Peculiar Geological Features in Nugget Sandstone of the Moxa Arch

Dhruv Agrawal, Brady Lujan, and Sumit Verma*
The University of Texas of the Permian Basin

1. Summary

The Green River Basin in the SW Wyoming is responsible for all production within Lincoln, Sublette, Sweetwater, and Uinta Counties in Wyoming. The Moxa Arch, a doubly plunging anticline formed during early stage of Laramide orogeny, is located to the west of Green River Basin and Rocky Mountain Uplift. This study focuses on peculiar features, we call them FLTs (funny looking things) observed in the seismic data associated with the Triassic/Jurassic deposition. The features could not be explained by acquisition or seismic processing errors, which led us to look for a geologic explanation. Well to seismic tie on three wells surrounding the seismic survey indicated that the observed FLTs on seismic are correspond to the Jurassic aged Nugget Sandstone formation. We concluded that the lithology distribution is comprised of dunal and inter-dunal deposits.

2. Location of Study Area

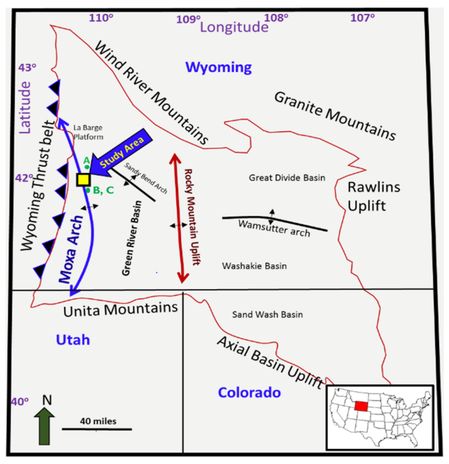
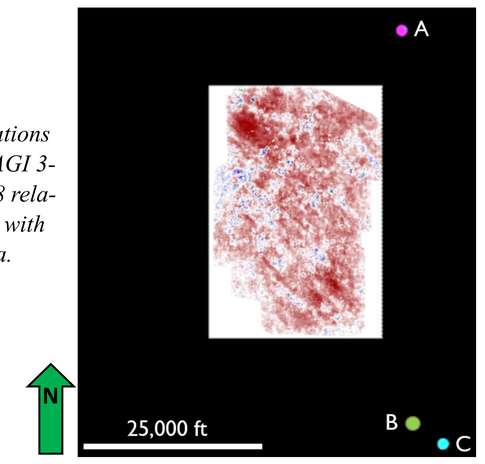


Figure 1. Location map of the Moxa Arch and Rock Springs Uplift in SW Wyoming (modified after Verma et al., 2016). A, B and C are the

3. Well and Seismic data

Figure 2 – Locations of Keller 1-12, AGI 3-14 and AGI 2-18 relative to the area with seismic data.



5a. Results and Discussion

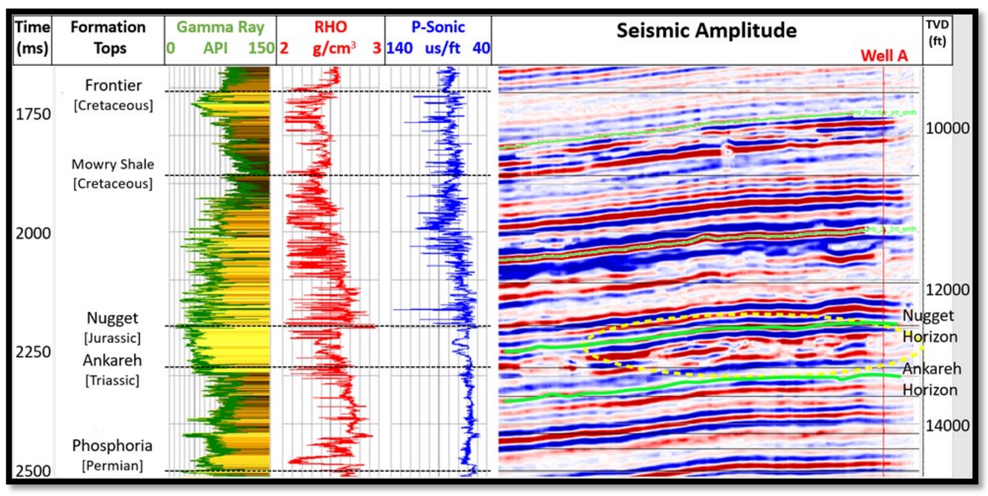


Figure 4. Well to seismic tie – Well A. Well A highlighted as red vertical line. The yellow ellipse exhibits the structures we are interested in.

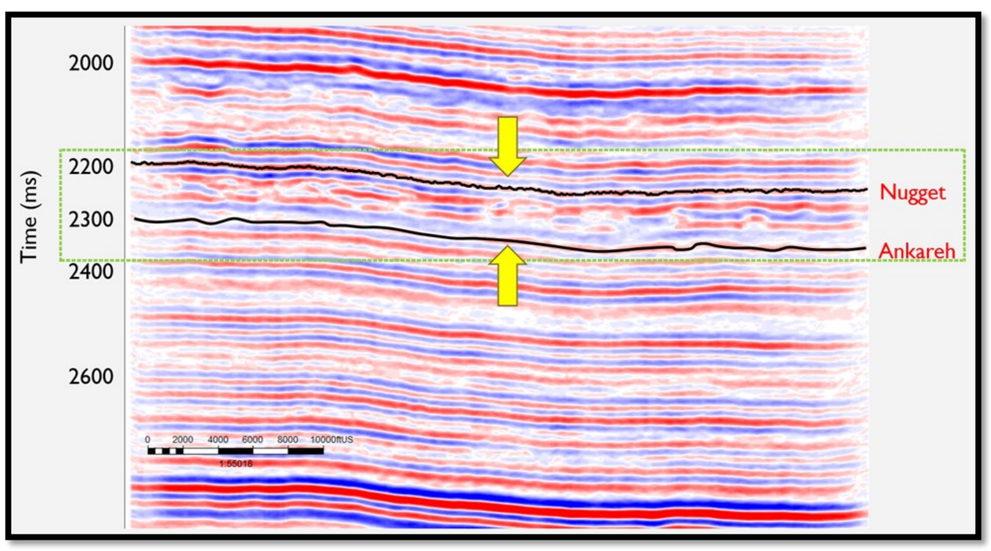


Figure 5. Nugget Sandstone and Ankareh Formation horizons picked above and below peculiar features.

Figure 6. Stratal slice (44 ms below Nugget) of Coherence and P-Impedance (Z_P). A co-rendering of coherence and inversion shows the cleaner sands (low impedance, light green to bright yellow to red) are in the structures delineated by coherence. These sands may be characterized as the dune sands while the areas in the blue to light blue colors (high impedance) show the areas with the limey to shaly siltstones and can be interpreted as the inter-dunes.

5b. Co-rendered Coherence and Curvature Attribute

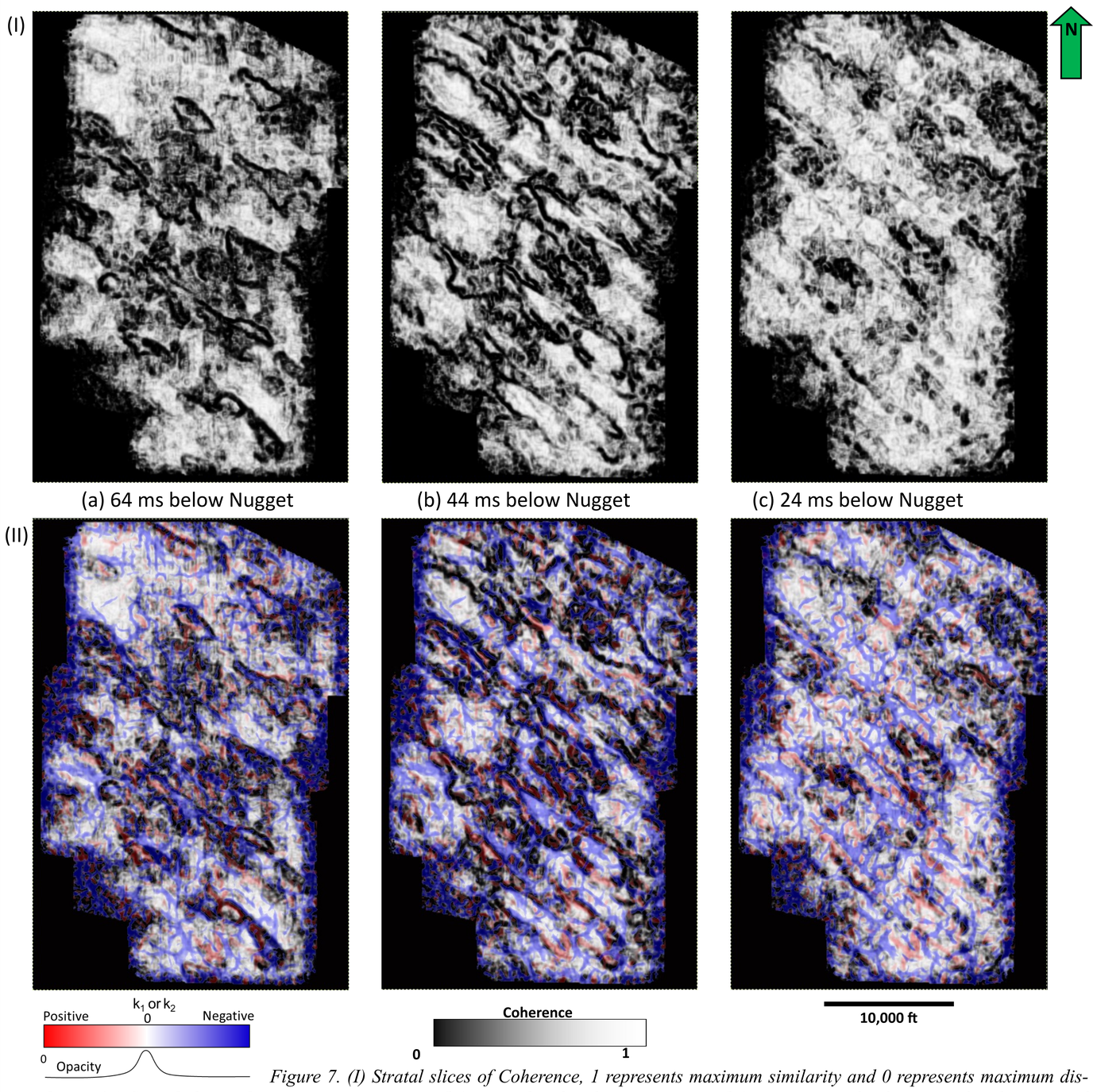


Figure 7. (I) Stratal slices of Coherence, 1 represents maximum similarity and 0 represents maximum dissimilarity, (II) Stratal slices of most positive curvature (k_1) co-rendered with most negative (k_2) curvature and coherence. The above stratal slices were taken after flattening the seismic section with respect to the Nugget horizon at 2226 ms. The structures begin to appear 24 ms below Nugget (Fig. c), become prominent (Fig. b) and then start disappearing about 64 ms below Nugget (Fig. a). Coherence determines the lateral changes in the lithology, so these structures are the areas that show discontinuity. The corendered figure implies that the distinct features seen in coherence slices are surrounded by anticlines and synclines.

6. Conclusions

The Nugget Sandstone is an eolian deposit and is equivalent to the Navajo sandstone. It is characterized by dunal facies comprised mainly of cross stratified eolian sands and inter-dunal facies characterized by thin horizontal lenticular beds. The time/depth correlation confirms that the FLTs seen in the seismic data are within the Nugget Sandstone, as seen in the seismic to well tie. Seismic interpretation further helps to discriminate the lithology distribution into dunal and inter-dunal deposits. Therefore the FLTs seen in our data are most likely to be dune deposits surrounded by inter-dunal deposits within the Nugget Sandstone. Further seismic analysis would be needed; thin-bed tuning especially, to interpret the exact lithology in the inter-dunal areas of the Nugget.

7. Reference

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