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Fractal analysis of folds in SE Zagros (Iran)

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Remote sensing is a significant tool to process the geological structures located in the zones with low vegetation and good exposures. In this paper we use statistical analysis of remote sensing data to model the process of folding in the SE of ZAGROS. The ZAGROS simply folded belt comprises a gently folded cover sequence which has been detached from the underlying basement along the Hormoz evaporates and is locally disrupted by resent faults. We used mosaic of 14 landsat ETM+ scenes that covers this region. We digitized 515 hinge lines of synclines and anticlines and measured their lengths. Objects, which display self-similarity over an infinitely extended scale range, are fractals and are characterized by a unique fractal dimension. However, geological objects dimensions are confined within a finite scale range. The length of folds is one (along with folds spacing, etc.) of the characteristics that describes the fractal behavior of fold networks. Meaning that the fractal dimension can be measured by a linear best-fit on a cumulative log-log histogram of fold lengths. Our measurements shows the corresponding fractal dimension calculated as D=2.31 for anticlines hinging lines. The same method carried out for synclines and fractal dimension calculated as D=2.30. The linearity of the curve in the log-log plot of the cumulative histogram of hinging lines and the similarity of the results for anticlines and synclines also validate the method used in the present work. The fractal analysis has 2 implications. First it allows the quantification of the complexity of the geological surface deformation. This complexity arises from growth, interaction and connection of folds to form networks. Secondly, it permits to model the development of folds. We propose that the fault network is an Iterated Function System (IFS). Such a model allows us to understand the structural evolution of a compressional range in 4 dimensions, the fourth dimension being time.