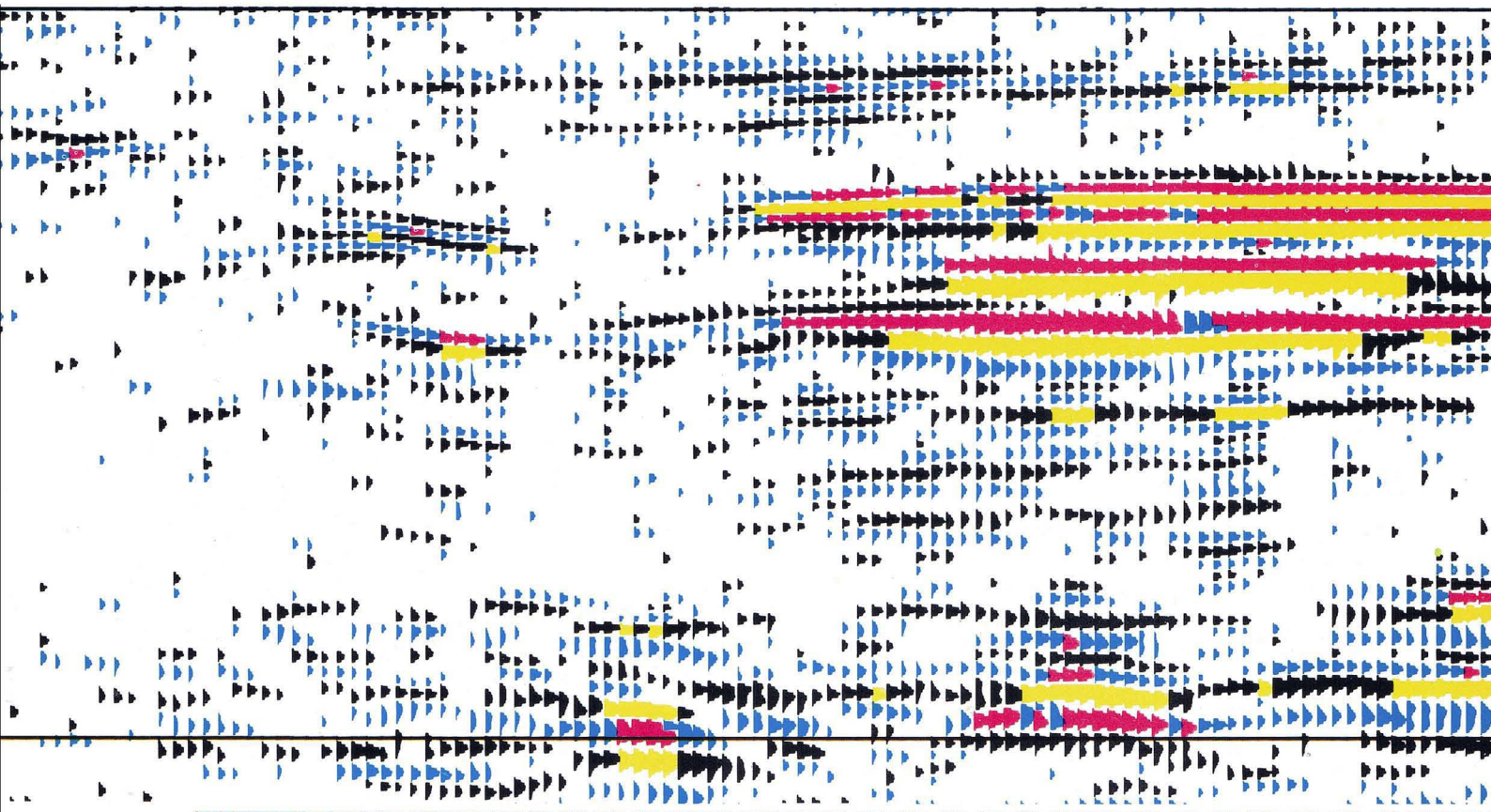
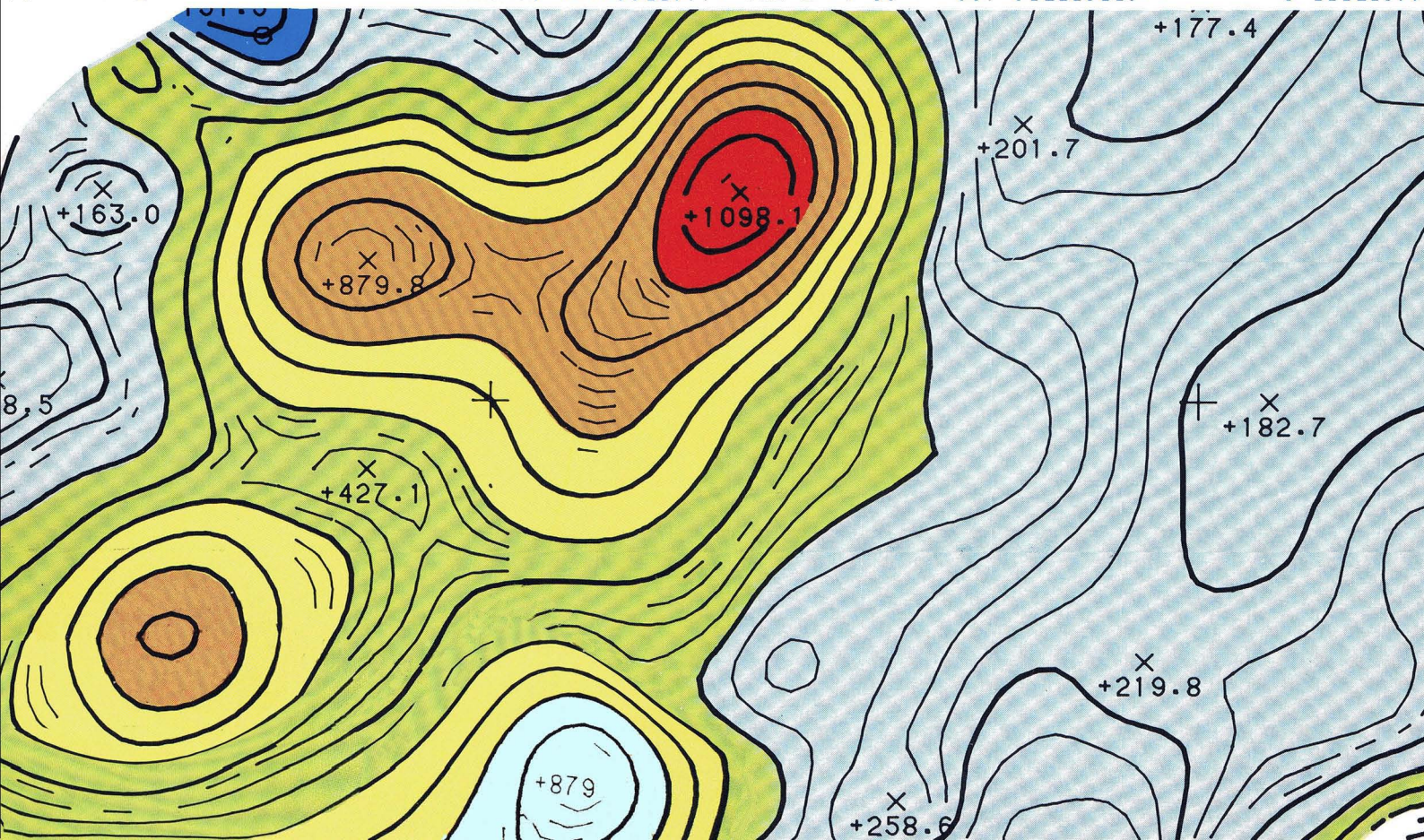
PRAKLA-SEISMOS INFORMATION No.10

Real Amplitude Processing





Real Amplitude Processing finds application in

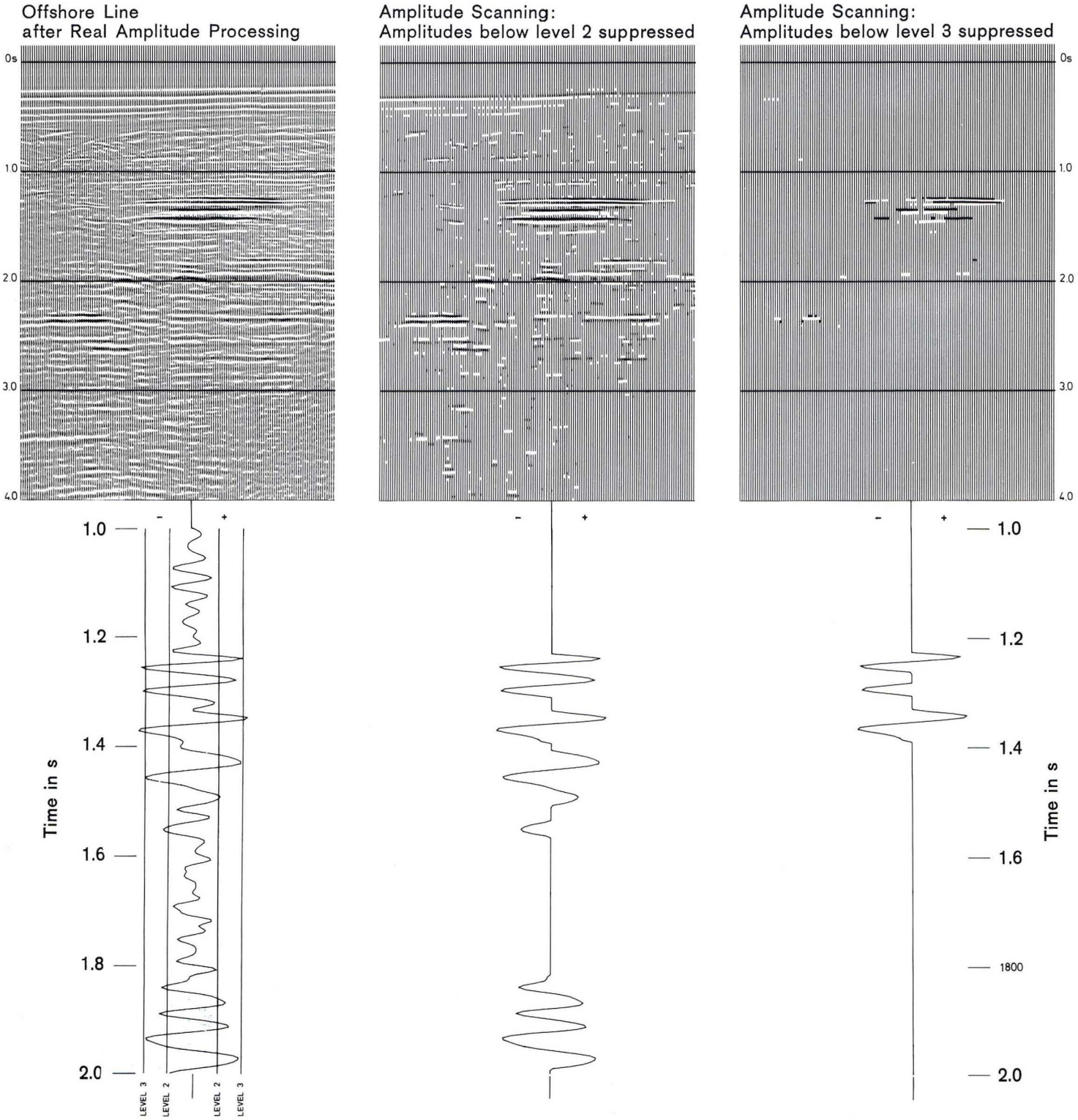
- explosive and non-explosive seismic methods
- Offshore, onshore and underground surveys as well as for vertical seismic profiling

Real Amplitude Processing is carried out routinely according to the flow diagram shown on the back cover. During Real Amplitude Processing the recorded amplitudes are processed without gain distortion. With the help of **Amplitude Decay Curves** (see fig. 2), the **process WAMP** compensates for losses due to spherical divergence, transmission and/or absorption. Thus, comparison of amplitudes is made possible both in the horizontal and vertical direction.

The amplitude relationships, representing relationships of reflection coefficients, are retained throughout the processing sequence up to the final display. In many cases conclusions may be drawn about the magnitude and sign of reflection coefficients, so that the acoustic impedance may be derived and displayed.

Interpretation of real amplitudes is facilitated by **Amplitude Scanning,** by means of which all amplitudes can be assigned quantitatively to selected amplitude domains. Such amplitude domains can be tied in to corresponding bore hole surveys. The principle of Amplitude Scanning is presented in fig. 1

Fig. 1: Results of Amplitude Scanning, the principle being shown by the single traces below



Programs for the **investigation of amplitudes in small gates** are of great importance for more sophisticated processing. Thus, it is possible to call up, in arbitrary gates, each trace with regard to certain amplitude values and to present these according to size and time. One application of this method is for instance that amplitude comparisons between two horizons can be carried out.

Another application is shown by the example below:
The reduction of amplitudes was based on surveys with a reference geophone and was necessary due to a technical energy variation.

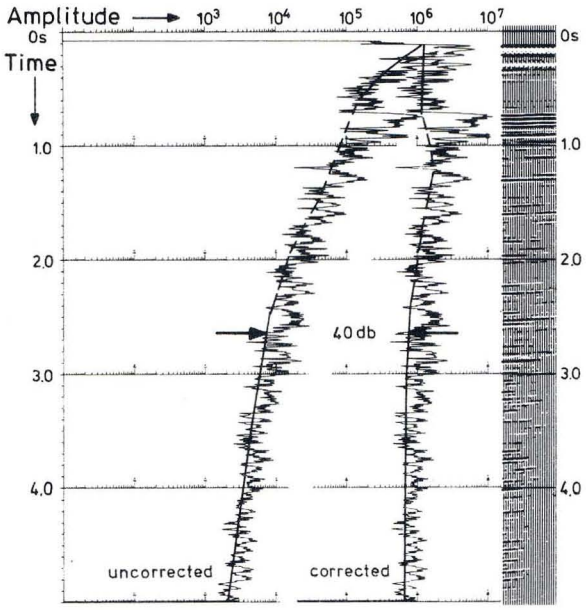


Fig. 2: Amplitude Decay Curve, uncorrected and after correction for Spherical Divergence, for the presented real amplitude processed seismogram

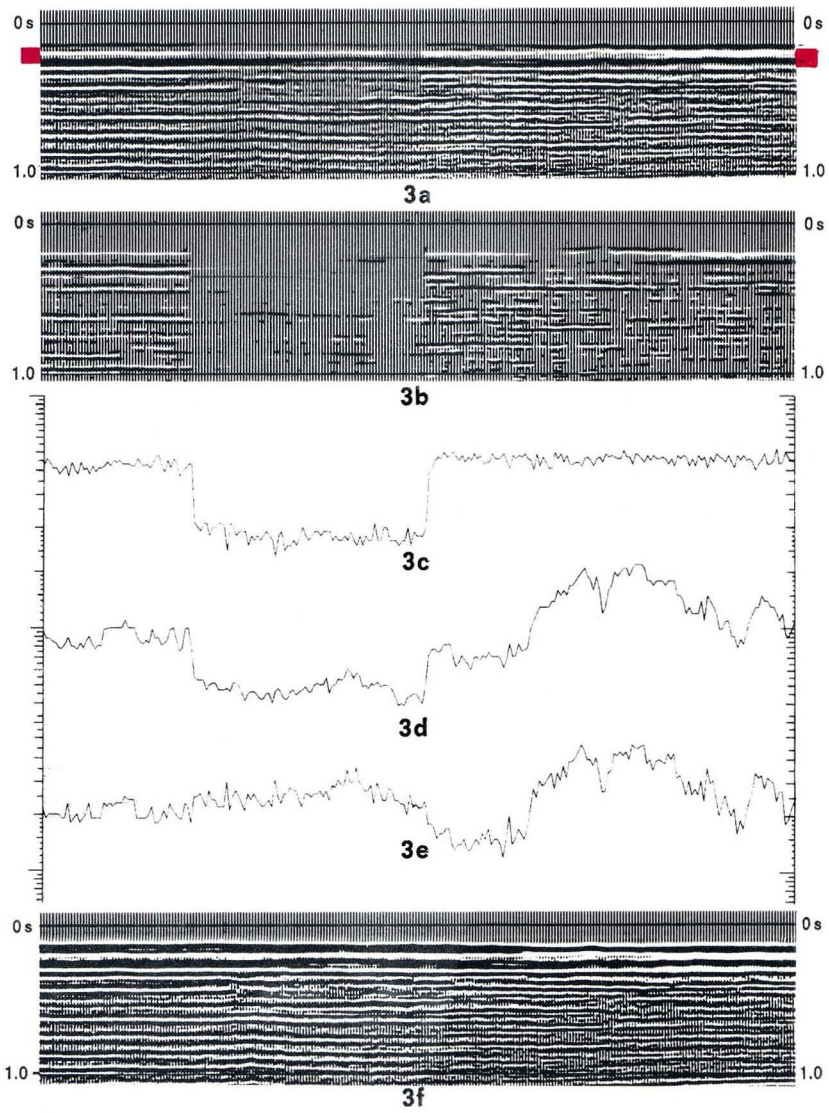


Fig. 3a: Offshore line after Real Amplitude Processing (note: low amplitudes in the left part)

3b: Amplitude Scanning: low amplitudes supressed

3c: Amplitudes recorded at the reference geophone (log. scale)

3d: Average amplitudes within gate, shown in fig. 3a in red.

3e: Reduced average amplitudes (corresponding to amplitude relationship of 3d to 3c)

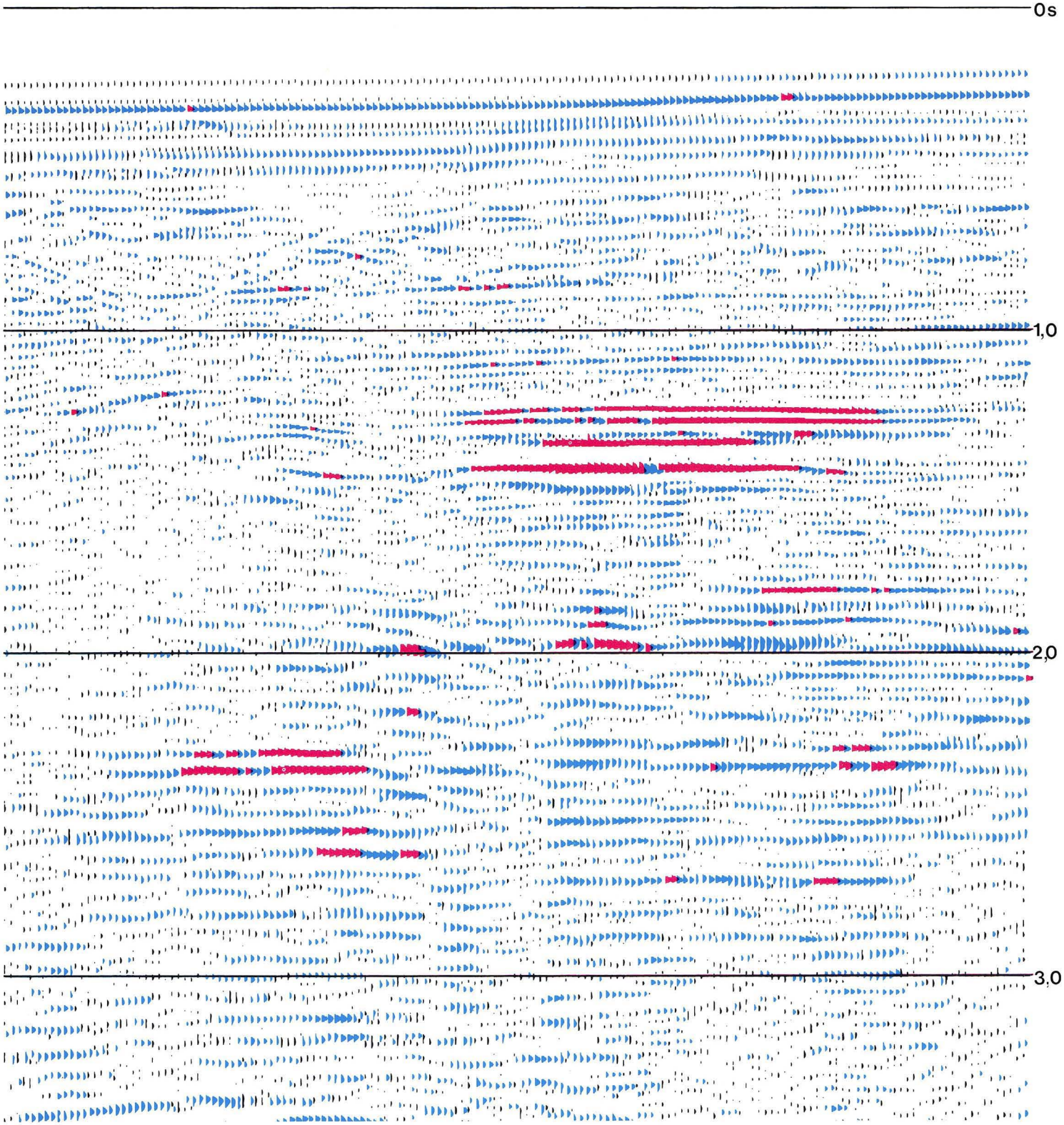
3f: Reduced amplitude presentation of fig. 3a

Amplitude Studies

Using our scanning method it is possible to select amplitude values for any given pair of levels independent of the sign. A corresponding detailed amplitude presentation enables the reproduction of the real amplitudes to any desired accuracy. Colour presentation available.

Fig. 4: Scaled Amplitude Presentation of RAMP-Stack
Colour Presentation of positive amplitudes

Amplitudes up to level 2:	black
Amplitudes between levels 2 and 6:	blue
Amplitudes above level 6:	red

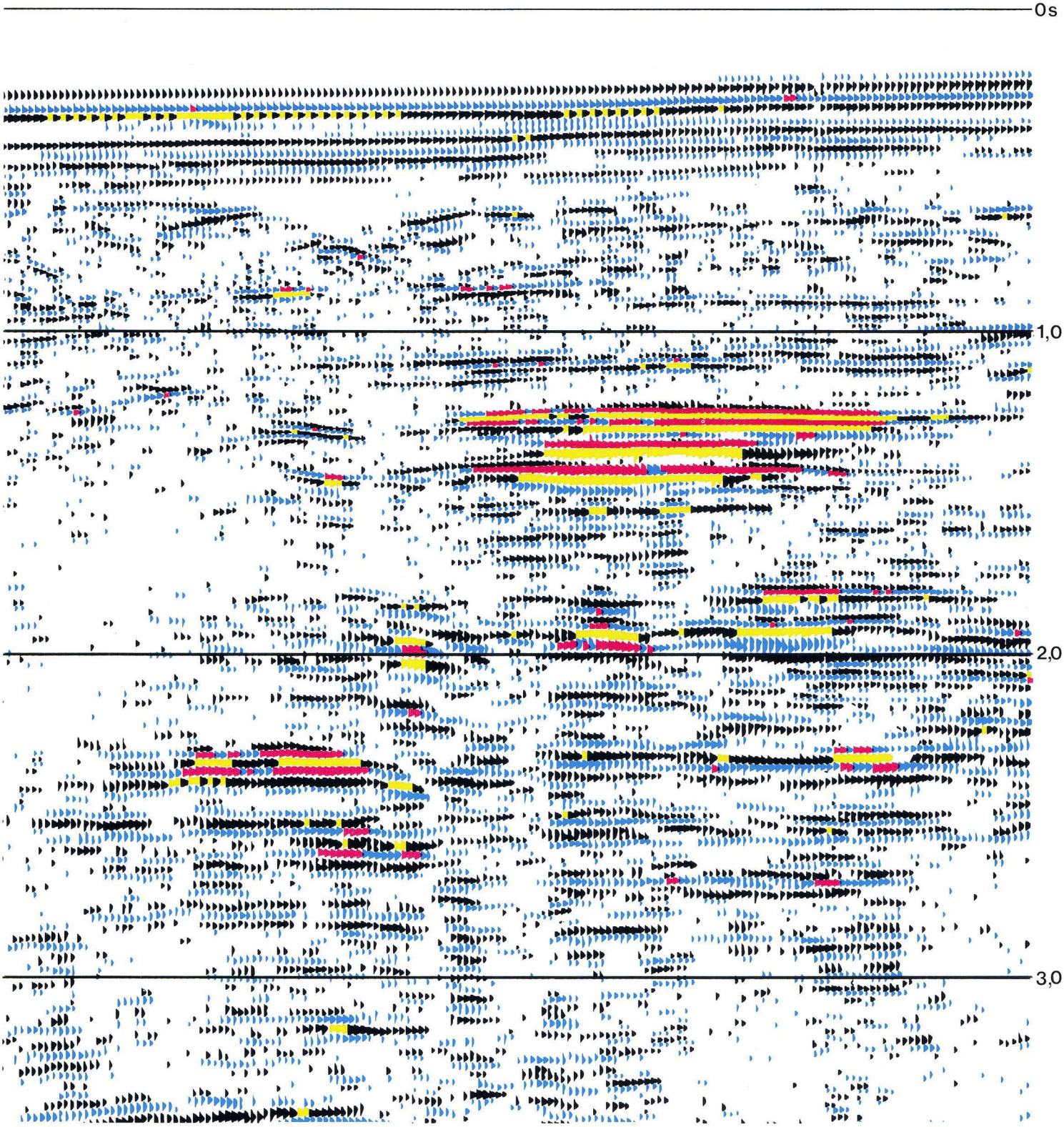


Reflections can be plotted, instead of as a sequence of peaks and troughs, as peaks of different colours. Consequently a clear statement can be made as to whether the peak or trough of a reflection is larger and whether a reflection has a positive or negative sign.

Fig. 5: Scaled Amplitude Presentation of RAMP-Stack
Colour Presentation of positive and negative amplitudes

	positive Amplitude	negative Amplitude
Amplitudes between levels 2 and 6:	blue	black
Amplitudes above level 6:	red	yellow

Amplitudes below level 2 are supressed.



The program is similar to that of offshore surveys. Differences concerning technical and geological energy variations on the transmitter- and receiver-side (different charges, different ground coupling, etc.) need an additional correction with **process WABS.**

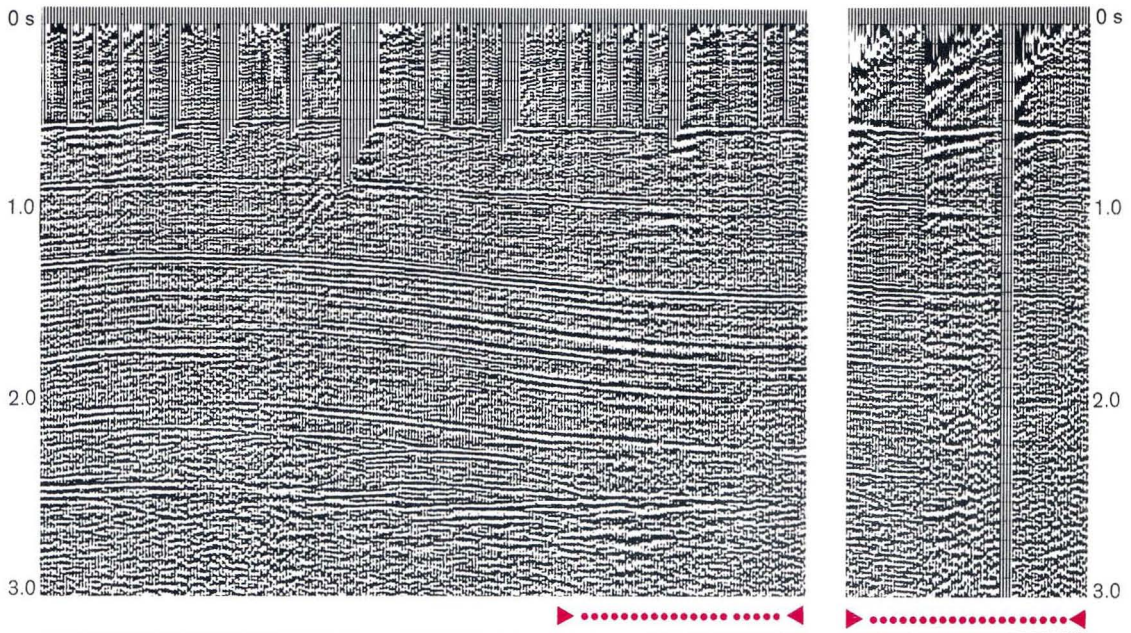
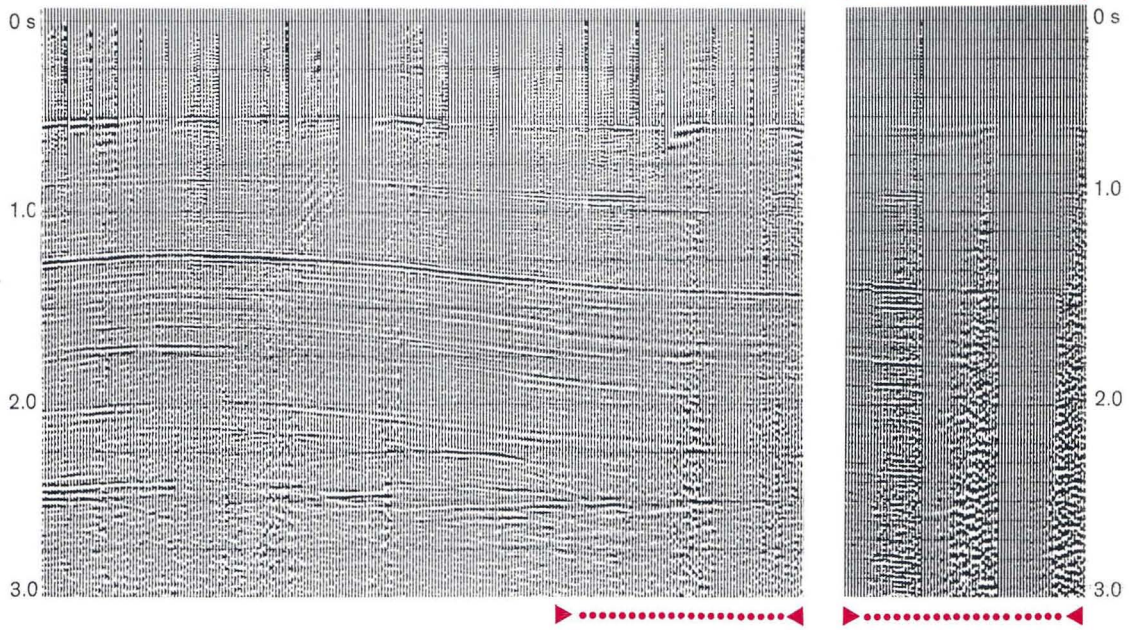
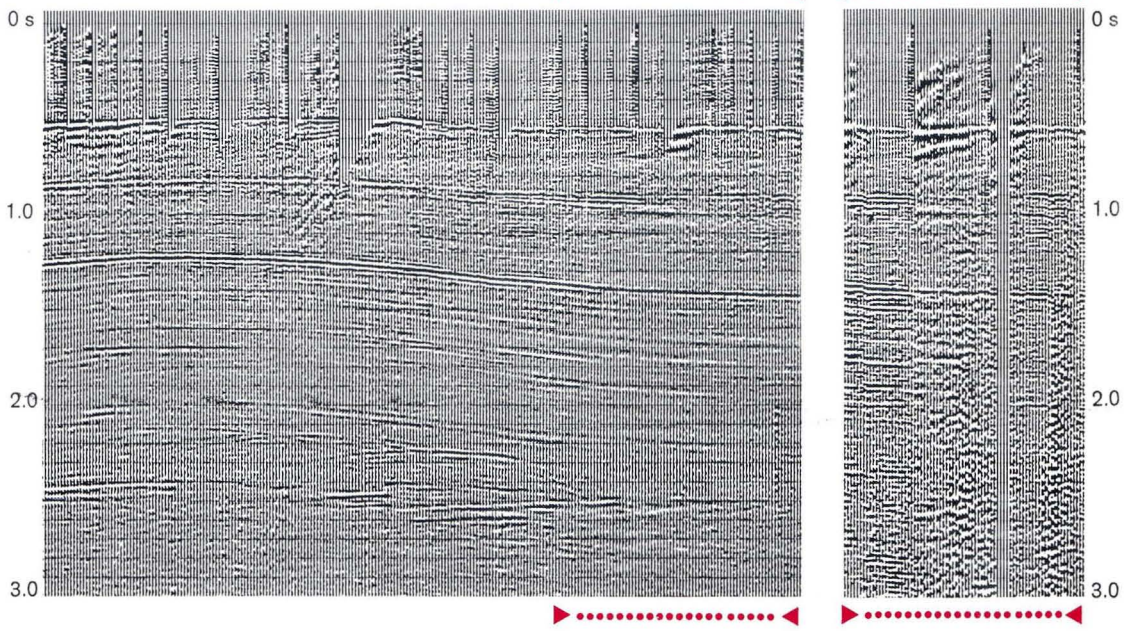


Fig. 6a:
Conventional Stack and 3 corresponding single seismograms



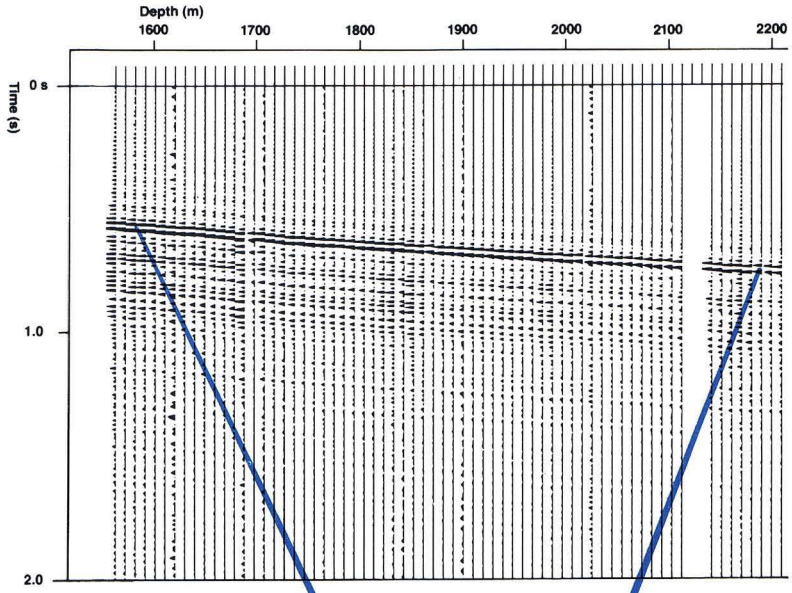
6b:
Stack After Real Amplitude Processing using the Process WAMP (Compensation for spherical divergence, transmission losses, and absorption, according to slightly changing amplitude decay curves)



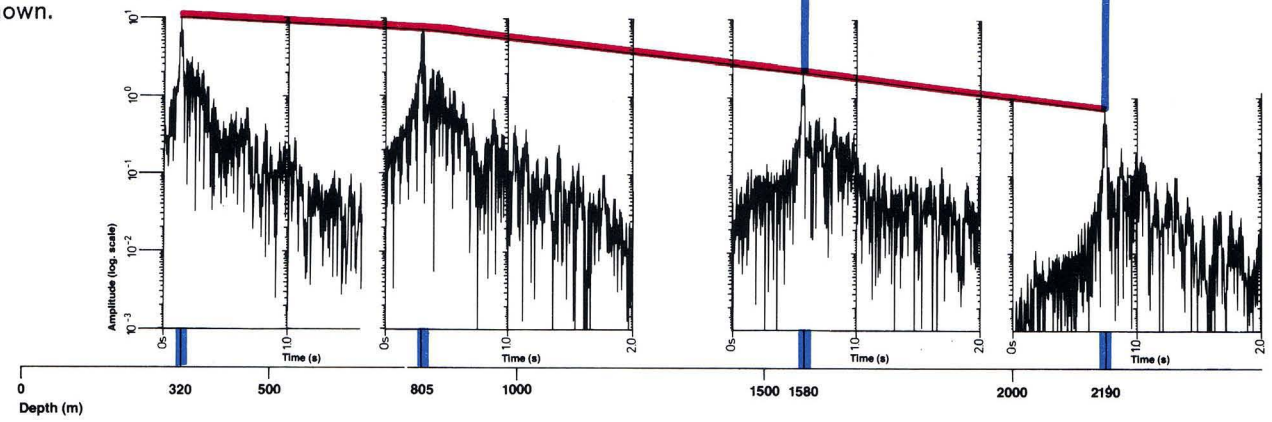
6c:
Stack After Real Amplitude Processing using processes WAMP and WABS (Compensation for spherical divergence and for transmission losses and absorption as well as for differences in shot energy, geophone coupling, and instrumental influences)

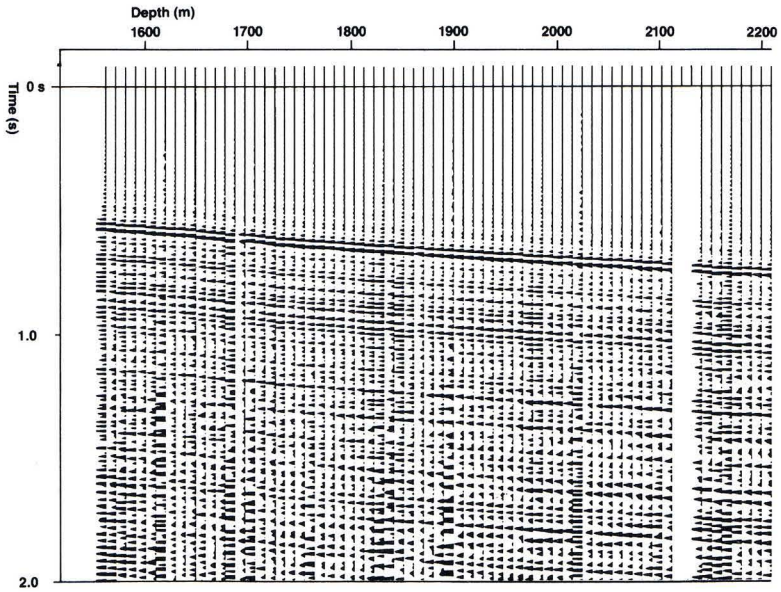
Even in vertical seismic profiling more information can be made available, when Real Amplitude Processing is carried out. Only in this case is e. g. a determination of attenuation-coefficients as an important mineral parameter possible. For vertical seismic profiling depth- and time-dependent amplitude losses have to be taken into consideration.

Fig. 7a:
Result of vertical seismic profiling without any amplitude correction



7b:
Amplitude Decay Curves for four selected traces in depths of 320 m, 805 m, 1580 m, 2190 m. Note the clear amplitude decay (red) within the four first breaks shown.





7c:
Result of vertical seismic profiling corrected for time- and depth-dependent residual attenuation

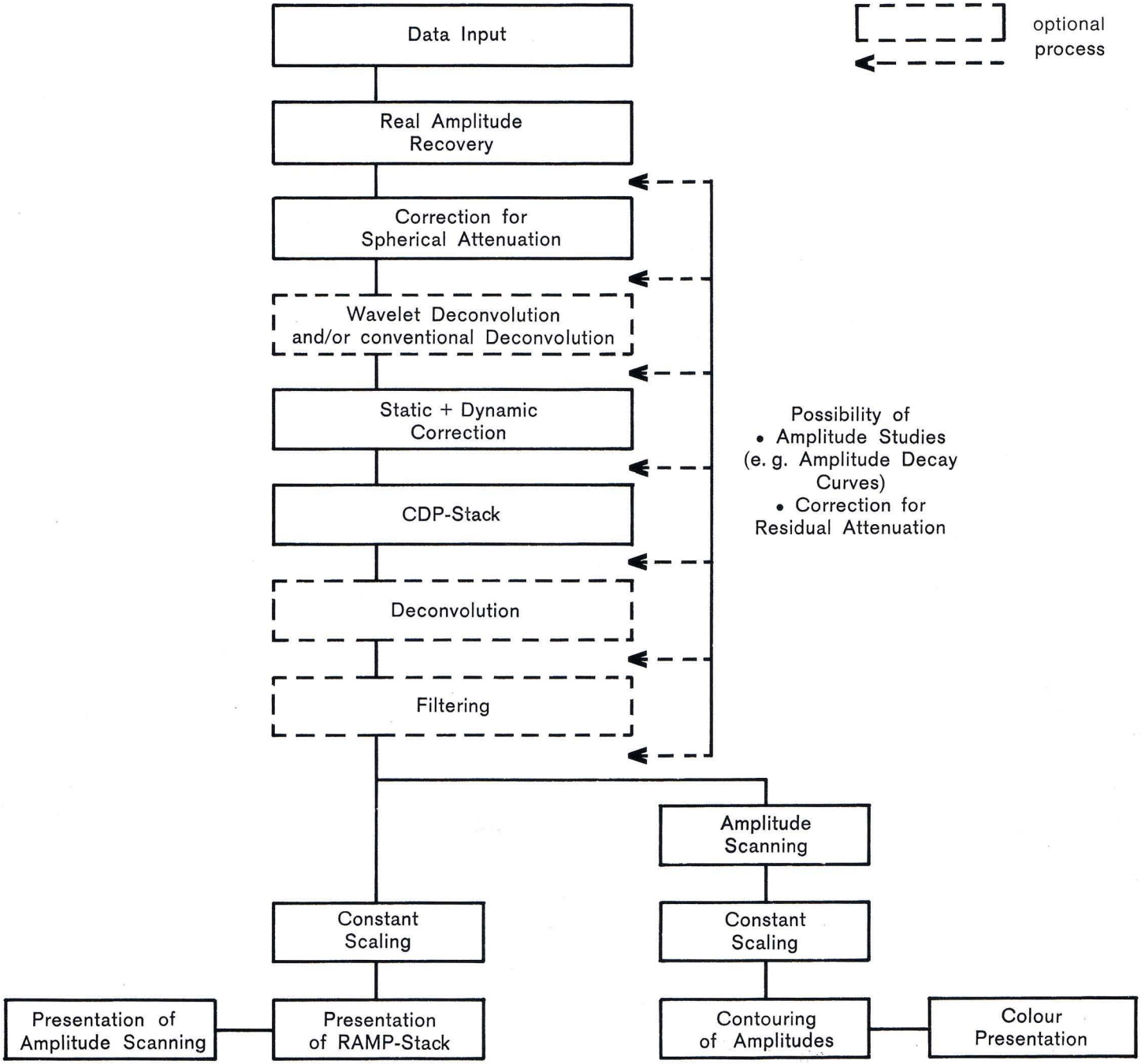
Amplitude Contouring

Automatic Contouring of the real amplitudes of a selectable horizon is an additional tool for all amplitude studies. Amplitudes may be of any type (e. g. original corrected, reduced).

Within the lines to be analyzed a small gate covering the selected horizon has to be determined. The program searches for the maximum positive and/or negative amplitude, fixing in addition the travel time. At the intersections with other lines equalization of the values takes place according to different methods.

The resulting maps show either the amplitude values in selectable steps or the contours of the amplitudes (see front cover); maximum and minimum values are always indicated.

Flow Diagram of Real Amplitude Processing



PRAKLA-SEISMOS GMBH · HAARSTRASSE 5 · P.O.B. 4767 · D-3000 HANNOVER 1
PHONE: 8 07 21 · TELEX: 9 22 847 · CABLE: PRAKLA · GERMANY