Computational seismology – *Courant and all that*

$$c\frac{dt}{dx} < \varepsilon$$

$$c = \lambda / T = \lambda f$$

1. You want to simulate global wave propagation. The highest frequencies that we observe for global wave fields is 1Hz. Let us for simplicity assume a homogeneous Earth. The P velocity is vp=10km/s and the vp/vs ratio is sqrt(3). Let assume 20 gird points per wavelength. How many grid cells would you need (assume cubic cells). What would be their size?

2. Now let us be more realistic. The maximum P-velocity in the Earth is 14km/s and the smallest P-velocity is 1.5 km/s in the oceans, or 5km/s in the crust. Assume that you can only have one grid size for the whole Earth. Estimate the number of cells, their size and the required time step.

3. Explain why for Earth models with large variations in seismic velocities, varying the grid cell size is highly desirable. What is the problem with having to have a global time step though?