Nova Scotia Deepwater Pre-stack Depth Migration – a case study

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The deep waters offshore Nova Scotia present a number of imaging challenges to the exploration geophysicist. Complex bathymetry not only produces strong complex multiples, but also causes wavefield distortion that cannot be corrected via pre-stack time migration. Complex salt structures cause even stronger wavefield distortion that certainly cannot be resolved without pre-stack depth migration.
In this case study, a number of modern imaging tools and algorithms are applied to the problem. It is hoped that through a walk through of this case history the specific benefits of Wave Equation migration and Kirchhoff migration as well as the utility of various modeling and diagnostic tools can be learned.

Note to session Chair
This project is nearing completion but as of now I do not have much more to add to the abstract. However to give you a taste of what to expect I will try to introduce just one slide and discuss its implications

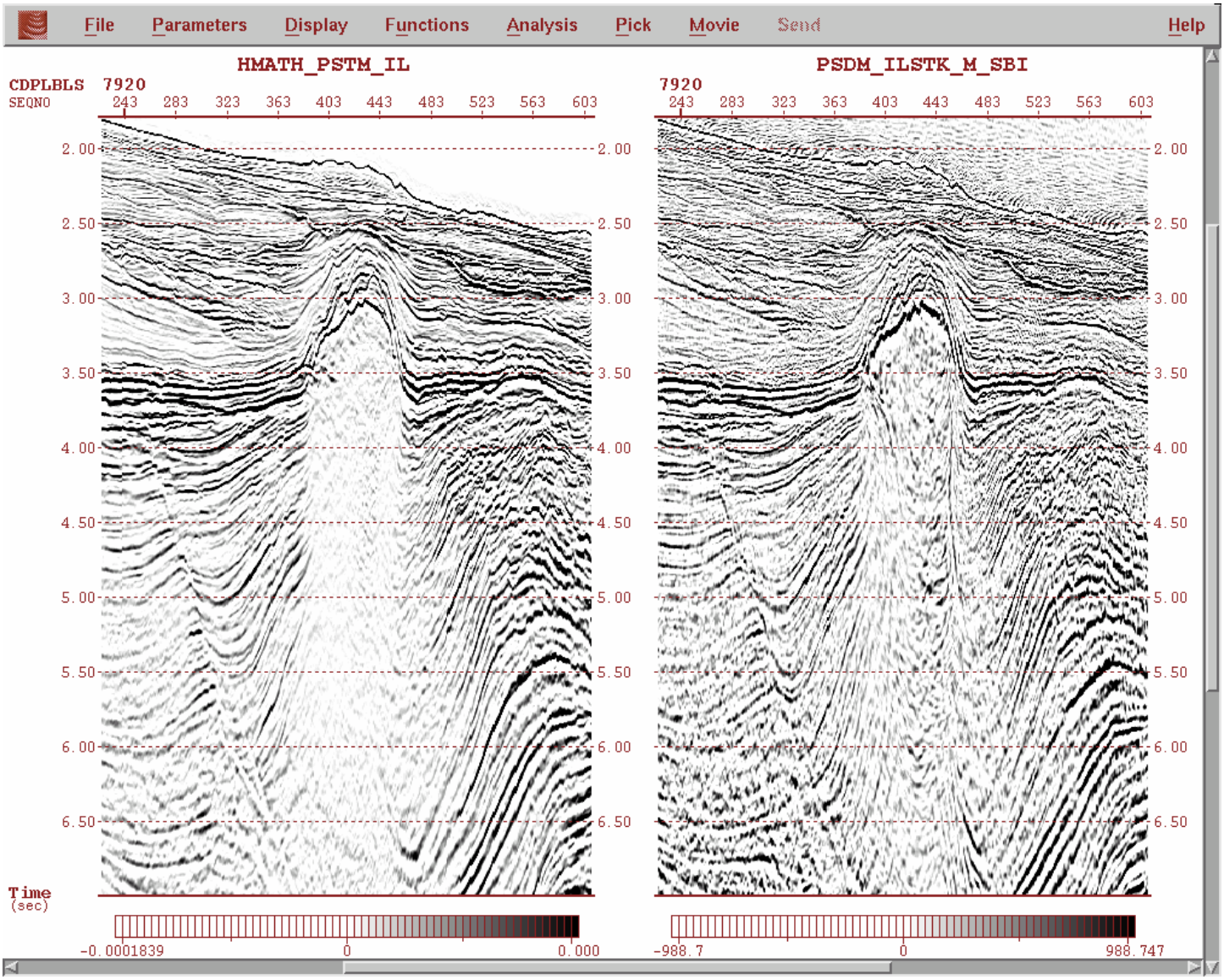

Figure 1

In Figure 1 we see a comparison of vertical slices through the PSTM volume and an intermediate PSDM volume. The PSTM section has been stretched to depth. When making this comparison we must bear in mind the limitations imposed upon the PSDM. The following table illustrates the differences:

Feature	PSTM	PSDM
Input bin size	25m x 25m	50m x 50m
Output sample rate	4ms	10m (coarse)
Migration dip tapering	Optimized time variant	None
Post migration Residual NMO	Yes	No
Post migration mute	Optimized inside and outside	Coarse outside mute
Post Migration Noise attenuation	Yes	No

The various disadvantages imposed upon the PSDM for the sake of quicker model building iteration cycle time accounts for the generally poorer signal to noise of the PSDM. However more interesting is the somewhat startling fact that the vertical or slightly overturned salt flank on the right has been imaged with

PSDM on a volume sampled as coarsely as 50m x 50m x 10ms. Usually we expect the maximum dip imageable to be determined by the input bin size. This suggests that in the East Coast at least time is better spent on iterating the velocity rather than computing each iteration at a very fine input and output density.