



# Observing Ice from Many Points of View

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## Introduction

We can learn a lot by observing using GLOBE and Fresh Eyes on Ice. We have tracked changes in ice and snow thickness and have taken photos of the ice during freeze-up using the GLOBE Observer app. These observations help, but in order for these observations to make sense, we need to understand the bigger picture of what is happening on the land and water, what our community has observed, and piece together a better picture of what is really happening. We think the knowledge of our community and science tools can work together.

## Question

Can we understand what we observe about the ice better if we include local knowledge and information from drones and satellites?

## Hypothesis

Including different viewpoints of our observations will help us better understand what is going on with the ice.

## Methods

- We went out to Big Lake to observe the ice using GLOBE Observer Land Cover app.
- We observed some patches of ice that were a different color, and we wondered what was happening. There were some holes we could kind of see.
- We learned how to build and fly drones so we could safely get a better picture of the mysterious patches from above.
- We talked with our community member, Manuel Gamboa who spends a lot of time at Big Lake and has lived in Venetie for a very long time.
- We also looked at satellite images to see if we could tell what was going on.



Observing Big Lake using a drone.



Making GLOBE Observer Land Cover observations.



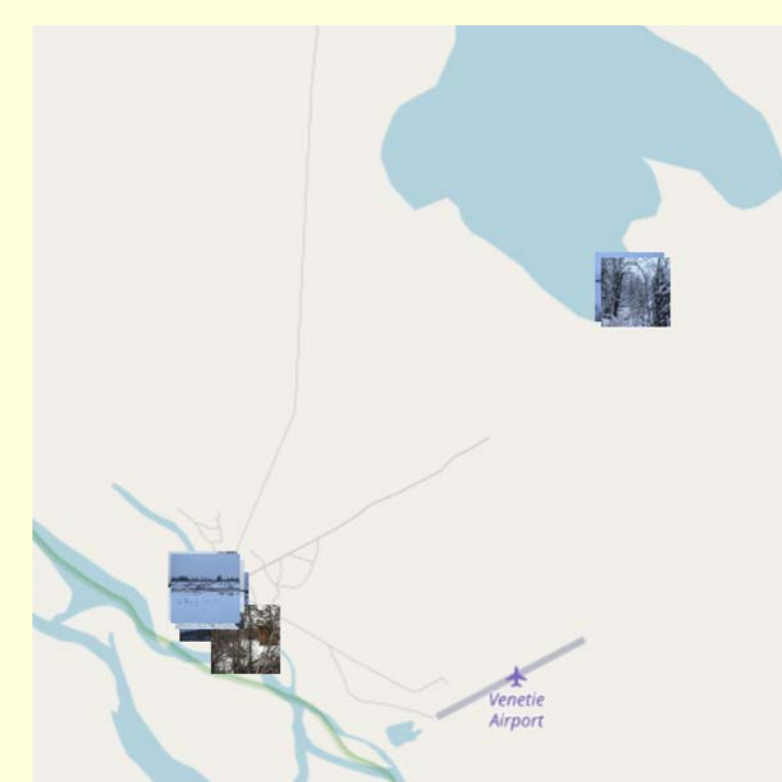
Measuring ice and snow thickness at Big Lake.



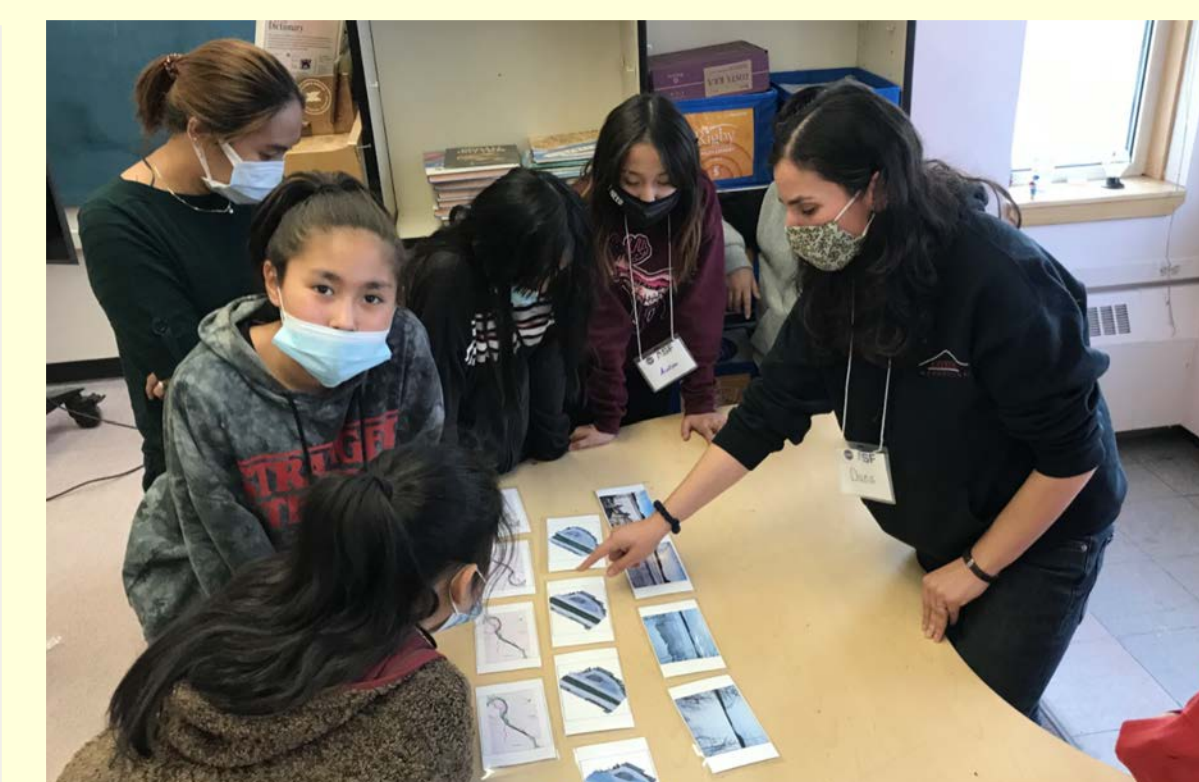
Learning to build and pilot our drones.



Viewing the lake from above using the drone.



Comparing GLOBE Observer images, drone images, and satellite images, and fitting them together with our local knowledge of the ice.



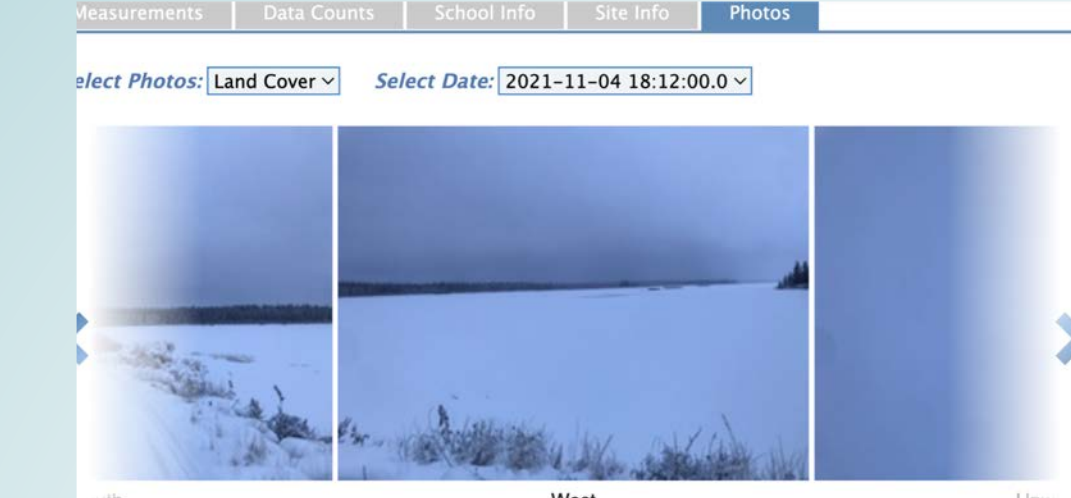
Our community helps us get out to observe the ice and teach us!



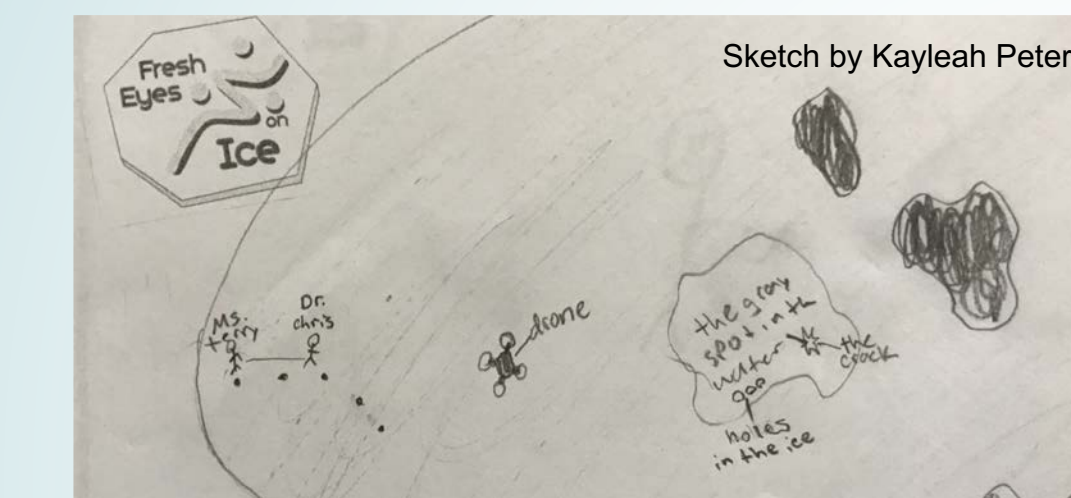
Our community ice night! We shared food, stories, and science about ice to learn from one another.



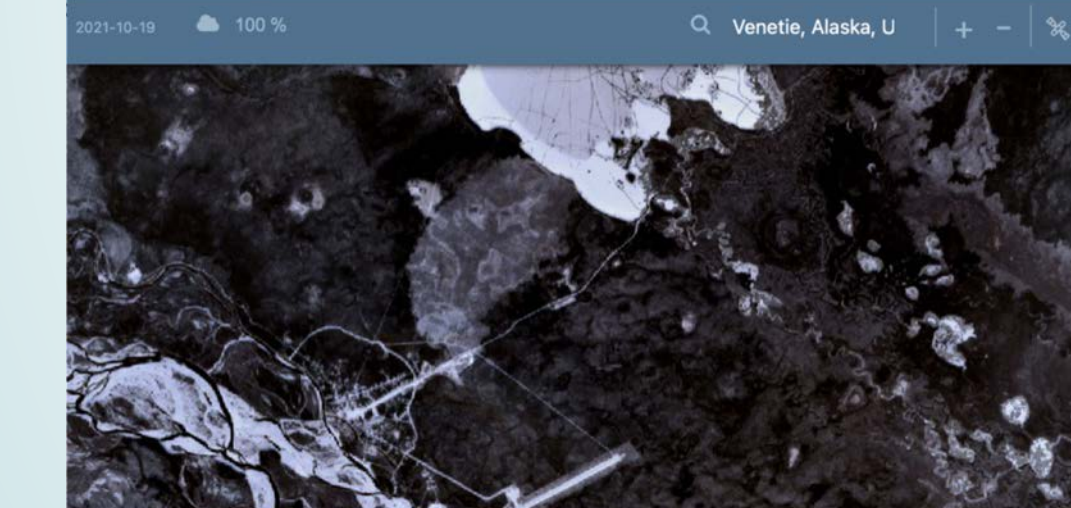
## Results



**1. View from the ground** - we saw there were some darker color patches in the ice. We made a GLOBE Observer Land Cover observation. We weren't sure what they were.



**2. View from the drone** - We could see that the center of the dark patches were star-shaped holes.



**3. View from satellite** - We could see that the lake had frozen, and then turned a darker color, and got some cracks in it.



**4. View from local knowledge** - We talked to Manuel Gamboa when he came out to Big Lake with us. He has been watching the lake all freeze-up and for many years. He saw muskrat push-ups where the star-shaped holes and dark ice patches are. The warm period had caused the push-ups to collapse and make a hole.

## Conclusions

The mysterious patches on the ice were caused by muskrat push-ups that had collapsed during some warm weather.

Getting viewpoints from GLOBE Observer, drones, satellites, and most importantly, our own community members, helped us understand what we were seeing in our own observations.

## Acknowledgements

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