P-wave reflections in 3-D model of coal basin with boulders

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This paper is devoted to the computation of reflections in 3-D model of coal basin with four boulders located in the upper bed of the coal seam. This model roughly represents a part of a lignite basin at the Domenico site in Central Greece (A. Tselentis, pers. comm.).

The model is composed of a low velocity layer, upper bed, four boulders, coal seam and bottom layer (see Fig. 1 and Tab. 1 for details). Fig. 1 shows approximately the horizontal projection of the model. The coal seam is dislocated by two faults. Boulders are represented by spheres with approximately 12 m diameter. P wave velocity of boulders is twice greater than the velocity in the surrounding upper bed.

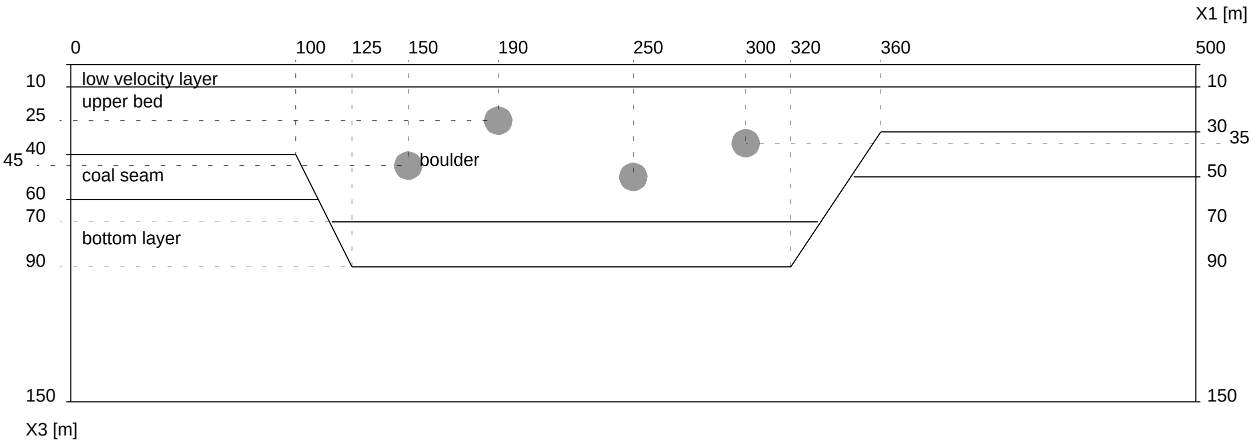

Figure 1. Horizontal projection of the coal basin model.

layer	*P wave velocity (m/s)*
low velocity layer	500
upper bed	2000
coal seam	1700
bottom layer	2000
boulders	4000

Table 1.

Fig. 2 shows the top view of the model with the measurement geometry and boulders. Four paralel measurement profiles at 20 m distance were used. There were 126 receivers with 4 m separation on each profile. Distance between shotpoints was 50 m (see Fig. 2).

All two point-rays in the model were determined by means of the shooting method using MODEL and CRT subroutine packages (Červený, Klimeš & Pšenčík 1988, Bulant

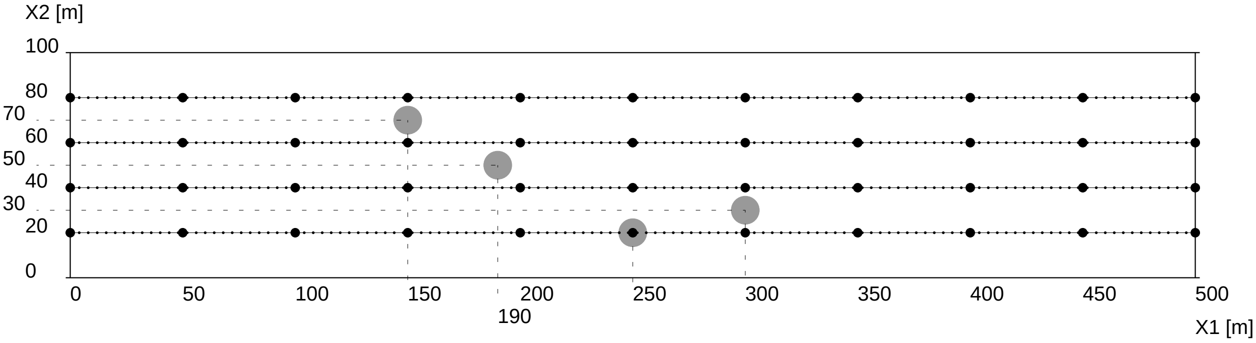

Figure 2. Top view of the coal basin model. Big dots represent boulders, medium dots represent shotpoints and small points represent receivers.

1996). Ray paths and travel times of seven P wave codes (reflection-transmission) were computed for each shotpoint and four profiles of receivers. Direct reflections and some multiple reflections were computed in low velocity layer, upper bed and coal seam. To find 121 252 two-point rays for the described measurement geometry more than 6.5 million rays have to be calculated.

Dislocated coal seam causes time gaps and lags at ray paths and travel time curves of selected P wave reflections (see Fig. 3). Difracted waves should be computed by additional method. There was found a very small number of rays contacting the boulders.

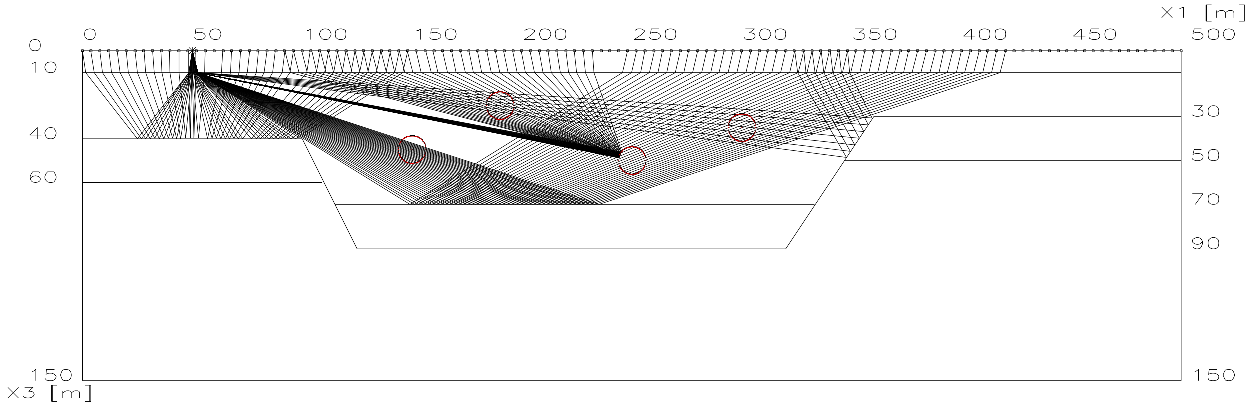

Figure 3. Horizontal projection of the coal basin model with the example of computed ray paths.

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