

## Realities in 3D Design - Planning and Processing

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### ABSTRACT

Much work has been presented or published regarding theoretical considerations in design of 3D seismic programs. However, most of this work is predicated on “pre-plot” models and gives little consideration for the qualities of various designs after perturbations due to realistic implementations.

For example, much discussion has occurred regarding the merits of the diagonal classes of 3D designs versus orthogonal classes. However, statistical measures of 3D integrity are much more sensitive to variations of included offsets than to the selection of model type. Seldom does a processor utilize the same mute pattern throughout a 3D prospect. The sensitivity to this variation is substantial and must be included in evaluations of models.

Furthermore, model characteristics are usually perturbed by field implementation. Lines are deviated to utilize existing trails, offsets and stub lines are employed around permit lockout areas, topography and survey error modify our offset calculations. Again, our industry has tried to evaluate various model classes without regard for their robustness under perturbation. Are the advertised qualities of various design types retained when typical perturbations are introduced? We offer a few concepts for consideration with regard to this issue.

Midpoint scatter has long been a point of discussion for 3D design experts. We offer a summary of the points of discussion and add a few new thoughts with regards to the present practice of overlapping and merging the processing of 3D's recorded with different parameters.

Finally, we discuss the application of variable spacing models as applied to areas of changing geologic targets within one survey. This is becoming more relevant as we move towards large, regional 3D projects.

**This is Submission Number is 437S0202**

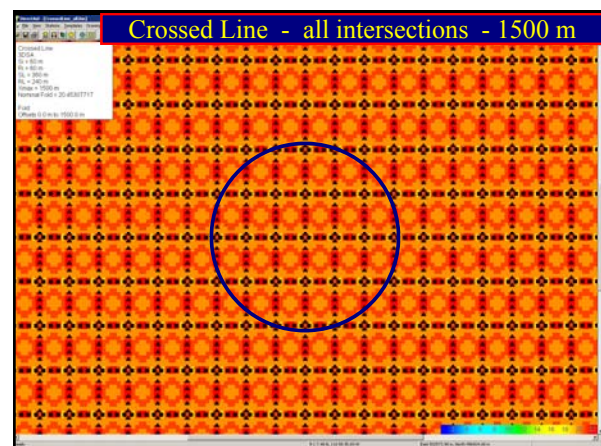
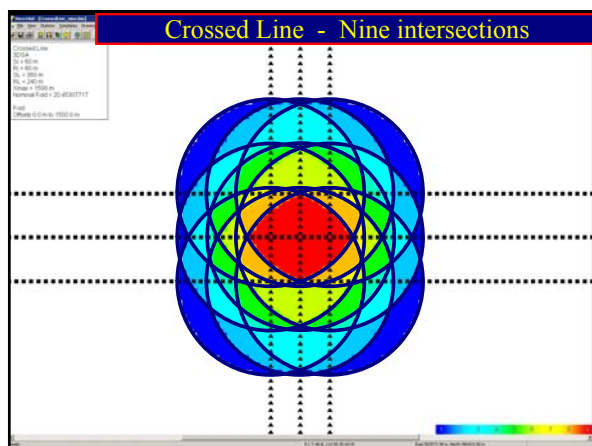
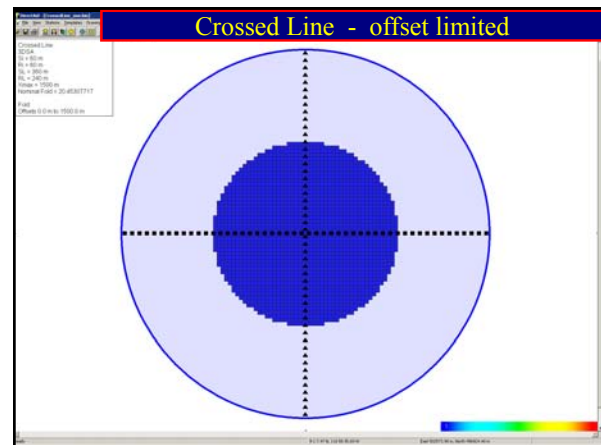
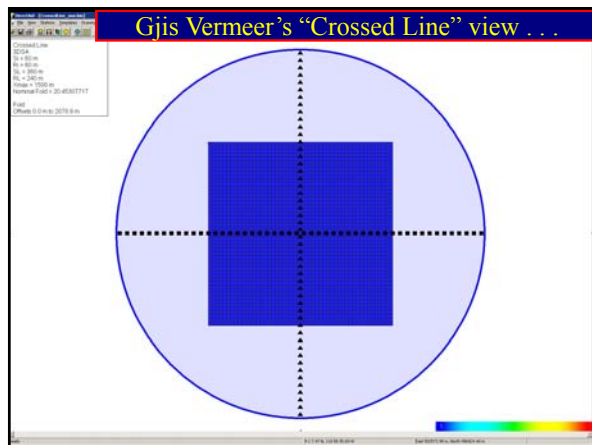
# Realities in 3D Design - Planning and Processing

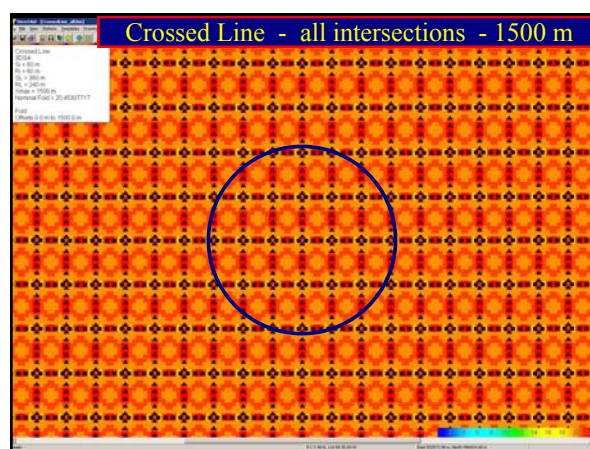
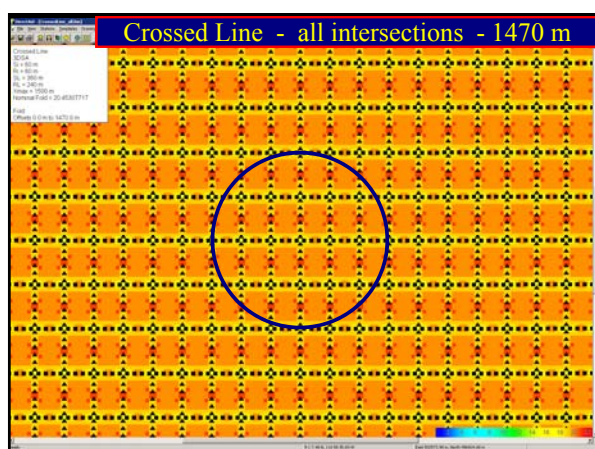
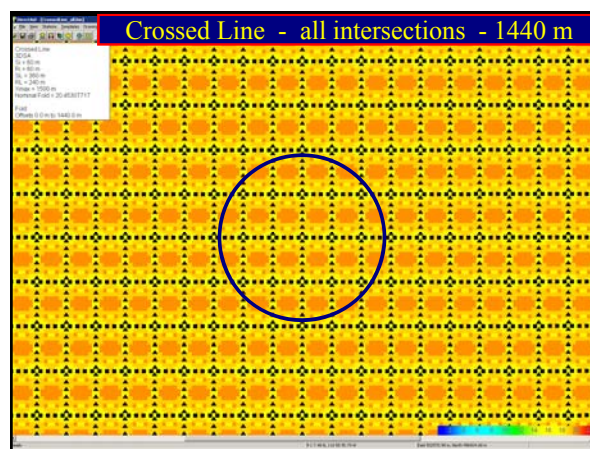
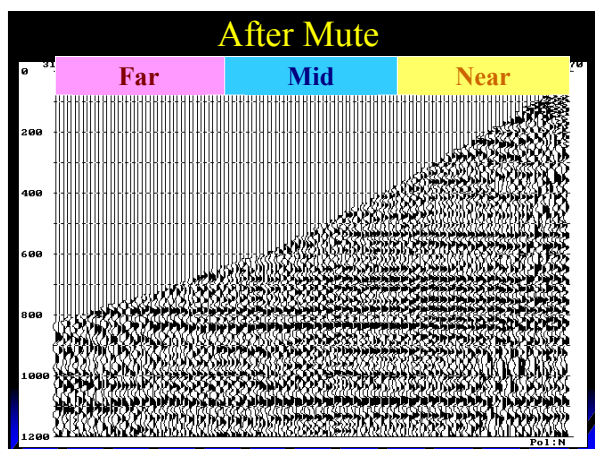
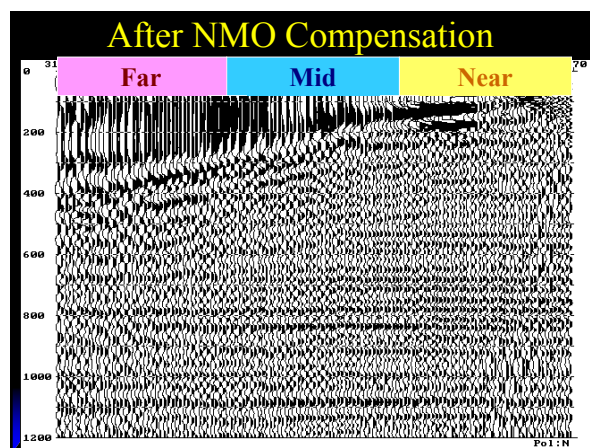
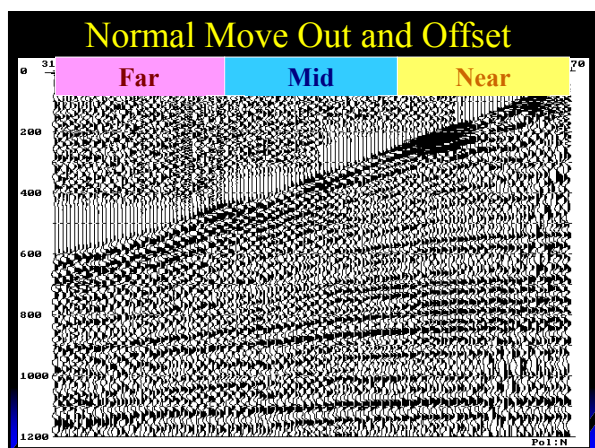
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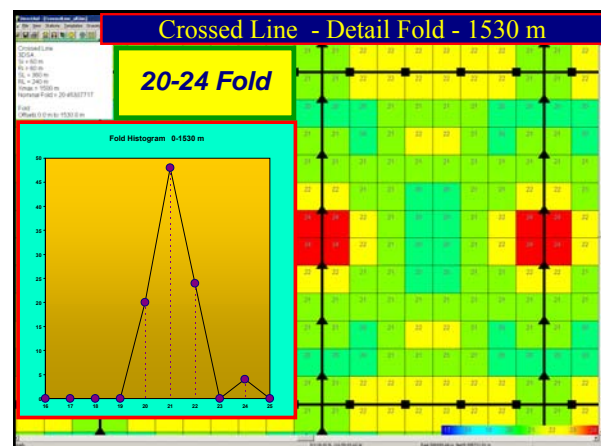
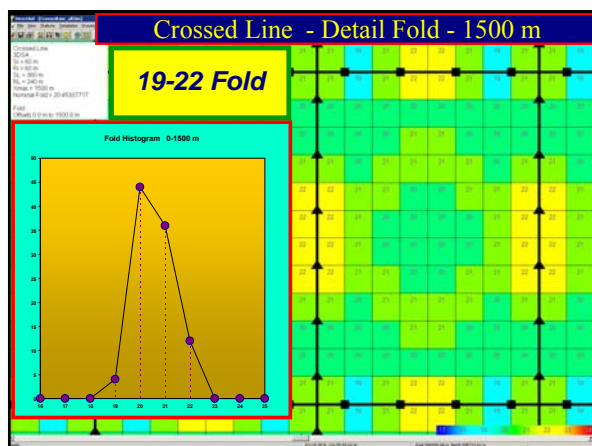
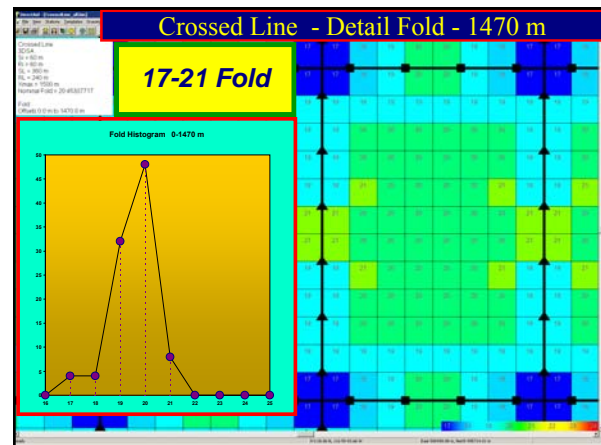
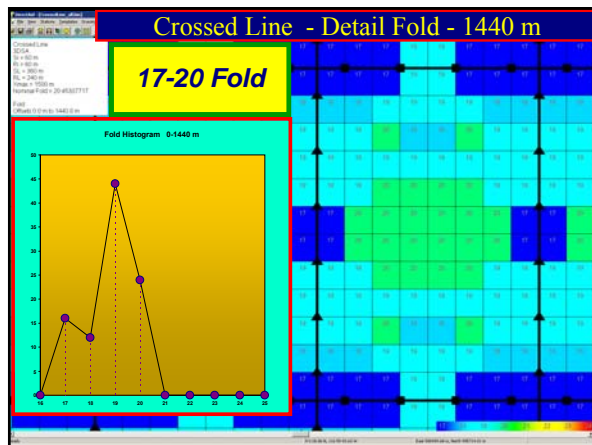
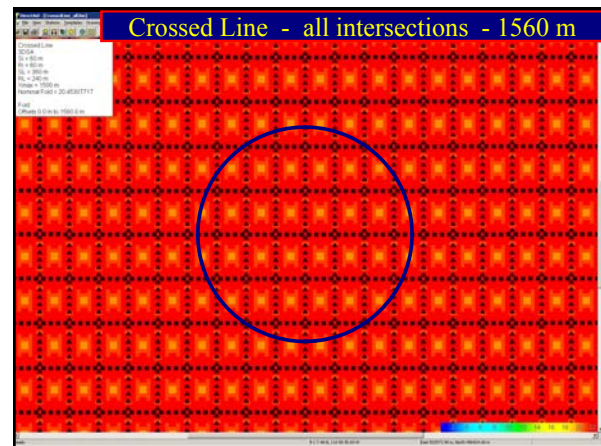
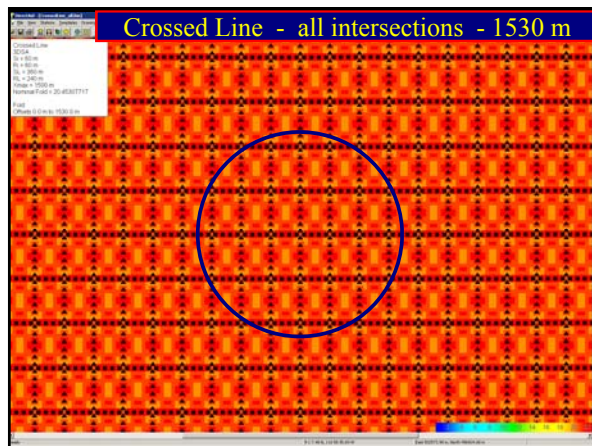
# Basic Building Blocks

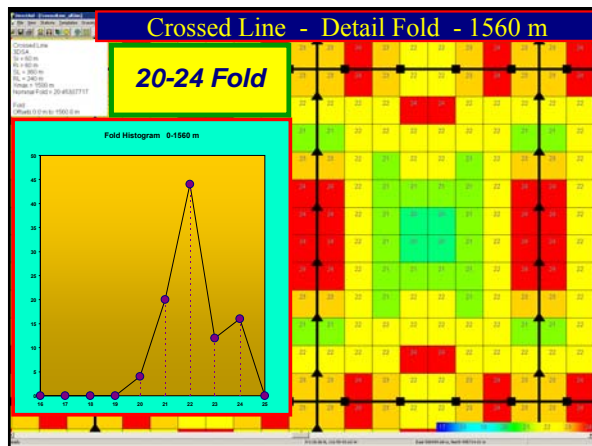
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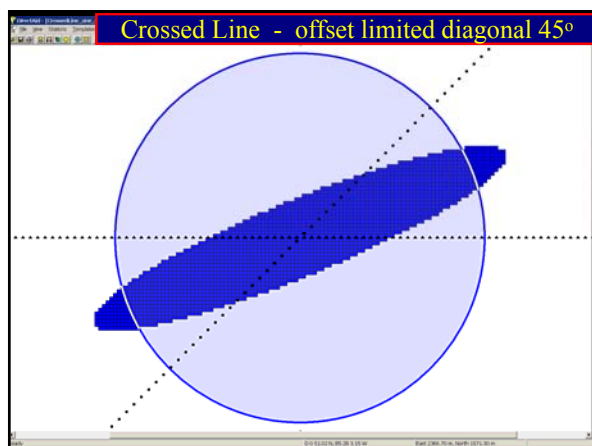
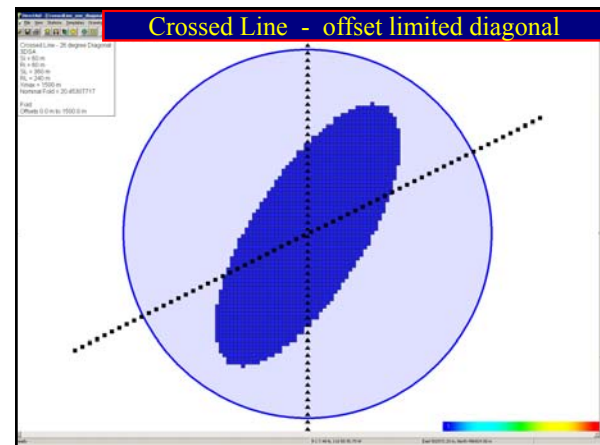
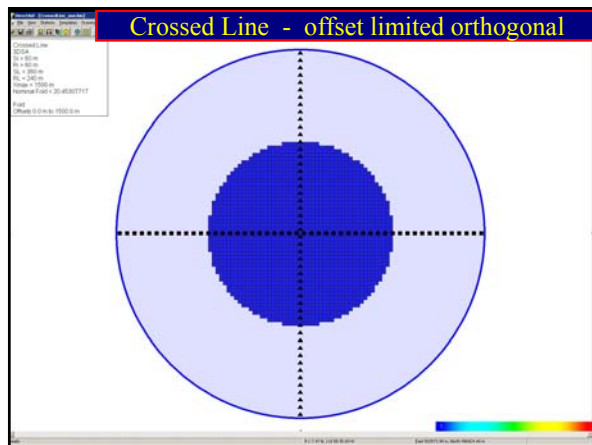






# Robustness Under Perturbation

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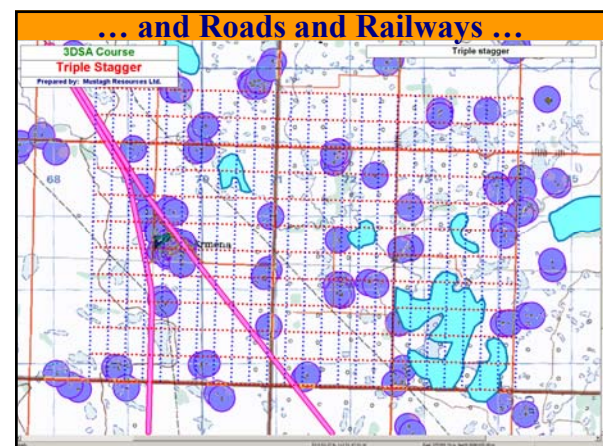
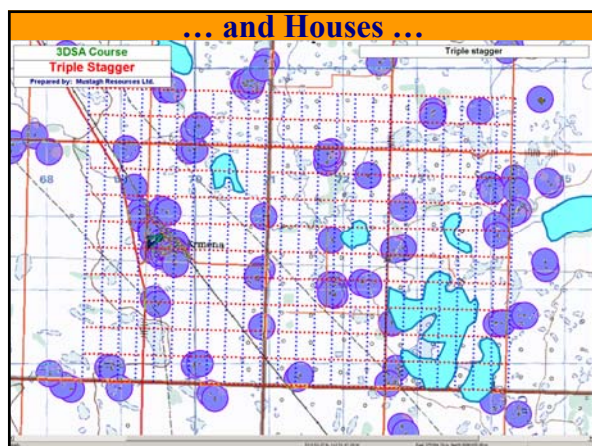
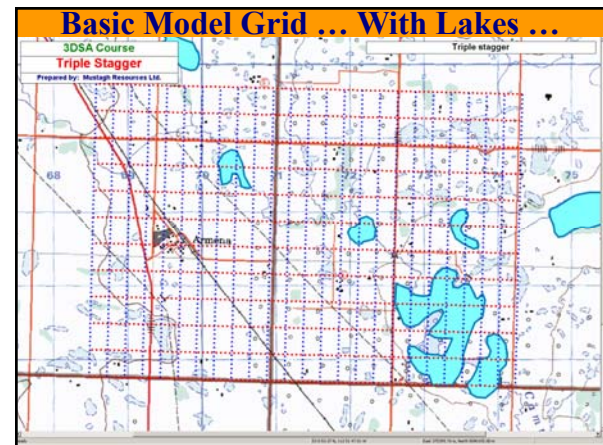
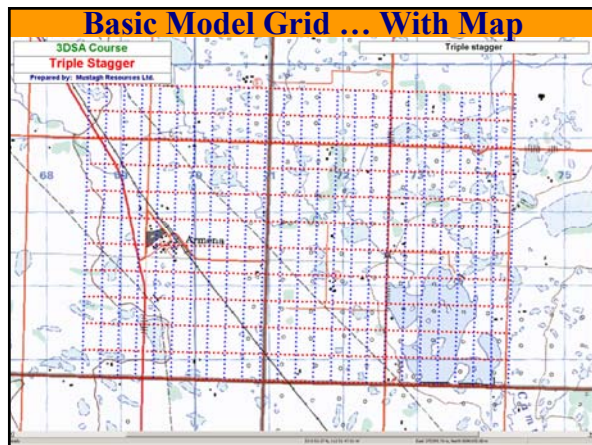
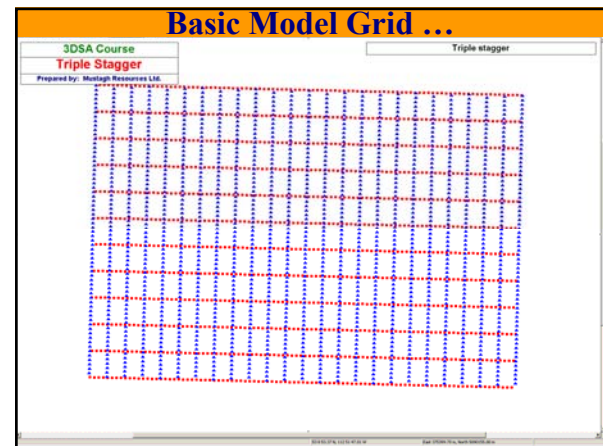


## Summary

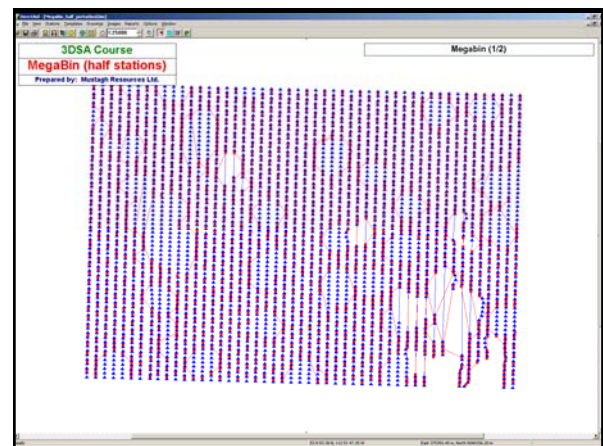
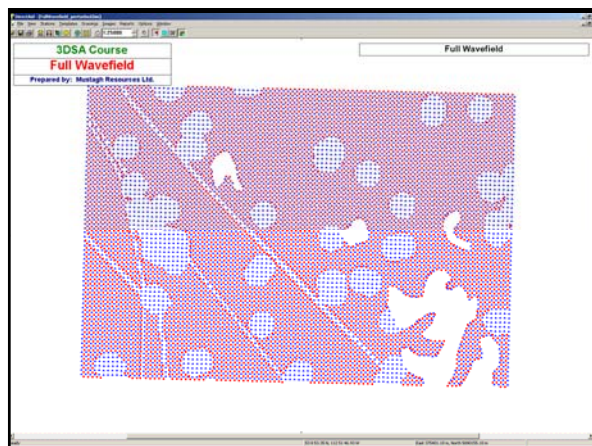
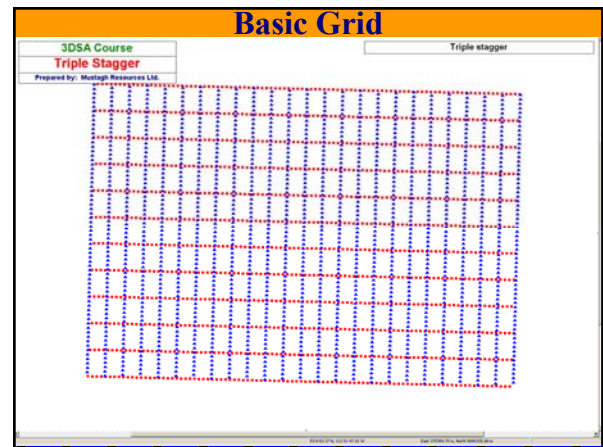
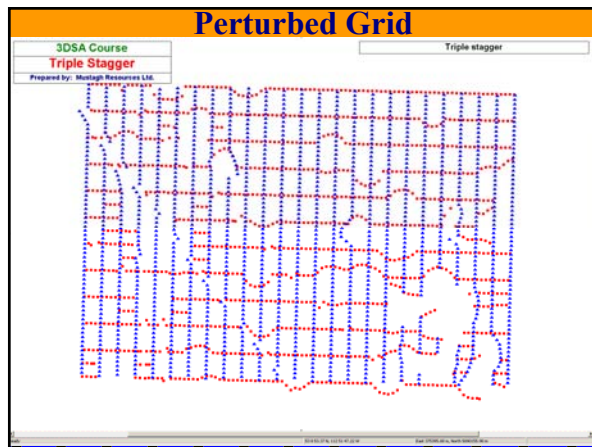
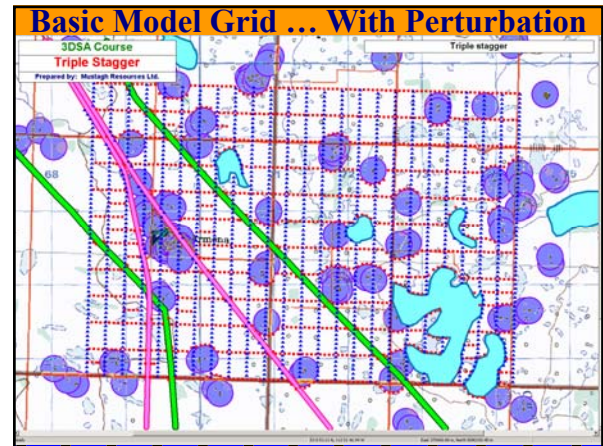
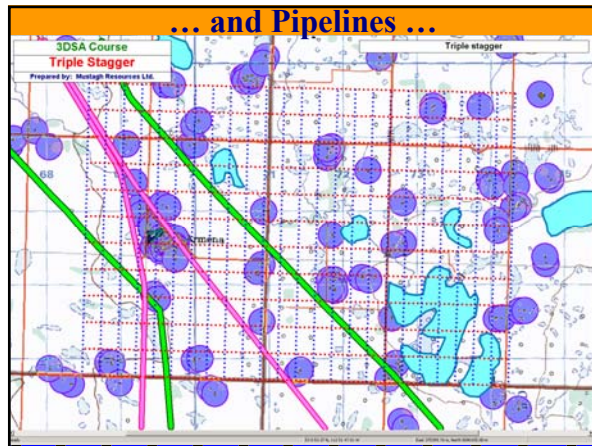
- ◆ Fold (and other more important statistics) are accumulated by overlapping unit patterns formed by each line intersection
- ◆ Radius of offset limit (mute) is greatest factor in determining geometric imprinting
- ◆ Orthogonal unit patterns form circles and are more robust under perturbation than the narrow ovals created by diagonal models.

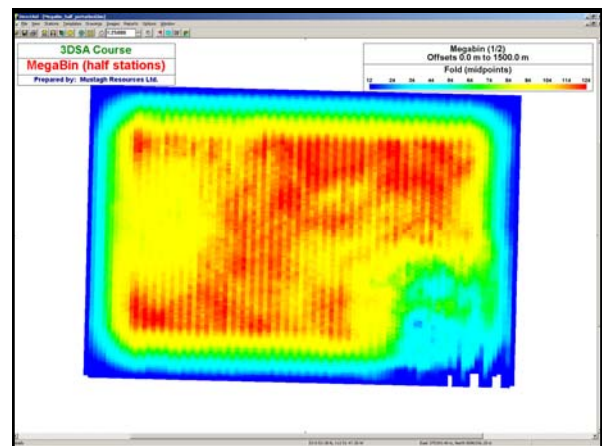
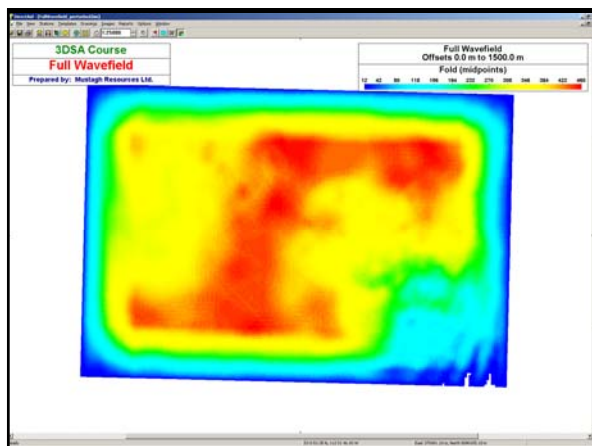
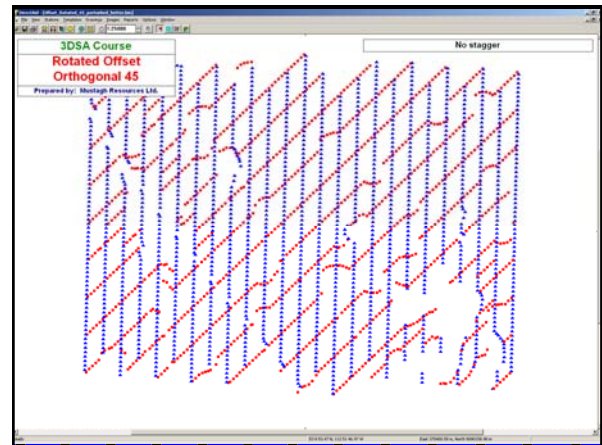
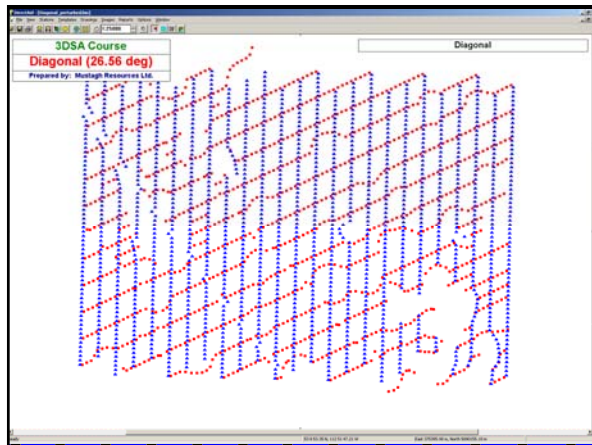
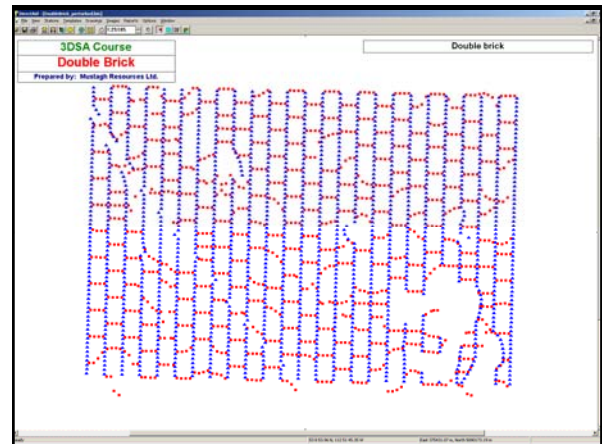
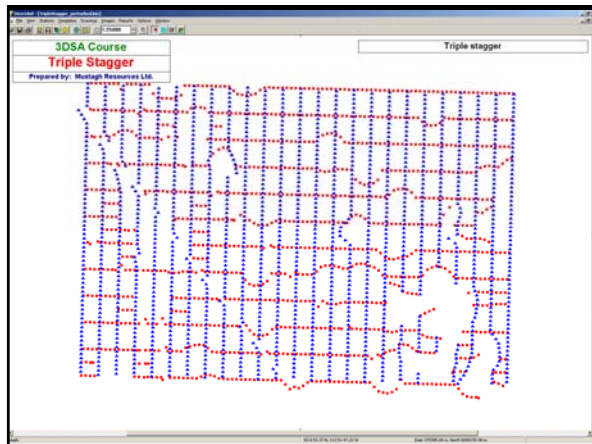
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# Perturbed Models

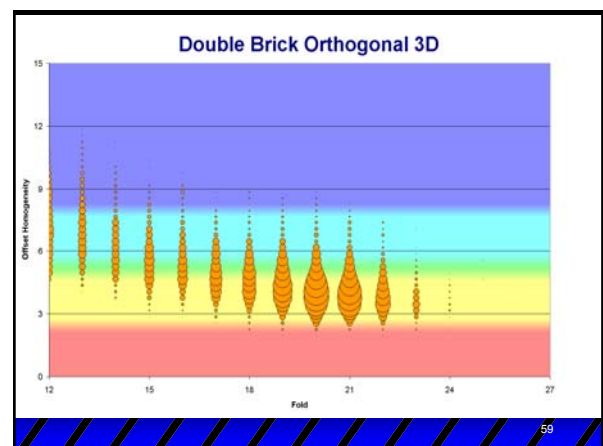
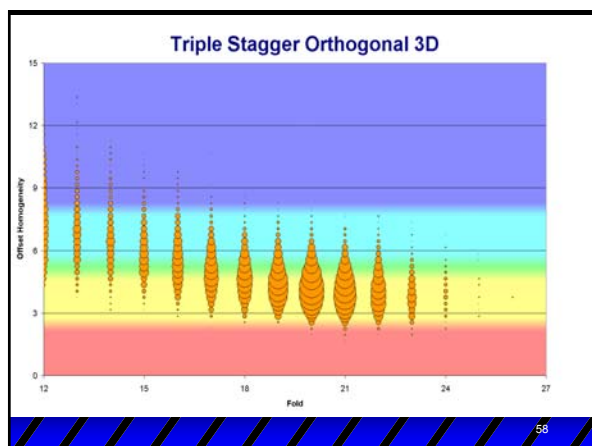
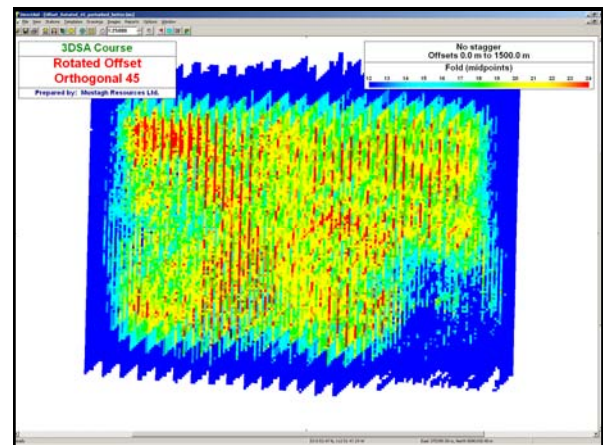
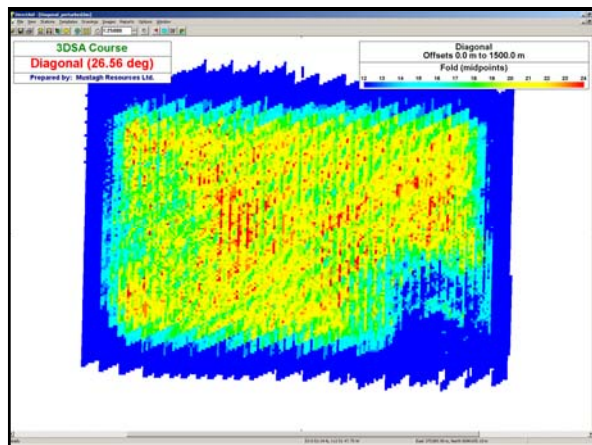
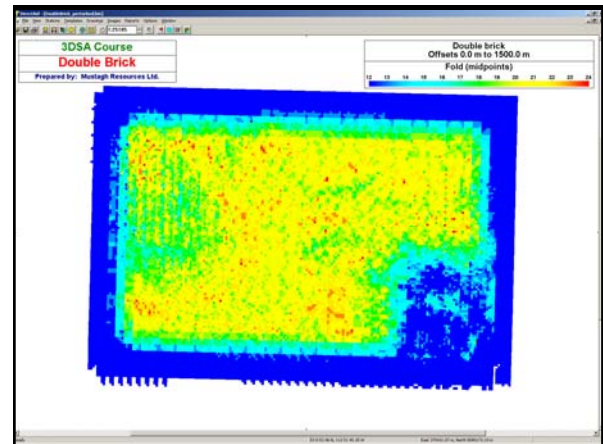
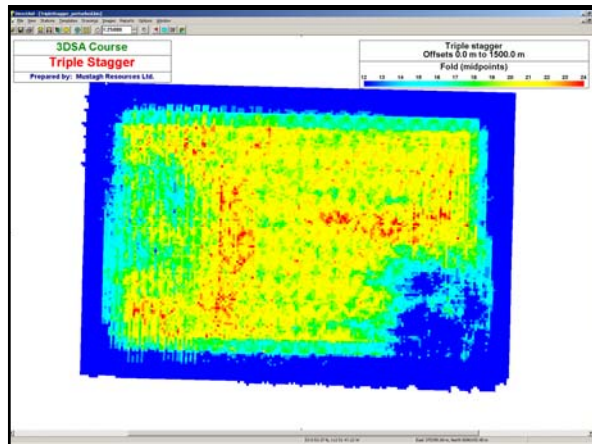


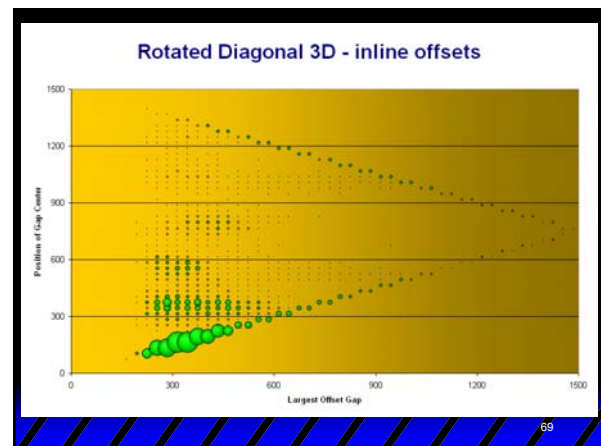
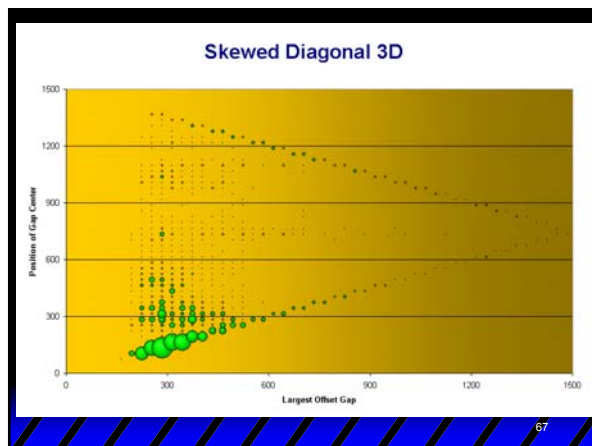
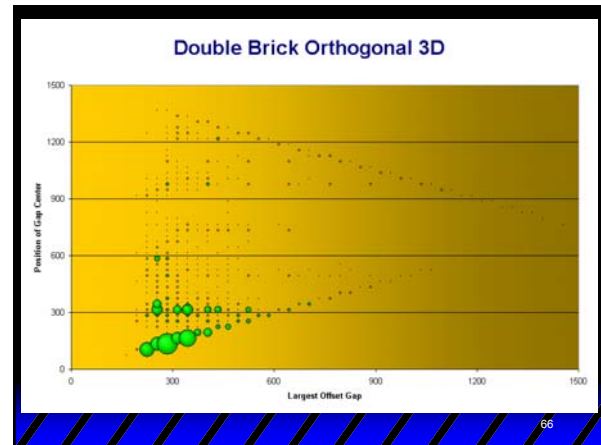
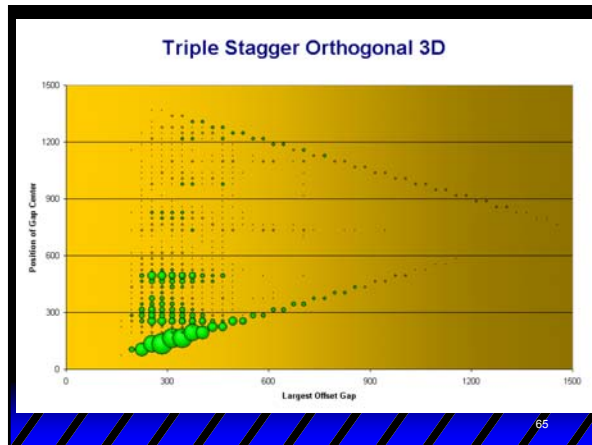
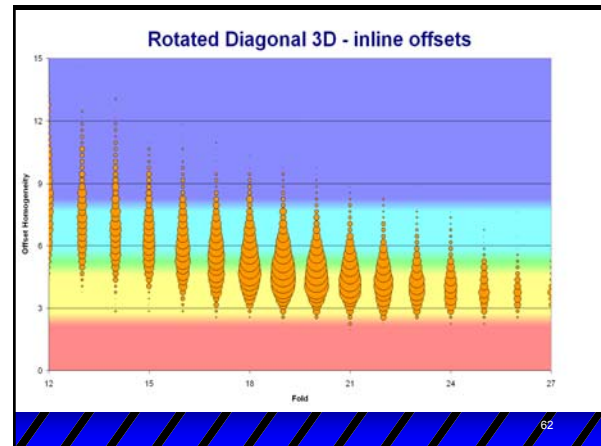
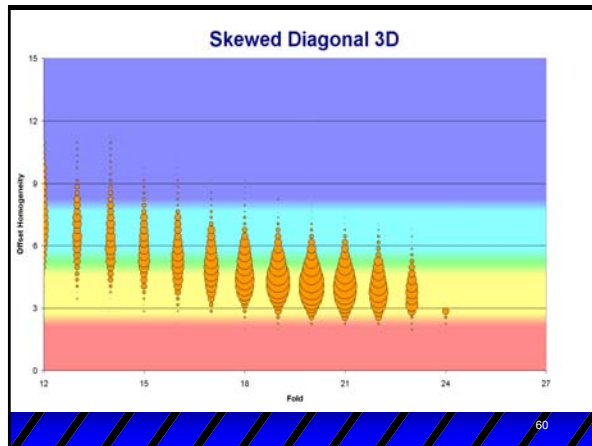










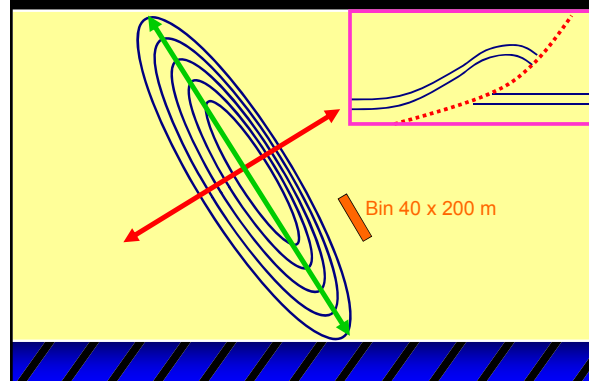




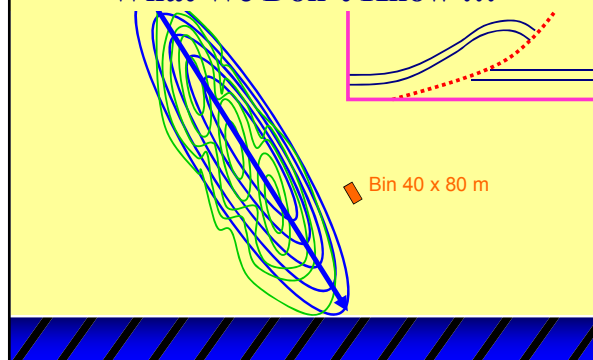
# Bin Size and Mid-Point Scatter

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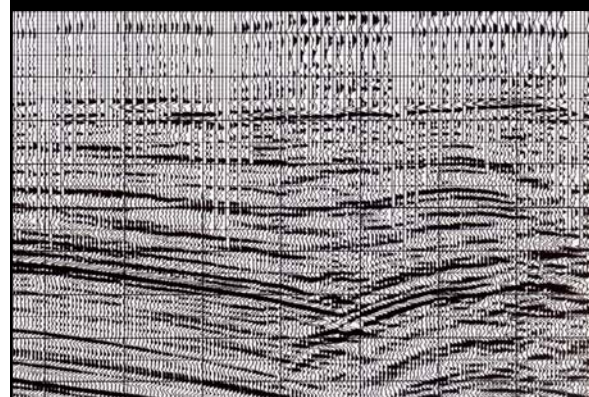
## Asymmetric Bins – linear features



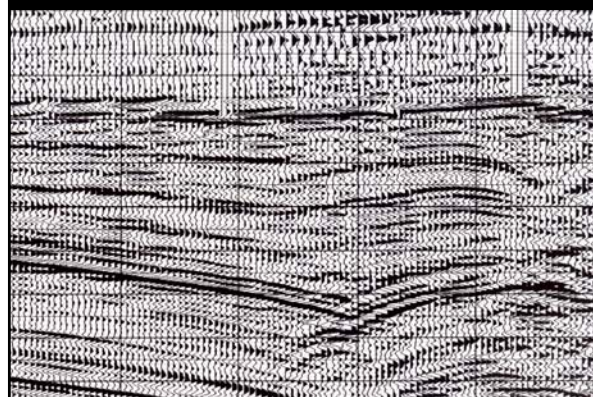
**We Must Allow for  
What We Don't Know !!!**



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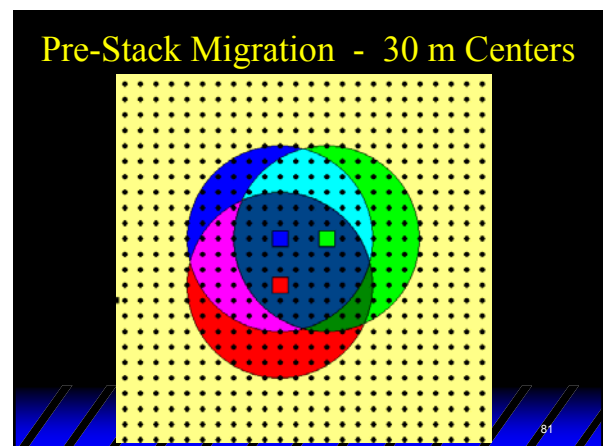
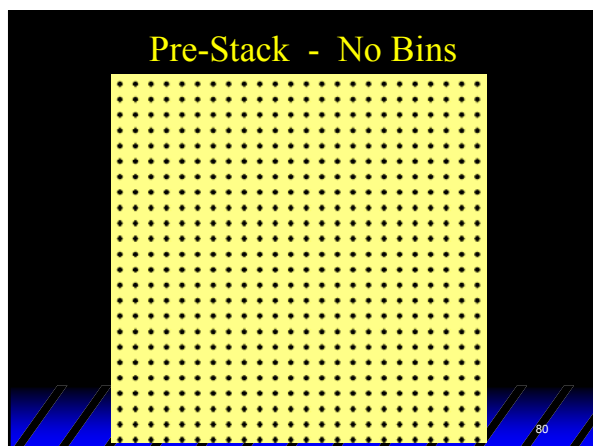
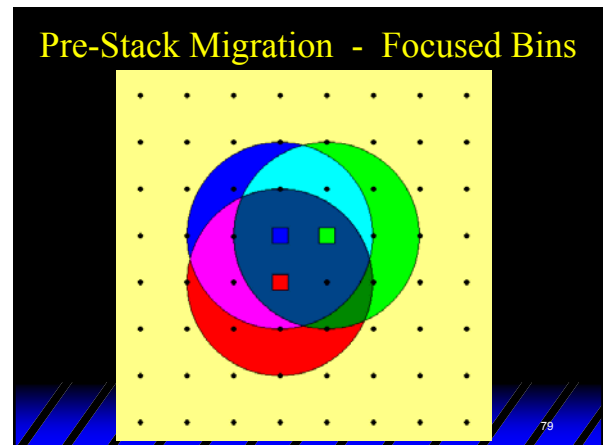
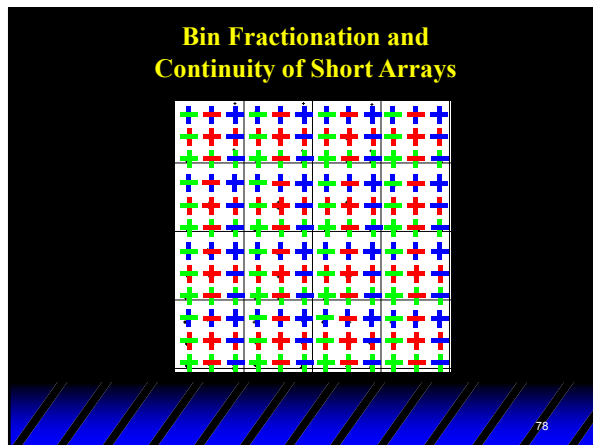
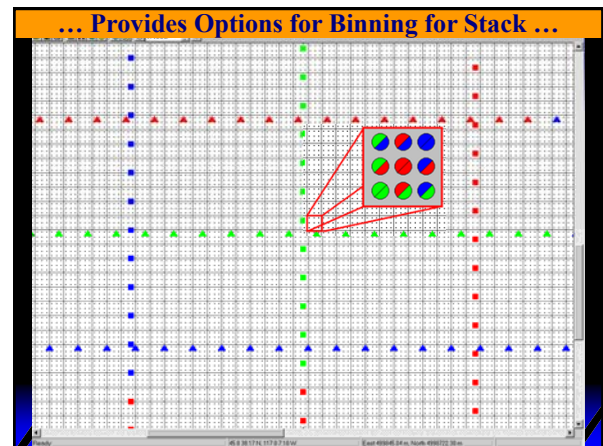
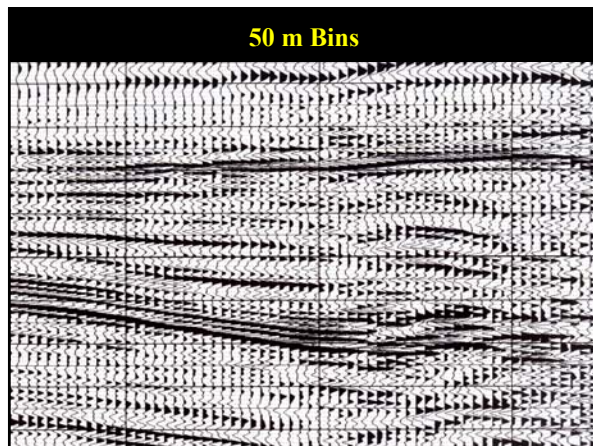
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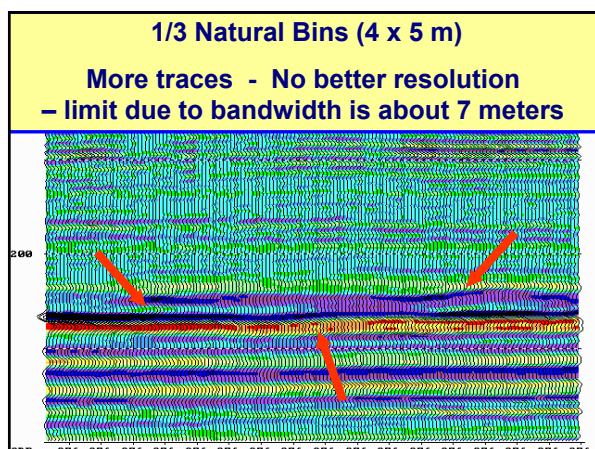
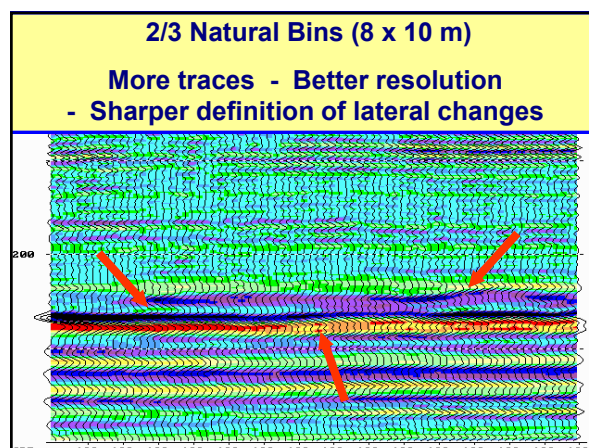
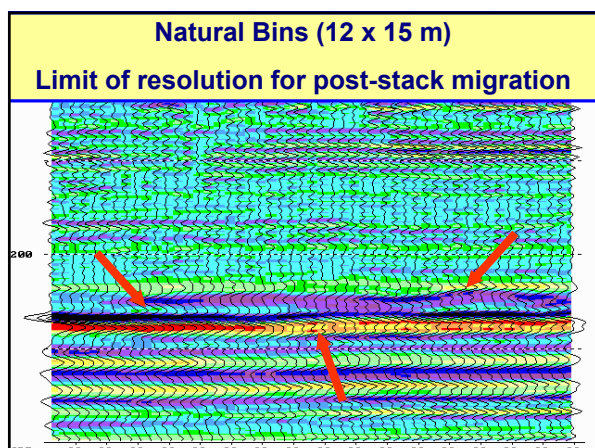


## 40 m Bins









## Conclusions

**Technical / Imaging differences amongst model types are subtle**  
**- Perturbation perhaps further minimizes differences**

**This evaluation did not introduce significant perturbation to Receiver line spacings**  
**- more investigation is required.**

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**Most Important Factors:**

**Preservation of the Wavefield**

**Statistical Diversity**

**Robustness under Perturbation**

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If you desire more information or would like a copy of this tutorial, please contact Norm Cooper or Yajaira Herrera

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