

ESS 512 HW 1

Simon-Hans Edasi

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1 Ch2 Ex3

a.

The first 10 cycles of the surface wave lasts from $20.1 * 10^2$ seconds to $23.5 * 10^2$ seconds, giving a dominant period of $23.5 * 10^2 - 20.1 * 10^2 = 340$ s. This gives us an individual period of 34 seconds.

b.

Frequency $f = \frac{1}{T}$, so our frequency is $f = \frac{1}{34s} = 0.03$ Hz

c.

Reading from the graph the maximum strain recorded on the seismogram looks like ± 275 microns.

d.

A seismic plane wave can be approximated as: $u_z = A \sin[2\pi f(t - (x/c))]$

$$\varepsilon = \frac{\partial u_z}{\partial x} \rightarrow \varepsilon = \frac{-2\pi f A}{c} \cos[(2\pi f(t - (x/c)))]$$

The maximum occurs when cosine = -1, so:

$$\varepsilon_{max} = \frac{2\pi f A}{c} \rightarrow \varepsilon_{max} = \frac{2\pi(0.03s^{-1})(275*10^{-6}m)}{3.9*10^6m/s} = 1.33 * 10^{-11}$$

2 Ch3 Ex1

Period T is to angular frequency ω ($\omega = \frac{2\pi}{T}$) as wavelength λ is to wavenumber k ($\lambda = \frac{2\pi}{k}$).

3 Ch3 Ex2

Start out with a plain sine wave with an amplitude: $u_z(t) = A \sin[\omega t - \phi]$. There is no phase shift, so $\phi = 0$, and we are given amplitude ($A = 0.04m$), wavelength ($\lambda = 8km$), and wavespeed ($V = 5km/s$).