CHARACTERIZING FRACTURE SPATIAL PATTERNS BY USING SEMIVERIOGRAM

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Semivariogram is applied to fracture data obtained from detailed scanline surveys of nine field sites in Western New York, USA in order to investigate the spatial patterns of natural fractures. The length of the scanline is up to 36m. How both fracture spacing and fracture length vary with distance is determined through semivariogram calculations. In this study, we developed a FORTRAN program to resample fracture data from the scanline survey. By calculating experimental semivariogram, we found five different types of spatial patterns that can be described by linear, spherical, reversed spherical, polynomial I (for a0), and polynomial II (for a0) models, in which the last three are newly proposed in this study. The well-structured semivariograms of fracture spacing and length indicate that both the location of the fractures and the length distribution within their structure domains are not random. The results of this study also suggest that semivariograms can provide useful information in terms of spatial correlation distance for fracture location and fracture length. These semivariograms can also be utilized to design more efficient sampling schemes for further survey, as well as to define the limits of highly probable extrapolation of a structure domain.