EXPLORATION GEOPHYSICS I – FINAL EXAM

February 10, 2012

Name,Vorname: _____

1. (10 points) Explain the following terms:

   (a) Critical angle

   (b) Aliasing

   (c) Deconvolution

   (d) NMO stretch

   (e) Static correction

2. (5 points) Consider a reflection line shot at the surface over a reflector dipping by 30°. The zero-offset two-way travel time at the shot point is 2 seconds, the velocity above the dipping reflector is 3 km/s. Determine the offset from the shot point, where the reflection has the minimal two-way travel time.

3. (5 points) Which recordings in a reflection profile are called noises or undesired signals? What is done to minimize them?

4. (5 points) The ghost reflection from the sea surface interferes with the direct source wavelet and acts as a notch filter for hydrophones planted on the sea floor. If the air-gun sources are fired at a depth of 8 m, estimate the frequency of the first notch in the spectrum of the vertical incident wave. The acoustic wave speed of water is 1500 m/s and the reflection coefficient at the sea surface is -1. If the sources are towed shallower, will this notch frequency increase or decrease?

5. (5 points) Consider the travel time curves in figure 1, A and B. Determine the velocities of the direct P and air wave, as well as the depth of the horizontal reflector for cases A and B. Assume that the velocity above the reflector is constant.

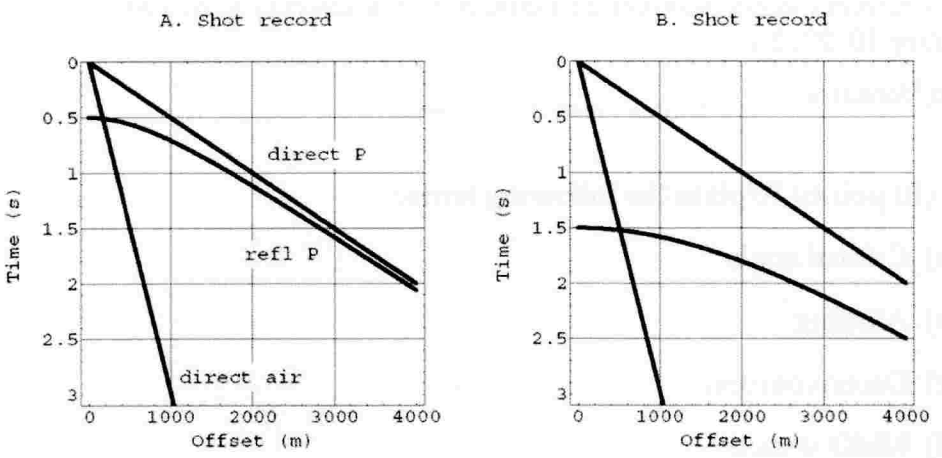


Figure 1: Problem 5

6. (5 points) A 240 geophone off-end spread is to be shot at 30-fold. How many geophones must be moved forward between shots to achieve this? Assume that the recordings in the seismic survey are sampled every 40 milliseconds, and each trace is 10 s long. For a geophone spacing of 5 m, how many data points are recorded in a 100 km-long survey?

7. (5 points) Answer the following questions by Yes or No:

(a) Does post-stack migration cause the reflection dip to increase compared to the original seismic section?

(b) Do seismic waves always follow the ray paths with minimum travel time?

(c) If the velocity in the subsurface is estimated higher than its real value, are reflectors estimated at greater depths?

(d) Is the reflection coefficient determined by the velocity contrast across a boundary?

(e) Two amplitude spectra of reflected waves are plotted in figure 2. Does the reflection in the case (A) occur deeper than in the case (B)?

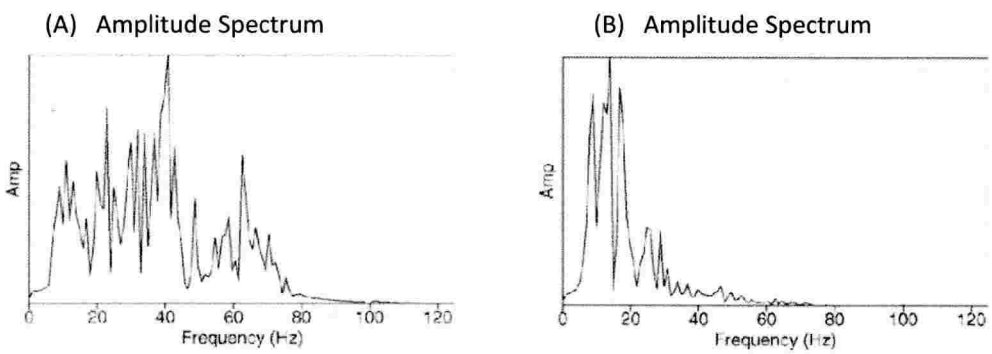


Figure 2: Problem 7(e)

8. (5 points) The seismic section (A) in figure 3 is an original zero-offset section, and the section (B) is obtained from (A) after some processing procedure. What kind of processing has been applied? Explain your answer.

9. (5 points) Identify possible faults and reservoirs in the seismic section in figure 4 and explain why you assume they are there.

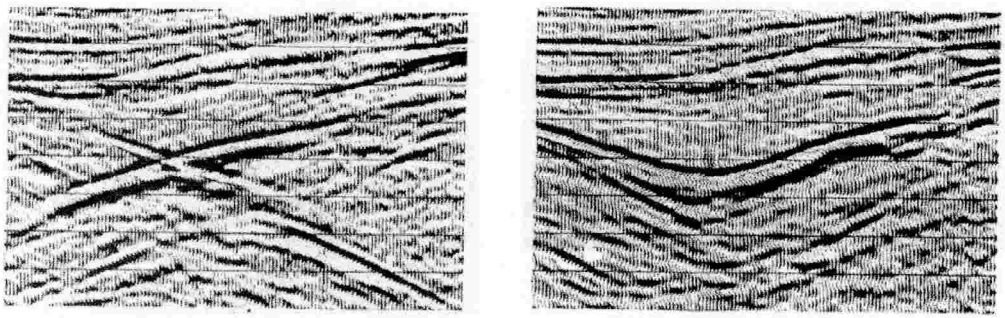
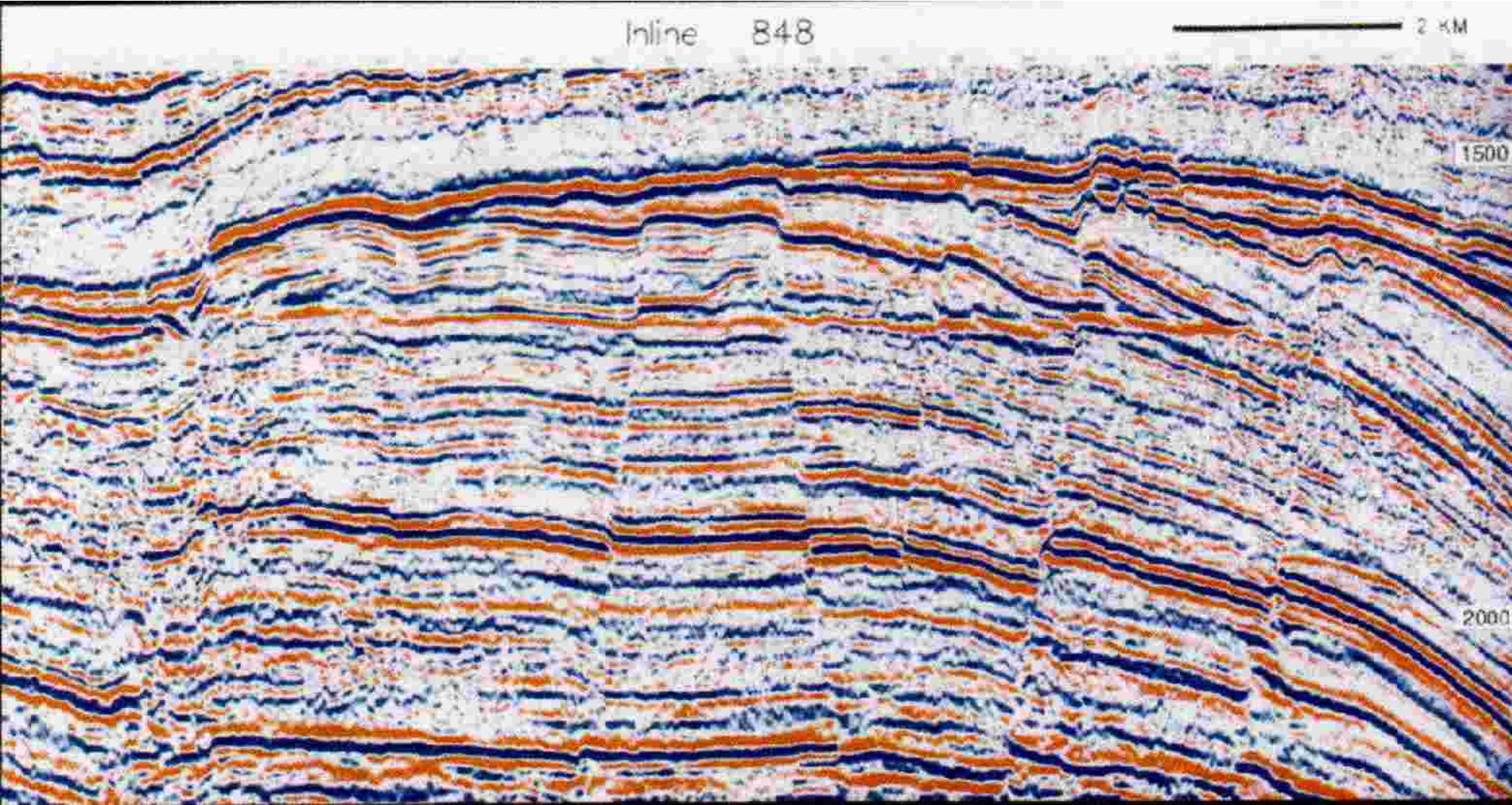


Figure 3: Problem 8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