USE OF MICROSCOPIC INFORMATION FOR MACROFRACTURE CHARACTERIZATION IN MESAVERDE GROUP SANDSTONES FROM THE SURFACE AND SUBSURFACE OF THE SAN JUAN BASIN

ORLANDO J. ORTEGA¹
RANDALL MARRETT²

¹ University of Texas at Austin, Department of Geological Sciences; o.ortega@mail.utexas.edu
² University of Texas at Austin, Department of Geological Sciences; marrett@mail.utexas.edu

An analysis of the fracture systems in outcrops and cores of the Mesaverde Group Sandstones in the San Juan Basin indicates that microfracture information can be used to predict macrofracture characteristics. Macrofractures were characterized in terms of type, orientation, diagenetic history, scaling properties and connectivity. Microfractures from oriented samples collected both from surface and subsurface were analyzed to compare their characteristics to macrofractures. The use of a Scanning Electronic Microscope Cathodoluminiscence device allowed the quantitative study of quartz filled microfractures based on the different luminescence of quartz grains and cement. Three fracture types were recognized: conjugate shear-mode fractures (faults), open-mode sealed fractures and surface related joints. The orientations of microfractures agree with macrofracture orientations when a statistically significant amount of data are collected from samples. Timing of fracture cementation with respect to hydrocarbon migration controls the prospectivity of the fracture system in the subsurface. Micro- and macrofracture populations show comparable power-law length distributions when the size distributions are normalized with respect to the area of observation. Departures from the power law can be explained as sampling artifacts and/or the effects of mechanical boundaries in the sandstones. Observed differences in the connectivity of the fracture system at the microscopic and macroscopic scales are consistent with an analysis of the connection probability of an individual fracture as a function of observation scale.