# Earth 107: Module 3 Lab

Important! We advise you to either print or download/save this document as it contains the steps you need to take to complete the Lab in Google Earth. In addition, it contains prompts for measurements and questions that you should take note of (by writing down or typing in) as you work through the Lab.

Once you have worked through all of the steps, you will go to the **Module 3 Lab** **in Canvas** to complete the Lab by answering multiple-choice questions. The answers to questions on this Lab worksheet will match choices in the multiple-choice questions in Canvas. Submit the quiz in Canvas for credit.

## General Instructions for Module 3 Lab

### Objective of the Lab:

### The objective of this lab is to examine the dynamics of a sandy shoreline. Two types of data will be explored: shoreline erosion using Google Earth timeline and shoreline elevation change data produced from elevation profiles. These two types of data yield a great deal of information about the dynamics of a sandy, wave dominated shoreline and reveal trends in erosion and deposition of sediment.

# Part 1. Measuring shoreline change using Google Earth Timeline

For this part of the lab you will use the Google Earth Timeline tool to calculate the erosion rate along a beach shoreline in the Louisiana Caminada Headland area. This location is on the Gulf of Mexico shore of the receding Mississippi River Delta. Therefore, it is experiencing rapid erosion rates.

Dates: use the following image dates for your calculation. November 1989, February 1998, January 2004, October 2007 and November 2012, January, 2015.

**Procedure**

Locations:

1. Search for and find the following coordinates using the Google Earth search box: 29.11444444, -90.16611111 (29°6’52.6N , 90°9’58.52W)
2. Select Timeline Tool (clock icon) and go back to 1989, by sliding the slider to the left.
3. Zoom to about 1000 m (1 km). Be sure your view is vertical. Adjust using the arrow below the eye in the N arrow – top right. Your pin should be on the shoreline. This is your starting measurement.
4. Slide the timeline tool slider to 1998.
5. Select the measure tool (ruler icon). Be sure the units are set in meters.
6. Make a measurement from the pin to the new shoreline, keeping the yellow line perpendicular to the shoreline. Record the distance (amount of displacement) on your data sheet. Place a pin on the 1998 shoreline position to mark it.
7. Clear the measure tool; move the timeline to 2004 and re-measure from the first (1989) pin to the shoreline. This is the amount of displacement for this time period.
8. Repeat this for the remaining dates through 2015.
9. Calculate the average rate of loss for the period from 1989 to 2012. Note that 2012 – 2015 is separated on the data table. Complete the data table and answer the questions below in the box using your data.

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| --- | --- | --- | --- | --- |
| Year | displacement since last time period | cumulative displacement  | years between measurements | average annual rate of shoreline displacement |
| 1989 | 0 | 0 | 0 |   |
| 1998 |  |  |  |  |
| 2004 |  |  |  |  |
| 2007 |  |  |  |  |
| 2012 |  |  |  |  |
| Total/ Average |  |  |  |  |
| 2015 |  |  |  |  |
| total |  |  |  |  |

|  |
| --- |
| Questions for Part 1 (1-4)1. What is the approximate average rate of shoreline erosion, or displacement at this site BETWEEN 1989 and 2012?
2. Which time period has the highest erosion for this site?
3. Which time period appears to show accretion (growth) instead of erosion?
4. Given that this shoreline has experienced consistent erosion until the time period identified in the previous question, what is the most plausible explanation for a sudden reversal?
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Part 2. Analyzing beach profile data

In this part of the lab, you will examine three sets of data plotted on a graph. These data show the elevation profile of a beach at 3 different dates over an almost 2-year timeframe. The data were collected by measuring the elevation change beginning at a control point in the back of the beach, a dune area. The changes in elevation were measured simply by sighting through two poles with centimeter graduations to the horizon. The difference in the measurement on the two poles tells the investigators the change in elevation. The change can be positive (uphill) or negative (downhill). The team moves down the beach taking measurements every 3 meters. The measurements are recorded, cumulative changes are calculated and then these values are graphed. When this procedure is repeated, changes to the profile begin to tell a story about what is happening to the beach over time in terms of sediment deposition and erosion. With sufficient data, volumetric changes can be calculated.

Below is a graph showing data for just three profile measurements on a beach similar in character to the one at Caminada Headland in Louisiana. Examine the three lines on the graph below and answer the questions.

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| Questions for Part 2 (5-9)1. On which profile were the dunes highest in Feb 2008?
2. On which profile did the width of the beach decrease the most between Feb 2008 and Sept 2008?
3. What is the best explanation for the change between Feb 1, 2008 and Sept 9, 2008?
4. Which profile shows the greatest recovery of the dunes?
5. What is the best description of the changes that took place between Sept 9, 2008 and November 1, 2009?
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Lab Completion Instructions

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