11.06: Pressure prediction in unloaded (unconventional) basins. Case Study: Delaware Basin

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ABSTRACT

I demonstrate how to predict pore pressure in an unconventional basin subjected to erosional unloading. I apply my workflow in the Delaware Basin, which is characterized by nearly 7000 ft of net erosion. I utilize 1-D triaxial unloading curves to normalize the present day data to a “paleo” virgin compaction curve. I explore two central assumptions that control the predicted pore pressures: Bowers’ unloading parameter U (Fig. 1) and Skempton’s pore pressure coefficient S (Fig. 2). Overall, I provide insight into how the geologic history controls the present state and evolution of pressure and stress in the subsurface.

CLICK ON IMAGE FOR LARGER VIEW

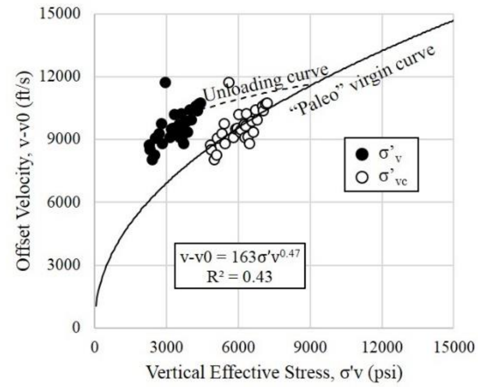

Fig 1: Normalization of present day data (black dots) to “paleo” virgin curve (white dots) using unloading curves. The slope of the “paleo” virgin curve is a function of U. In this example, U=8.

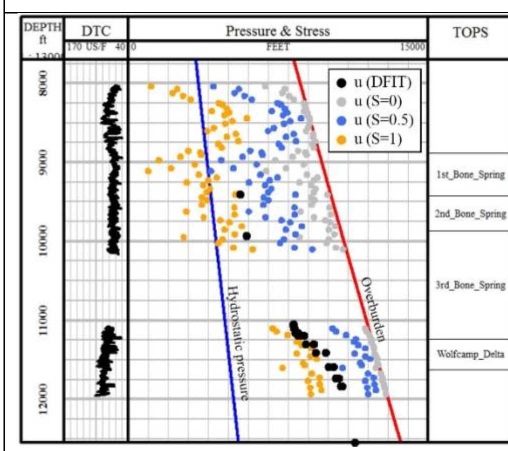

Fig 2: Predicted pore pressures using the unloading curves parameterized in Fig 1. The predicted pore pressure vary as a function of Skempton’s pore pressure coefficient (S).

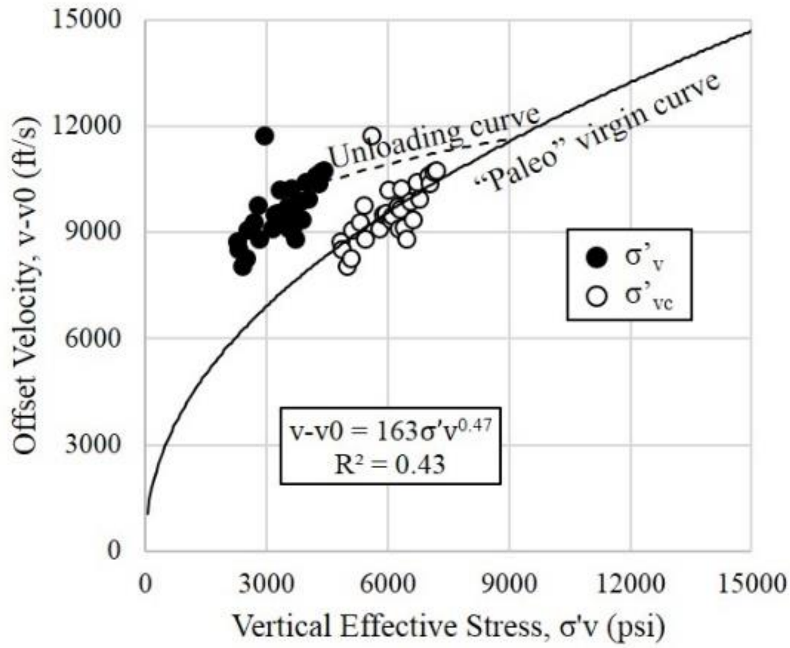

Fig. 1: Normalization of present day data (black dots) to "paleo" virgin curve (white dots) using unloading curves. The slope of the "paleo" virgin curve is a function of U. In this example, U=8.

Back

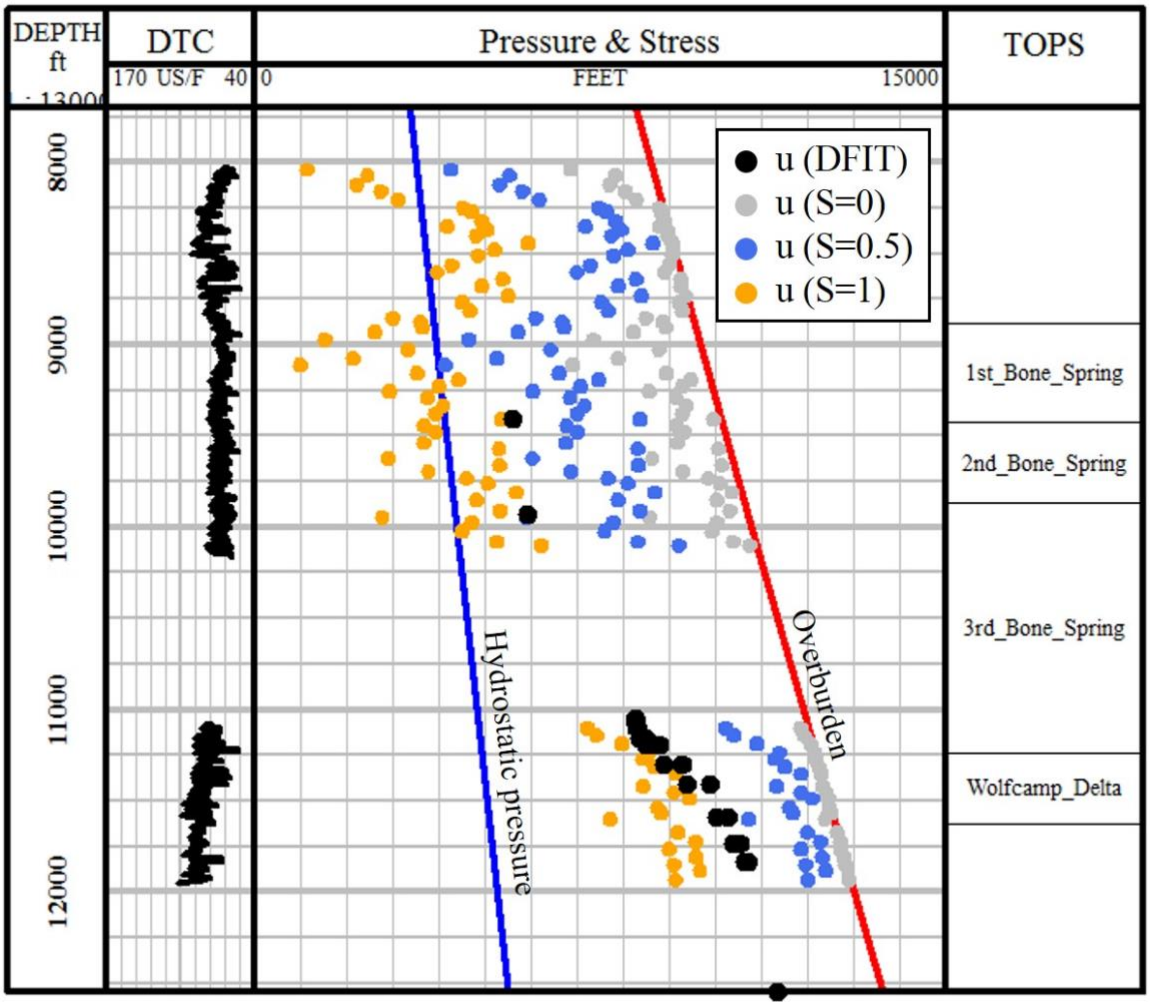

Fig. 2: Predicted pore pressures using the unloading curves parameterized in Fig 1. The predicted pore pressure vary as a function of Skempton's pore pressure coefficient (S).

Back