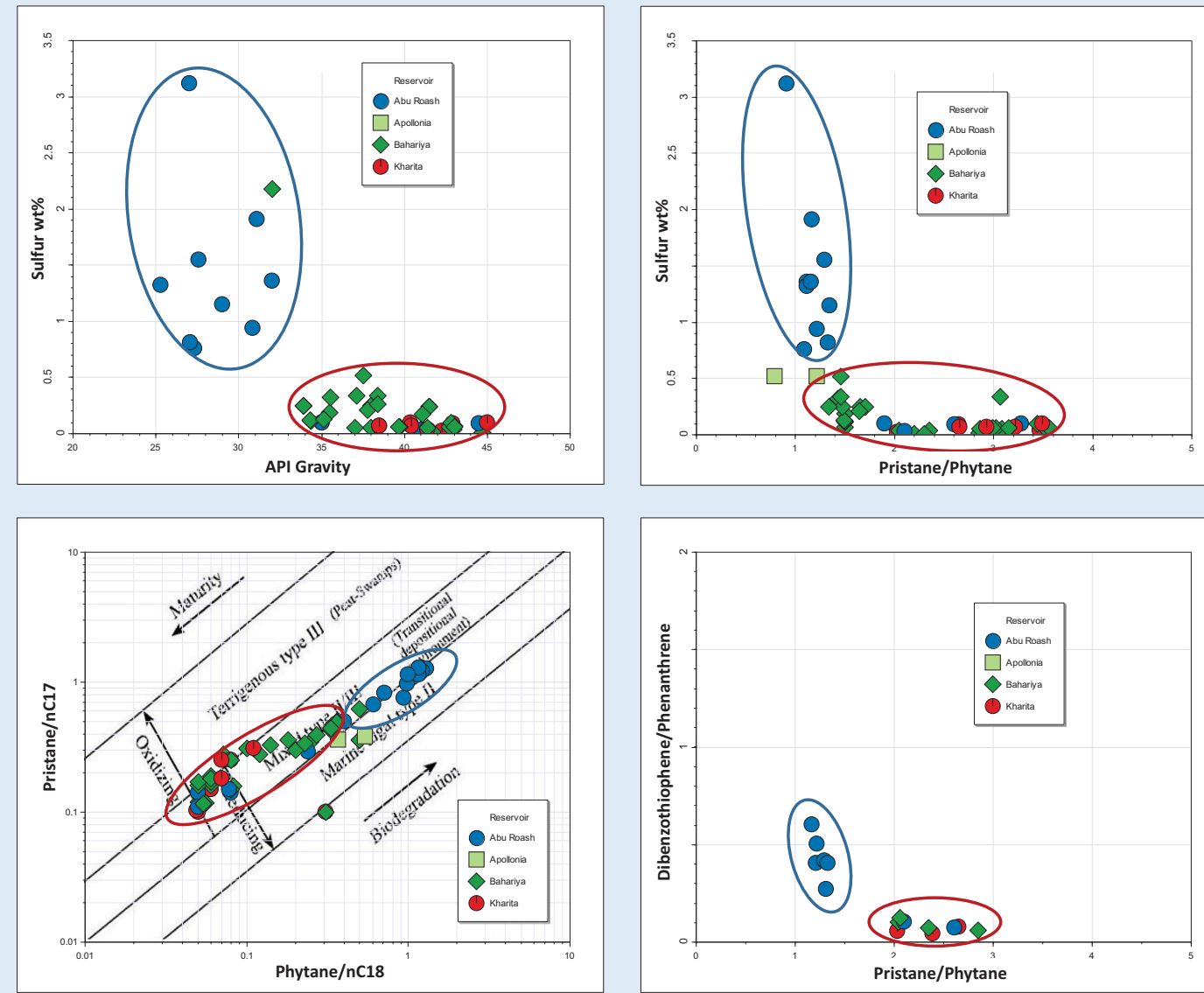
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Geochemical interpretation of Beni Suef Basin oils suggests they have originated from source rocks of two different organofacies: a terrestrial facies (organofacies D/E) and a marine facies (organofacies B). Source rock geochemistry data confirmed the presence of organofacies D/E source within the Aptian/Early Albian Lower Kharita section and organofacies B source within the Turonian Abu Roash F section. Differences for these two groups of oils are clear among many oil geochemical parameters such as Pr/Ph, S%, and sterane indices. Also notable is that terrestrial oils from the older source form accumulations in deeper reservoirs such as Upper to Lower Bahariya and Kharita sands, while marine oil group from the younger source are found mostly in shallower reservoirs: Cenomanian Abu Roash A, E and G.

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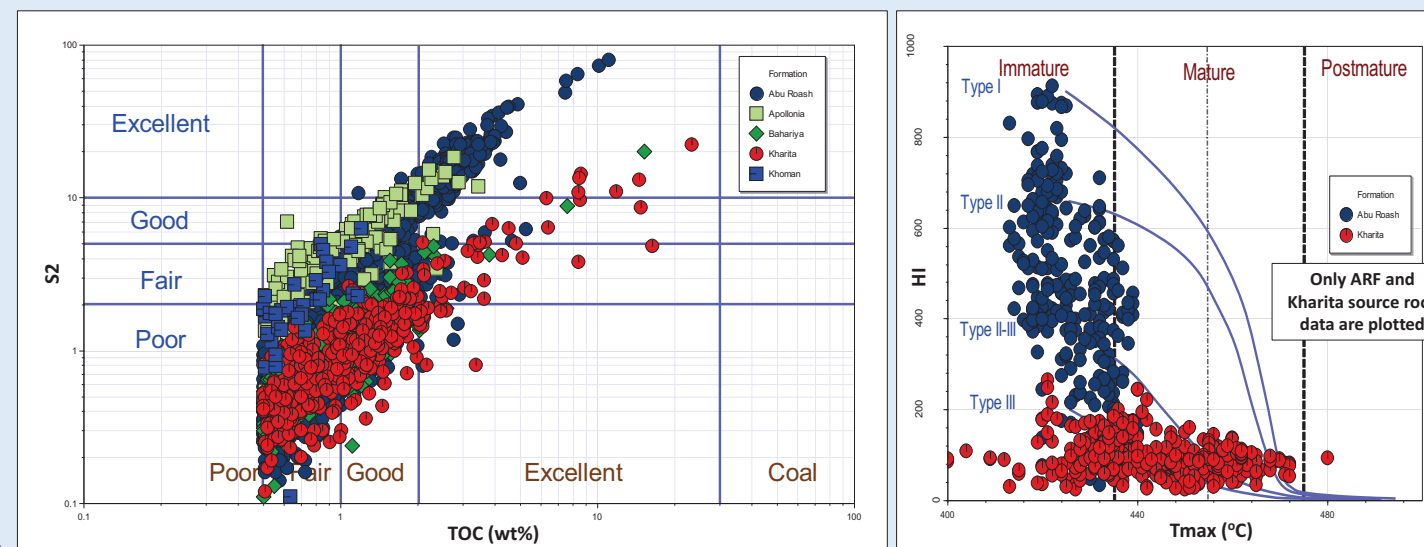
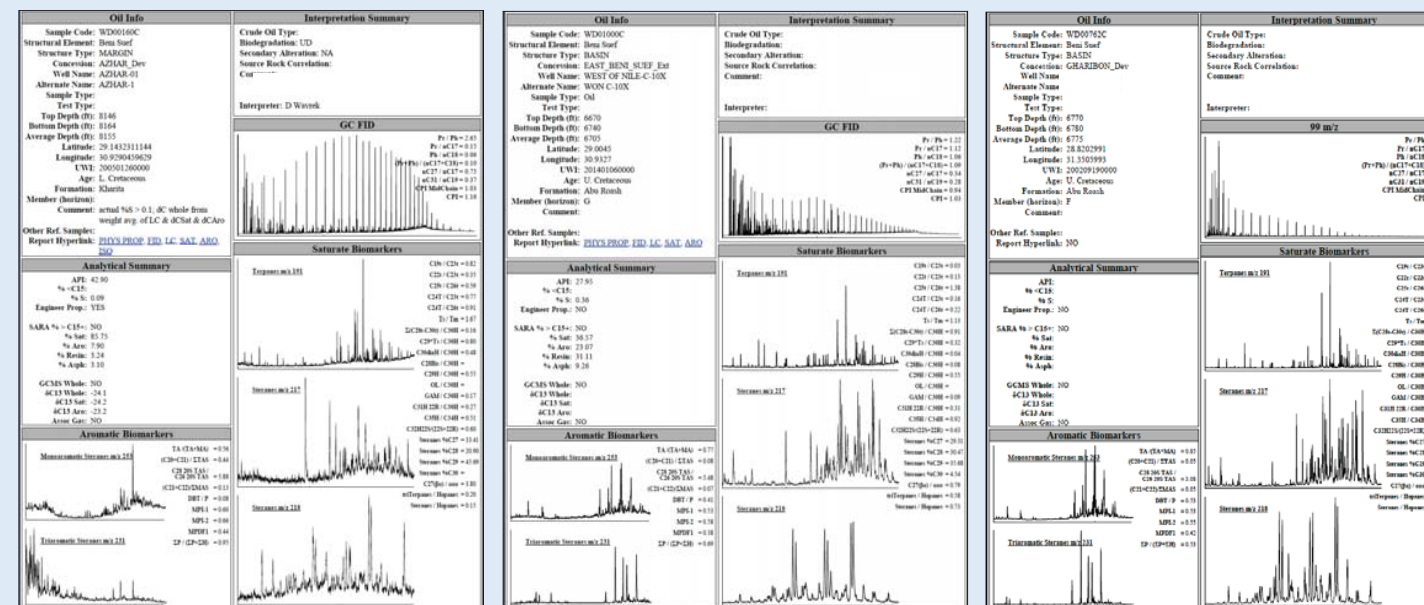
## OBSERVATIONS FROM OIL GEOCHEMISTRY FINGERPRINTING



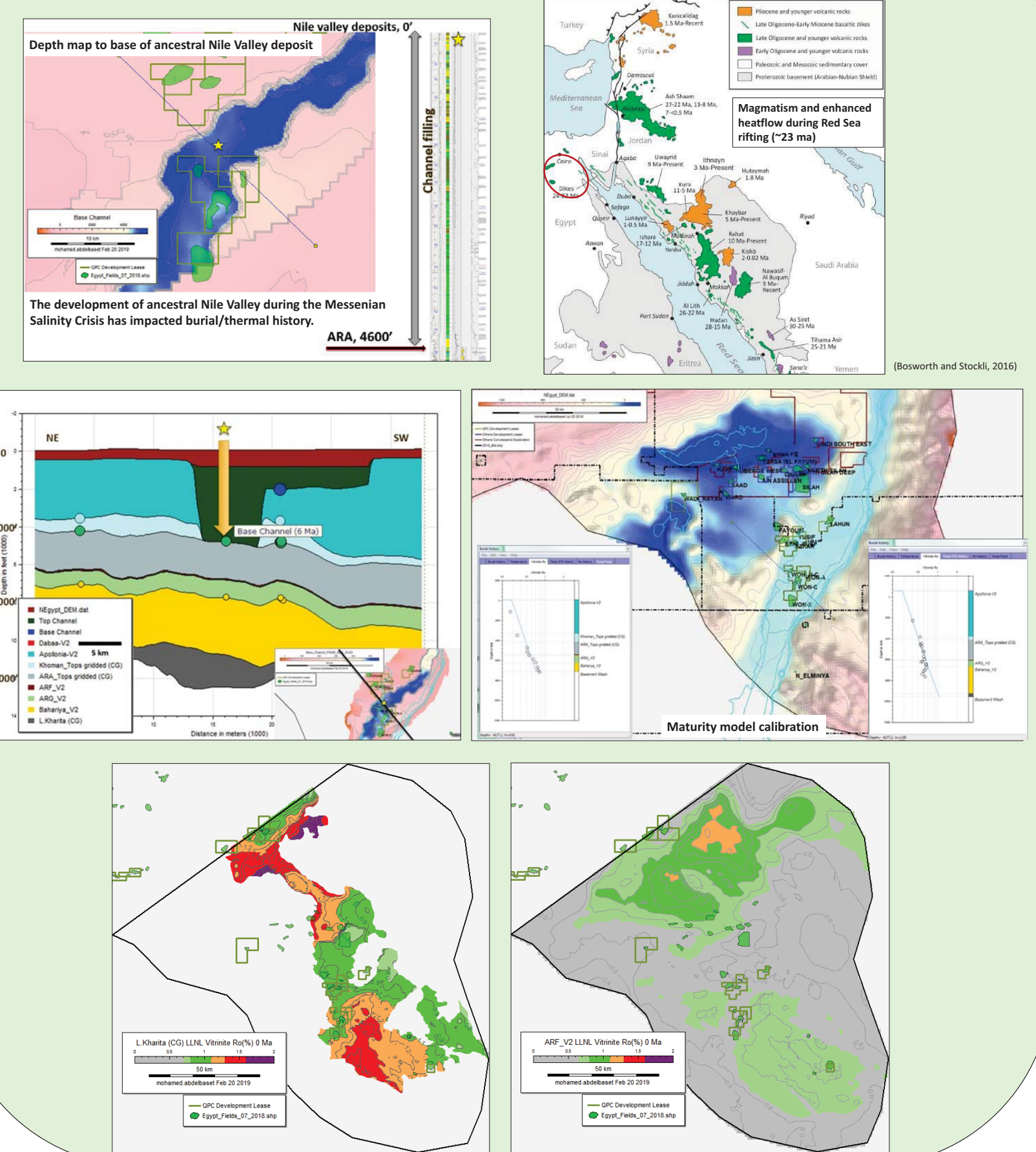
Typical oil from Kharita sources

Typical oil from ARF sources

ARF source rock extract



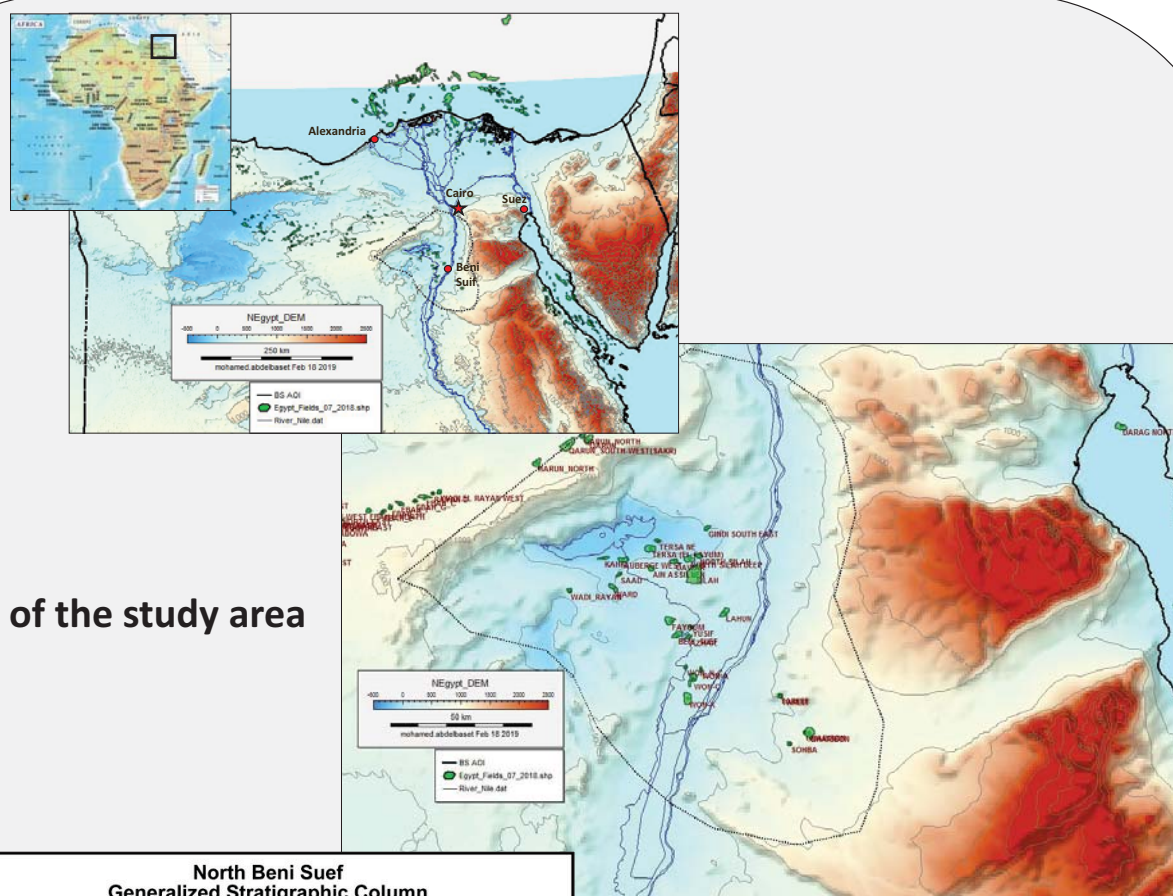
## INSIGHT FROM BENI SUEF PETROLEUM SYSTEMS MODELING



## CONCLUSIONS AND REFERENCES

- Two distinctive oil families were identified from bulk properties and biomarker parameters.
- A deeper Organofacies D/E and a shallower Organofacies B are both responsible for charging the traps.
- Maturity is higher for the oil sourced from the deeper L. Kharita source rock and lower for the oil sourced from the shallower ARF source rock.
- The Beni Suef sub-basin is different from the known Western Desert as it was initiated during the Aptian time, resulted in the deposition of L. Kharita source rock in the initial rift phase, the zero edge of which is controlled by the basement relief map.
- The well known Turonian Abu Roash F marine source rock was deposited later.
- The area was subjected to the Syrian Arc deformation and inversion, which enabled vertical migration of L. Kharita source derived petroleum to shallower reservoirs.
- Uplift then affected the area during the red sea opening with enhanced heat flow.
- The ancestral Nile valley cut through all the sediments down to AR strata 5-6 ma, followed by the river Nile deposits above.

Bosworth and Stockli, 2016, Early Magmatism in the Greater Red Sea Rift: Timing and Significance. Canadian J. of Earth Sciences, 53:1158-1176



Location of the study area

North Beni Suef Generalized Stratigraphic Column						
Epoch	Age/Stage	Fm.	Mbr.	Lithology	Source Basins	Principal Plays
Eocene		Dabaa				
		Apollonia				
		Kioman				
		Maastrichtian				
Cretaceous		AR-A				
		AR-B				
		AR-C				
		AR-D				Abu Roash
		AR-E				
		AR-F				
		AR-G				
		Bahariya				Bahariya
		Kharita				Kharita
		Burg El Arab				
Early		Lower Kharita				L.Kharita
		Basement				

Stratigraphy chart for Beni Suef sub-basin