

GLY 4734/6932 - Coastal Morphology and Processes

Sea Cliff Retreat

April 18, 2019

Names: _____

Group: _____

Sea cliff retreat is a thresholded process; the portion of the cliff face impacted by wave action is steadily eroded until the undercut portion of the cliff collapses in a single event. For this activity, *erosion rate* refers to the rate at which wave action erodes the lower cliff face, *threshold for failure* refers to the depth of notch erosion necessary for a cliff failure event, and *cliff retreat rate* refers to the rate at which the top of the cliff retreats.

1. Describe how each of the following affect the *erosion rate* and *explain why*:

(a) Wave height

1 pt for identifying a direct relationship, 1 pt for explanation (more wave energy)

(b) Sea level

1 pt for identifying a direct relationship (up to a point), 1 pt for explanation (more wave access to cliff)

(c) Precipitation

1 pt for identifying a direct relationship, 1 pt for explanation (weakens the rock)

2. Describe how each of the following affect the *threshold for failure and explain why*:

(a) Wave height

1 pt for identifying no correlation, 1 pt for attempt to explain

(b) Sea level

1 pt for identifying a inverse relationship, 1 pt for explanation (less length of cantilevered block connected to cliff)

(c) Precipitation

1 pt for identifying an inverse relationship (or none), 1 pt for attempt to explain

3. Over a time scale encompassing several cliff failure events:

(a) How does erosion rate affect cliff retreat rate?

1 pt for identifying a direct relationship

(b) How does the threshold for failure affect cliff retreat rate?

1 pt for identifying no relationship

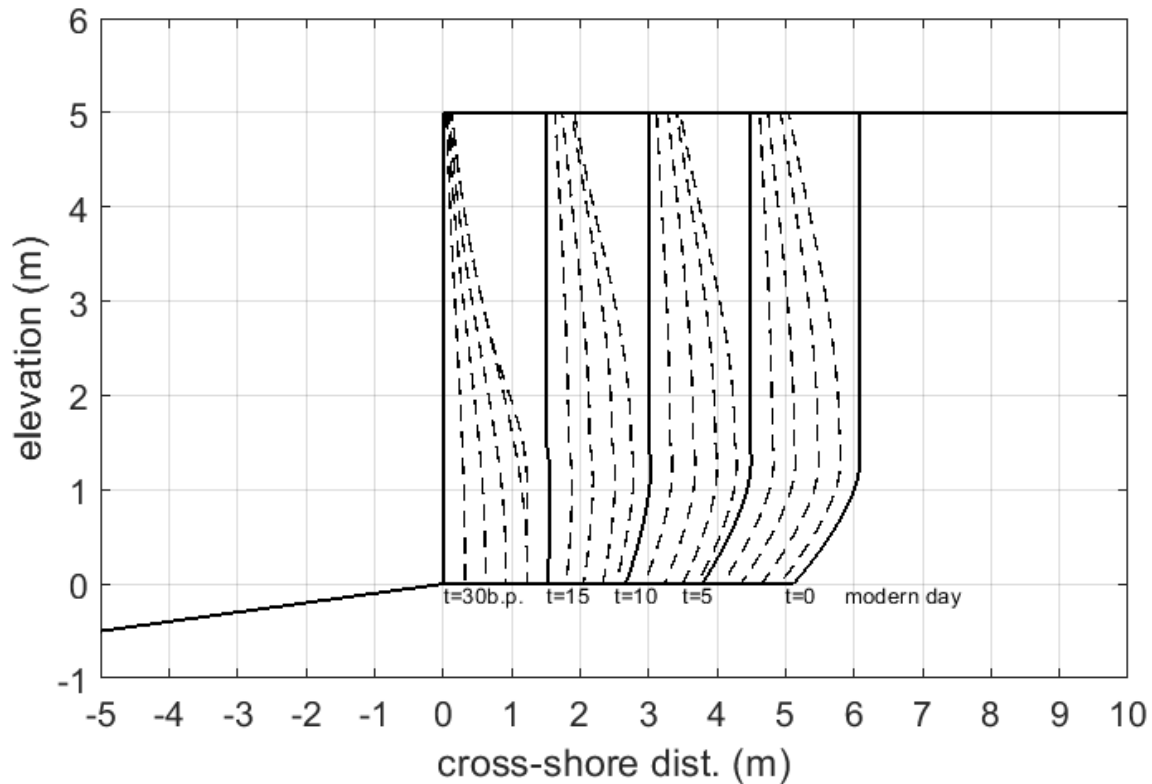
4. Consider a scenario in which wave height, cliff height, sea level, and annual precipitation are held steady.

(a) How does the rate of cliff retreat change over time if the cliff toe is submerged (the elevation of the cliff toe is lower than sea level)? Why?

1 pt for stating that the rate does not change if the cliff toes is submerged, 1 pt for explanation (wave energy is not changing)

(b) Does this change if the cliff toe is not submerged? Why?

1 pt for stating that the rate decreases, 1 pt for explanation (wider beach to dissipate wave energy)



5. Use to diagram above to complete the following:

- (a) How does the modern day sea level at this location ($t=0$) compare to sea level 18 years ago?
Draw the modern day sea level on the diagram.

1 pt for stating sea level is higher today, 1 pt for diagram

- (b) Imagine the both the wave height and the annual precipitation at this location were to increase. Additionally, the top of the cliff experiences a meter of vertical erosion. Draw on the diagram above predictions for cliff profiles at this location over the next five years. Explain your predictions.

1 pt for drawing greater cliff retreat in 5 years, 1 pt for steady notch depth, 2 pt for accurate explanation