Pass the Hat Night!

San Joaquin Geological Society

Date: **Tuesday, May 14th, 2013**

Time: **6:00 PM Social Hour**
7:00 PM Dinner
8:00 PM Lecture

Place: **American Legion**
2020 H St. Bakersfield, CA 93301

PSAAPG Members & Mesozoic's
$25 w/reservation
$30 without reservation

Non PSAAPG Members
$30 w/reservation

Full-time Students with ID:
Free, Courtesy of Chevron & Occidental

Integrating outcrop analogs and geomechanical modeling – Insights into induced hydraulic fractures

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The success of the Eagle Ford shale play in south Texas depends, as do other unconventional resource plays, primarily on our ability to stimulate the source-reservoir by hydraulic fracturing. But not all stimulation programs are equally successful at generating economic production from a well. Apart from the variables inherent in hydraulic fracturing itself, rock properties such as natural fracture intensities and orientations, mechanical stratigraphy, and in situ stress state strongly affect the outcome of induced fracture completion programs. In the spirit of H. H. Read – "the best geologist is the one who has seen the most rocks" – we conducted an outcrop analog investigation of the Cretaceous Boquillas Formation (equivalent to the Eagle Ford) and we are using our field observations to inform geomechanical models of the hydraulic fracturing process.

Model results illustrate that mechanical stratigraphy strongly influences the extent and pattern of hydraulic fracture growth. While long, nearly planar, fractures are possible in mechanically homogeneous systems, our analyses suggest that inclusion of the layering that is typical of most geologic systems leads to complicated and not easily predicted deformation patterns. In general, weak intervals tend to retard fracture propagation and, if sufficiently thick, may cause fractures to terminate well short of classical predictions that rely on simple elastic behavior. Contrasts in rock stiffness and strength across layer boundaries can lead to substantial layer-parallel fracture growth that would not be predicted from classic stress theory (i.e., that fractures should propagate in the $\sigma 1/\sigma 2$ plane). Our modeling results also suggest that the anisotropy of the initial stress state can significantly affect the induced fracture pattern. Higher stress anisotropy ($\sigma 1 \gg \sigma 3$) tends to produce more discrete zones of plastic strain that are interpreted to reflect longer, planar fractures whereas more isotropic stress states tend to result in broad zones of damage that do not propagate as far.

Alan Morris - Bio

Alan P. Morris received his B.Sc. degree in geology from Imperial College, London in 1973 and his Ph.D. in geology from the University of Cambridge in 1980. Before joining Southwest Research Institute in 2005, he was a full professor at the University of Texas at San Antonio, having been on the faculty for 22 yr. Alan is now a staff scientist at Southwest Research Institute and focuses on quantitative analysis of deformation processes and stress in diverse tectonic regimes and conducts research and technical assistance projects for the oil, gas, and geothermal industries.

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By: Friday May 10th, 2012

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