地震勘探原理 双语教学材料

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Exercise 1

Substitute the plane wave solution

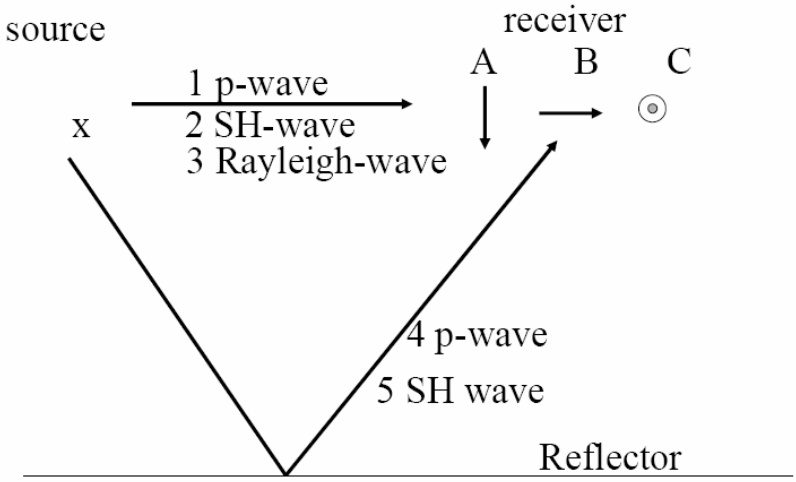
$$F = F_0 \exp[j(\omega t - kz)]$$

into the wave equation

$$\frac{\partial^2 F}{\partial z^2} - \frac{1}{c^2}\frac{\partial^2 F}{\partial t^2} = 0$$

and express the velocity c in terms of ω and k

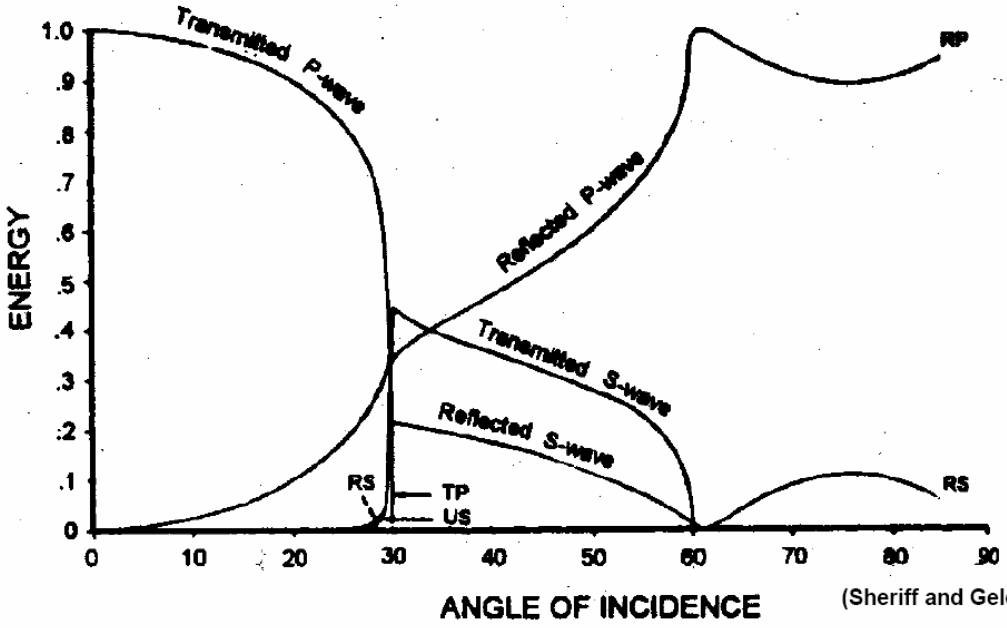
Exercise 2



For which component(s) of the receiver (A, B, C) do we measure a response in the five cases shown above?

	Receiver Geophone		
Case	A	B	C
1	?	?	?
2-5	?	?	?

Exercise 3:
Angle-dependent reflection- and transmission-coefficients for an incident P-wave

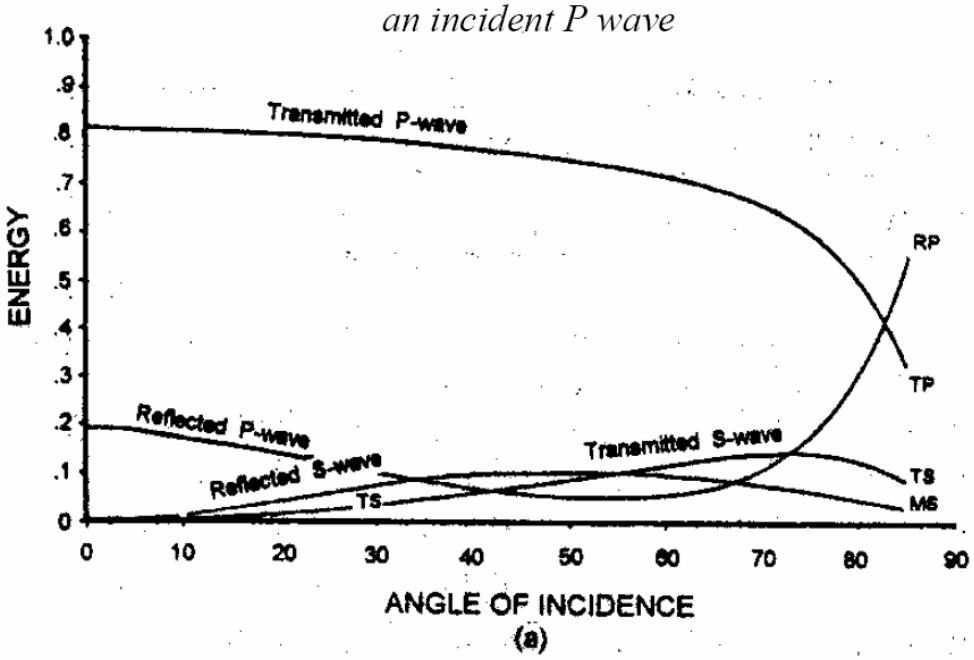


(Sheriff and Geldart, 1995

Find values for: v_{P1}/v_{P2}=? ρ_1/ρ_2=? v_{P1}/v_{S2}=?

Exercise 4:

Angle-dependent reflection- and transmission-coefficients for an incident P wave



Seismics Determine the ratio Z_2/Z_1=?

Exercise 5

Check GPR reflection coefficient equation from Keary, Brooks and Hill (p. 225):

$$R = \frac{V_2 - V_1}{V_2 + V_1} = \frac{\sqrt{\varepsilon_2} - \sqrt{\varepsilon_1}}{\sqrt{\varepsilon_2} + \sqrt{\varepsilon_1}}$$

This equation is not correct, what is wrong?

Exercise 6:

- Calculate the reflection coefficient for a wave that travels up and reflects at the free-surface of the see
  - ρ_{air}=1.293 kg/m^3, ρ_{water}=1025kg/m^3
  - V_{air}=0.3 km/s, v_{water}= 1.4 km/s)
- Calculate the reflection coefficient for a GPR wave that travels down in dry sand (ε_r=4) and reflects at the saturated sand (ε_r=30)