Improved Resolution in Initial Interval Velocity model building by integrating well data and seismic data

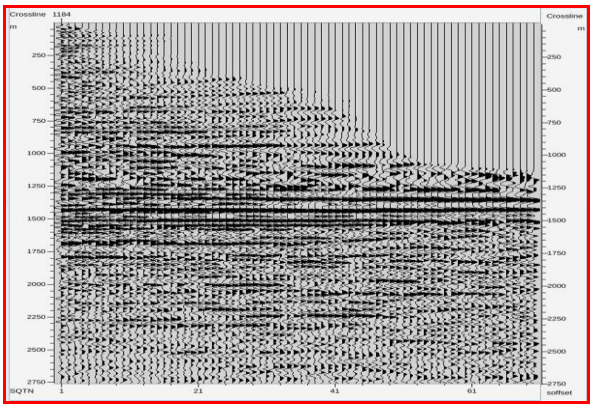

Figure 10: Final PSDM Gather, after six isotropic tomographic iterations (used initial velocity prepared by CVI method).

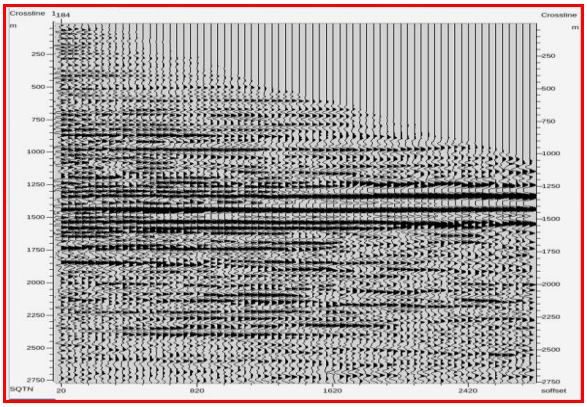

Figure 11: Final PSDM Gather, after six isotropic tomographic iterations (used initial Velocity prepared by Geostatistical method).

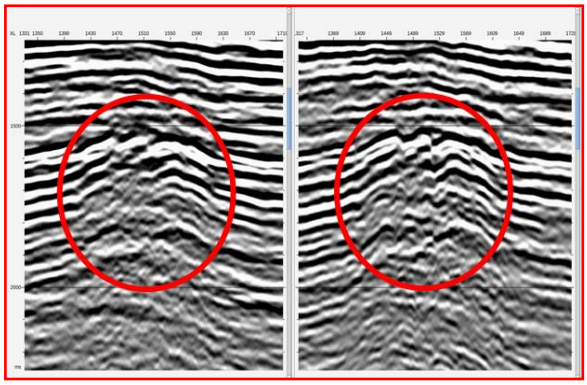

Figure 12: Comparison of PSTM (Left) and PSDM scale to time stack (Right).

Fine tuning of velocity model was done by two iterations of welltie tomography inversions for minimizing the misties between horizons and well markers. Comparison of sonic velocity with PSDM Velocity and welltie velocity is shown in figure 13. This shows the Final velocity not only produces good well marker match, it also produces comprehensive geological velocity.

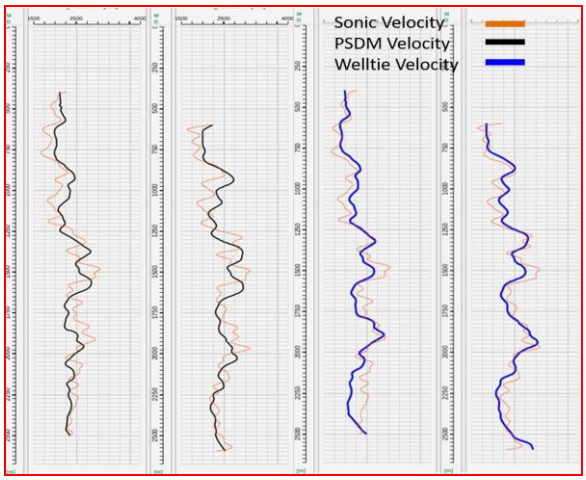

Figure 13: Showing comparison of sonic velocity with PSDM and welltie velocity.

Conclusions

- Integration of well data with seismic data has brought out the detailed variation in velocity laterally as well as temporally.
- The velocity so obtained is not only geophysical velocity but representing geology. Final velocity volume also confirms the trend of log which will now provide value addition in detailed findings.
- Fine tuning of velocity model could be more accurate when more well logs are to be included in this Geostatistical method.
- Consecutively, the welltie tomography was proficient enough to correct the mis-ties between seismic and available well markers resulting fine tuning of both interval velocity and depth model.
- PSDM seismic data has meticulously imaged and brought out noticeable improvement compared to earlier data. This enhanced output will definitely provide better confidence to the interpreter's literal need for the critical subsurface delineation and well planning.

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References

G. P. Deidda et al. "Prestack Depth Migration of Ultra shallow Seismic Data" A Critical Analysis" EAGE Publication, September 2015.

Model based depth imaging by Stuart Fugin, course note series No 10 (SEG).

Vishnoi D K*, Lavendra Kumar, A C Mandal, Srilata Mohapatra, D Chatterjee, "Well logs driven Initial Velocity Model building for Depth Imaging: A Geostatistical Approach" SPG Conference 2013.

Geoff Bohling, KRIGING, C&PE 940, 19 October 2005.

Robert Pickering, LookBack Exploration Ltd, sonic velocities & depth conversion, Vol. 42, No. 6, October 2017.

E. Tartaras et al. "Multi property earth model building through data integration for improved subsurface imaging" first break volume 29, April 2011.

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