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First account on the sedimentological, geochemical and petrophysical record of the Messinian Salinity Crisis in the subsurface of onshore Nile Delta, Egypt.

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The giant Cenozoic Nile Delta system in the extreme northern part of Egypt occupies the southeastern part of the Eastern Mediterranean Basin and represents the most prolific gas province in Egypt with estimates more than 62 tcf of proven reserves (Niazi and Dahi, 2004). Despite the importance of the Messinian sediments in the Nile Delta hosting excellent petroleum reservoirs and seals (Dolson et al., 2001), they are still poorly studied. A multidisciplinary sedimentological, geochemical and petrophysical study is being carried out to unravel the depositional environment and tectonic setting before, during and after the important Messinian Salinity Crisis (MSC) period in the Eastern Mediterranean, and how this affected the eastern part of the onshore Nile Delta. The Lower Messinian Qawasim Formation consists of high to low-density turbiditic sandstones displaying several vertical stacked patterns of coarsening and fining upwards trends reflecting different pulses of sedimentation suggesting a sedimentation in a submarine fan developed at the base of shelf slope. The deeply incised valley infill, dating the Upper Messinian consists of the Abu Madi Formation made of lowstand braided and meandering fluvial sandstone interbedded with fine-grained floodplain sandstones and siltstones. The base of this unit is erosional and contains large mud clasts embedded in a fine-grained matrix. The Upper Miocene lowstand fluvial sandstones are capped by estuarine fine-grained cross laminated sandstones, siltstones/mudstones followed by an open marine mudstones of the Early Pliocene Kafr El-Sheikh Formation representing the end of the MSC and the subsequent transgression episode after the re-establishment of the connection between the Mediterranean and the Atlantic Ocean.

Both the Qawasim and Abu Madi Formations display similar geochemical fingerprints from the clastic components. Recycled Cretaceous and Eocene sedimentary and granodioritic to intermediate igneous rocks located in the Red Sea hills are considered to be the protolithites for the Miocene clastic rock.

The depositional environment and diagenetic alterations enormously influenced the resulting composition and reservoir quality of the Miocene sandstones. Within the fluvial environmental conditions, early mechanical clay infiltration occurred that completely modified the original texture and porosity of the fluvial sandstones. In this unit the frequent transformation of feldspars into authigenic kaolinite, likely enhanced by favourable climatic conditions, also occurred. In general, the fluvial sandstones were subjected to more intense weathering than the turbiditic sandstones resulting in higher alteration indices (CIA and PIA). The sedimentological and geochemical data suggest that both depositional environments developed at the transition between the Lower Messinian and Early Pliocene, occurred in a passive margin setting likely at the edge of a shelf scarp, where the drastic drop in sea level resulted in the incision of a deep valley subsequently filled up during the Zanclean (?) transgression.

References

Niazi, M., Dahi, M., 2004. Unexplored giant sandstone features in ultra- deepwater, West Mediterranean, Egypt. In: American Association of Petroleum Geologists International Conference: October 24- 27, 2004; Cancun, Mexico.

Dolson, J., Shann, M., Matbouly, S., Harwood, C., Rashed, R., Hammouda, H., 2001. The Petroleum Potential of Egypt, AAPG Memoir 74: 453– 482.