Seismic Modeling, Migration, and Velocity Inversion Blessing Texas

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Outline

Blessing Texas

- Synopsis
- 3D Data
- Velocity Model
- Migrations and Gathers
- Migration Depth Slices
- Coherence Cubes
- Summary



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Blessing Texas Approximate Location Map



Blessing Texas 3D survey location is SW of Houston and NE of Palacios

Synopsis

- Objective is fault terminated trap in the Frio
- Tertiary geological environment
- Trap found on 2D seismic
 - Early 1990's
- 3D obtained to improve recovery
- Provide best image of fault structures



Blessing Texas Fold Diagram



Blessing Texas 3D fold coverage.

Panerama Technologies Blessing Texas 3D Data

Blessing Texas Shot Location Map



Blessing Texas 3D shot coverage.

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Blessing Texas 3D Data

Blessing Texas Receiver Location Map



Blessing Texas 3D receiver coverage.

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Blessing Texas Typical Shot



Blessing Texas eight channel shot.



Blessing Texas Prepossessing

Preprocessing

- First break mute
- Band pass filter 6-40 Hz
- Two-second automatic gain control
- Three-dimensional spreading correction
 - Recovers spreading energy decay

Blessing Texas Velocity Model

Blessing Texas 3D Velocity Field



Final Blessing Velocity Model. Standard no-horizon 4 iteration MVA.

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Blessing Texas 3D Velocity Field



Final Blessing Velocity Model showing impact of major fault.

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Blessing Texas Kirchhoff PSTM



CDP 1410 at LIN 1410 together with PSTM of Crossline 1410. Gather on left show strong amplitude at top of Frio. Note lack of strong dipping events to the right of the base fault. Remember, the input were automatically gained so tack of AVO is not surprising..

Blessing Texas Kirchhoff PSDM



CDP 1410 at Line 1410 together with Kirchhoff PSDM of Crossline 1410. Smeared look of CDP gather is a display artifact caused by a large offset spacing. Note that this depth migration has preserved relative amplitude strength.

Blessing Texas Beam PSDM



CDP 1410 at Crossline 1410 together with Beam Stack Kirchhoff PSDM of Crossline 1410. Smeared look of CDP gather is a display artifact caused by a large offset increment. Dipping events appeared to be somewhat suppressed.

Blessing Texas Kirchhoff Migration



Kirchhoff 3D depth migration showing LINE 1410. Strong amplitude event sum the pay zone.

Blessing Texas Beam Migration



Beam-Stack 3D depth migration showing LINE 1410. Strong amplitude eventures is the pay zone.

Blessing Texas RTM Migration



RTM 3D depth migration showing LINE 1410. Strong amplitude event is the armorphy zone. Note improved resolution of this migration.

Blessing Texas Kirchhoff Migration



Kirchhoff migration and depth slice



Blessing Texas RTM Migration



Full two-way reverse-time migration and depth slice



Blessing Texas Kirchhoff Migration



Kirchhoff Depth Slice



Blessing Texas RTM Migration



Full two-way-reverse-time Depth Slice



Blessing Texas Kirchhoff Coherence



Kirchhoff coherence depth slice



Blessing Texas RTM Coherence



Full two-way-reverse-time coherence depth slice



Blessing Texas Kirchhoff Coherence



Kirchhoff coherence depth slice



Blessing Texas RTM Coherence



Full two-way-reverse-time coherence depth slice



Summary and Conclusions

Best fault resolution

- Somewhat dependent on scaling
- Depends on objective
- RTM has highest fault resolution
- RTM seems to provide best resolution overall
- Multiples remain in final images
 - Peg legs and not free surface
 - Difficult to remove with destroying primaries
- Velocity analysis straightforward
- Little evidence of anisotropy
 - Interpretation done on depth-to-time sections



Questions?

