IJG> Vol.4 No.1, January 2013

OPEN ACCESS

Analysis and Tectonic Implication of DEM-Derived Structural Lineaments, Sinai Peninsula, Egypt

PDF (Size:14780KB) PP. 183-201 DOI: 10.4236/ijg.2013.41016

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ABSTRACT

Sinai Peninsula has fascinating geologic setting and is displaying a diversity of structural lineaments that have greatly influenced the distribution of natural resources and hazards. Shaded relief images derived from SRTM-DEM mosaics were used for the identification, extraction, and mapping of these structural lineaments. Statistical parameters particularly, azimuth frequency, lineament intersection, lengths, and density distribution were analyzed using SPSS software. Two additional new statistical indices; Lineament Relative Abundance Index (LRAI) and Lineament Majority-Minority Index (LMMI) were applied. Moreover, the distribution of the different statistical parameters was illustrated as contour maps through GIS environment. Basically, two dominant clusters; NW-SE and NNE-SSW trends were detected. These trends are related to major fracture systems that are characterized by extensive mean lengths and high proportion values. Furthermore, the northern and central parts of Sinai Peninsula have lower density and intersection of structural lineaments that gradually increase towards the southern part. However, the northern part of Sinai displays wider areas of majority zones than the southern part. This could be attributed to the lower density of lineaments and little tendency for multiple lineament populations. The majority zones are usually associated with NE and NW-SE in the northern part of Sinai, whereas the majority zones are of less abundance in the central and southern parts of Sinai due to the multiple orientations of lineament populations which reduce the tendency for majority. Eventually, the results of the present work could be applicable in the different geologic and environmental aspects that are based on a good understanding of the genetic and spatial relationships of fracture systems. These aspects encompass geodynamics, exploration for mineralization and groundwater, in addition to the mitigation of natural hazards such as flush flooding and earthquakes.

KEYWORDS

Sinai Peninsula; Structural Lineaments; Statistical Analysis; SRTM; Image Processing; GIS

Cite this paper

T. Seleem, "Analysis and Tectonic Implication of DEM-Derived Structural Lineaments, Sinai Peninsula, Egypt," *International Journal of Geosciences*, Vol. 4 No. 1, 2013, pp. 183-201. doi: 10.4236/ijg.2013.41016.

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