

# CREWES NEWS

The Consortium for Research in Elastic Wave Exploration Seismology

## CREWES Presentations at the CSEG.

Time	Title	Authors	Room*
<b>Tuesday</b>			
1:30	Harsh imaging techniques for shallow high resolution seismic data	D.C. Henley	MH D
2:30	Depth imaging challenges	L.R. Lines	MH A
2:30	Simulation of the bulk modulus of porous media	C. Ursenbach	MH C
3:30	Finite-difference modeling with stability and dispersion corrections	P.M. Manning G.F. Margrave	MH C
<b>Wednesday</b>			
10:00	Constrained three-parameter AVO inversion and uncertainty analysis	J.E. Downton L.R. Lines	MH A
10:30	The AVO modelling volume	B. Russell et al.	MH A
11:30	Suppression of water-column multiples by wavefield separation techniques	Y. Yan R.J. Brown	MH C
11:30	Practical aspects of nonstationary wavefield extrapolation	Z. Yao et al.	MH D
2:00	Time-lapse seismic monitoring at Pikes Peak, Saskatchewan	I.A. Watson L.R. Lines	MH B
2:30	AVO analysis at Pikes Peak	J.E. Downton L.R. Lines	MH B
3:00	Complex seismic trace analysis and its application to time-lapse seismic (poster)	J.J. Zhang L.R. Bentley	EHF
<b>Thursday</b>			
8:30	Frequency domain methods for Vibroseis deconvolution	K.F. Brittle L.R. Lines	MH B
9:00	A lake-bottom cable seismic survey: acquisition and processing	R.R. Stewart et al.	MH C
9:00	Preventing noise alignment in cross-correlation	C. Ursenbach J.C. Bancroft	MH B
9:30	Walkaway VSP processing and Q estimation: Pikes Peak, Saskatchewan	C. Xu et al.	MH B

\* MH = Macleod Hall; EHF = Entrance Hall Foyer

Abstracts of these talks are available in PDF format at [www.crewes.org](http://www.crewes.org)

## In This Issue...

- **CREWES at the CSEG**
  - A timetable of presentations and where to find us!
- **Fighting monochromatic noise with spectral clipping**
  - Dave Henley's latest module for ProMAX
- **Synthetic seismogram tools improved**
  - Gary Margrave enhances the CREWES Matlab toolbox
- **Congratulations**
  - **Dr Chuck Ursenbach**
  - Fatherhood and a new role with CREWES
- **Student Welcome**
  - CREWES welcomes Ph.D. student, Jon Downton

## CREWES at the CSEG

CREWES is looking forward to meeting old friends and making new acquaintances at this year's CSEG.

We hope that, as well as stopping at our booth (#919), with the University of Calgary and the Fold Fault Research Project, you will manage to attend many of the talks by our students and research staff.

For your diaries, we have noted all the presentations and their authors in the timetable (left). We look forward to seeing you there.

## Fighting monochromatic noise with spectral clipping

The usual technique for dealing with traces dominated by monochromatic noise is trace killing, which leaves trace gathers unevenly spatially sampled. Another technique is to transform the individual traces to the frequency domain, and to apply a notch filter at the frequency of the noise. Notch filters can be difficult to use, however, since the frequency of the noise must be known very precisely; additionally, the filter itself, if aggressively applied, often results in undesirable artefacts.

An alternative approach that Dave Henley has developed (originally for use in the radial trace domain) is to automatically edit the amplitude spectrum, eliminating both peaks and notches that deviate more than a threshold amount from some "average" spectrum. This method, although it is non-linear, has the distinct advantage of requiring no knowledge of the frequency of the noise, and of simultaneously addressing any monochromatic noises present, as long as there is some separation in frequency between them.

A newly-implemented ProMAX module accomplishes this spectral editing or "spectral clipping" by transforming input traces to amplitude and phase spectra and comparing the raw amplitude spectrum point by point with the median spectrum. Values that deviate from the median by more than a specified threshold (12 to 18 dB for typical seismic data) are replaced by the corresponding median values, effectively "clipping" the peaks and filling the notches in the raw amplitude spectrum. An inverse transform back to the time domain completes the operation. If the median length and threshold are well-chosen, the spectral deviations corresponding to seismic signal are untouched, except only in the regions of the edited peaks and notches.

To show the effectiveness of spectral clipping, Figures 1 and 2 show the same paired shot gathers before and after then application of spectral clipping. Traces that appear to be nearly pure 60 Hz on the raw records contain legitimate seismic events after clipping. This technique is clearly a viable alternative to trace killing for these data.

Other circumstances under which this technique can be beneficial are in the presence of highly dispersive linear noise and on reverberations. Those interested in further information regarding this module should contact Dave Henley at [henley@crewes.org](mailto:henley@crewes.org).

## Student Welcome

CREWES extends a belated welcome to Jon Downton, who joined its roll of graduate students last year.

Jon holds a B.Sc. honours degree in Geophysics from the University of Alberta, Canada. He began his career in 1985 as a geophysicist at Suncor. In 1987, he joined Inverse Theory & Applications as a processor and remained with Landmark/I.T.A. until 1994, becoming Manager of Special Projects.

After joining Integra Geoservices as Vice President, upon Integra's acquisition by Core Labs, he was appointed Manager of Research and Development at Scott Pickford, also owned by Core Labs.

Jon is a co-author of the CSEG 2000 Best Paper. His research interests include the combined use of AVO and poststack inversion to estimate rock and fluid properties.

He is studying for his Ph.D. with Professor Larry Lines.

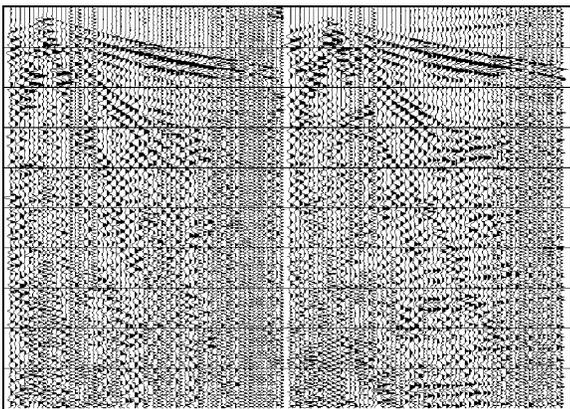


Figure 1: Raw shot gathers from Okotoks, Alberta, each having several traces heavily contaminated with 60 Hz pickup.  
Data: University of Calgary field school

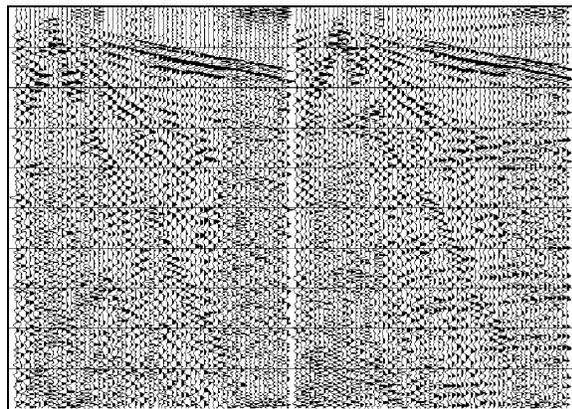
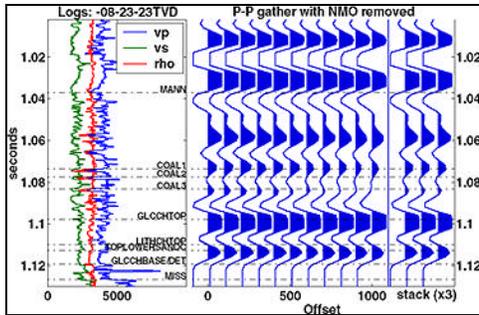


Figure 2: The same shot gathers after application of spectral clipping with a threshold of 12 dB. Note restoration of visible seismic signal on most traces.

## Synthetic seismogram tools improved



Those needing P-P or P-S synthetic gathers with realistic AVO effects should check out the latest tools that have been added to the CREWES Matlab toolkits. The Matlab toolkits include a number of facilities for creating synthetic seismograms of various types. Synth, a simple but accurate synthetic seismogram algorithm originally developed by Don Lawton and converted to Matlab by Gary Margrave, has recently received a significant upgrade. Synth creates P-P and P-S offset gathers from well logs. Based on raytracing and the Zoeppritz equations, it can compute the primary reflections from a great number of layers in only a few seconds. Among other enhancements, the new version plots the logs in time next to the gathers, implements an automatic mute, and has a more user-friendly interface. A number of bugs have also been fixed.

Synth is designed to work in conjunction with logedit, another Matlab program. Logedit provides a great deal of flexibility, allowing easy alteration of the logs to explore different scenarios. The logs are prepared and tops are picked in logedit and saved as an LAS file. Synth reads the LAS file and creates the gather.

The picture above shows a P-P model for one of the Blackfoot wells. The gather is displayed on the right, with the stacked trace repeated 3 times; the P-wave and S-wave velocity logs and the density log are on the left, in the same time scale as the gather. The formation tops are annotated.

To obtain the latest version of this software tool, download the CREWES Matlab software release from [www.crewes.org](http://www.crewes.org). Comments or questions regarding this software should be directed to Gary at [gary@crewes.org](mailto:gary@crewes.org).

## Congratulations



Congratulations to CREWES Research Geophysicist, Dr Chuck Ursenbach, who became the proud father of a baby boy this month. Mother and baby Adam, their third child, are doing well.

In an unrelated development, Chuck was also appointed CREWES NEWS' Technical Editor, heralding an expansion in the level and depth of our coverage. Watch for exciting new changes coming soon.

## Revised Contact Details

Readers wishing to contact staff and students should note that all CREWES usernames are attached to the [@crewes.org](mailto:@crewes.org) domain.

## Making Contact...

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