CE640 / OC512 Matlab
Homework 8 – Time Series

Many different frequencies are present in the ocean. Tides, infragravity waves, waves, etc. Let's look at how basic filtering can help us identify the various signals.

1. Create a synthetic time series spanning one week. Build this with four components: (i) waves with a period of 10 s and an amplitude of 0.5 m, (ii) infragravity waves with an amplitude of 0.25 m and a period of 200 s, (iii) tides with an amplitude of 1.5 m and a period of 12.5 hours, and (iv) normally-distributed random noise with an amplitude of 10 cm. I would suggest a time step of 0.5 s, or less.

you do this as follows: each sin wave has the form

amp * sin ([2 * pi / T] * t), where T is the period in seconds and t is the time in seconds.

2. Use a filtering method of your choice to isolate the wave signal. Hint: you have to screen out the noise, and also the infragravity and the tide.
3. Repeat in order to isolate the infragravity wave signal.
4. Repeat in order to isolate the tide signal.
5. Make a 4 x 1 panel plot. Top plot → raw signal, lower three plots, show the results from (2)-(4) above. **In each panel adjust the time axis so that the signal of interest can be clearly seen (zoom in as needed, in other words).** Label all axes.