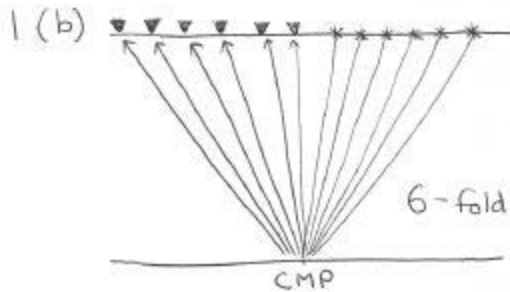GEOPHYSICS 224   FINAL EXAM 2004
SOLUTION

1 (a)   The gas lowers the seismic velocity and creates
an impedance contrast

$$R = \frac{Z_2 - Z_1}{Z_2 + Z_1}$$

porosity = 7%

1 (b)

6-fold

CMP

⇒ choose shot and receivers
so they all reflect at
the same location

ADVANTAGES
⇒ multi-channel data gives
information about depth and
velocity
⇒ stacking can ~~see~~ reduce the
noise levels in the data.

1 (c)   Resolution limit is $\lambda/4$. See notes.

If we reduce λ, the frequency increases. This
will cause an increase in attenuation and the signal
may not be detectable

PAGE 1

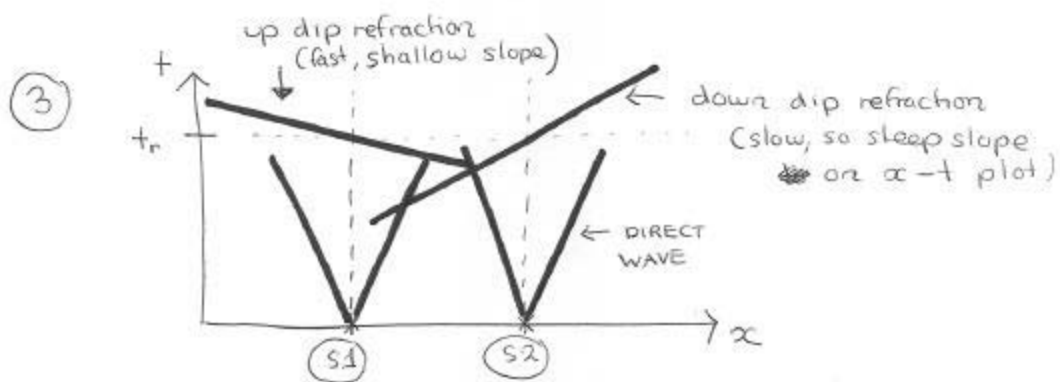2(a) Landfill has lower density than surroundings

(b) within the -0.2 mgal contour (assuming that the density is constant)

(c) Use $g_z = 2\pi G \Delta\rho \, \Delta z$ $\Rightarrow \Delta z = 23.9$ m

(d) ASSUMPTIONS

UNIFORM DENSITY : if $\Delta\rho$ is higher; Δz reduced

INFINITE SLAB : Δz may be over-estimate

③

up dip refraction
(fast, shallow slope)

$\leftarrow$ down dip refraction
(slow, so steep slope
on $x-t$ plot)

$\leftarrow$ DIRECT WAVE

t_r = <u>reciprocal time</u>;   same from $S1 \rightarrow S2$
and $S2 \rightarrow S1$

Reflections : parabolas with minimum travel
time offset to left, because of
the dip.

will be bounded by the direct arrivals
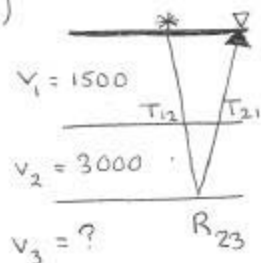
PAGE 2

4(a) Label direct arrival, ground roll, reflections $(1,2)$

(b) $V_1 = 1506$ m/s ; $z_1 = 452$ m

(c) $V_{rms,2} = 2213$ m/s

(d) $V_2 = 2996$ m/s $\quad z_2 = 579$ m

(e) $R = \dfrac{3000 - 1500}{3000 + 1500} = 0.33 \quad$ as expected

(f)

$V_1 = 1500$

$T_{12} \quad T_{21}$

$V_2 = 3000$

$V_3 = ? \quad R_{23}$

amplitude $= \quad -0.17$

$= T_{12} \, R_{23} \, T_{21}$

show that $\quad R = -0.19$

$$-0.19 = \frac{V_3 - V_2}{V_3 + V_2}$$

solve to give $V_3 = 2000$ m/s

5(a) see 2005 Final exam

(b) These changes are caused by the interaction of the solar wind with the Earth's magnetic field

These time variations will be recorded as a magnetometer is moved along a profile. We cannot determine if changes in magnetic field are due to the rock magnetism or external effects in the magnetosphere.

PAGE 3

5(b) continued. Problem solved with a base station where magnetic fields are continuously recorded at a fixed location.

5(c) |F|

B_E

A   A'

x

lower amplitude
and wider because
top of dike is deeper

B_E

|F|

B_E

B   B'

x