

Graphing Tides

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Introduction

Goals

Student analysis using real data (well, real from a tidal calculator) to see the three tidal types and the effect of tidal resonance.

Practice in graphmaking and interpretation

Description

Students plot high and low tide for Wilmington Beach (semi-diurnal), Pensacola (diurnal), Seattle (mixed), and Joggins Wharf (semi-diurnal, but extreme tidal range), so they can see the important effect of location on tides.

Context

Used in an introductory oceanography course, where I have explained basic tidal theory: you should get two high tides per day (plus a few minutes). Students get all four locations to graph and interpret. I follow this lab with an activity on calculating tidal resonance period for the Bay of Fundy.

In my general education Earth Science class, I give pairs of students one of these locations and then have the whole class report on results for all four locations.

What follows in Roman is information or questions for the students. My answers/comments are in *italics*.

Seattle, WA				
Day	Time	Height	Unit	Event
1	6:23	11.0	feet	High Tide
1	11:46	5.0	feet	Low Tide
1	17:16	10.9	feet	High Tide
2	0:05	-0.6	feet	Low Tide
2	7:09	11.3	feet	High Tide
2	12:27	5.8	feet	Low Tide
2	17:40	10.6	feet	High Tide
3	0:38	-0.9	feet	Low Tide
3	7:53	11.4	feet	High Tide
3	13:09	6.4	feet	Low Tide
3	18:05	10.2	feet	High Tide
4	1:12	-0.9	feet	Low Tide
4	7:38	11.4	feet	High Tide
4	13:54	7.0	feet	Low Tide
4	18:32	9.8	feet	High Tide
5	1:49	-0.7	feet	Low Tide

Pensacola, FL				
Day	Time	Height	Unit	Event
1	9:24	0.2	feet	Low Tide
1	23:23	1.6	feet	High Tide
2	10:12	0.1	feet	Low Tide
2	23:55	1.7	feet	High Tide
3	11:00	0.0	feet	Low Tide
4	0:31	1.7	feet	High Tide
4	11:49	-0.1	feet	Low Tide
5	1:12	1.7	feet	High Tide
5	12:42	0.0	feet	Low Tide
6	1:57	1.7	feet	High Tide
6	13:37	0.0	feet	Low Tide
7	2:45	1.6	feet	High Tide
7	14:31	0.0	feet	Low Tide
8	3:34	1.5	feet	High Tide
8	15:19	0.1	feet	Low Tide
9	4:23	1.4	feet	High Tide
9	15:58	0.2	feet	Low Tide

Figure 1. Two of the datasets provided to students. Each location has about the same number of data points, so note different number of days. Students are told to plot until the data runs out or they fill up the supplied graph paper.

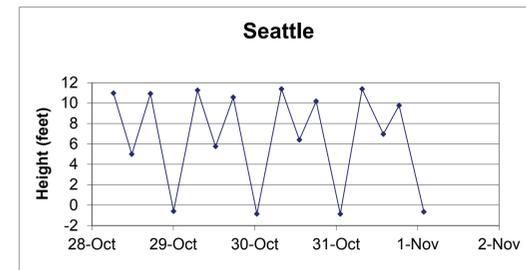
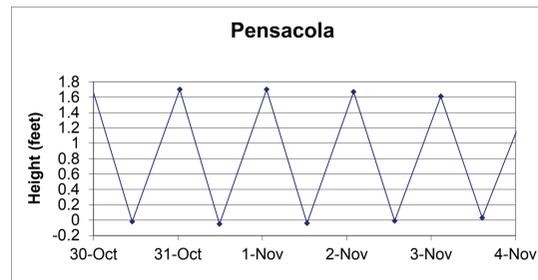
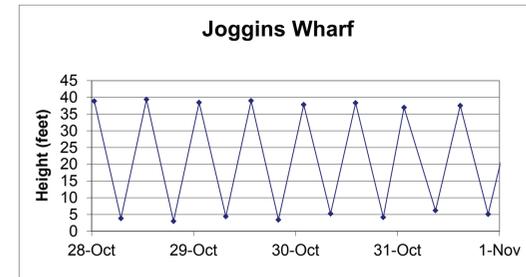
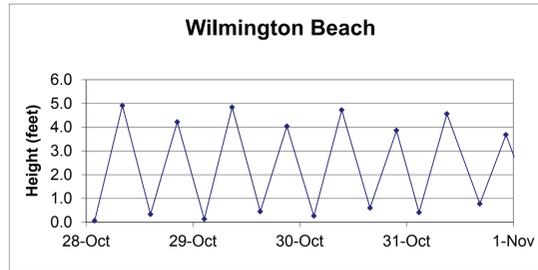


Figure 2. Tide levels at four locations illustrating semidiurnal, diurnal, mixed tide types and the large tidal range of the Bay of Fundy (Joggins Wharf). These are my Excel-plotted master graphs for ease of visibility. Students plot by hand.

Tides

Plot the tidal record from each of the locations on the graph paper. You can plot multiple locations on one graph by marking data points with W,P,S,J.

What tide type occurs at _____ What is the elevation of mean high water? _____

Wilmington Beach

Semi-Diurnal

4.4 ft

Pensacola

Diurnal

1.6 ft

Seattle

Mixed

10.8 ft

Joggins Wharf

Semi-Diurnal

38 ft

Which location has the smallest tidal range and which the largest? What is the tidal range at these locations?

Pensacola is smallest (roughly 1.5 ft range), Joggins Wharf is largest (roughly 34 ft range)

What is the significance of the negative tidal heights at some times?

The tidal datum is MLLW (mean lower low water), which by definition is not the lowest level the ocean can reach.

Remains of Joggins Wharf-->



Figure 3. Joggins, Nova Scotia at low tide. The position of high tide can be seen from the debris line on the beach at upper right.



Figure 4. Windmill at the Joggins Museum. The gray band shows the tidal range (white circles are the variability).

Source of Tidal Data

I get my tidal data from

<http://tbone.biol.sc.edu/tide>