Size Distribution and Spatial Arrangement of Normal Faults, Buckskin Mountains, Western Arizona

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ABSTRACT

Understanding the spatial arrangement of structural features, such as faults, can lead to an understanding of whether the features are randomly located, clustered together, or anti-clustered in space. The objective of this project is to understand the spatial arrangement of normal faults in A-Bomb Canyon, in the Buckskin Mountains of Arizona. Previous spatial arrangement studies have included statistical analyses of nearest neighbor spacings (Priest and Hudson, 1976; Narr and Suppe, 1991) and box counting (Barton, 1995), which have been shown to have limited utility (Gomez and Marrett, in review). The normalized correlation count methodology (Marrett et al., in review) was utilized in this study in order to quantify the spatial arrangement of faults. In the process of studying the arrangement of these faults, the size distribution, coefficient of variation as well as the normalized correlation count will be examined in order to understand whether or not the faults are clustered or randomly spaced and, if they are clustered, whether those clusters show fractal scaling. Data were collected in the field along three different scanlines, with lengths of 12.14 meters (0.001 m threshold), 124.80 meters (0.01 meter and 0.1 meter thresholds) and 750.95 meters (1 meter threshold). The two shortest scanlines are considered high-resolution and focused on faults with displacements on the millimeter, centimeter and 10 centimeter scale. The third scanline, which is considerably longer, focused only on faults with displacements larger than a meter. Scanline collection is done in the field by moving along a linear transect across strike of structures in question and surveying the position of each structural feature that appears along the scanline. Data analysis utilizes traditional approaches, size distribution analysis along with the correlation count technique. Preliminary conclusions show that the size distribution of the fault displacements follows a common power law that spans ~four orders of magnitude. The scanlines with thresholds less than a meter demonstrate a plateau pattern in normalized correlation count indicating that they contain clusters with varying widths, but clustering is not self organized. The meter displacement scanline illustrates a dominant spacing of approximately twenty meters between features, normal faults in the case of this study.

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