



**King Saud University
College of Science
Geology Dept.**

**Seismic Hazard Assessment of Southwestern Arabian
Peninsula and Southern Red Sea Region**

Prepared by : Majed Ahmad Al-Malki

Supervisor : Prof. Abdullah M. Al-Amri

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King Saud University**

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ABSTRACT

There are a great number of historical and recent earthquakes have occurred in the southern Red Sea and southwestern Saudi Arabia between Latitudes 14° - 19° N and Longitudes 39° - 45° E in the period of 200-2005 A.D. with magnitudes ranges from $2 \leq M \leq 8.0$. The area of interest has a complicated geological structures and tectonics. The epicentral distribution of both historical and instrumental earthquakes shows a general correlation with the regional geology and tectonics. Concentration of activity are seen where the spreading zone is intersected by NE transform faults. Most of the seismicity of this area is of swarm type and volcanic-related. Based on the seismic activity, focal mechanism solutions, geological structures and tectonics, four seismic source zones were defined; Southern Arabian Shield, Southern Red Sea, Northern Yemen and Middle of the Red Sea. The maximum expected magnitude for each seismic source zone was estimated. The b values correlate well with the tectonic environment and seem to increase gradually southwards with the opening of the Red Sea where it has 0.57 for the middle Red Sea and attains 1.06 for the southern Arabian Shield. This may reflects the heterogeneity of the crust and regional stress field. The stochastic method is applied for the seismic hazard assessment using more recent and advanced FORTRAN program for Strong Motion simulation (SMSIM). The area was divided into small grid of point each 0.5 degree for both of latitude and longitude. The source parameters and the maximum expected magnitude for each seismic source were implemented into the method as input data also the path and site effect taken into consideration for the assessment of seismic hazard potentialities within the area in terms of Peak Ground Acceleration (PGA) and the response spectra for different rock units at the populated cities. The results of this method show that the maximum simulated time history of PGA on the bed-rock is 41.1 cm/sec^2 resulted from the southern Red Sea source, while the maximum PGA on the ground surface is 72.15 cm/sec^2 resulted also from the southern Red Sea source. The response spectra were calculated for different rock units at selected sites for 1%, 3%, 5% and 10% from the critical damping.