14.03: Velocity-based pore pressure prediction with late-stage erosion: Delaware Basin, U.S.

Landon Lockhart, The University of Texas at Austin

ABSTRACT

I present an approach to predict pressure from velocity data in a basin where significant erosion has occurred. My approach also allows for the estimation of erosion, and the identification of the boundary between the hydrostatically pressured and overpressured mudrock (Fig. 1). I demonstrate the effectiveness of my method in the Delaware Basin, where I calibrate my model from a single well and apply it to four other wells across the basin. I quantify the degree to which my method is more successful than a traditional approach that relies on a normal compaction trend (NCT, Fig. 2). The results show that my method predicts pressures that are in close agreement to the measured pore pressures, while the traditional NCT approach overpredicts pressures by up to 5.3 ppg.

CLICK ON IMAGE FOR LARGER VIEW

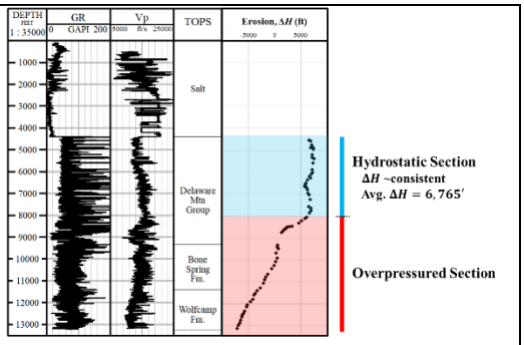


Fig 1: Every picked mudrock velocity was used to estimate an erosional value (black dots in last track), assuming hydrostatic pore pressures. The consistent erosional values in the upper section (highlighted in blue) are averaged and interpreted as the erosional value for the entire well. The depth at which the black dots begin to break from the above trend (8,000'), is interpreted as the onset of overpressure.

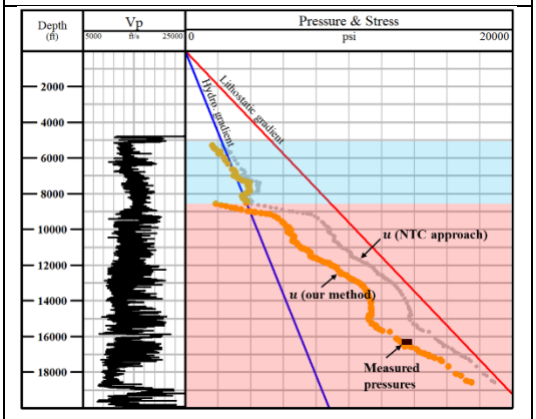
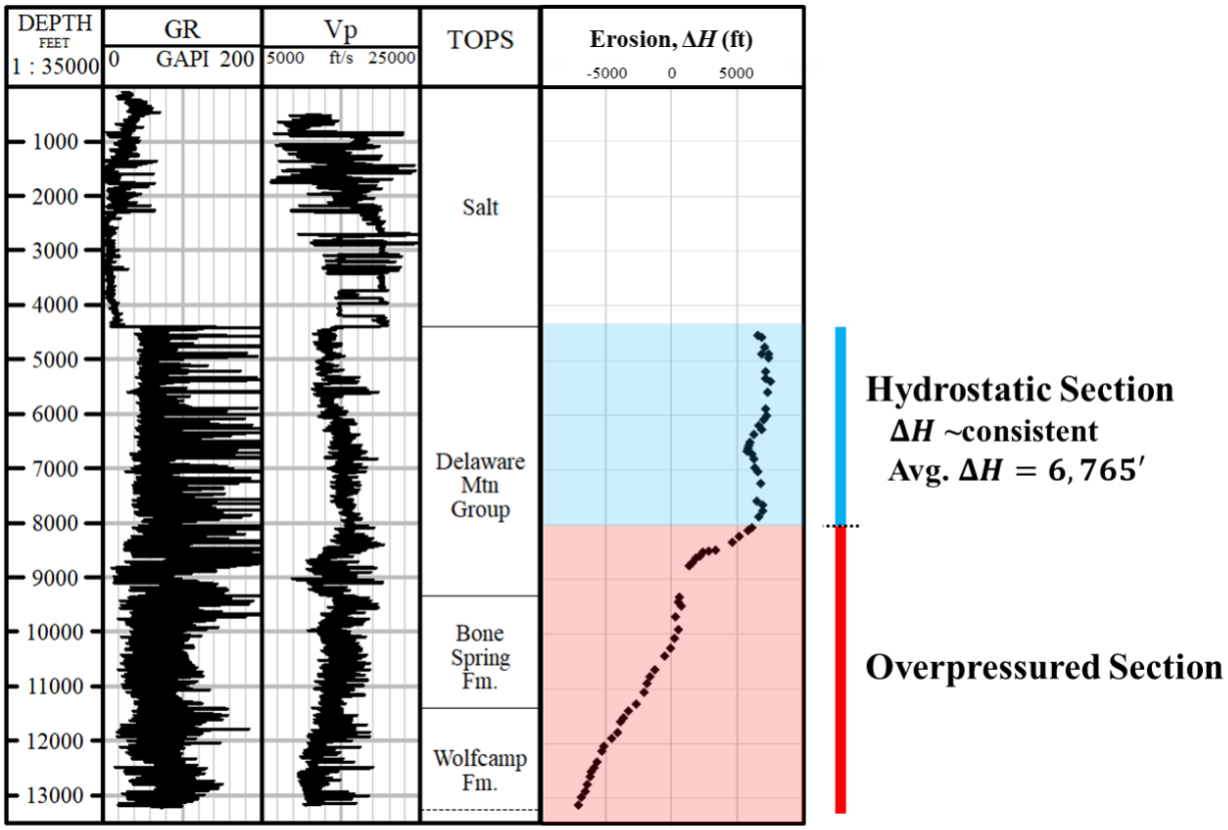


Fig 2: Pore pressure prediction results. Results using my model that accounts for erosional unloading are shown in orange. Results that predict pressure from a normal compaction trend (NCT) are shown in gray. NCT systematically predicts pore pressure higher than my method.



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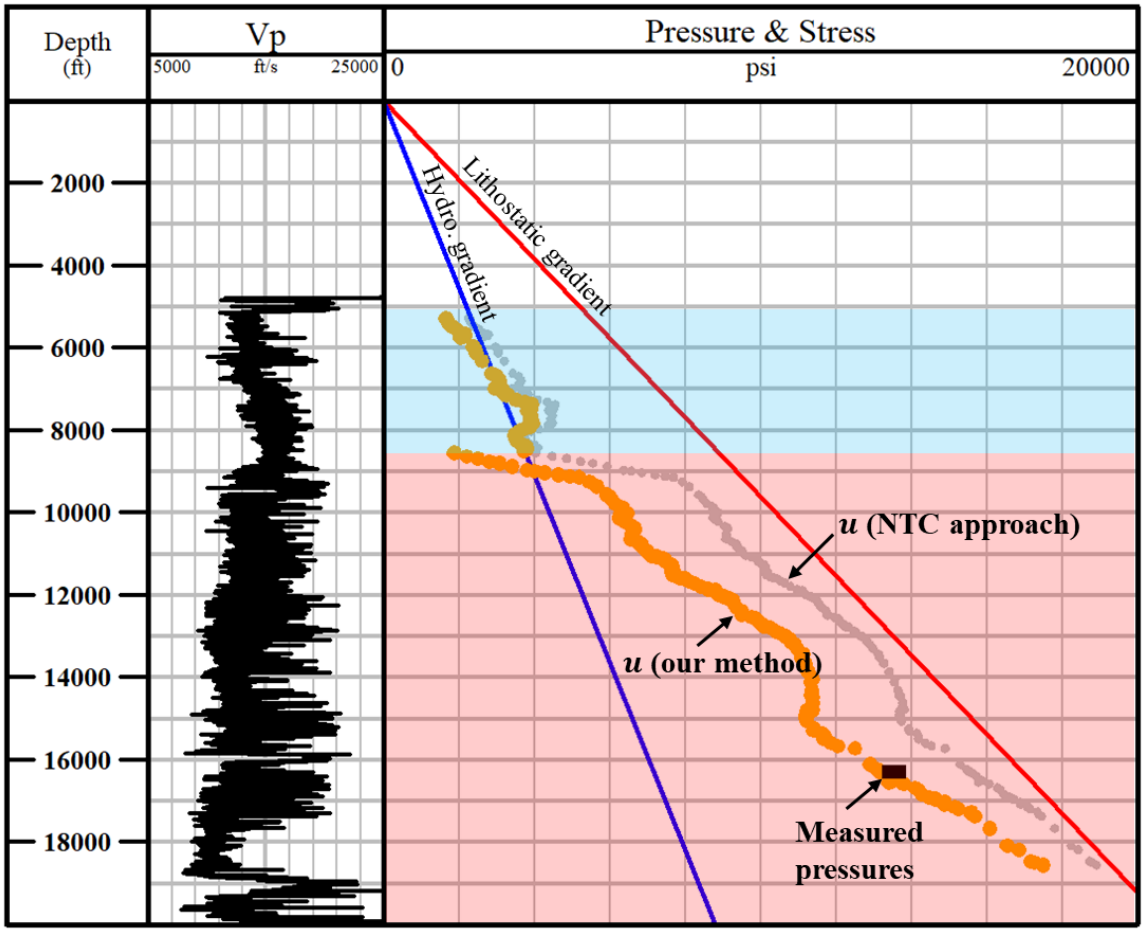

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