Processing and interpretation of 2D seismic data from Inglewood Park, Calgary, Alberta

Bobby J. Gunning*, Don C. Lawton
rjgunnin@ucalgary.ca

Abstract

Significant rainfall and rapid snowmelt occurred in June of 2013 in Southern Alberta. The largest flood, on record, of the Bow River and its tributaries was triggered from the heavy rainfall and snowmelt. Following the flooding event, several 2D seismic lines were recorded on a point bar near the intersections of the Bow and Elbow Rivers in Calgary Alberta. Several seismic data processing steps were used to attempt to create an image, representative of geology, of the subsurface beneath Calgary. The near surface was searched for signs of fluvial geomorphology and two major drape structures were identified from the seismic.

Figure: 1. The project area, Inglewood Park, in Calgary, AB. The study focusses on line 3. Image courtesy of Google Maps 2014

Processing

- Preprocessing (trace kills, preprocessing mutes, geometry)
- Amplitude corrections – time-variant scaling
- Static corrections
- Deconvolution
- F-K spectral noise filtering (ground roll removal and aliased refractions)
- Velocity analysis and NMO corrections
- Mute air-blast noise
- Residual statics
- stack
- FX deconvolution
- Post-stack time migration
- Vista Seismic Processing software was used

Interpretation

- The processed version of line 3 is shown below in figure 2
- The overall signal to noise ratio is quite poor in the section
- The high noise level is a result of conducting a seismic survey in an urban setting
- Note that peaks are black in the variable density plots below

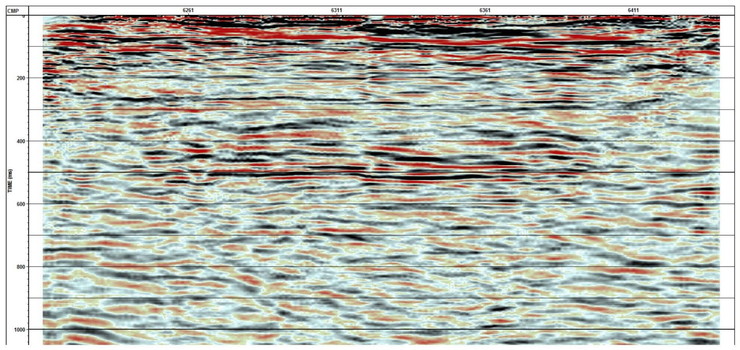

Figure: 2. Line 3 post-processing, first second of the record. Note the complex geomorphology in the near-surface. Black represents peaks.

- The first 100ms of line 3 is displayed below in figure 3
- Annotations 1 and 2 on figure 3 show where I interpreted seismic drape structures
- These drape structures may represent fluvual geomorphology but more geologic controls are needed to confirm this

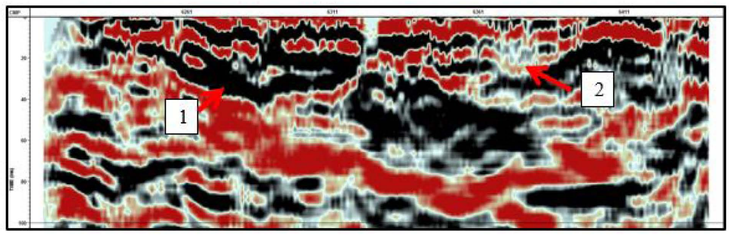

Figure: 3. The first 100ms of line 3, labels 1 and 2 indicate draping features.

Conclusions and Further Work

- A 2D seismic line shot in Inglewood Park in Calgary, Alberta was processed and interpreted
- The near surface was found to be complex, and two seismic drape features were identified
- No major conclusions can be made without the assistance of additional geologic information
- Future studies may include processing and interpretation of the other Inglewood seismic lines
- Special thanks to all of the CREWES sponsors, faculty and students

Bibliography

- Abma, R. and Claerbout J.F., (1995) *Lateral Prediction for Noise Attenuation by t-x and f-x Techniques* Geophysics, 60, No. 6, pp. 1887–1896
- Ronen, J. and Claerbout J.F., (1985) *Surface consistent residual statics estimation by stack power maximization* Geophysics, 50, No. 12, pp. 2759–2767
- Lindseth, R.O., (1979) *Synthetic sonic logs - a process for stratigraphic interpretation* Geophysics, 44, No. 1, pp. 3–26
- Krebes, E.S., (2014) *GOPH 551 - Seismic Theory: course notes* Department of Geoscience, University of Calgary
- Margrave, G.F., (2014) *GOPH 517 - Methods of Seismic Data Processing I: course notes* Department of Geoscience, University of Calgary
- Margrave, G.F., (2014) *GOPH 517 - Methods of Seismic Data Processing II: course notes* Department of Geoscience, University of Calgary
- Yilmaz, Ö., (2001) *Seismic Data Analysis* Society of Exploration Geophysicists, Volume 1, Tulsa OK
- Lamphier, G., (2013) *Alberta Flood Tab Could Run as High as $5B: Too Early for Insurer of 278 Municipalities to Estimate Costs* Edmonton Journal, Retrieved June 25, 2013
- Musser, K., (2007) *Saskatchewan River Map*