David C. Henley Joe Wong Peter M. Manning

A BRIEF LAPSE IN TIME: PROCESSING TIME-LAPSE MODEL DATA

Outline

- Two models
- Possible test variations—additive noise, seasonal variations, increased spatial sampling, missing data
- Processing steps
- Comparisons

BASELINE MODEL



MONITOR MODEL





Source gather from baseline model with no near-surface variations



Shot gather from baseline model with low-velocity surface layer, strong near-surface variations

Processing steps

- Multi-pass radial trace (RT) filtering
- Gabor deconvolution
- NMO correction
- 3 passes max-stack-power autostatics OR raypath interferometry
- CMP stack

Gabor decon, FX decon

Difference detection

- Stack baseline and time-lapse surveys and subtract
- Subtract baseline and time-lapse shots and stack
- Match filter analysis—not tested



Baseline model A—Brute stack—no statics applied



Baseline model A—static-corrected stack—max power autostatics



Time-lapse model B—static-corrected stack—max power autostatics



Stack difference—static-corrected time-lapse stack minus staticcorrected baseline stack—no random noise

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Stack difference—static-corrected time-lapse stack minus staticcorrected baseline stack—raw shot S/N = 1.0



Stack difference—static-corrected time-lapse stack minus staticcorrected baseline stack—raw shot S/N = 1.0—seasonal statics <u>simulated on time-lapse survey</u>



baselineA stack after raypath interferometry—random noise , S/N = 1.0 added to raw shots



Time-lapse B stack after raypath interferometry—random noise, S/N = 1.0 added to raw shots



Stack difference—time-lapse stack minus baseline stack after interferometric statics—S/N = 1.0 on raw shots

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Time (ms)

Stack difference—time-lapse stack minus baseline stack after interferometric statics—S/N = 1.0 on raw shots—seasonal statics simulated

Conclusions

- 2D elastic modeling is a fast and convenient way to explore detectability issues for timelapse surveys—many more possibilities than we show here
- Time-matching (including static correction) has the biggest influence on time-lapse anomaly detection, as long as acquisition and processing parameters are identical for two surveys

Acknowledgements

Peter Manning—for the use of his code
Joe Wong—for actually running it