

07.10: Velocity-Effective Stress Relationships at Mad Dog

Landon Lockhart, The University of Texas at Austin

ABSTRACT

I predict pore pressure with two different approaches at the G.C. 826-1 well within the Mad Dog Field. I first constrain a sonic velocity (v) vs. vertical effective stress (σ'_v) relationship (Fig. 1) to predict pore pressure (Fig. 2). I then develop a similar relationship based on mean effective equivalent stress (σ'_e) where the total stresses are derived from a geomechanical model (Nikolinakou & Heidari; Talk 7.11) (Fig. 1b). The results show that at the 826-1 well, both calibrations predict very similar pore pressures. This is not surprising because the 826-1 well is relatively far from the salt body and thus stress perturbations due to salt are not significant. I will next apply these relationships to predict pore pressure in other wells in the Mad Dog Field. Ultimately, I will provide the empirical foundation to understand the relationship between mudstone velocity and effective stress, which will be critical to our new approach to pore pressure prediction that couples field data and geomechanical models.

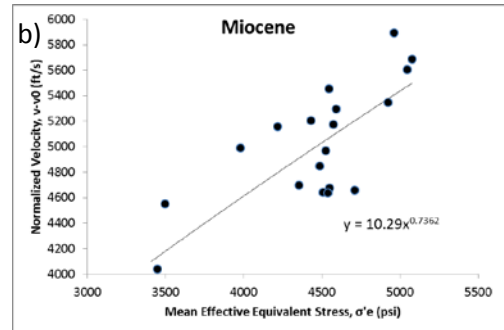
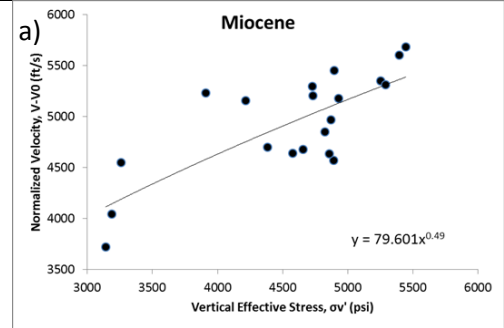


Fig 1: a) Miocene sonic velocity (v) vs. vertical effective stress (σ'_v); and b) Miocene sonic velocity (v) vs. mean effective equivalent stress (σ'_e), obtained from geomechanical model. A v_0 of 4930 ft/s was assumed.

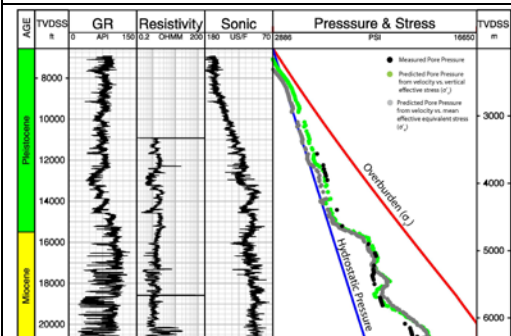


Fig 2: Well 826-1 profile. Track 5 shows predicted pore pressure using v vs. σ'_v (green dots), predicted pore pressure using v vs. modeled σ'_e (gray dots), and direct pore pressure measurements (black dots).

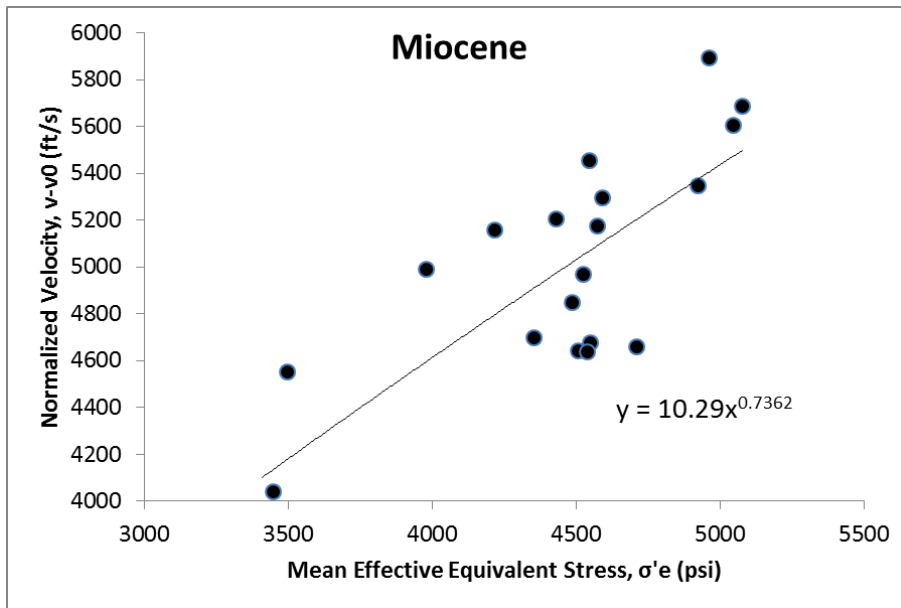
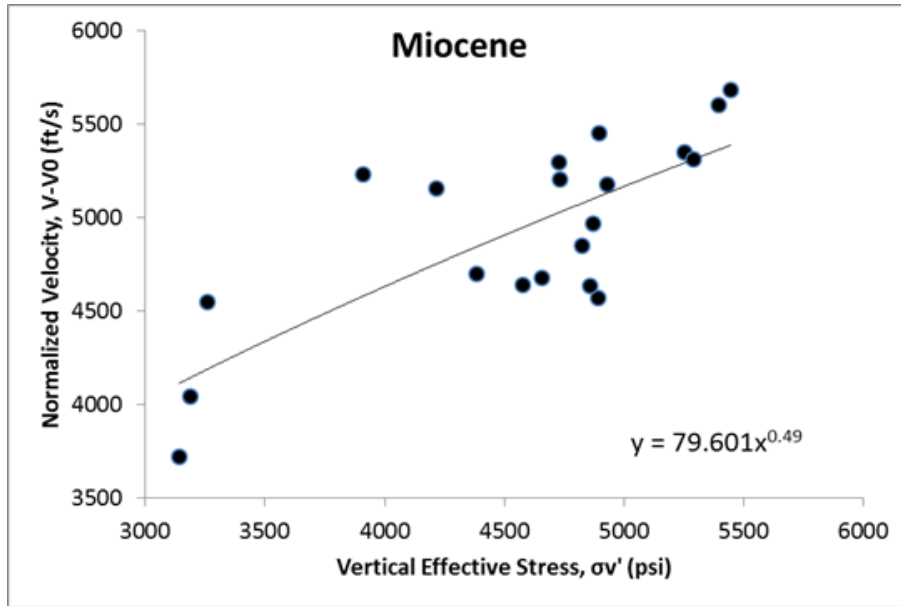


Fig 1: a) Miocene sonic velocity (v) vs. vertical effective stress (σ'_v); and b) Miocene sonic velocity (v) vs. mean effective equivalent stress (σ'_e), obtained from geomechanical model. A v_0 of 4930 ft/s was assumed.

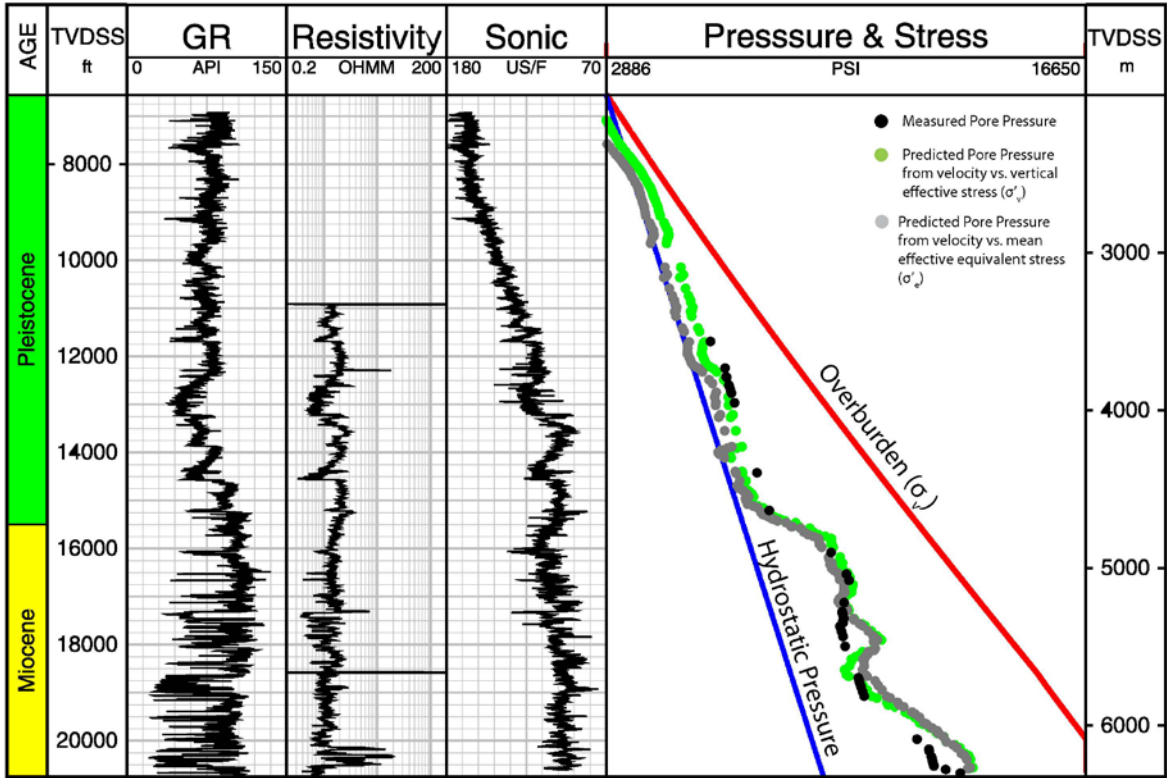


Fig 2: Well 826-1 profile. Track 5 shows predicted pore pressure using v vs. σ'_v (green dots), predicted pore pressure using v vs. modeled σ'_e (gray dots), and direct pore pressure measurements (black dots).