Kontinentales Tiefbohrprogramm der Bundesrepublik Deutschland

Erbendorf, Shallow Refraction Seismic
Stümpel, Rabbel, Steuernagel (Kiel)

Problem:
In the close vicinity of the KTB-location "Oberpfalz" the near surface distribution of seismic velocities and refractor dephts was to be mapped.

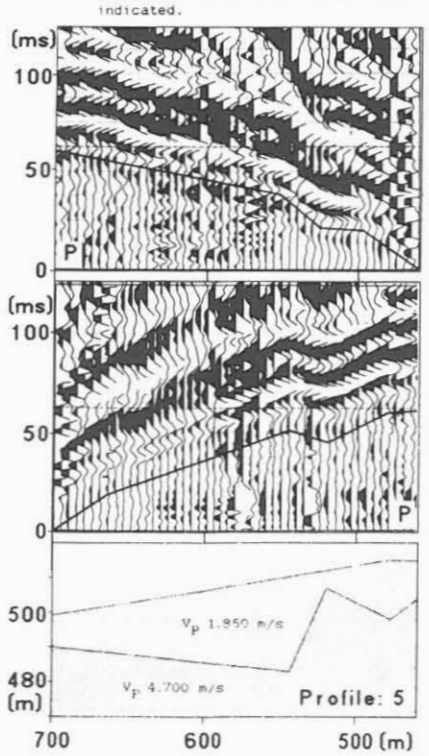
Field equipment and configuration:
The shallow seismic measurements were carried out on 6 crossing profiles (Fig. 1a and 1b):

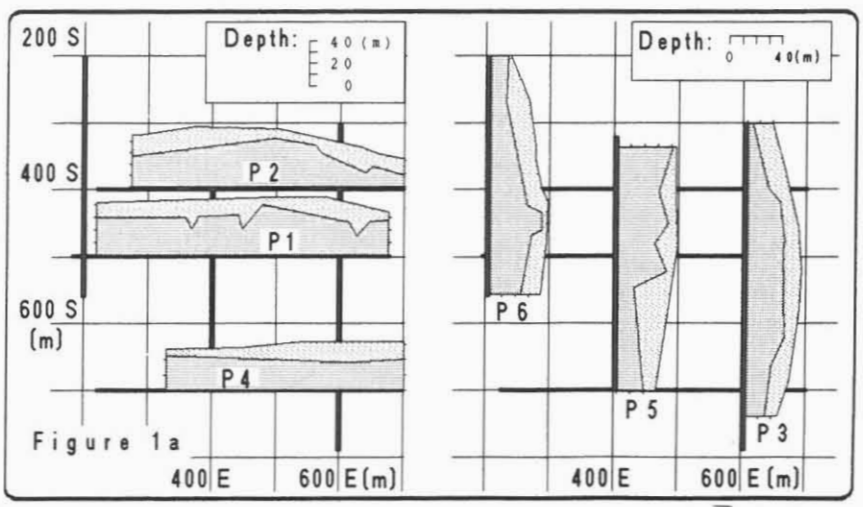
Geophon spacing	: 5 m
Registration	: 24 channels, digital
Source	: P- and SH-pneumatic hammer
Spread length	: 120 m or 480 m
Coverage	: 2 - 4 spreads

Data and method of interpretation:
Both P- and S-wavefields show a lot of pronounced traveltime anomalies. The traveltime anomalies originate either from undulation of the refractor topographie or from lateral velocity variations or from both. Distinguishing between these different possibilities would require a detailed mapping of the uppermost velocities. The interpretation is based on the assumption of a two layer medium with smooth velocity variations. It was performed by ray tracing.

Results:
With regard to the crossing points of the profiles a consistent interpretation of the P-wave data was obtained by assuming constant velocities (V_P= 1850 m/s and 4700 m/s) and a considerable refractor topography. Keeping the latter one constant, the S-wave data are fitted by introducing smooth lateral V_S-variations for the overburden (V_S= 670 - 960 m/s and 2475 m/s). The low V_P/V_S-ratio of 1.9-2.8 of the top layer indicates that its material is not a watersaturated sediment but weathered hardrock. Considering the velocity uncertainty the refractor topography could easily translated into lateral velocity variations of the top layer. However, this would not affect the V_P/V_S-ratio and the drawn conclusions.

Fig. 3: Example of traveltime anomalies
top : P-wave seismogram section
middle : reversed shot section
bottom : seismic model
velocities and computed travel times indicated.





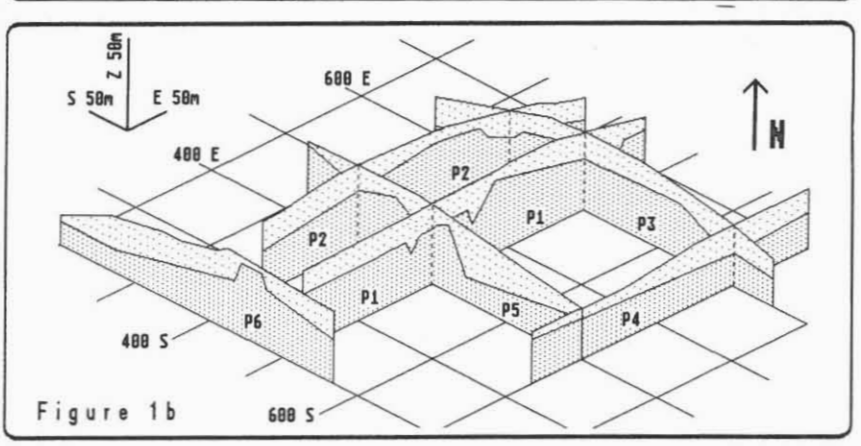


Fig. 1a/1b: Location of seismic profiles and interpretation results
top layer V_P= 1850 m/s,
bottom layer V_P= 4700 m/s;

Fig. 2: Typical seismic registration
top : P -wave seismogram section
middle : SH-wave seismogram section
bottom : seismic model
velocities and computed ray tracing travel times indicated.