Exercise for Reflection seismic 1 - Exercise 3 (06.12.2004)

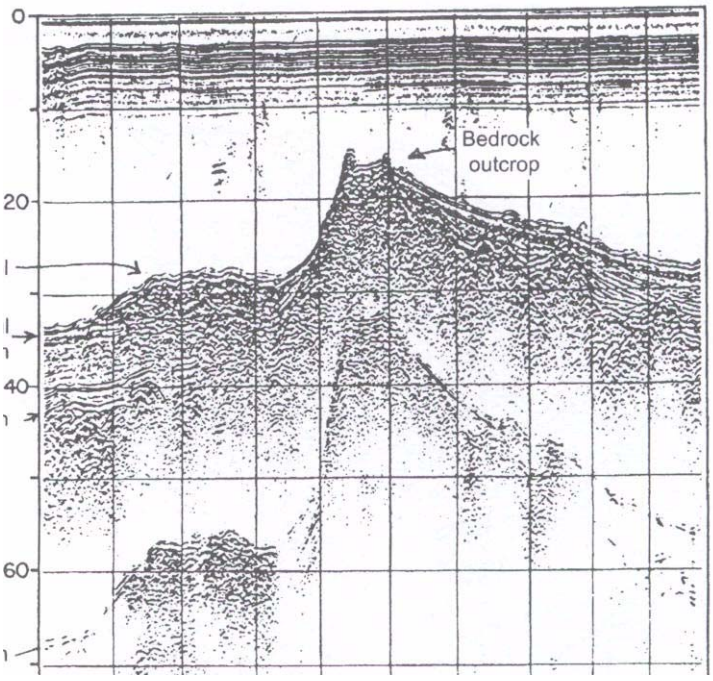
(1) Determine the vertical and horizontal resolution for a seismic measurement at a depth z for a maximum frequency f and a seismic velocity v:

(a) f = 3.5 kHz; z = 50 m; v = 1600 m/s
(b) f = 30 Hz; z = 3000 m; v = 3500 m/s
(c) f = 100 Hz; z = 100 m; v = 1800 m/s
(d) Suggest a typical application for the resolution and parameters of (a), (b) und (c). Which seismic source is appropriate for (a), (b) und (c)?

(2) Calculate the following convolution $x_k = g_k * f_k$
with g = 0, 1, 0, 3, 3, 5
and f = 1, 4, 4, 2

(3)Calculate the Autocorrelation ϕ_{xx} for the following function:
x_k = 1, 0, 2, 0, 1, 2, 1, 0, 0, 1, 2, 1
with a shift from -5 till +5
(without normalisation)

(4) Identify the reflection and the accompanying multiple in the following figure:



(5) The following dataset was obtained from a reversed seismic refraction line 275 m long. The survey was carried out in a level area of alluvial cover to determine depths to the underlying bedrock surface.

Offset (m)	Forward direction	Reverse direction
12.5	6	6
25	12.5	12.5
37.5	19	17
50	25	19.5
75	37	25
100	42.5	30.5
125	48.5	37.5
150	53	45.5
175	57	52
200	61.5	59
225	66	65.5
250	71	71
275	76.5	76.5

Carry out a plus-minus interpretation of the data and comment briefly on the resultant bedrock profile

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Questions:
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