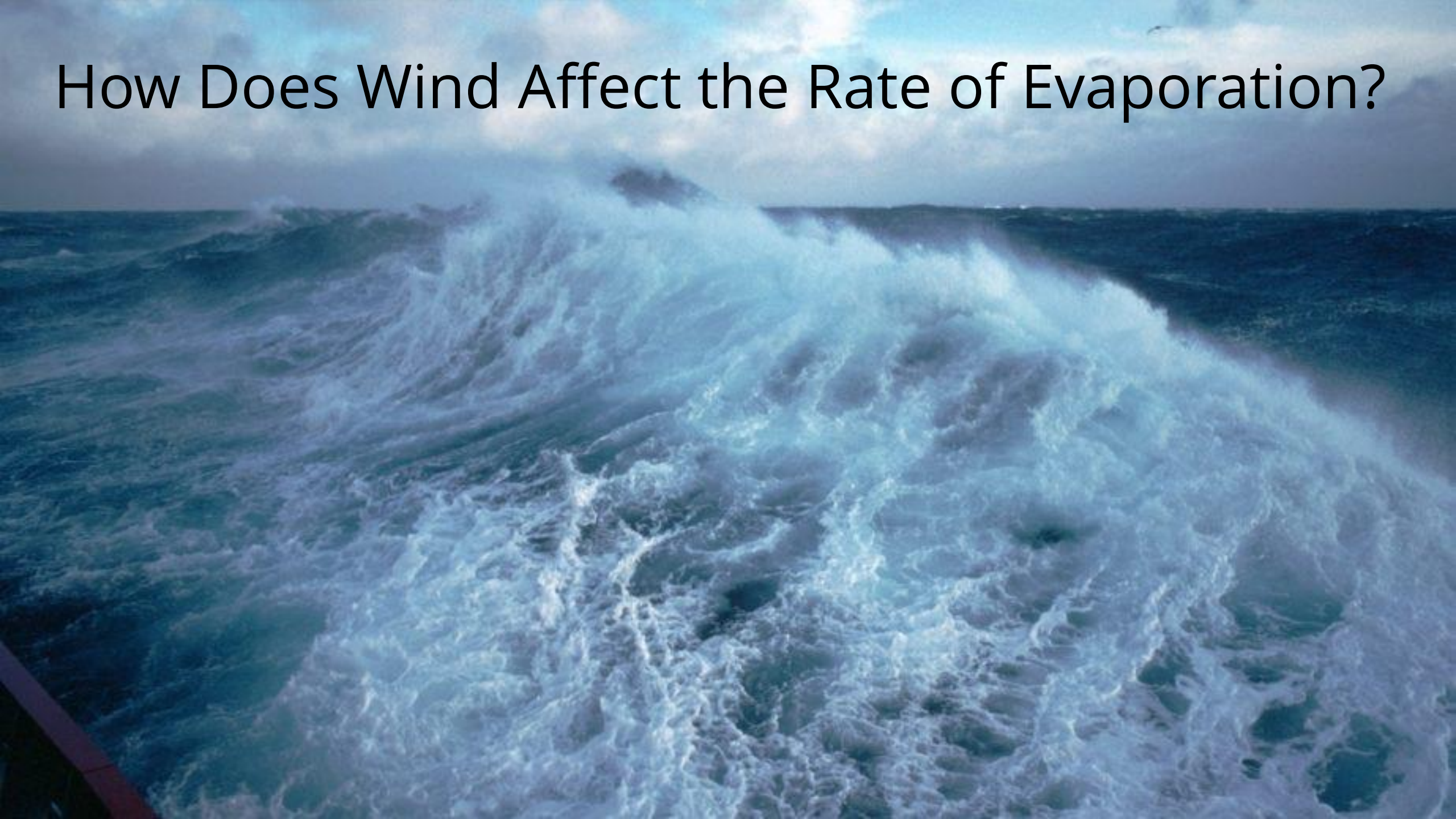


How Does Wind Affect the Rate of Evaporation?



Background Information

I found these websites that talk about other experiments over the ocean and lakes

- <https://www.theweatherprediction.com/habyhints2/470/>
- <https://www.brighthub.com/environment/science-environmental/articles/110665/>
- https://serc.carleton.edu/integrate/teaching_materials/food_supply/student_materials/905

They all agree that the rate of evaporation depends on 5 things:

- The wind speed
- The temperature of the water
- The temperature of the air
- The humidity in the air
- The sun

I can't control the air or the sun, but they will be the same for all my experimental test cases.

Hypotheses

I hypothesize that blowing wind over water will cause the rate of evaporation to increase compared to the rate in a jar with no wind.

I hypothesize that warm water will evaporate faster than cold water

I hypothesize that adding salt to the water will have no effect on the evaporation compared to water of the same temperature but without salt

Materials

1. 6 Glass Jars
2. ~12 Liters of Water (~2 liters per jar: 8L of cold; 4L of warm)
3. 6 Digital Thermometers
4. 1 big box fan
5. 1 Clock
6. 2 cups salt
7. Large white table
8. 1 notebook & pencil
9. Food color (R/B/G)
10. A sharpie
11. A ruler/tape measure
12. A big spoon



Procedure

1. Set out the table in the sunshine, and get a clock
2. Fill 4 jars with 2 liters each of cold tap water – label them cold, add blue color
3. Fill 2 jars with 2 liters each of warm water – label them warm, add red color
4. Add 2 cups of salt to two of the cold jars – label them salty, add green color
5. Stir both jars with the big spoon until the salt dissolves.
6. Use the sharpie to mark the water line on each jar
7. Measure the height of each mark with the ruler (**enter the data**)
8. Put the jars on the table: 1 hot, 1 cold, 1 salty on each end of the table
9. Place the box fan behind three of the jars.
10. The fan should be OFF at this time.
11. Place thermometer in each jar – record the temperature (enter data)

Procedure

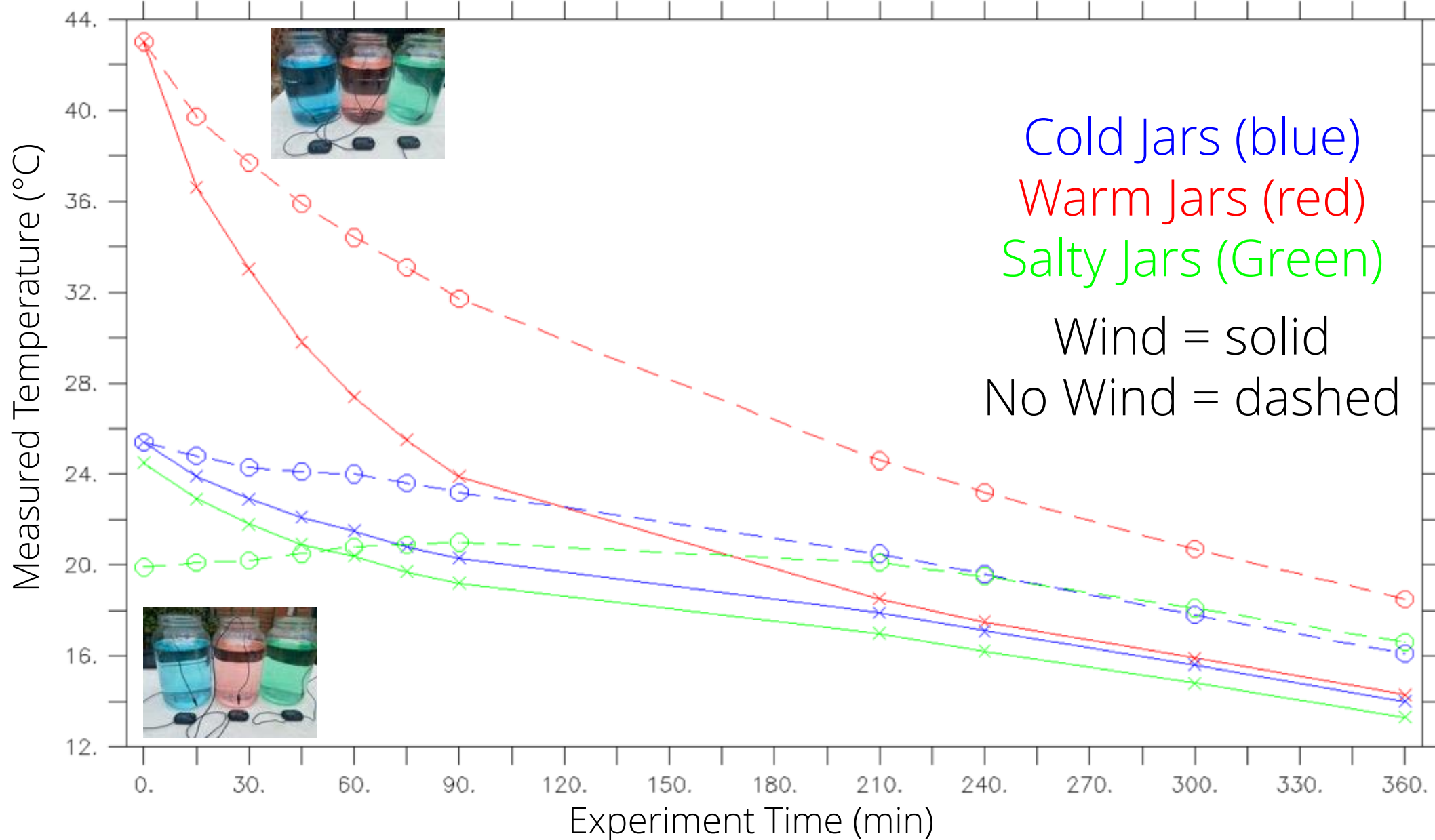
12. Turn on the fan.
13. Wait 15-30 minutes
14. Note the time in your notebook
15. Mark the water line on each jar
16. Measure the height of the water line (enter data)
17. Record the temperature in each jar (enter data)
18. Repeat steps 14-18 until 6 hours has passed

Data Collected

| | Start Time=1pm | 15 min Time=1:15 | 30 min Time=1:30 | 45 min Time=1:45 | 60 min Time=2:00 | 75 min Time=2:15 | 90 min Time=2:30 | 210 min Time=4:30 | 240 min Time=5pm | 300 min Time=6pm | 360 min Time=7pm [END] |
|----------------|--|---------------------|---------------------|---------------------|---------------------|--|---------------------|----------------------|--|---------------------|--|
| Cold+ wind | Height = 18.1cm Temp = 25.4°C | Temp = 23.9°C | Temp = 22.9°C | Temp = 22.1°C | Temp = 21.5°C | Height = 18.0cm Temp = 20.8°C | Temp = 20.3°C | Temp = 17.9°C | Height = 17.9cm Temp = 17.1°C | Temp = 15.6°C | Height = 17.7cm Temp = 14.0°C |
| Warm+ wind | Height = 18.1cm Temp = 43.0°C | Temp = 36.6°C | Temp = 33.0°C | Temp = 29.8°C | Temp = 27.4°C | Height = 17.9cm Temp = 25.5°C | Temp = 23.9°C | Temp = 18.5°C | Height = 17.7cm Temp = 17.5°C | Temp = 15.9°C | Height = 17.5cm Temp = 14.3°C |
| Salty+ wind | Height = 18.3cm Temp = 24.5°C | Temp = 22.9°C | Temp = 21.8°C | Temp = 20.9°C | Temp = 20.4°C | Height = 18.3cm Temp = 19.7°C | Temp = 19.2°C | Temp = 17.0°C | Height = 18.1cm Temp = 16.2°C | Temp = 14.8°C | Height = 17.8cm Temp = 13.3°C |
| Cold | Height = 17.8cm Temp = 25.4°C | Temp = 24.8°C | Temp = 24.3°C | Temp = 24.1°C | Temp = 24.0°C | Height = 17.8cm Temp = 23.6°C | Temp = 23.2°C | Temp = 20.5°C | Height = 17.7cm Temp = 19.6°C | Temp = 17.8°C | Height = 17.7cm Temp = 16.1°C |
| Warm | Height = 18.2cm Temp = 43.0°C | Temp = 39.7°C | Temp = 37.7°C | Temp = 35.9°C | Temp = 34.4°C | Height = 18.2cm Temp = 33.1°C | Temp = 31.7°C | Temp = 24.6°C | Height = 18.1cm Temp = 23.2°C | Temp = 20.7°C | Height = 18.1cm Temp = 18.5°C |
| Salty | Height = 18.0cm Temp = 19.9°C | Temp = 20.1°C | Temp = 20.2°C | Temp = 20.5°C | Temp = 20.8°C | Height = 18.0cm Temp = 20.9°C | Temp = 21.0°C | Temp = 20.1°C | Height = 17.9cm Temp = 19.5°C | Temp = 18.1°C | Height = 17.9cm Temp = 16.6°C |

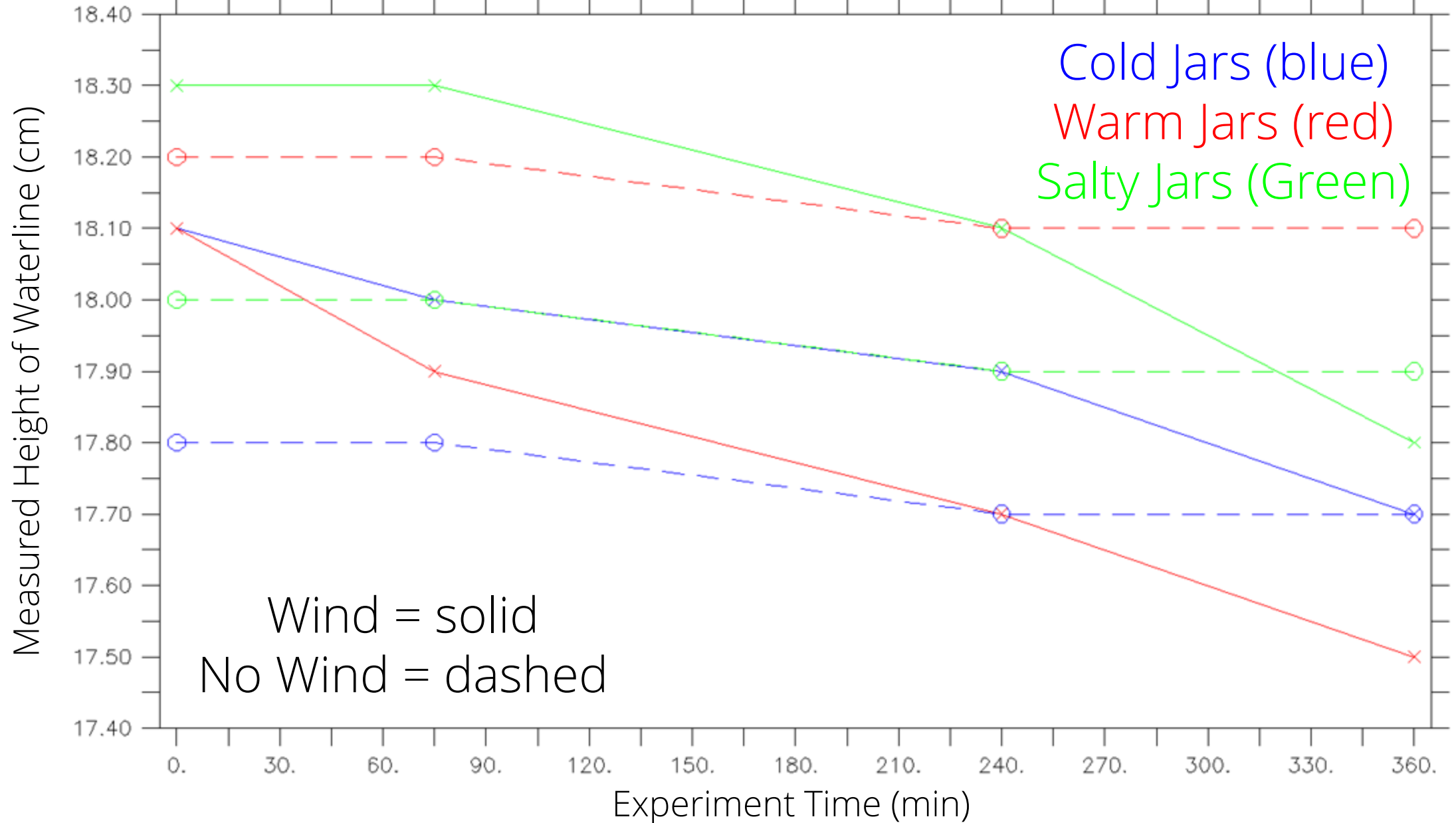
Results

Temperature vs Time



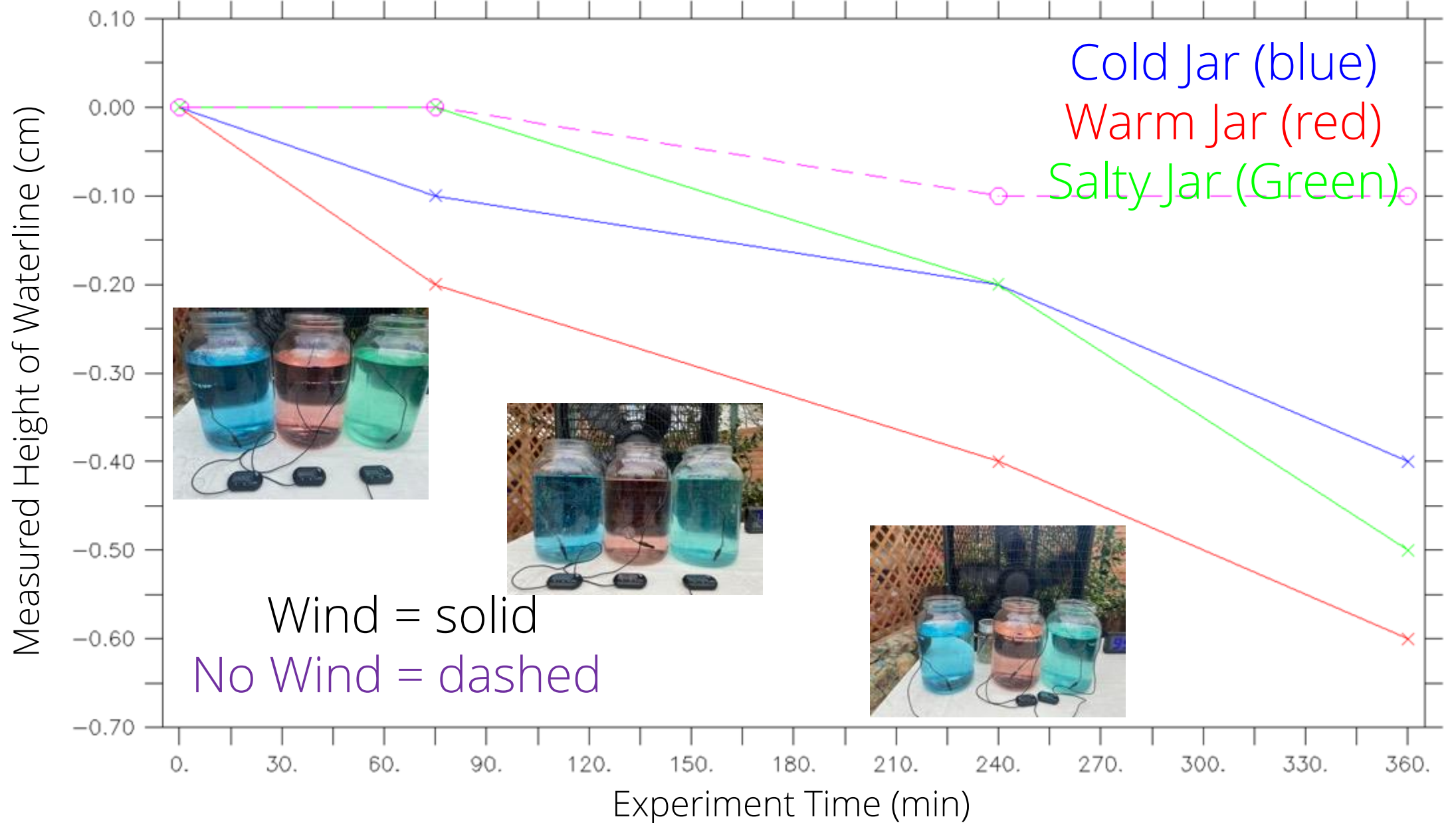
Results

Height vs Time



Results

Change in Height vs Time



Analysis/Notes/Discussion

- Water evaporates very slowly
- The jars with no wind barely changed in 6 hours or even after a whole day! (photo→)
- I had to go out between 90 minutes and 210 minutes, but the fan was running the whole time
- The warm and windy jar evaporated the most water in 6 hours (about 6mm), but all three jars in the wind evaporated more than all three of the “no wind” jars which each only evaporated about 1mm in the same time.

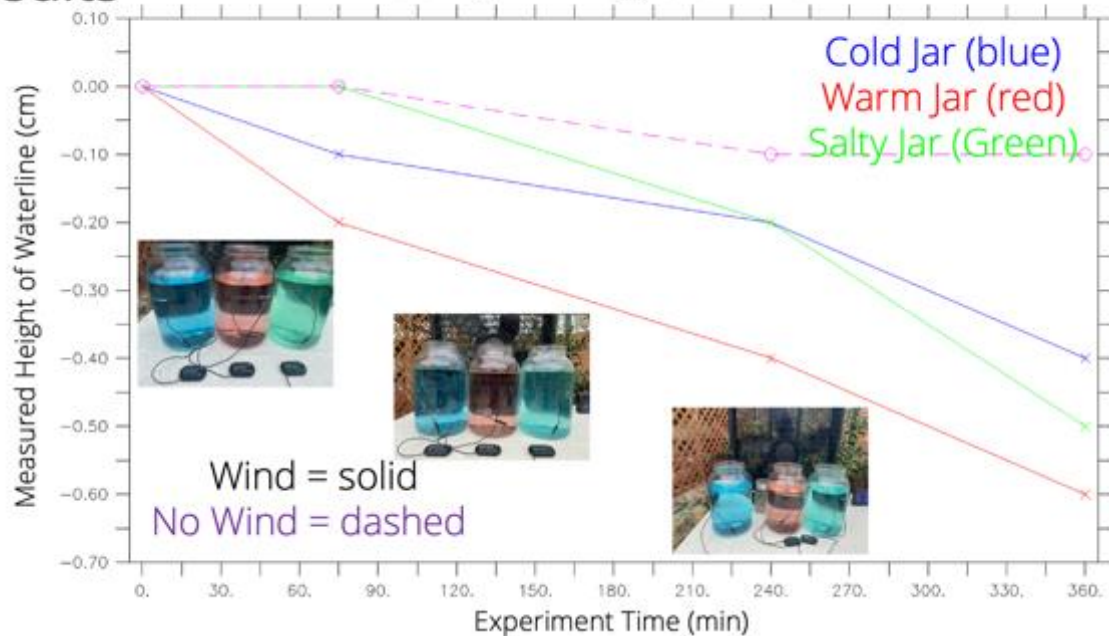


Conclusions

1. The differences between wind and no wind were clear
2. My main hypothesis was verified – the warm windy jar had the most evaporation
3. My method is probably not sensitive enough to see small changes
4. Wind made the water cool down much faster

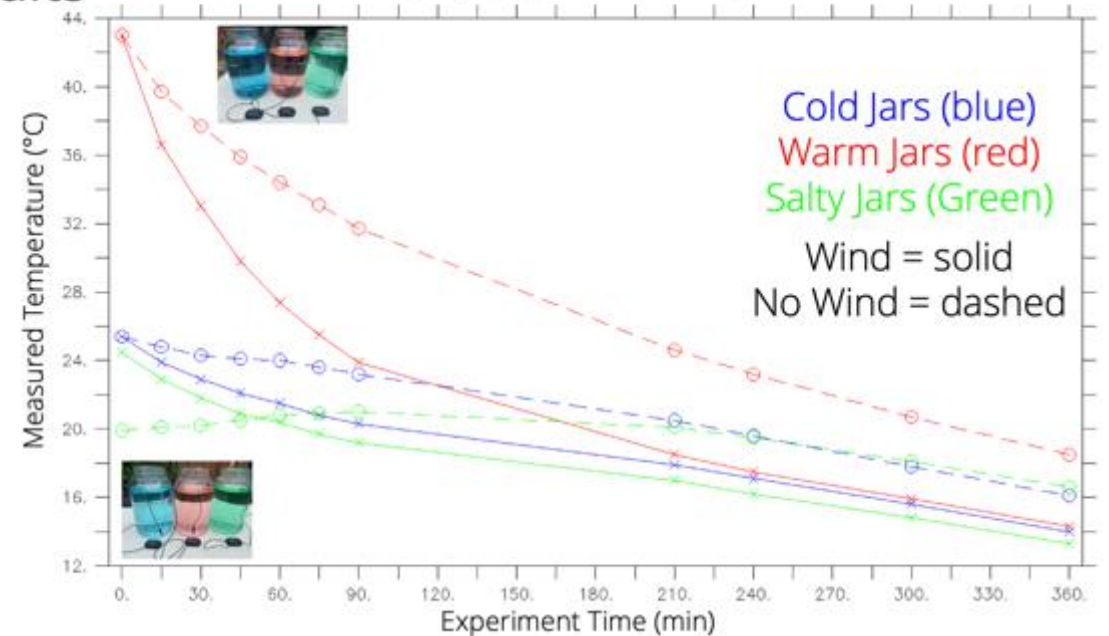
Results

Change in Height vs Time



Results

Temperature vs Time

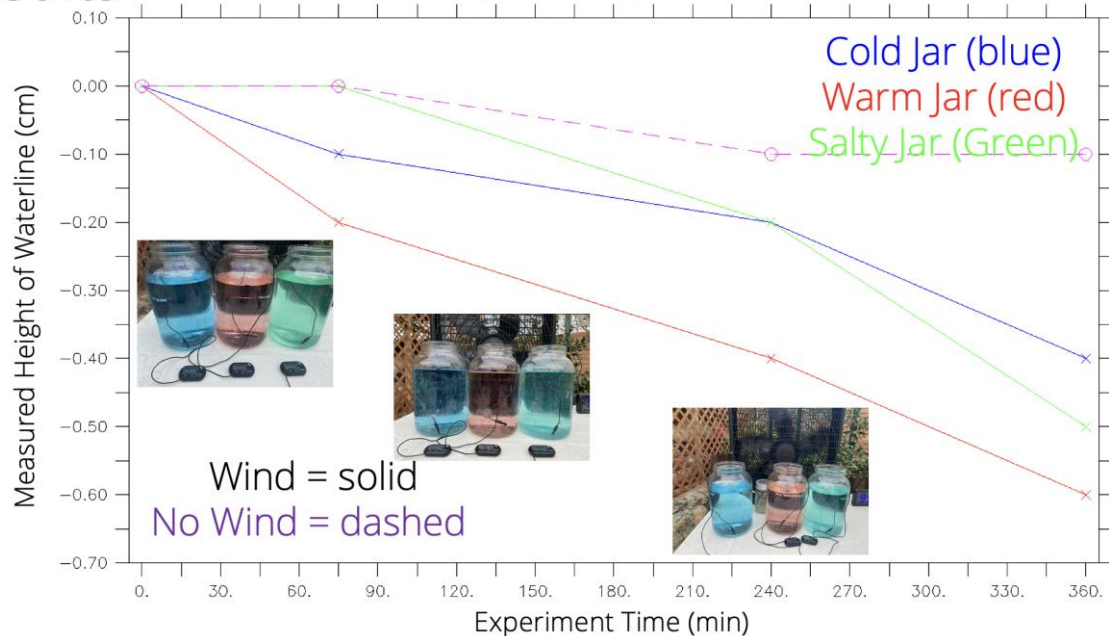


Future Work

1. Use different containers – pans, pots, trays, etc.
2. Use fans with different wind speeds – mine was just on high the whole time
3. Weight the jars and the water (I wanted to do this but forgot to weigh them at the end)

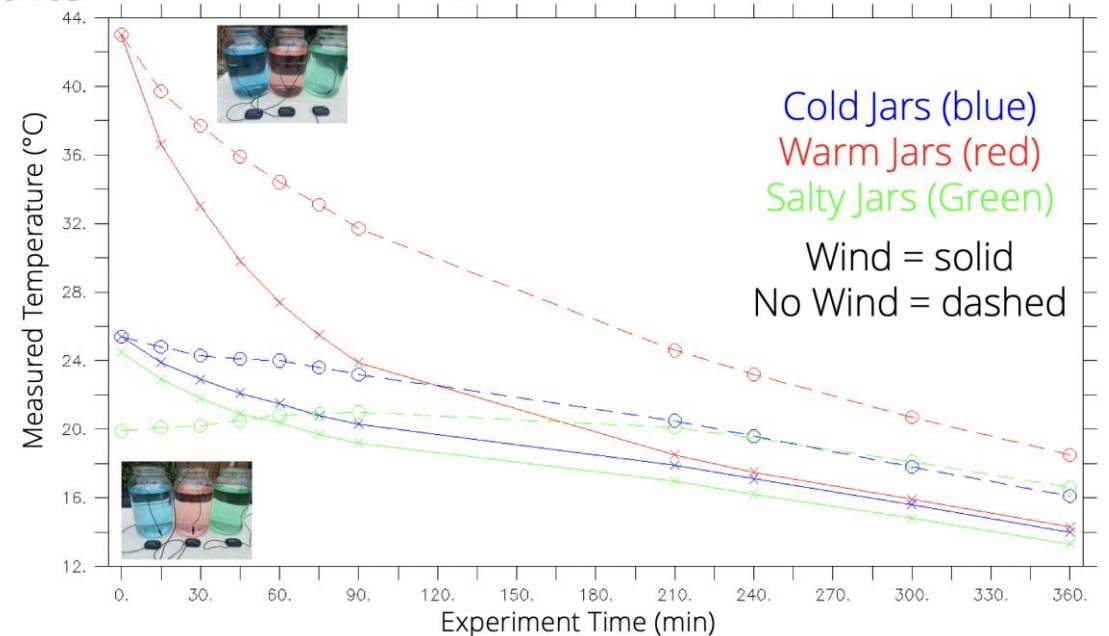
Results

Change in Height vs Time



Results

Temperature vs Time



References

- <https://www.theweatherprediction.com/habyhints2/470/>
- <https://www.brighthub.com/environment/science-environmental/articles/110665/>
- https://serc.carleton.edu/integrate/teaching_materials/food_supply/student_materials/905

