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An innovative technique for estimating water saturation from capillary pressure in clastic reservoirs

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1 **An innovative technique for estimating water saturation from capillary pressure in**  
2 **clastic reservoirs**

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10 **ABSTRACT**

11 A major drawback of old resistivity tools is the poor vertical resolution and estimation of  
12 hydrocarbon when applying water saturation ( $S_w$ ) from historical resistivity method. In  
13 this study, we have provided an alternative method called saturation height function to  
14 estimate hydrocarbon in some clastic reservoirs in the Niger Delta. The saturation height  
15 function was derived from pseudo capillary pressure curves generated using modern  
16 wells with complete log data. Our method was based on the determination of rock type  
17 from log derived porosity-permeability relationship, supported by volume of shale for its  
18 classification into different zones. Leverette-J functions were derived for each rock type.  
19 Our results show good correlation between  $S_w$  from resistivity based method and  $S_w$  from  
20 pseudo capillary pressure curves in wells with modern log data. The resistivity based  
21 model overestimates  $S_w$  in some wells while  $S_w$  from the pseudo capillary pressure curves  
22 validates and predicts more accurate  $S_w$ . In addition, the result of  $S_w$  from pseudo  
23 capillary pressure curves replaces that of resistivity based model in a well where the  
24 resistivity equipment failed. The plot of hydrocarbon pore volume (HCPV) from J-  
25 function against HCPV from Archie shows that wells with high HCPV have high sand  
26 qualities and vice versa. This was further used to predict the geometry of stratigraphic  
27 units. The model presented here freshly addresses the gap in the estimation of  $S_w$  and is  
28 applicable to reservoirs of similar rock type in other frontier basins worldwide.

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30 *Keywords:* Water saturation, Leverette-J functions, Reservoir, Core data, Pseudo  
31 capillary pressure curves  
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