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PROBABILISTIC SEISMIC HAZARD ASSESSMENT FOR WEST AFRICA AND SURROUNDING REGIONS

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Seismic Hazard Assessments for West Africa and near regions of Mid-Atlantic Ridge (MAR) and the Gulf of Guinea (GoG) have been carried out. The results clearly showed a trend of an increasing seismicity along the MAR bordering West African region in terms of number of earthquake occurrence and magnitudes. Statistical and probability Seismic Hazard Assessment (PSHA) techniques were employed in this research. Earthquake data covering more than 300 years extracted from different catalogues were used in this study. The catalogues were declustered to remove foreshocks, aftershocks and earthquake swarms. The PSHA carried out along the MAR and West African region respectively revealed that increasing number of earthquakes have occurred in the last 20 years, especially along the mega oceanic fracture zones linking with fractures on mainland in West African region. The statistical technique involved Regression Analysis, Focal Depth & Frequency Distribution analysis of observed events to establish distinct trend, using a decade-long each of earthquake catalogs at different completion levels in each case spanning 1963-2014 for MAR and 1618-2014 for the West African region. On the other hand, the b-values, activity rates and Mmax for West Africa were 0.77, 4.047 and 6.8 respectively. Finally respective annual probability of exceedances and return periods (years) were iteratively computed for each earthquake magnitudes, 3.50 being the threshold magnitude and Max of 6.8. Although, West Africa is not an active region compared to regions of high seismicity like EAR, Japan, California, Turkey, etc., a trend that showed an increasing earthquake occurrence and bigger magnitudes were revealed in this study. This study is intended to reveal more insights into seismic hazard in the West African region and the surroundings and how surrounding active areas may have been influencing observed seismicity especially in the coastal region of West Africa.

Keywords: MAR, tectonic activity, earthquake occurrence, seismicity of West Africa.

Table 1: Some results of PSHA for West Africa

Magnitude
Activity Rate (Lambda)
Return Period
Prob: T=1 yr
Prob: T=50 yrs
Prob: T=100 yrs
Prob: T=1000 yrs
3.50
4.047

0.247
97.29%
100.00%
100.00%
100.00%
3.60
3.387
0.295
95.37%
100.00%
100.00%
100.00%
3.70
2.839
0.352
92.67%
100.00%
100.00%
100.00%
3.80
2.384
0.419
89.16%
100.00%
100.00%
100.00%
3.90
2.005
0.499
84.88%
100.00%
100.00%
100.00%
4.00
1.689
0.592
79.92%
100.00%
100.00%
100.00%
6.60

0.011
91.500
1.09%
41.56%
65.24%
99.98%
6.70
0.007
153.000
0.65%
27.61%
47.26%
99.58%
6.80
0.003
370.000
0.27%
12.59%
23.50%
91.76%

