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Depositional and petrophysical controls on the volumes of hydrocarbons trapped in the Messinian reservoirs, onshore Nile Delta, Egypt

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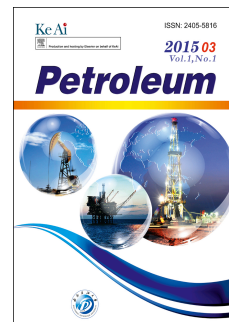
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1 **Depositional and petrophysical controls on the volumes of hydrocarbons trapped in**
2 **the Messinian reservoirs, onshore Nile Delta, Egypt.**

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7 **Abstract**

8 The Messinian sequence in the Nile Delta hosts the most prolific hydrocarbon reservoirs,
9 and is therefore of great importance from the aspect of nonrenewable fuel sources exploration
10 and development strategies. This study presents an investigation for the differential impacts
11 of the depositional and petrophysical attributes on the hydrocarbon volumes trapped in the
12 Messinian reservoirs. Analyses of the pressure data and pressure gradients revealed
13 hydraulically- connected and homogeneous Messinian reservoir rocks. The amounts of Stock
14 Tank Oil and Gas Initially In Places (STOIIP & GIIP) are typically controlled by the
15 depositional primary attributes (matrix content and grain size) which induce several reservoir
16 heterogeneities. The Lower Messinian Qawasim reservoir is subdivided into two main zones:
17 the distal deltaic (zone 1) prograded into proximal deltaic facies (zone 2). The petrophysical
18 reservoir quality in terms of porosity, permeability and water saturation increases upward from
19 zone 1 to zone 2. These are largely controlled by the depositional attributes, and therefore
20 zone 2 with a minimum matrix content, coarse-grained sandstones and mega pore spaces
21 (>150 μm) hosts almost 90% of the STOIIP and 100% of the GIIP. Notably, approximately
22 78% and 65% of the total STOIIP and GIIP, respectively are confined within the coarse-
23 grained delta-plain distributary channels of zone 2. Similarly, the fluvial sediments (zone 1) of
24 the Upper Messinian Abu Madi Formation host 78% of the GIIP in West Al-Khilala Field and
25 the other 22% is trapped in the overlying zone 2 and is mostly distributed within the sand-
26 prone tidal channel and tidal sand bars facies. The channel width/ thickness (W/T) ratio
27 largely controls the STOIIP and GIIP values. STOIIP and GIIP display a progressive linear

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