SEISMIC REFLECTION METHOD MADE IN OKLAHOMA

Roderick Perez
100 E Boyd Street, Sarkeys Energy Center, Room 810
Norman, Oklahoma 73019
roderickperez@ou.edu

While the development of geophysics has been inspired by the curiosity of man to better understand the world in which we live, the motivation behind its creation was driven by the brutalities of war. Pioneers and visionaries, such as Reginald Fessenden and Thomas Edison, guided J. C. Karcher to apply his seismic reflection knowledge gained during World War I to map geological structures. The goal of this research is recreate and honor Karcher's second seismic reflection acquisition, using his original parameters acquisition parameters.

The 20th century opened a broadband of opportunities in geophysics, led by many creative minds whose groundbreaking work would push geophysics to a new level. Canadian-American Reginald A. Fessenden is well known to be the first person to broadcast words and music over radio waves in 1906. But few people know that in 1913, he invented a seismic instrument that was used to record both refractions and reflections. Using a mechanical oscillator and microphones, his device measured deviations in reflection and refraction waves to identify anomalies in the ground. Research was being advanced on both sides of the battlefield, and history credits German Ludwig Mintrop with developing the first seismic refraction field instrument, though the original patent is held by Fessenden.

With the shadow of war still present, John Clarence Karcher is the one who finally made the reflection method reality. The first seismic reflection experiment was held in Oklahoma City, in 1921. The basic idea was to set off a group of dynamite charges and record seismic waves with several receivers located at different distances from the source. Unfortunately the data recorded in Oklahoma City did not reveal any structure, and there was no way to geologically verify the interpretation at the location site.

Once the Oklahoma City shoot made history, the reflection crew needed to find a site where they could prove the concept of recording reflections. Dr. Daniel W. Ohern suggested a location in the Arbuckle Mountains in southern Oklahoma, where a known buried reflector was located with a good impedance contrast. The location was described as Vines Branch Creek, where the Viola limestone is overlapped by a gentle wedge of the Sylvan shale starting at the creek and thickening eastward up the slope. This location was also chosen due to the differing rates of dip of the Viola limestone and the overlying Sylvan shale.

In the original acquisition experiment, nine shots (dynamite) and nine geophone locations were surveyed (100 ft intervals). The film records were timed out, and using the swinging arcs method of migration, the results were used to calculate the slope of the Viola lime beneath the Sylvan shale. Based on geological information, the results were found to be in good agreement with the dip slope displayed by the seismic profile.

Before going into the field, the history behind the men and their work needed to be gathered, dissected and put back together to understand their complete accomplishment. All available historical documentation was gathered from libraries, internet sources and museum documentation/artifacts. Then original acquisition parameters were loaded into ray tracing and wave equation modeling software packages in order to recreate and validate the initial results obtained by Karcher. Afterward, different seismic acquisition parameters were tested using additional channels while retaining a single source shot.

In order to recreate the same conditions described by Karcher in his field notes, several geological field trips to the Arbuckles were necessary. For security reasons, shooting with dynamite as the primarily source was discarded. Using the same migration technique used by Karcher, the new seismic profile was compare with Karcher's original profile from 1921.

In future seismic acquisitions alternative seismic sources will be tested, such as the sledge hammer, the Betsy gun, and the gas piston driven (GDP) source, in order to evaluate their penetration power and their frequency content. Also different acquisition arrays, previously tested in the seismic modeling software will be used.

We hope that these results carried out 80 years after Karcher's original seismic acquisition honor the memory of one person who gave a new meaning to the word geophysics, and inspire new generations of geophysicists to invent and develop new technologies but never forget the people and the events who have changed history.

LESTER ARKANSAS' FIRST OIL DISCOVERY (ALMOST)

Raymond P. Sorenson
1912 S. Cheyenne Avenue, Tulsa, OK 74119
sorensonrk@sbcglobal.net

During the years 1909-1911, three exploratory wells were drilled on the lands of the Lester Mill Company, northwest of Camden in Ouachita County, Arkansas, encountering multiple shows of oil and gas in Upper Cretaceous sandstones. The Oil & Gas Journal covered the progress of the first 2 wells, and the third well bailed 5.5 barrels of oil in 8 hours, prompting a