



Comparison of two seismic sources during shallow seismic survey in coal mine Kovin

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A high-resolution shallow seismic reflection survey was carried out in the southern Banat region, Serbia. The survey area is located in the western part of the field "A" coal mine Kovin, near the riverbank of Danube. The aim of the survey was to investigate possibility to define depth and thickness of the coal layer and to detect and map eventual faults in the shallow subsurface. During the investigation we have compared two seismic sources, vibroseis and seismic caps in shallow holes. On the base of the previous geological works, the coal is upper Miocene age. Expected depth to the top of the main coal layer is from 22 to 27 m and expected thickness is from 9 to 12 m. The upper part of the section includes layers of the gravel and sand, Quaternary age. Thickness of the gravel sequence is from 10 to 15 m, thickness of the sand layer is about 10 m. Beneath the coal layer mainly sands with a clay content and the second thin coal layer are identified. Surface elevation is between 69 and 71 m. The elevation of water table is 68 m. The coal sequence gently subsides from the east to the west. The experimental seismic line was located in the protected part of field "A", along the outer part of dike. Detecting shallow reflectors requires the use of high frequencies. Acquisition parameters for vibro survey were: type of vibrator IVI, Y 1100, number of vibrators 1, sweep length 5 s, number of sweeps 5, sweep frequency 20 - 250 Hz, instruments I/O system one, number of channels 150, sampling interval 1 ms, record length 1 s, receiver spacing 1 m, source spacing 4 m, fold 18, offset range 4-78 m. The depth of the coal layer is estimated on approximatively 25 m (30-40 ms). Estimated thickness was about 10 m. Correlation with the existing wells was not satisfied, and it was necessary to get seismic data of higher resolution. Experiment was repeated, and an energy source was now seismic caps in shallow holes (0.5 m). Acquisition parameters were: instruments SERCEL 408XL, number of channels 120,

sampling interval 0.5 ms, record length 1 s, receiver spacing 1 m, source spacing 4 m, fold 15, offset range 2-61 m. The data were processed on a IBM cluster system using a commercially available processing software. As for many shallow seismic reflection data sets, shot gathers were contaminated with high-amplitude, source-generated noise (air waves, ground roll). After applying spike deconvolution and spectrum balancing on records amplitude spectrum is much broader and flatter. By balancing all the spectral components to the same level, the signal to source generated noise ratio has become higher. Comparison of two seismic sections recorded with two different energy sources presents that we have got broader spectrum in the case of seismic caps in shallow holes (8-500 Hz) than for vibro (20-250 Hz). Correlation of seismic data with the well data was satisfied. The seismic data quality and resolution is very satisfactory and it is possible to define depth and the thickness of the coal layer with greater certainty.