

## Future of the Cryosphere Lab

### Part I: Melting sea and land ice contribution to sea level rise.

#### Materials:

- Large bowl
- Water
- Ice Cubes
- Rock or block of wood
- Ruler Additional craft supplies
- Heat Lamps



**Procedure:** Set up your bins so that there is “land” and there is water. Put the same amount of water in each bin. Measure with a ruler how deep the water is and record it in your table below. In one bin put the ice in the water and the other bin put the ice on the land. Set up your heat lamps so that each bin is getting the same amount of heat. Let the bins sit under the heat lamp while you do Part II of the lab.

#### Discussion Questions:

1. Make a prediction. Which type of ice (sea ice or land ice) do you think poses a larger threat to sea level rise if large-scale melting due to climate change were to occur? Explain.

#### Sea Ice:

Starting Ocean Depth (m):

Ending Ocean Depth (m):

#### Land Ice:

Starting Ocean Depth (m):

Ending Ocean Depth (m):

2. Which type of ice contributed more to sea level rise? Sea Ice/Land Ice 3. Did your model support your prediction? Explain.

3. How could you make your model more accurate?

## Part II: Future Climate Change Projections & the Cryosphere

Click on the following link.

<https://sealevel.nasa.gov/vesl/web/sea-level/slr-eustatic/>

\*\*Can customize experience by User Level: Public/Scientist ; Unit System: Metric/US Standard ; Temp. Scale: Kelvin, Fahrenheit, or Celsius\*\*

Use the interactive map to answer the following questions.

Change the region with these buttons

Primary Controls

- Sea Level Rise Region -

Florida

Gulf Coast

California

## Questions

- How does sea level rise change for each region in the U.S. when the Antarctic Ice sheet decreases by 25,45,50, and 75%? Use the slider or type in the number

**Antarctica Controls**

- Basin -

All Basins
▼

- Remove Ice -

%

Florida	25%	45%	50%	75%
sea level rise in Meters				
How does this affect the coastline?				
Gulf Coast	25%	45%	50%	75%
sea level rise in Meters				
How does this affect the coastline?				
California	25%	45%	50%	75%
sea level rise in Meters				
How does this affect the coastline?				

2. How does sea level rise change for each region in the U.S. when the Greenland Ice sheet decreases by 25,45,50, and 75%? Use the slider or type in the number

**Greenland Controls**

- Basin -

All Basins

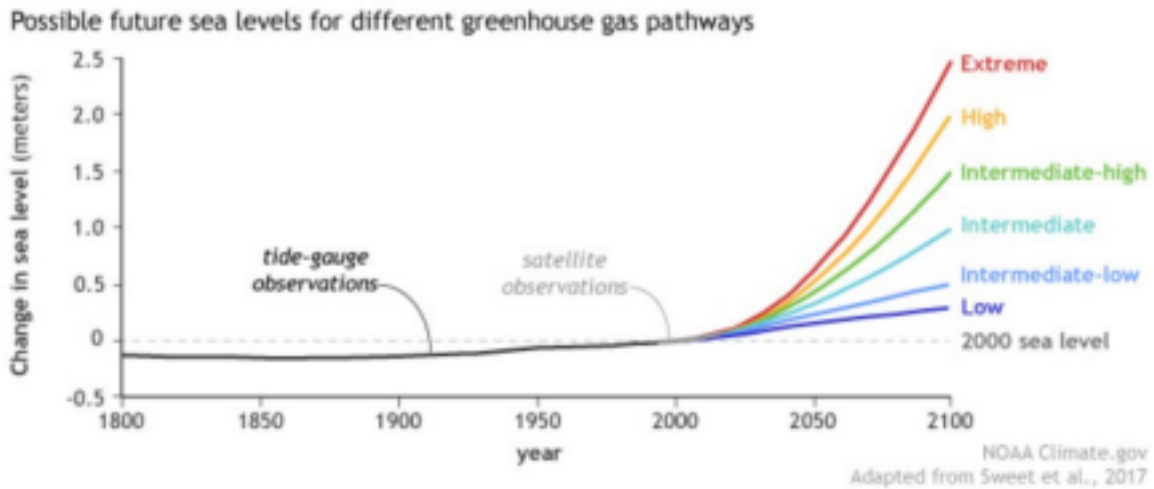
- Remove Ice -

0 %

Florida	25%	45%	50%	75%
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sea level rise in Meters				
How does this affect the coastline?				

3. For the each coast, which ice sheet contributed more to regional sea level rise? Circle one
- Florida - Antarctica/Greenland
  - Gulf Coast - Antarctica/Greenland
  - California - Antarctica/Greenland

## Sea Level Rise & Future Projected GHG Emissions (Figure Analysis)



Observed sea level from tide gauges (dark gray) and satellites (light gray) from 1800-2015, with future sea level through 2100 under six possible future scenarios (colored lines). The scenarios differ based on potential future rates of greenhouse gas emissions and differences in the plausible rates of glacier and ice sheet loss. NOAA Climate.gov graph, adapted from Figure 8 in Sweet et al., 2017.

### Sea Level Rise Discussion Questions:

1. What is the maximum projected sea level change by the year 2050?
2. What is the full range of projected sea level change by the year 2100?
3. Define what each level of emission pathways means in terms of human action to decrease greenhouse gases.
4. Think about and list what types of changes we as humans could make to put us in the intermediate-intermediate low-low range of emissions.

**Lab Overview Discussion Questions:**

1. How do climate and the cryosphere influence each other?
2. How does the cryosphere impact life on Earth?
3. Other than cooling, what benefits does the cryosphere give Earth?
4. How are humans impacting the cryosphere?
5. Predict what the planet might be like without the cryosphere.