Examining Tidal Observations

One way to test your hypotheses about tides would be to make observations of changes in water level (tides) and examine the timing of these changes in relation to other phenomena. These would be relatively easy data to collect in the field, but to capture the full range of tidal variability at any location requires nearly continuous measurements over an extended time period (about 1 year). Fortunately, water level observations are continuously recorded at numerous locations, and these data can be accessed online. One complication with the use of actual water level observations is that there are additional, non-tidal processes which can cause variations in water level at a variety of time scales. To simplify our investigation we will focus on tidal predictions, as opposed to actual observations, not only because these data reduce inherent complications, but because they happen to be somewhat easier to access online. Nonetheless, one of the things that you will hopefully take away from our discussion of tides is that tidal variations in water level are an extremely regular phenomenon which makes them easy to predict with great reliability, consequently actual observations of water level variations will closely track predicted variations in the absence of any mitigating factors.

The data that you will be examining was obtained from the NOAA Tides & Currents website: (**http://tidesandcurrents.noaa.gov**) which provides access to a wide variety of tidal and current related information and data including tidal predictions, real time and historical records of water level variations, and long term records of sea-level change.

Tidal predictions for many locations around the country can be accessed through the pull down menu in the upper, center part of the page under the heading: Products >> Tides >> NOAA Tide Predictions.

You will compare tide (water level) predictions from three locations around North America.

Galveston, TX – 8771450
Boston, MA – 8443970
San Francisco, CA – 9414290

By navigating to a specific station, graphical tidal predictions can be accessed for a period spanning several years. The interface allows predictions to be graphed for specific time intervals of interest. For this activity you will examine water level graphs that span either a 3 day period or a two month period in order to investigate both short and long-term variability associated with tidal processes. The following pages include the necessary graphs. However, you are encouraged to visit the NOAA Tides & Currents website and explore the wide variety of oceanographic data that may be easily accessed online.

Questions

Use the short-term (72 hour plots) for following questions:

1. What is the range (vertical distance) between high and low tides at each location? Is it always the same?

2. Do high and low tides occur at the same time each day? If not, by how much do the times change each day?

3. What is the tidal period (time between successive high tides or between successive low tides)?

4. How do your observations compare to your hypotheses? Make a list of any observations that might have surprised you, or any questions that might have come up so that we can discuss them as a class.

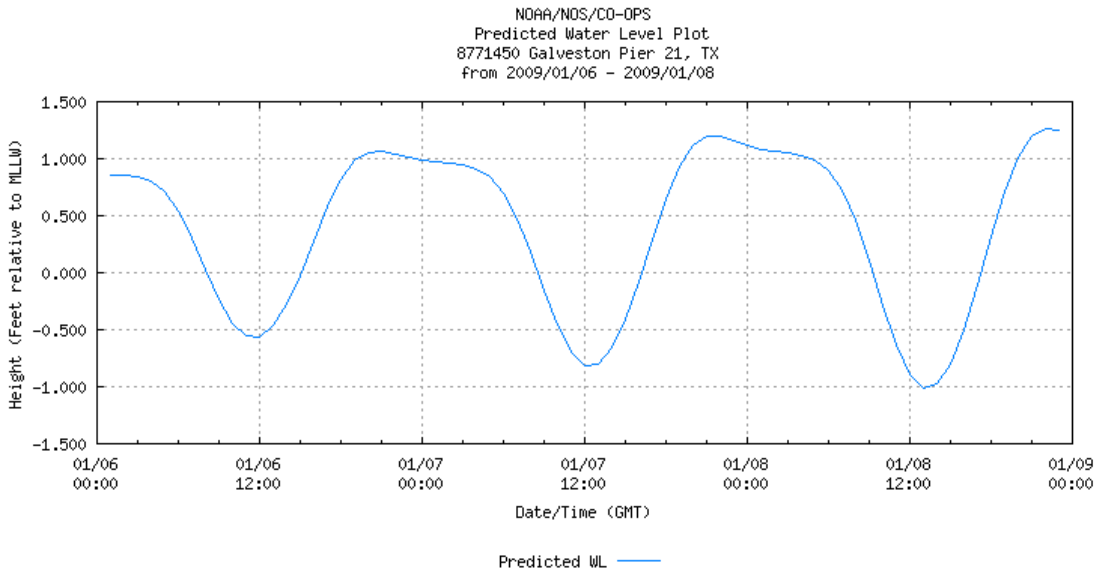
Use the long term (two month) records to answer the following questions:

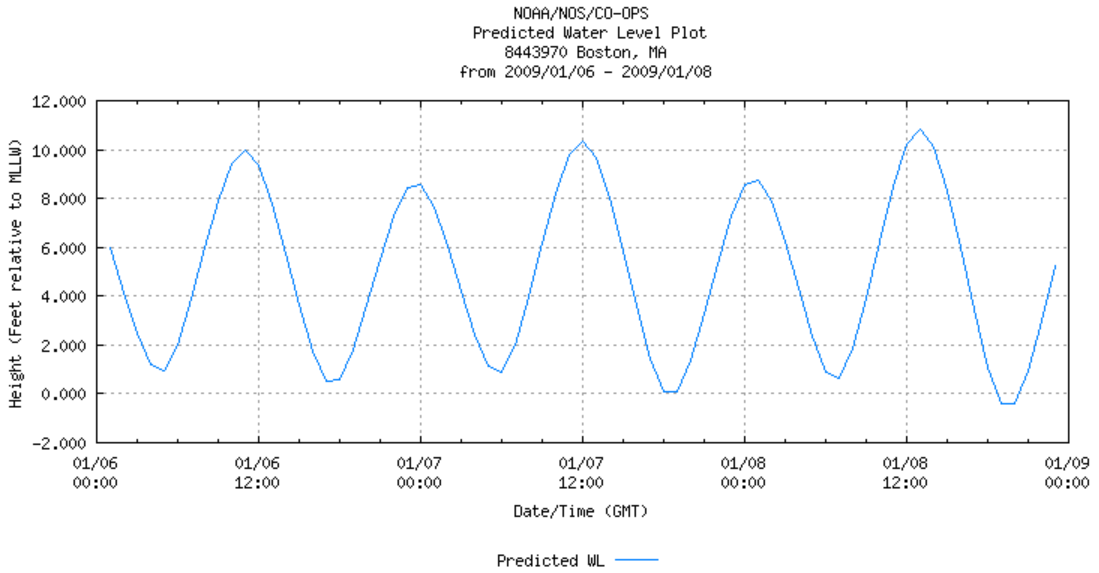
5. What happens to the tidal range over this longer period?

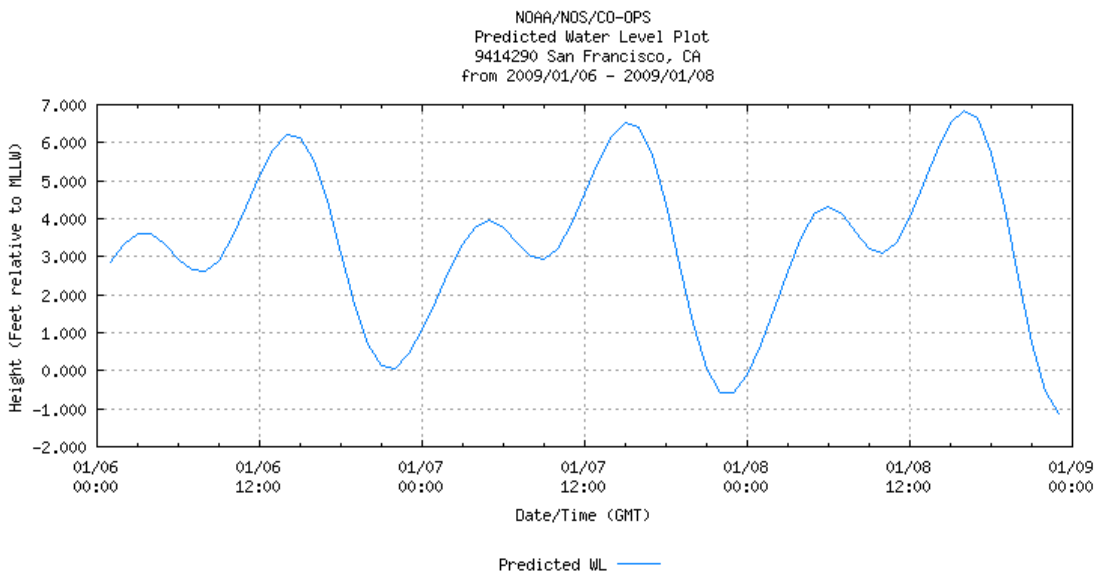
6. Is there a regular cycle to these changes – if so what is the period of these changes?

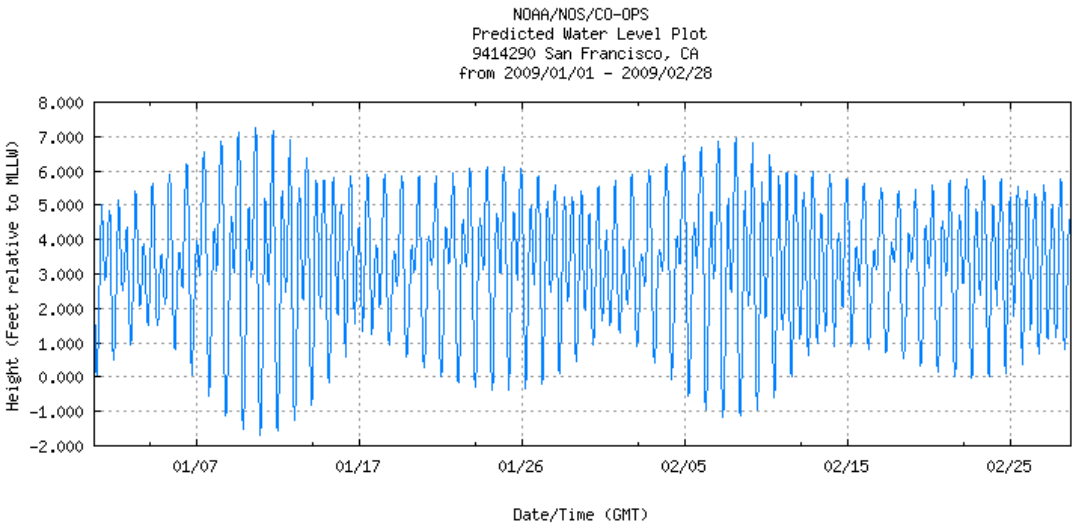
7. What process might be responsible for these longer term changes in the tides?

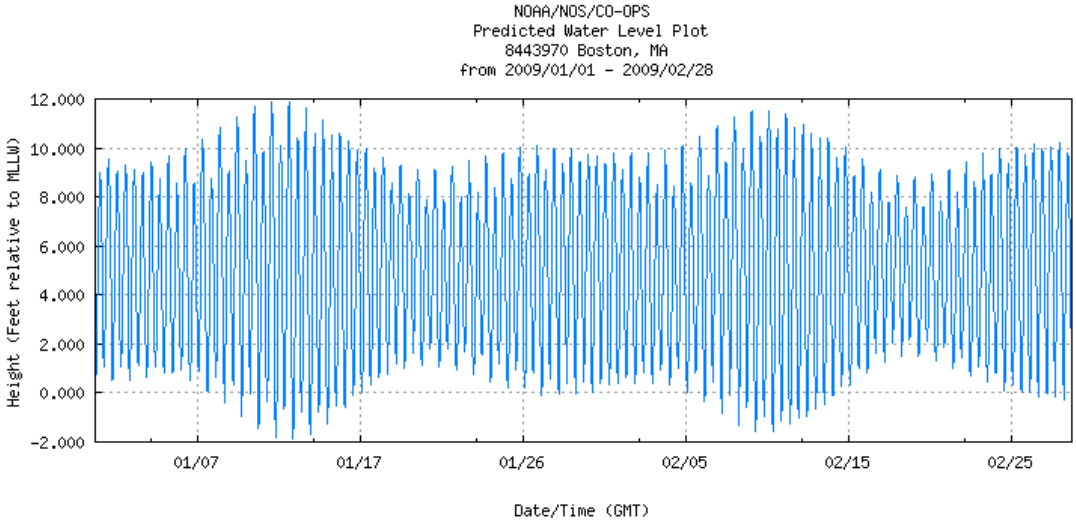
8. Again, how do your observations compare to your hypotheses? Add to your list of any observations that might have surprised you, or any questions that might have come up so that we can discuss them as a class.

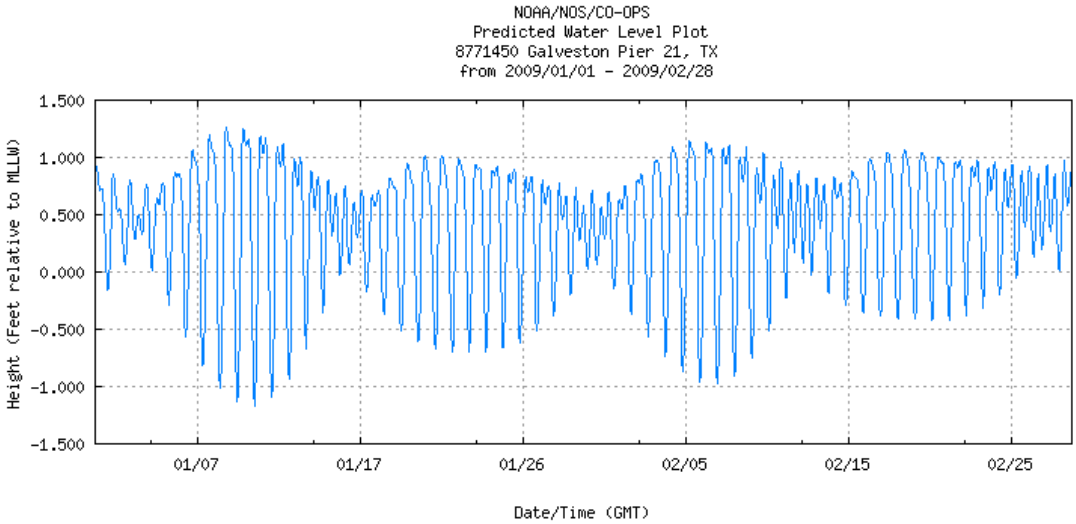

NOAA/NOS/CO-OPS
Predicted Water Level Plot
8771450 Galveston Pier 21, TX
from 2009/01/06 - 2009/01/08
Height (Feet relative to MLLW)
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
01/06 00:00
01/06 12:00
01/07 00:00
01/07 12:00
01/08 00:00
01/08 12:00
01/09 00:00
Date/Time (GMT)
Predicted WL


NOAA/NOS/CO-OPS
Predicted Water Level Plot
8443970 Boston, MA
from 2009/01/06 - 2009/01/08
Height (Feet relative to MLLW)
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
01/06 00:00
01/06 12:00
01/07 00:00
01/07 12:00
01/08 00:00
01/08 12:00
01/09 00:00
Date/Time (GMT)
Predicted WL


NOAA/NOS/CO-OPS
Predicted Water Level Plot
9414290 San Francisco, CA
from 2009/01/06 - 2009/01/08
Height (Feet relative to MLLW)
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
01/06 00:00
01/06 12:00
01/07 00:00
01/07 12:00
01/08 00:00
01/08 12:00
01/09 00:00
Date/Time (GMT)
Predicted WL


NOAA/NOS/CO-OPS
Predicted Water Level Plot
9414290 San Francisco, CA
from 2009/01/01 - 2009/02/28
Height (Feet relative to MLLW)
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
-1.000
-2.000
01/07
01/17
01/26
02/05
02/15
02/25
Date/Time (GMT)


NOAA/NOS/CO-OPS
Predicted Water Level Plot
8443970 Boston, MA
from 2009/01/01 - 2009/02/28
Height (Feet relative to MLLW)
12.000
10.000
8.000
6.000
4.000
2.000
0.000
-2.000
01/07
01/17
01/26
02/05
02/15
02/25
Date/Time (GMT)


NOAA/NOS/CO-OPS
Predicted Water Level Plot
8771450 Galveston Pier 21, TX
from 2009/01/01 - 2009/02/28
Height (Feet relative to MLLW)
1.500
1.000
0.500
0.000
-0.500
-1.000
-1.500
01/07
01/17
01/26
02/05
02/15
02/25
Date/Time (GMT)