Recommended Practice on Well to Seismic Tie

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Outline of the Presentation

I. Introduction and Objective

II. Well to seismic tie procedure

III. Helpful hints during well to seismic tie

IV. Summary
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IV. Summary
Why is a good well tie important?

- Align the synthetic trace computed from the well log and link to the corresponding events of the seismic section
  - More confidence on seismic interpretation
  - Impedance and inversion
Wavelet phase: time shift of logs

- Impedance log not correlated properly

- Shift the log (change the depth-time curve)
- Extract the wavelet
Theoretically, we can shift the wavelet instead of the log

NOT DESIRABLE:

(1) If there is more than one well, a single wavelet shift will not fix all the mis-ties.

(2) Doing inversion with the shifted wavelet will position the derived impedance at the wrong time.
Wavelet extraction

1. Use the well(s) and seismic to extract both the amplitude and phase spectra of the wavelet.

2. Use the seismic alone to extract the amplitude spectrum of the wavelet.
Why not always use the wells?

- Log correlation errors can cause very big phase problems

- Optimized log correlation before wavelet extraction using wells
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Extract statistical wavelet

Current correlation: -0.316
Max. correlation: 0.374 at -44ms time shift
Select best match events and bulk time shift

Current correlation: -0.316
Max. correlation: 0.374 at -44ms time shift
Select best match events and bulk time shift

Max. correlation: 0.354 at 8ms time shift

Current correlation: 0.062
Stretch-squeeze
QC sonic log velocity changes

Apply relative changes

Change depth-time curve only
Current correlation: 0.545 using statistical wavelet
Max. correlation: 0.545 at 0ms time shift

- Create Pwave_corr2 after log correlation
Option 1: Rotate wavelet after log correlation using statistical wavelet – useful if there is only one well
Extract wavelet using well

Option 2: extract wavelet using well after log correlation using statistical wavelet

Current correlation: -0.166  Phase: -110 deg.
Max. correlation: 0.711 at -6ms time shift
Correlation: 0.713 using wavelet from well 8-08
Max. correlation: 0.713 at 0ms time shift

Create Pwave_corr3 after log correlation
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Helpful hint 1:

- Create an interval velocity out of the depth-time P-wave_corr3
QC sonic log velocity changes

Interval velocity
Too much stretch-squeeze!
Helpful hint 2:

- Compare wavelet phase and shape from wells
Helpful hint 3:

- Create an arbitrary line containing all wells
Extract global wavelet

Current correlation: 0.661 using wells
Ave. wavelet phase: -56 deg.

➢ Create Pwave_corr_final after log correlation
Helpful hint 4:

- Compare final DT of wells
DT of 4 wells

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16-08
Geologic factors that can stand in the way of a good tie:

1. Structural complexity
2. Rapid lateral variations in velocity and reflectivity
3. Unconformable dips within the match gate
4. Finely layered sequences having severe impedance fluctuations
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Summary

1. Extract statistical wavelet and do log correlation before extracting wavelet from wells
2. Extract the average wavelet from multi-wells to fine tune log correlation
3. Create an Interval velocity from the Depth-time Pwave correlated
4. Compare wavelet phase and shape of all wells
5. Create an arbitrary line from all the wells
6. Compare DT of all wells