Practical Exercise in Tidal Analysis

Note that in the following I have made some modifications to what we worked on through in the Data Analysis Lab in order to make this easier to follow without an instructor present.

**Resources**

*Permanent Service for Mean Sea Level*

Webpage for Takoradi Tide Gauge

<http://www.psmsl.org/data/obtaining/stations/331.php>

The hourly data is available by clicking the download metric sea level data.

Note that the data for 1983-1986 that we are using is flagged as suspect. However, it is still useful for the exercise.

*University of Hawaii Sea Level Center*

<https://uhslc.soest.hawaii.edu/data/?rq#uh231a>

Scroll to the row with the Takoradi data and there are several options of file types to download, as well as metadata (e.g., latitude and longitude).

**Datasets**

The Takoradi tide gauge data file used in this exercise is named h231c.csv. This file was downloaded from the University of Hawaii Sea Level Center. This ascii file has three columns:

Column 1 is the decimal year

Column 2 is the water level in mm

There are also data files from other periods: h231a.csv and h231b.csv. Later you can modify the included programs to load and plot these data. There are some problems with the data in h231a.csv. If you plot all three data sets later you can see if you can identify that there is a problem.

**Software**

MATLAB functions to load the water level data

Two toolboxes are included: The seawater toolbox and utide, which is a tidal harmonic analysis toolbox.

load\_Takoradi.m

load\_insitu\_str.m

run\_tides.m

**Procedure**

First the Matlab Path has to be changed to add the directories/folders where the ut\_solve.m and ut\_pre and the seawater toolboxes are located.

1. Click on Home tab
2. Click on Set Path
3. Browse to the location of each directory/folder and add to the path

Open the file run\_tides. This can be run in one batch, but it can also be run cell by cell. A cell is delineated by pairs of double percent signs (%%). If you click within a cell it will highlight it in yellow. In the Editor tab you can click Run Section and only that portion of the code will run. Try running the program cell by cell. You can use this as a template for further analyses.

The comments in each cell explain what is going on in each cell.

Questions

1. What do you think happened near the end of the Tema record?
2. Where does high tide occur first: Tema or Takoradi?
3. Looking at the attached cotidal chart of the M2 tide (the principal lunar semidiurnal constituent) does the answer for #2 make sense? Why?

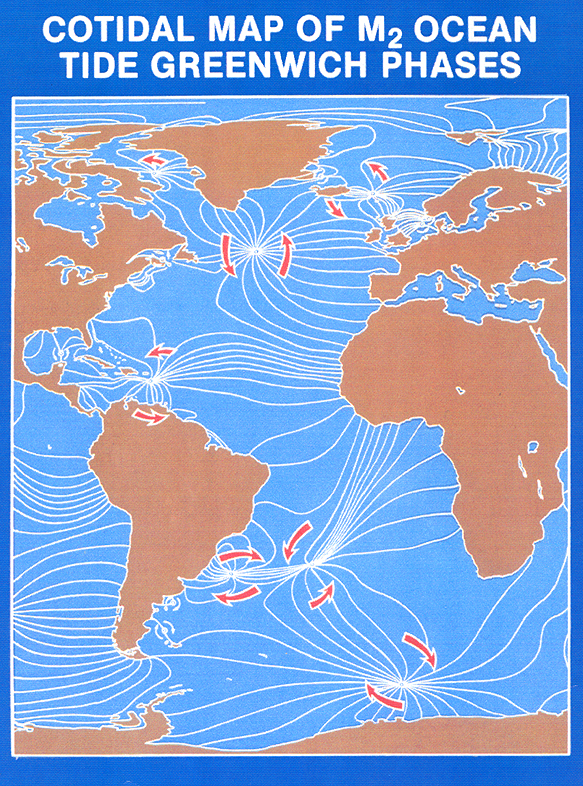


Figure 1 Co-Phase lines of the M2 tide (NOAA). At any time the phase of the M2 tide is the same (e.g., high tide) along a line. The arrows show the direction of the propagation of phase.

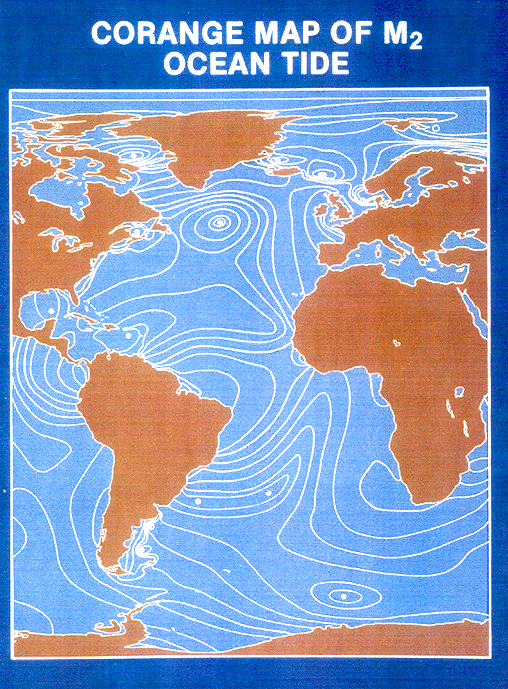


Figure 2. Co-Range lines of the M2 tide. Along a given line the range of the tide is constant. (NOAA).