Characterization and Prediction of the Spatial Distribution of Opening-Mode Fractures

Leonel Gomez
Jackson School of Geosciences, Department of Geological Sciences,
The University of Texas at Austin
Austin, Texas, U.S.A
leonelgomez@mail.utexas.edu

I will test the hypothesis that microfractures (observable only at microscopic scales) can be used to characterize the spatial distribution of genetically associated macrofractures (observable with the unaided eye). I will attain this objective by measuring the spatial distribution of microfractures in outcrop samples and comparing the results with detailed measurements of the spatial distribution of macrofractures in the same outcrops. If successful, my research would allow to directly characterize the spatial distribution of a subsurface fracture system using oriented core samples while providing a realistic method to estimate the horizontal distance that a well should be drilled in order to become economically feasible.

Fracture aperture and spacing data along 1D scanlines will be analyzed using two new analytical techniques (normalized correlogram and normalized correlation integral) developed by Marrett and Gale (in prep.) that account for the spatial sequence of both fracture spacings and sizes. Preliminary results at Pedernales State Park show systematic clustering and follow a power law for 4 orders of magnitude in length scale. This suggests that the spatial distribution of fractures at the Pedernales outcrop is fractal from millimeter to decimeter scale, and therefore it is possible that by quantifying the spatial distribution of fractures at a small scale (thin section) one can predict the spatial distribution at a larger scale (outcrop, reservoir). Results from both techniques from outcrop scanlines and thin section scanlines will be plotted together. If both follow the same power law, it will prove the viability of microfracture spacing predicting macrofracture spacing.