

Pressure and Stress at Mad Dog, GOM

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ABSTRACT

This study on the Mad Dog field, Gulf of Mexico shows how the pressure and stress behave in the presence of the Mad Dog salt body. The Mad Dog Field is located on blocks 825, 826, and 782, 305 km sw of New Orleans in 4,500 feet of water. The initial discovery was in 1998 and production began in 2005. Production is from Miocene sandstones that lie at approximately 21,000 feet of depth directly beneath a large salt body. It is observed that the pore pressure approaches the overburden stress directly below salt. Pore pressures in the producing interval are 12,000 psi and the lambda* value is 0.37. The field is separated into Mad Dog East with an oil-water contact at 20,640 TVDSS and Mad Dog West with an oil-water contact at 23,330 TVDSS. Mad Dog East has a Pw* of 2789 PSI and Mad Dog West has a Pw* of 2906 PSI which infers these are not hydraulically connected. I developed a porosity-effective stress relationship from one well to estimate the in-situ pressure in other wells throughout the field. My results show that the porosity-effective stress parameters predict the in-situ well near thick salt intervals.

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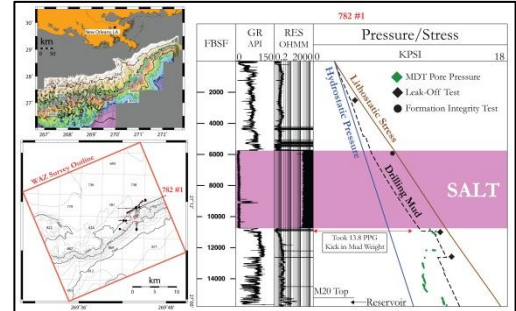


Fig. 1: Gulf of Mexico seafloor bathymetry and the location of the Mad Dog field is shown. Well profile of the initial subsalt well at Mad Dog and the associated pressures and stresses.

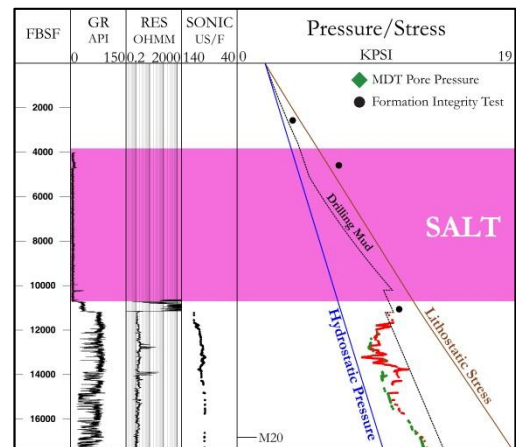


Fig. 2: Predicted pore pressure (red) using porosity and effective stress relationships compared to the MDT pore pressure measurements (green) for well 783 #1.

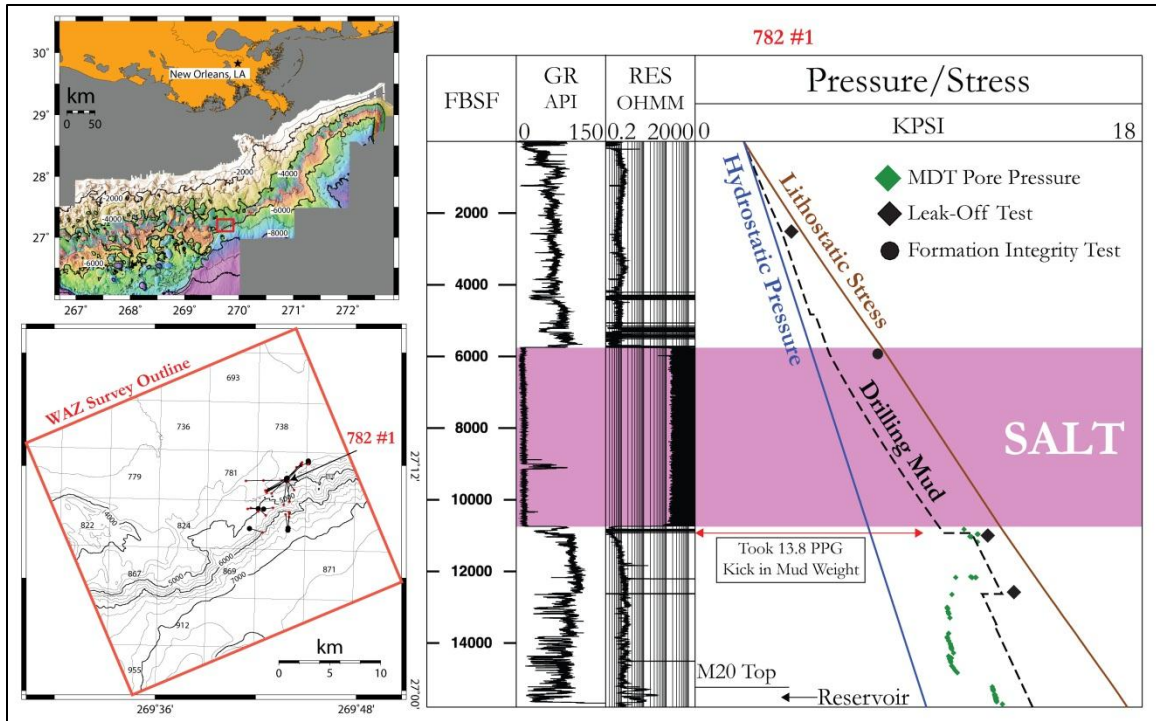


Fig. 1: Upper left: Gulf of Mexico seafloor bathymetry and the location of the Mad Dog field is shown. The bathymetry is illustrated with 1000 feet contours. Bottom left: The 3D wide azimuth survey outline with seafloor topography illustrated with 100 feet contours along with the well profiles. Right: The well profile of the initial subsalt well 782 #1 at Mad Dog. The subsalt sediments are overpressured with the pore pressure approaching the overburden stress directly below salt. The reservoir is located at 15,000 FBSF with pore pressures of 12,000 psi and overpressure of 2800 psi.

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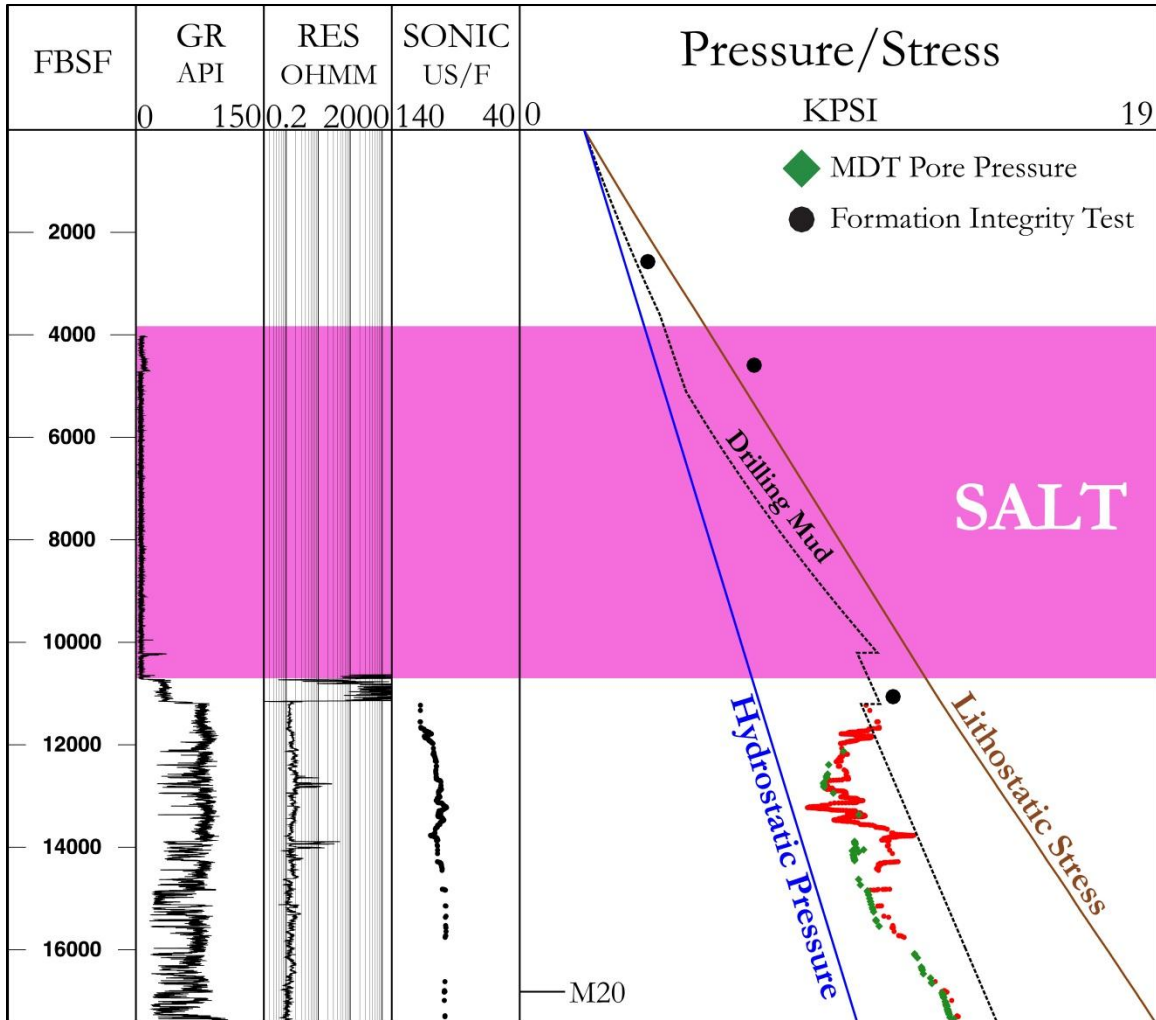


Fig. 2: Predicted pore pressure (red) using porosity and effective stress relationships compared to the MDT pore pressure measurements (green) for well 783 #1. The porosity was derived from the sonic log shown above. Based on the derived parameters from the offset well 782 #1 the predicted pore pressures agree with the in-situ pore pressures for well 783 #1.

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