

Inquiry-Based 5E Model Climate Literacy Lesson

Climate Forecasters

Grade Level: 2nd – 3rd

Duration: 45 minutes

Lesson Overview:

This lesson covers the definitions and what differentiates weather and climate. Students will discuss climates around the world and collaborate to determine distinct attributes of the climates. For this lesson, the focus will be on the ice block activity to demonstrate how a changing climate affects the local ecosystem.

Author: Nina Berry Gonzaga University Class of 2022

Jiana Stover, M.S., Science Outreach Coordinator at
Gonzaga Science in Action!

Disciplinary Area:
Earth and
Human
Activity

Key Concepts:

- Climate and Weather
- Attributes of climates around the world
- Animal traits

Key Lesson Information

Lesson Development Acknowledgement

This lesson was developed in collaboration with the [Gonzaga Science in Action!](#) program. The Science in Action! Program helped test the kits included in these lessons and helped guide Gonzaga undergraduates in developing the accompanying lessons. We thank Gonzaga SIA! for their collaboration and support!

NGSS Performance Standards Addressed

NGSS Standard 2-LS4	
Disciplinary Core Idea 2-LS4-1	Make observations of plants and animals to compare the diversity of life in different habitats.

NGSS Standard 3-ESS2	
Disciplinary Core Idea 3-ESS2-1	Make a claim about the merit of a design solution that reduces the impacts of a weather-related hazard.
Disciplinary Core Idea 3-ESS2-2	Obtain and combine information to describe climates in different regions of the world.

Materials List

Material	Units needed	URL for Purchasing
Ice Block Kit	10	Link here
Box of Arctic Figurines	4	Link here
White Paint	1	Link here

Key Terms List:

- **Weather:** day-to-day variation of the atmosphere's condition locally.
- **Climate:** variation of weather conditions over long periods of time, usually years.
- **Climate Change:** change in the average conditions — such as temperature and rainfall — in a region over a long period of time. For example, 20,000 years ago, much of the United States was covered in glaciers. In the United States today, we have a warmer climate and fewer glaciers.
- **Atmosphere:** Earth's atmosphere is a jacket of gases that surrounds our planet. It keeps us warm, gives us oxygen to breathe and it is where our weather happens.
- **Meteorologist:** study the atmosphere, the air around our planet. They use tools and observations to understand the earth's atmosphere and to forecast or predict how the earth's atmosphere will interact with and affect life on our planet. On a daily level, these scientists help us decide whether we need to bring an umbrella for an afternoon rain shower. On a larger scale, meteorologists can help understand the impact and likelihood of larger weather events like hurricanes, tornadoes, or floods.

5E model part 1: Engage (15 minutes)

Introduction and Background

The purpose of today's lesson is to understand the key distinctions between weather and climate. There are different climates all over the world, specific animals and plants live in each climate because they can tolerate a certain temperature and type of weather conditions. Problems arise when an animal's climate changes to a condition that they cannot successfully live in.

Climate vs. Weather

Ask students what they know about weather and climate. After the class discussion, define terms:

- Weather: day-to-day variation of the atmosphere's condition locally.
- Climate: variation of weather conditions over long periods of time, usually years.

Activity: Climates Around the World

What are the ideal climate conditions for different animals? Animals care about climate, not weather because climate is the average weather conditions of the region they live in.

Essential Concepts

Animals do not base where they live on a single weather event. They base it off the climate of the region they live in.

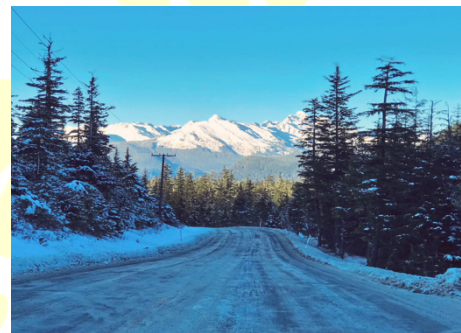
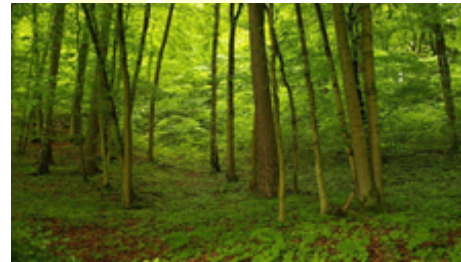
Animals adapt to specific climate conditions, and when those climates change, animals are not happy living there and must move to an area with a suitable climate to live in that best fits their adaptations.

Activity Procedure

1. Students are given animals that inhabit the different climates listed below. Students will be asked to describe different attributes of the climates and group the animals that best fit that climate description.
2. After students group animals based on what climate they think they prefer/ live in, we will ask students to discuss what qualities the animals from each climate have in common that coincide with attributes of the climate.

Example Climates:

- a. **Tropical.** Hot/ humid and lots of rain
 - a. Hawaii (61°F to 85°F)
- b. **Dry.** Very dry and hot, little to no rain
 - a. Arizona- the desert! (45°F to 107°F)
- c. **Temperate.** Mild weather, rain.
 - a. Seattle (37°F to 79°F)
- d. **Continental.** Have warm to cool summers and very cold winters. In the winter, this zone can experience snowstorms, strong winds, and very cold temperatures
 - a. Alaska (25°F to 65°F)
- e. **Polar.** In the polar climate zones, it's extremely cold. Even in summer, the temperatures here never go higher than 50°F (10°C)
 - a. Arctic (-50°F to 50°F)



Each animal that lives in these different climates have specific traits that help them survive. If their climate were to change, they would not be well adapted to that region anymore, forcing them to leave their home and find a region with their required climate.

5E model part 2: Explore (15 minutes)

Arctic Ice is Melting!

Let's head south to the Arctic with the Ice Block Activity! What does a changing climate look like in the arctic?

Ice Block Activity!

Climate patterns in a certain area are important for the animals and plants that live there. When the climate begins to change, the environment changes which makes the animals and plants unable to live comfortably in that region.

Essential Concepts

Animals do not base where they live on a single weather event. They base it off the climate of the region they live in.

Animals adapt to specific climate conditions, and when those climates change, animals are not happy living there and must move to an area with a suitable climate to live in that best fits their adaptations.

Activity Procedure

1. Students are provided Arctic animal figurines will be placed around model- the native species live happiest when there is solid ice.
2. Sheet of paper with an aerial view of the arctic. Broken up into three parts: ocean, melting sea ice (warming temperatures), and tundra.
3. Students will predict what area of the arctic the animals will prefer to live (i.e. will the polar bears want to stay on the melting sea ice or move towards the tundra?)
4. Students will place ice blocks on outlined squares
5. Students be asked to make a prediction about which block they think the ice will melt when placed it based on the one is melting sea ice (warming temperature- longer melting season) and the other is normal temperature (normal melting season)
6. Place Ice on blocks and watch one ice melt faster on the block that represents changing climate while ice on the other 'normal' climate block does not melt right away

5E model part 3: Explain (5 minutes)

Albedo Effect

Dark objects left out in the sun get warm. Lighter-colored objects, not so much. This drives weather and climate because on a regional scale, it can influence the melting of sea ice and glaciers.

For instance, at higher latitudes, warmer temperatures melt the ice sheets. However, if warm temperatures decrease the ice cover and the area is replaced by water or land, the albedo will decrease. This increases the amount of solar energy absorbed, leading to more warming. The effect has mostly been discussed in terms of the recent trend of declining Arctic Sea ice. The change in albedo acts to reinforce the initial alteration in the ice area leading to more warming. Warming tends to decrease ice cover and hence decrease the albedo, increasing the amount of solar energy absorbed and leading to more warming. Discuss which block animals in the arctic would prefer? The normal climate- with no melting ice or the changing climate- melting ice?

- Climates around the world are changing due to human activities

Important Concept Check in: Key Terms

Key Terms List:

- **Weather:** day-to-day variation of the atmosphere's condition locally.
- **Climate:** variation of weather conditions over long periods of time, usually years.
- **Climate Change:** change in the average conditions — such as temperature and rainfall — in a region over a long period of time. For example, 20,000 years ago, much of the United States was covered in glaciers. In the United States today, we have a warmer climate and fewer glaciers.
- **Atmosphere:** Earth's atmosphere is a jacket of gases that surrounds our planet. It keeps us warm, gives us oxygen to breathe and it is where our weather happens.

5E model part 4: Elaborate (5 minutes)

Clarify the connection

What is Climate Change?

- **Climate Change:** change in the average conditions — such as temperature and rainfall — in a region over a long period of time. For example, 20,000 years ago, much of the United States was covered in glaciers. In the United States today, we have a warmer climate and fewer glaciers.
- **Atmosphere:** Earth's atmosphere is a jacket of gases that surrounds our planet. It keeps us warm, gives us oxygen to breathe, and it is where our weather happens.

Different climates all over the world allows different plants and animals to live in the climate best fit for their needs.

If a climate changes too much those plants and animals can no longer live there, and they need to find a different place to call home.

The melting of sea ice is a loss to some (arctic foxes, seals, walruses, and polar bears) and a potential benefit to others (namely, the whales).

Discussion

Review the difference between weather and climate.

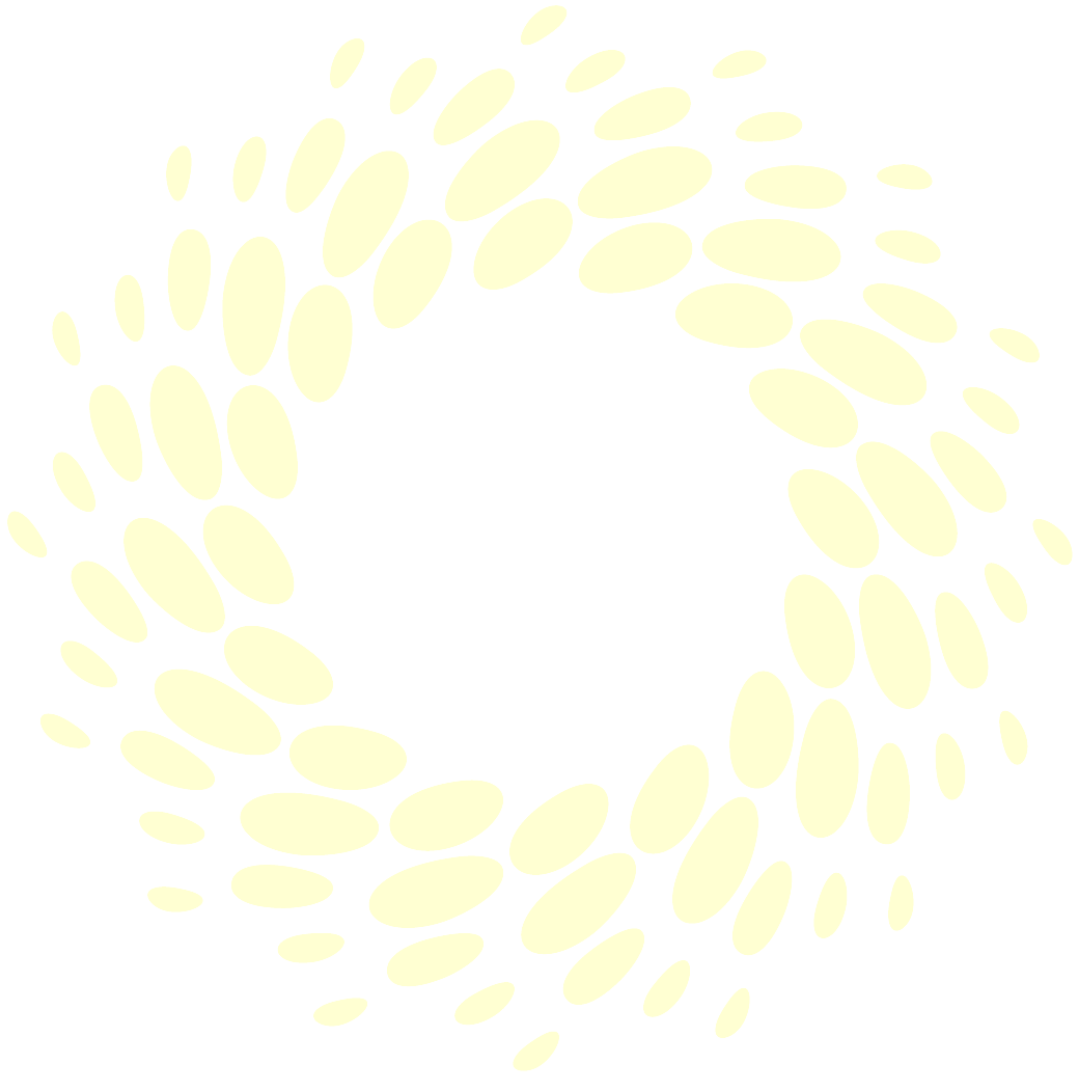
- Weather can vary day to day- that is normal
- Big changes in a regional climate is not normal

Expand

How can we stop climate change together?

5E model part 5: Evaluate (5 minutes)

Take-home activity: coloring worksheet of different climates all over the world



By the end of this Lesson

Concepts Learned:

- Students can define climate and weather.
- Students can name attributes of different types of climates around the world.
- Students understand that a change in climate affects animals and plants.

Connection/Evidence Gathered:

- Animals have specific traits that help them survive in different climates.
- The albedo effect makes dark objects left out in the sun warmer.



Additional Resources:

What's in Your Closet?

Weather tells you what to wear each day. Climate tells you what types of clothes to have in your closet.

Essential Concepts

Different climates are important. Different climates allow various plants and animals to live in the climate that is best suited for them.

WEATHER	CLIMATE
<p>Tells you what to wear each day</p> 	<p>Tells you what types of clothes to have in your closet</p> 

NOAA National Centers for Environmental Information www.ncei.noaa.gov

Activity Procedure

1. Students receive cut outs of various pieces of clothing (shorts, sandals, t-shirt, puffer jacket, sweatshirt, tank top, raincoat, snow boots, etc.)
 2. Images of different places (Seattle, Phoenix, Hawaii, Antarctica, Alaska) appear on screen and students assemble the proper closet for that climate
 3. Discuss different climates around the world- ask students if they have lived anywhere other than Spokane, if so what was the climate like?
 - **Tropical.** Hot/ humid and lots of rain
 - Hawaii (61°F to 85°F)
 - **Dry.** Very dry and hot, little to no rain
 - Arizona- the desert! (45°F to 107°F)
 - **Temperate.** Mild weather, rain.
 - Seattle (37°F to 79°F)
 - **Continental.** Have warm to cool summers and very cold winters. In the winter, this zone can experience snowstorms, strong winds, and very cold temperatures
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-

Meteorologist in Training!

Students will become meteorologists in training right here in Spokane.

Essential Concepts

Weather refers to short-term changes in the atmosphere, climate describes what the weather is like over a long period of time in a specific area. Different regions can have different climates. To describe the climate of a place, we might say what the temperatures are like during different seasons.

Activity Procedure:

1. Ask students: Who has watched the news and seen the segment of the weather person tell what the weather will be like for the week?
2. Define term Meteorologist and Atmosphere
3. What is Spokane's climate? Images of Spokane during the different seasons
 - Students define what season they see and what are normal weather events for that season
 - Estimate weather event and average temperature
4. Weather is something that happens day to day. If someone is visiting Spokane, what would they need to bring?

Key Terms List:

- **Atmosphere:** Earth's atmosphere is a jacket of gases that surrounds our planet. It keeps us warm, gives us oxygen to breathe and it is where our weather happens.
- **Meteorologist:** study the atmosphere, the air around our planet. They use tools and observations to understand the earth's atmosphere and to forecast or predict how the earth's atmosphere will interact with and affect life on our planet. On a daily level, these scientists help us decide whether we need to bring an umbrella for an afternoon rain shower. On a larger scale, meteorologists can help understand the impact and likelihood of larger weather events like hurricanes, tornadoes, or floods.



When scientists talk about climate, they're often looking at averages of precipitation, temperature, humidity, sunshine, wind, and other measures of weather that occur over a long period in a particular place. In some instances, they might look at these averages over 30 years.



CLIMATE FORECASTERS



Center for **Climate, Society,**
and the **Environment**





WHAT IS WEATHER?

WHAT IS CLIMATE? 3





DEFINITIONS

WEATHER

NOTES:

**CONDITIONS
OUTSIDE RIGHT
NOW IN A
SPECIFIC PLACE
AND TIME.**



CLIMATE

NOTES:

**PATTERN OF
WEATHER
CONDITIONS OVER
A LONG PERIOD OF
TIME FOR A
CERTAIN PLACE.**



CLIMATES AROUND THE

WORLD

WHAT ARE THE
IDEAL CLIMATE
CONDITIONS FOR
DIFFERENT
ANIMALS?



TROPICAL CLIMATE

- Hot and humid all year long!
 - Around 70 to 80 degrees
 - Little change between seasons
- Lots of rain
- Examples: Amazon Rainforest in Brazil



DESERT CLIMATE

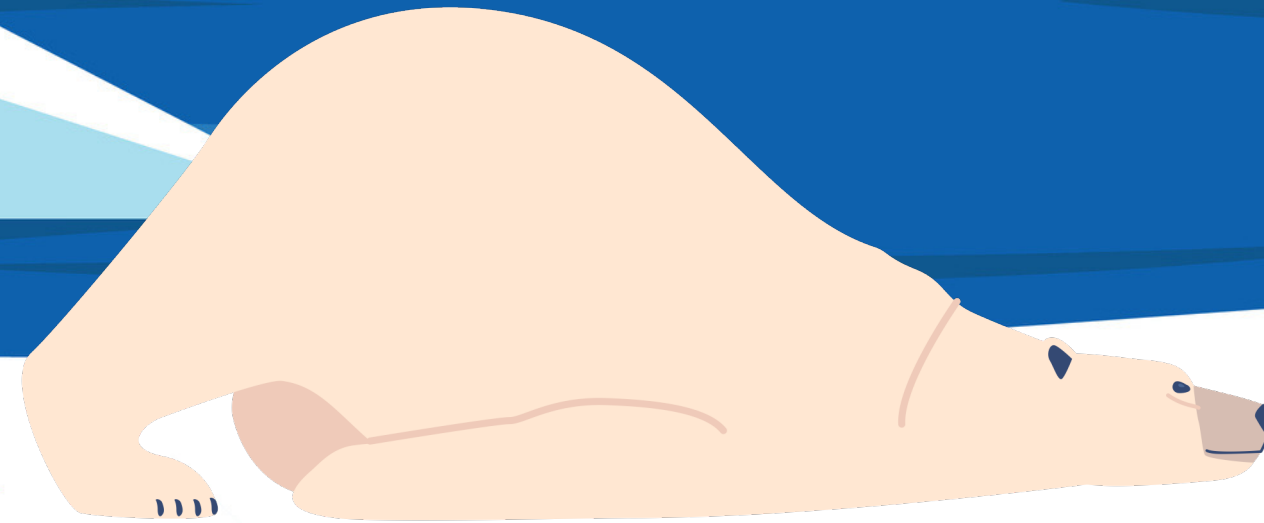
- Very hot, dry, and sunny!
- High temperatures
 - However, temperatures can also be very low at night
- Low amount of rainfall
- Not a lot of plants
- Examples: Arizona and Saharah Desert



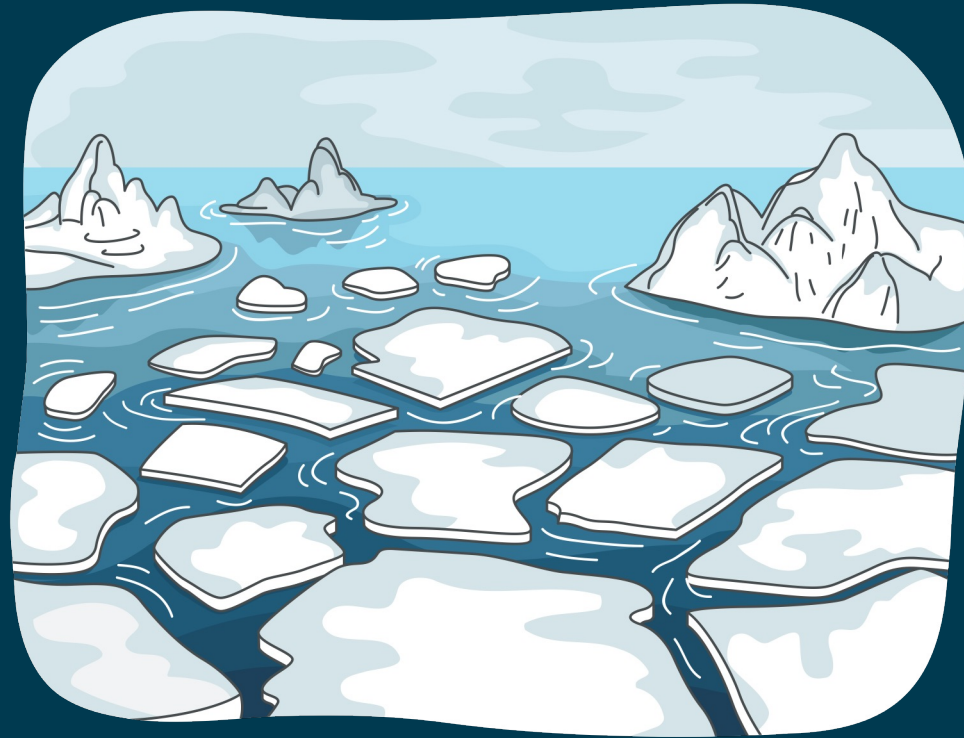
POLAR CLIMATE

- Extremely cold, icy, and covered in snow...brrrr
- Mostly below freezing temperatures
 - Very cold winters & cool summers
- No direct sunlight
- Examples: Arctic and Antarctica

WELCOME TO THE ARCTIC...BRRRRR



**WHAT WOULD HAPPEN IF THE
CLIMATE IN THE ARCTIC CHANGED?**

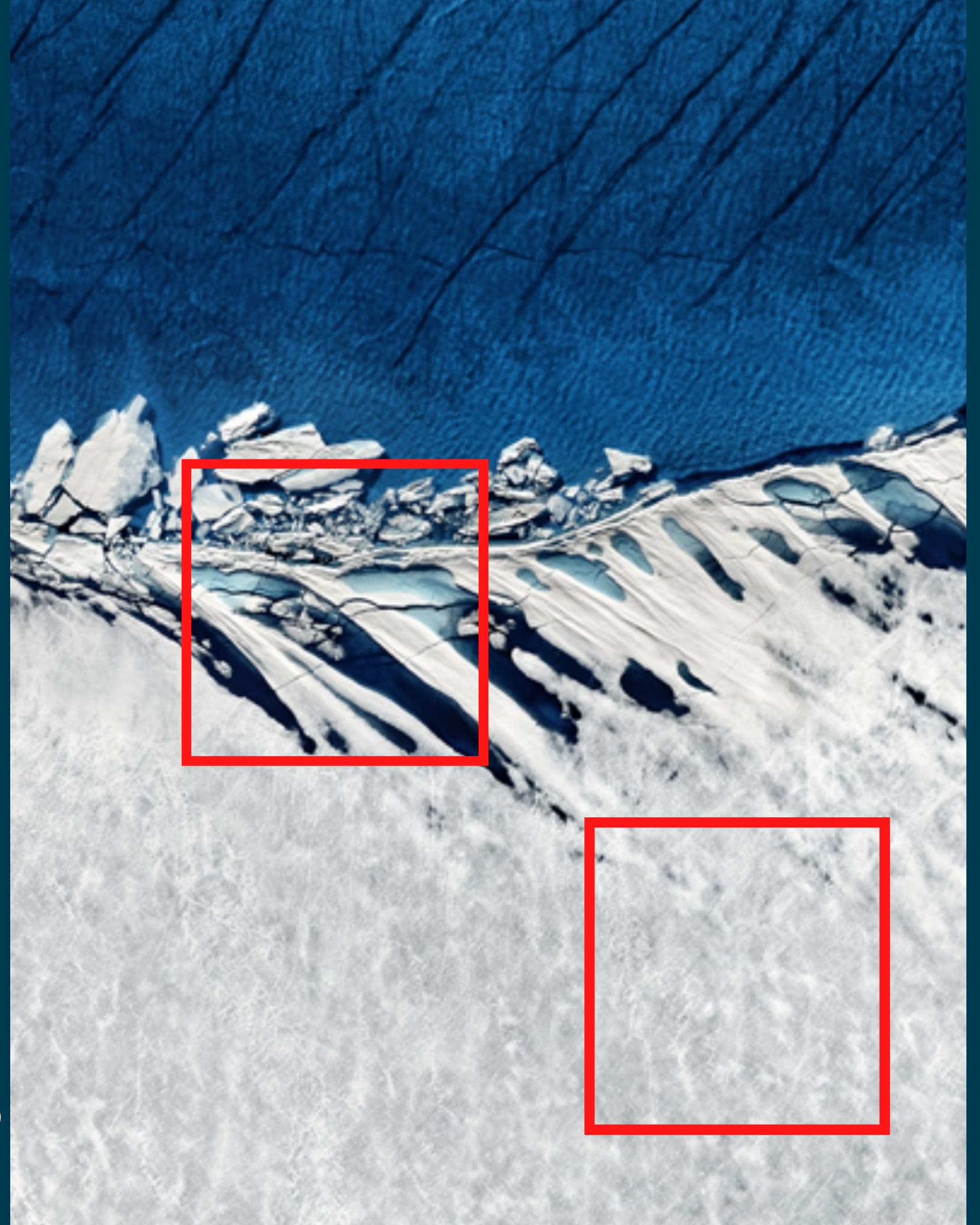


**HOW WOULD A CHANGE IN CLIMATE
AFFECT THE ANIMALS' HABITAT AND
LIFESTYLE?**

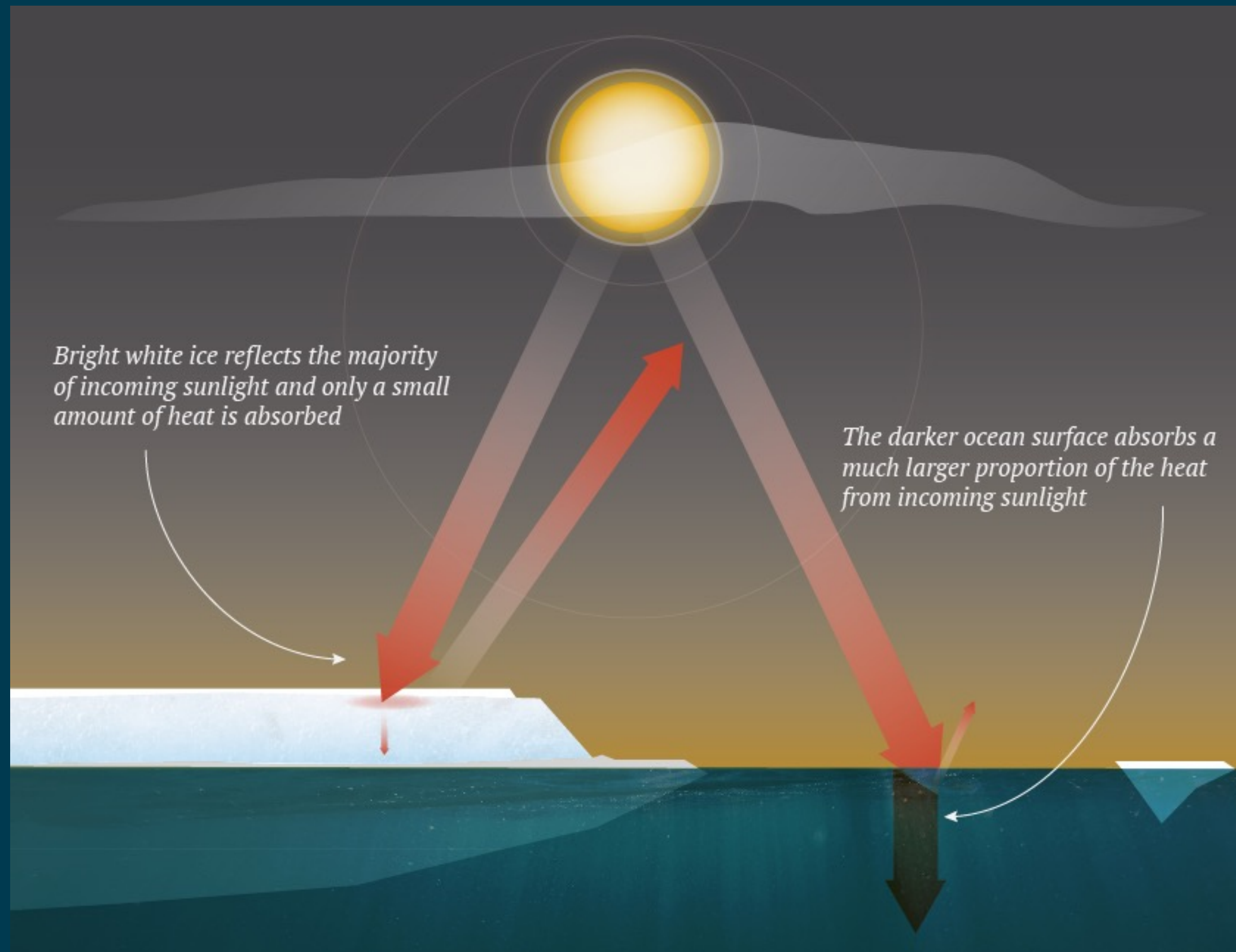
Place blocks on the Arctic landscape

- One block is solid ice (normal climate conditions)
- The other block is partially covered in ice with some exposed sea water (changing climate conditions)

What block will melt the ice?



ALBEDO EFFECT



MELTING SEA ICE IN THE ARCTIC

TIME SERIES: 1979-2021

Data source: Satellite observations.

Credit: [NASA Scientific Visualization Studio](#)

1979



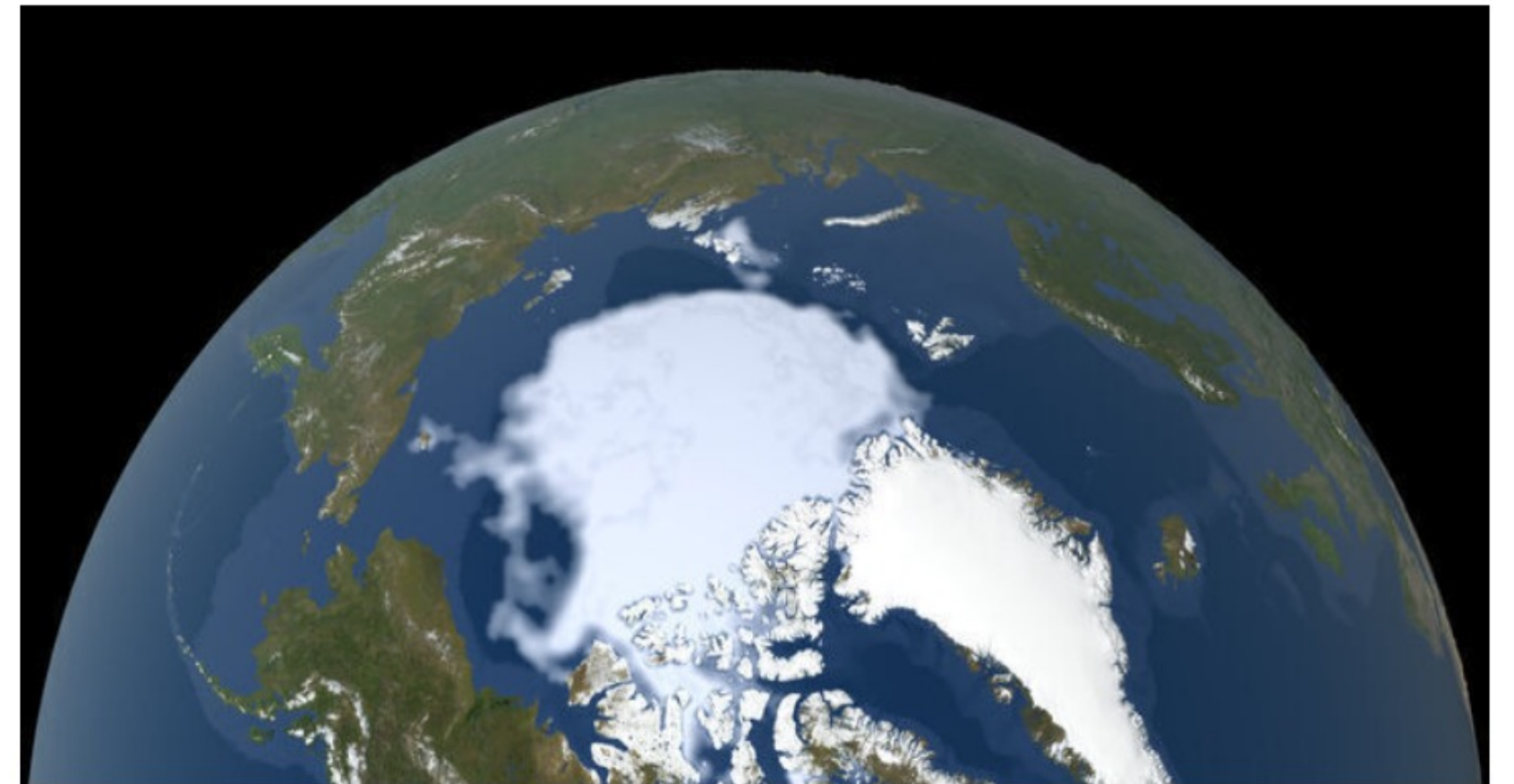
▶ 1979 ○ 2021

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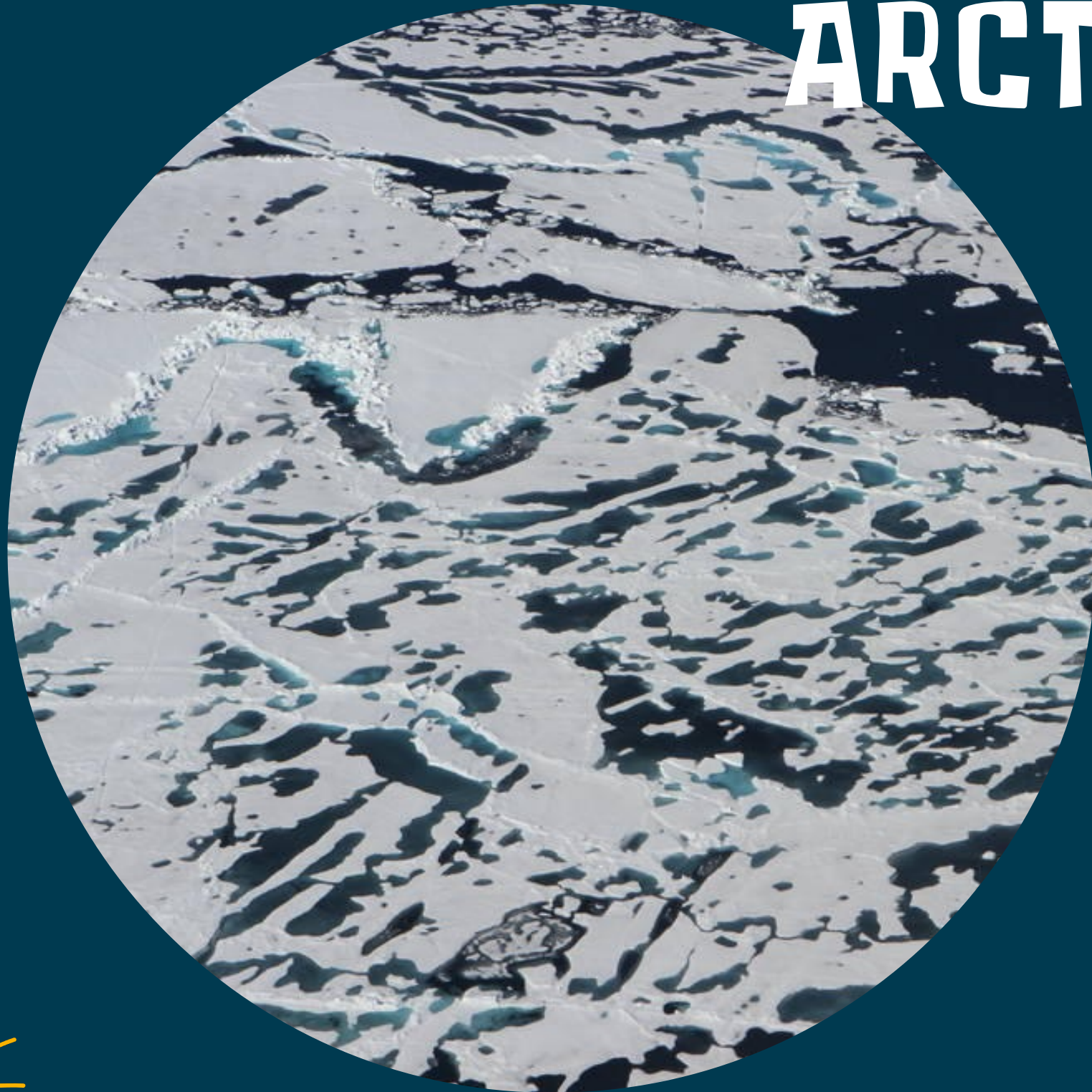
2021



▶ 1979 ○ 2021

NASA IMAGES

MELTING SEA ICE IN THE ARCTIC

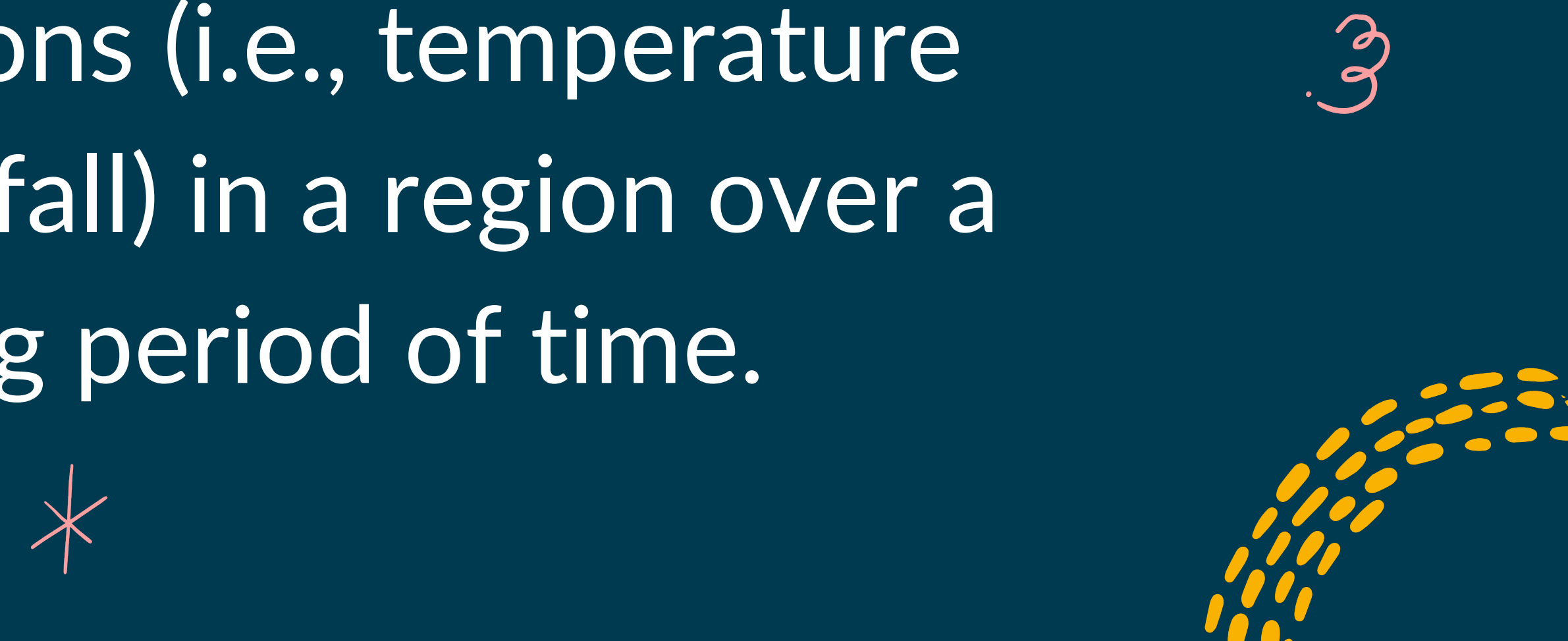


AS TEMPERATURES OF THE AIR AND SEA
RISE MORE ICE MELTS WARMING THE
ARCTIC- CHANGING THE CLIMATE!



CLIMATE CHANGE

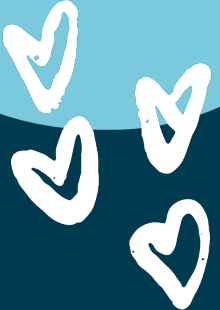
Change in the normal weather conditions (i.e., temperature and rainfall) in a region over a long period of time.





WHAT WE LEARNED TODAY



- WEATHER IS CONDITIONS OUTSIDE RIGHT NOW
 - CLIMATE IS PATTERN OF WEATHER CONDITIONS OVER TIME
 - CLIMATES ALL OVER THE WORLD HAVE DIFFERENT PLANTS AND ANIMALS
 - CHANGING CLIMATE CONDITIONS AFFECT PLANTS AND ANIMALS-
CLIMATE CHANGE IS CHANGE IN NORMAL WEATHER CONDITIONS
- 





THANK YOU!!!



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