

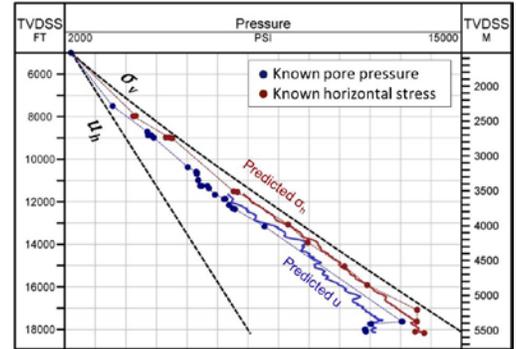
## 08.17: Pore pressure and fracture stress analysis at the Macondo well

*F. William M. Pinkston, University of Texas at Austin*

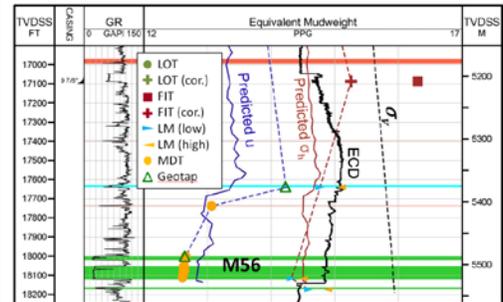
### ABSTRACT

We characterize the vertical stress ( $\sigma_v$ ), pore pressure ( $u$ ), and horizontal stress ( $\sigma_h$ ) in the Macondo well (Mississippi Canyon Block 252) with in-situ pressure measurements, log data, leak-off tests (LOT), and the occurrence of kicks and lost mud events during drilling (Fig 1). Pore pressure and horizontal stress nearly parallel the overburden stress from 3000 to 12000 ft below sea floor (TVD<sub>sea floor</sub>). Sand pressures drop 1200 psi over 370 ft approaching the reservoir at 13000 ft TVD<sub>sea floor</sub>, and predicted mudstone pressures record 750 psi pressure regression, reflecting localized compaction. An effective stress ratio ( $K = (\sigma_h - u) / (\sigma_v - u)$ ) of 0.54, parameterized using LOT and lost mud events, is used to model horizontal stresses throughout the well. We interpret a variable and narrow mud window below 17,000 ft that contributed to challenging drilling and cementing conditions.

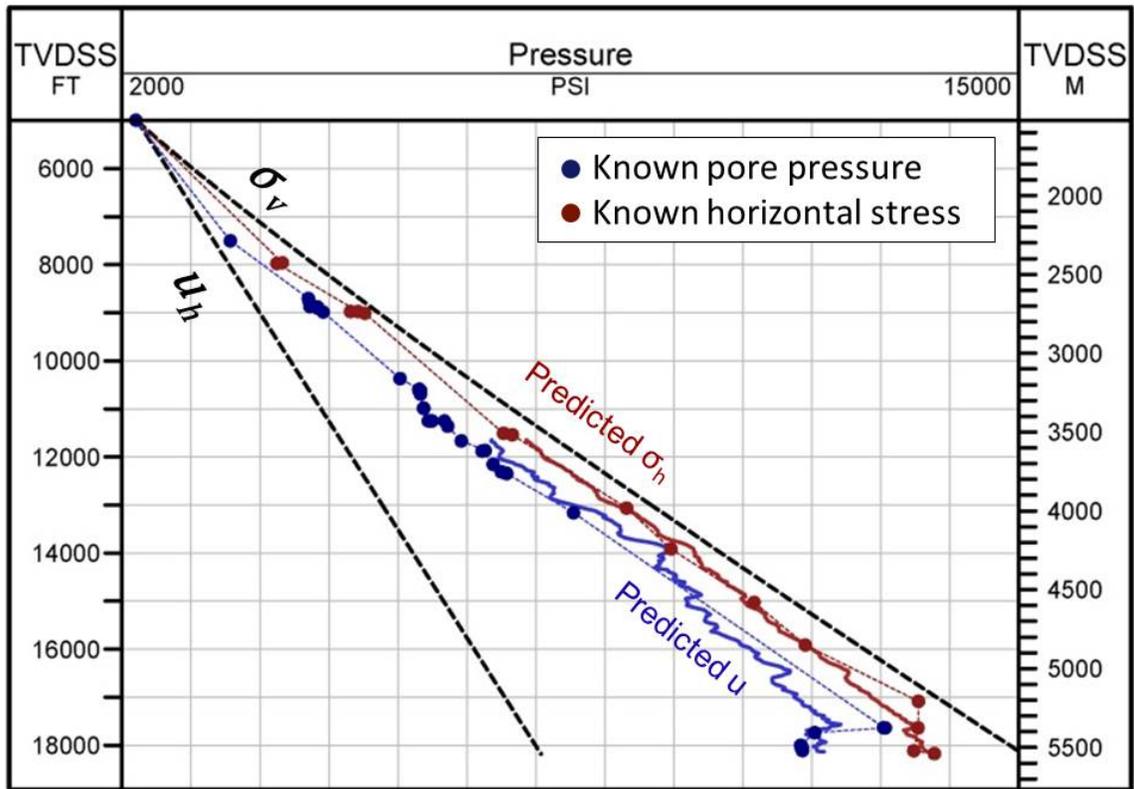
**CLICK ON IMAGE FOR LARGER VIEW**



**Fig 1:** Macondo well pressure profile in TVD<sub>SS</sub>. Hydrostatic pressure ( $u_h$ ), vertical stress ( $\sigma_v$ ), known pressure and stress points shown, and connected with a dashed line to illustrate trend. Solid lines show mudstone predicted pressures and horizontal stresses.

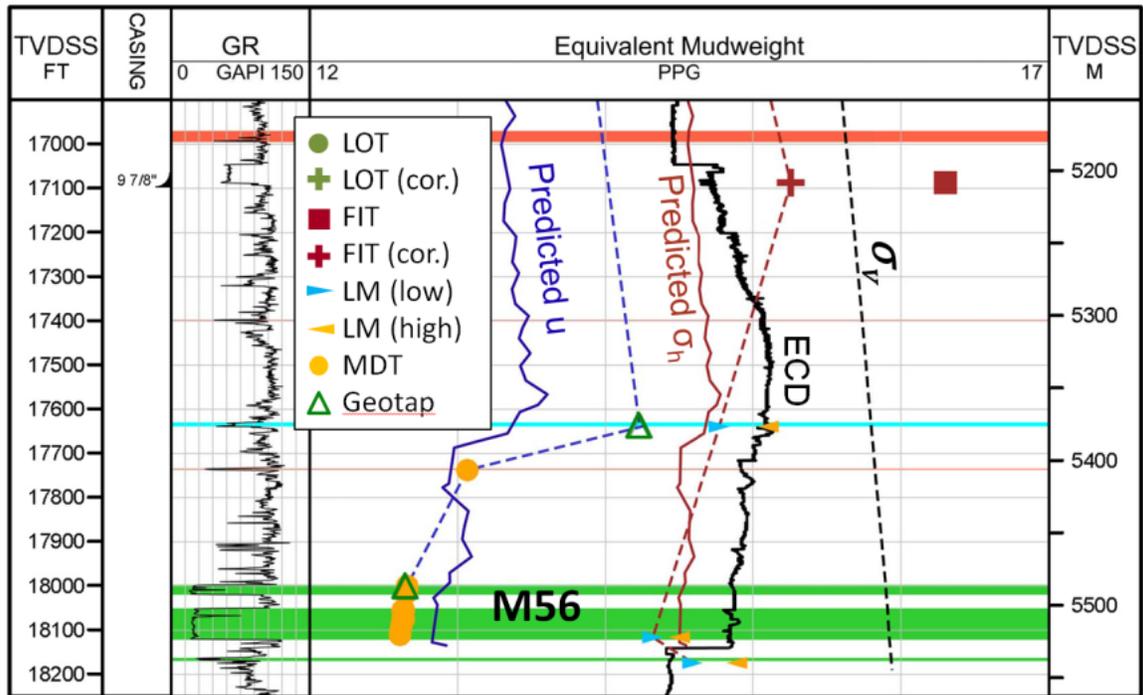


**Fig 2:** Pay interval pressure profile in mudweight space shown in TVD<sub>SS</sub>. Hoop stress corrected formation integrity test (FIT) suggests shoe high shoe strength. Subsequent lost mud events suggest narrowing of mud window into the M56.



**Fig. 1:** Macondo well pressure profile in TVD<sub>SS</sub>. Hydrostatic pressure ( $u_h$ ), vertical stress ( $\sigma_v$ ), known pressure and stress points shown, and connected with a dashed line to illustrate trend. Solid lines show mudstone predicted pressures and horizontal stresses.

[Back](#)



**Fig. 2:** Pay interval pressure profile in mudweight space shown in TVD<sub>SS</sub>. Hoop stress corrected formation integrity test (FIT) suggests shoe high shoe strength. Subsequent lost mud events suggest narrowing of mud window into the M56.

[Back](#)