

Essential Question:

How does unequal heating and the Earth's rotation affect wind patterns?

Standards:

S6E4a. Demonstrate that land and water absorb and lose heat at different rates and explain the resulting effects on weather patterns.

S6E4b. Relate unequal heating of land and water surfaces to form large global wind systems...

S6E2c. Relate the tilt of the earth to the distribution of sunlight throughout the year and its effect on climate.

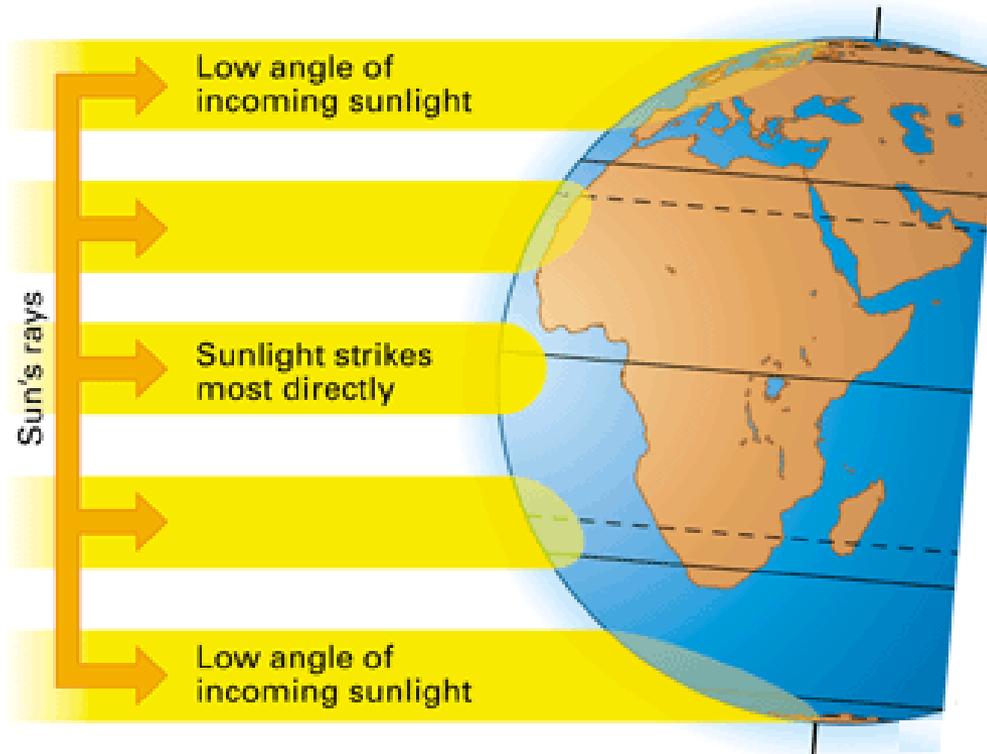
Activating Strategy:

**Watch one of the videos below
then discuss with a partner what
causes wind.**

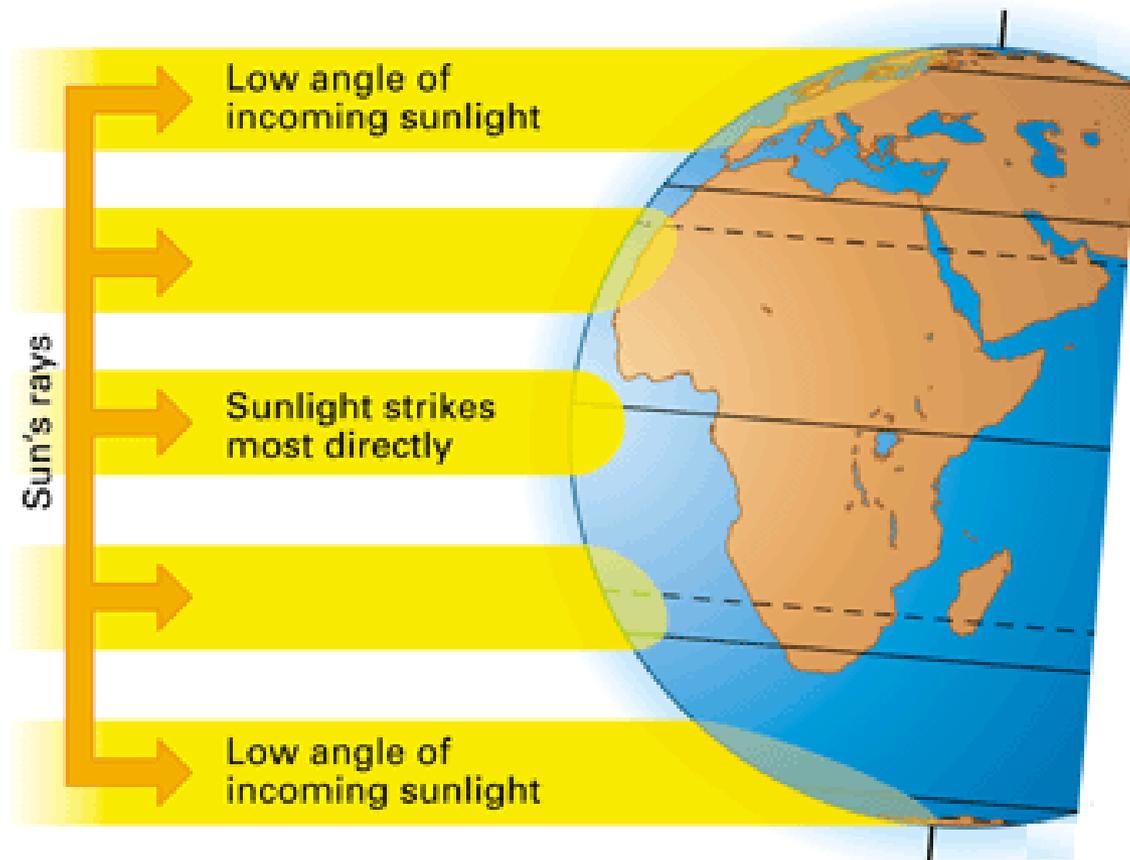
https://www.youtube.com/watch?v=6E9q0BFX_-I

https://www.youtube.com/watch?v=QO9_IP6rbrk

In previous lessons, you learned that the uneven heating of Earth's surface by the Sun causes some areas to be warmer than others.



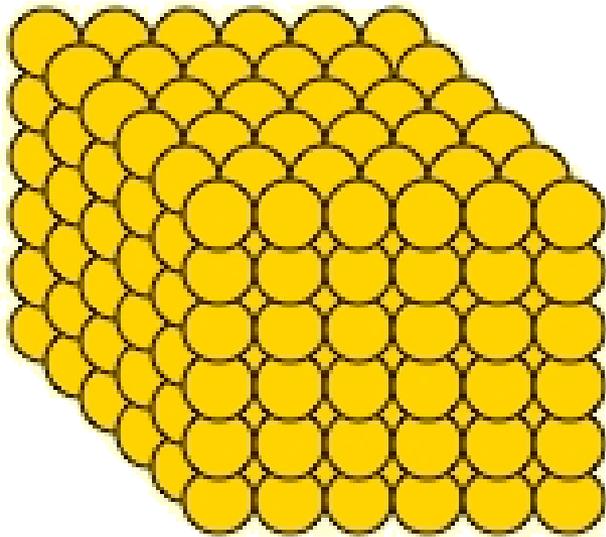
This uneven heating of land forms wind systems.



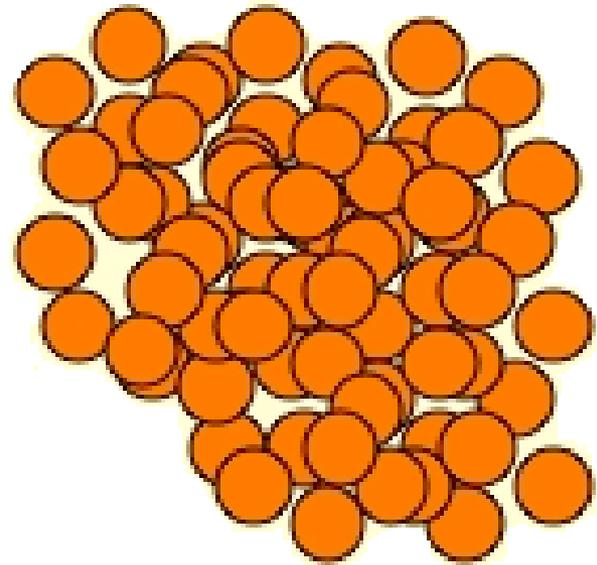
Wind is caused by differences in air pressure. Areas of high pressure move to areas of low pressure.

Air pressure is related to density. Let's review density.

Which one has greater density? Greater pressure?



**Greater Density
Greater Pressure**



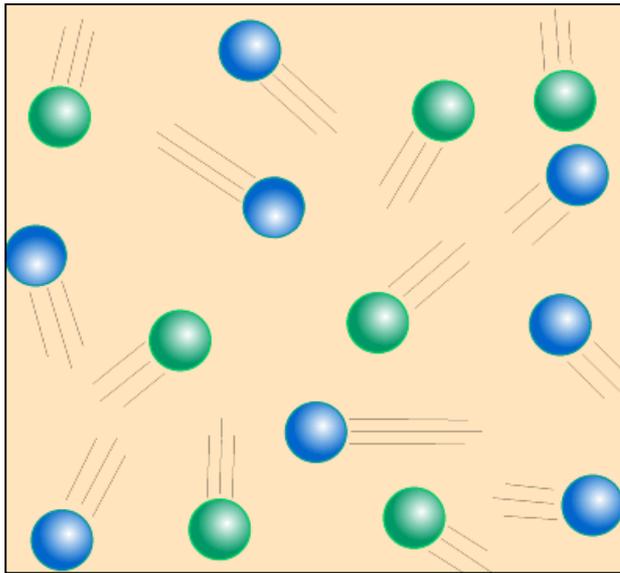
**Lower Density
Lower Pressure**

We will consider Density and Pressure to be the same.

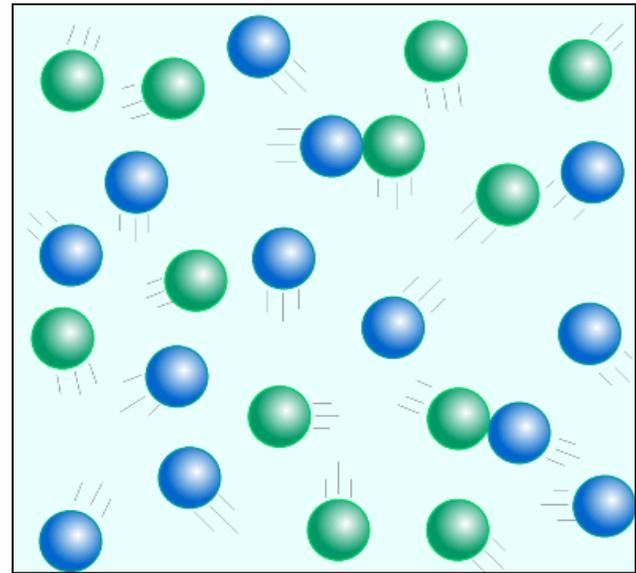
**What about temperature?
What did you learn about temperature and density?**



Look at the images below. Identify which image has: Higher Temperature, Higher Density, Higher Pressure.

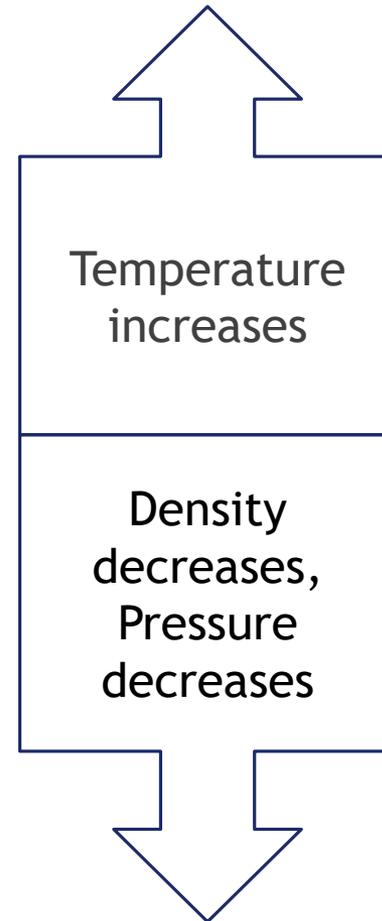
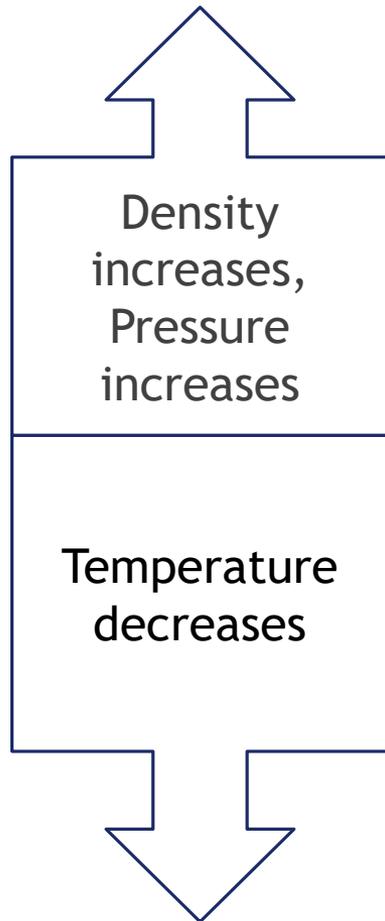


**Higher Temperature
Lower Density
Lower Pressure**



**Lower Temperature
Higher Density
Higher Pressure**

Temperature, Density and Pressure

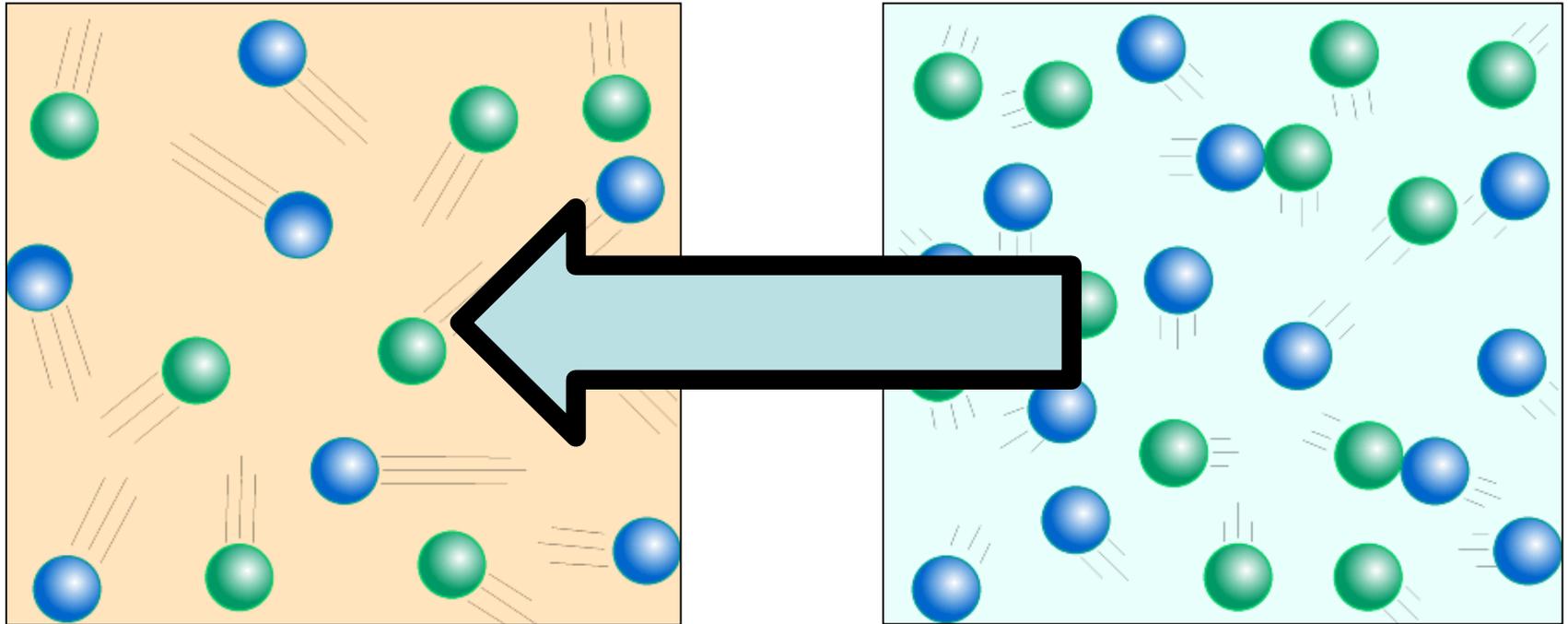


**Let's apply these
concepts back to wind.**

**Wind is caused by
differences in air pressure.
Areas of high pressure move
to areas of low pressure.**



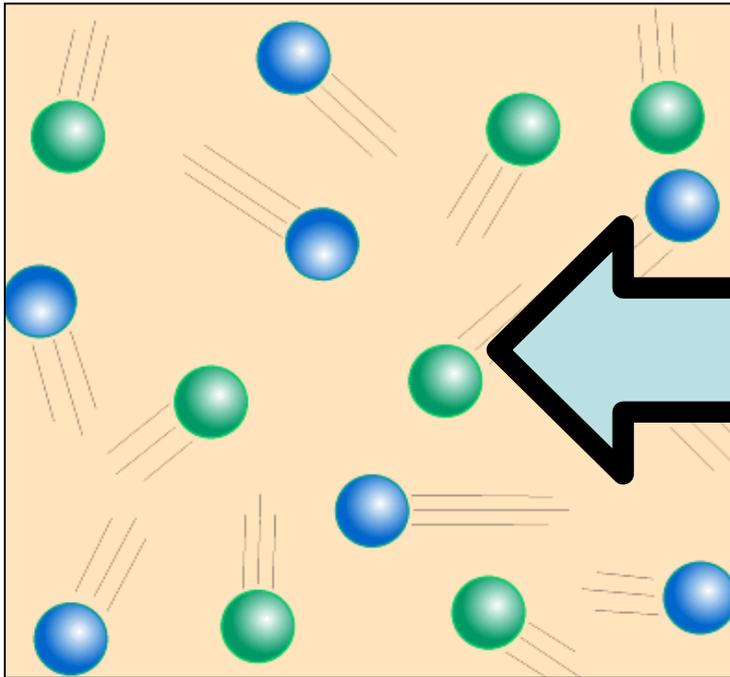
**In which direction would the wind
move below.**



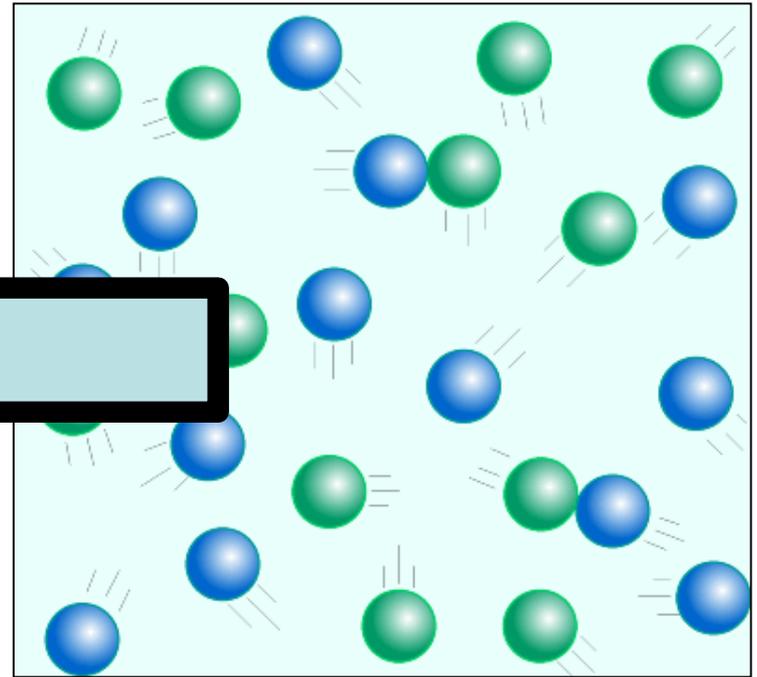
**Higher Temperature
Lower Density
Lower Pressure**

**Lower Temperature
Higher Density
Higher Pressure**

Why?

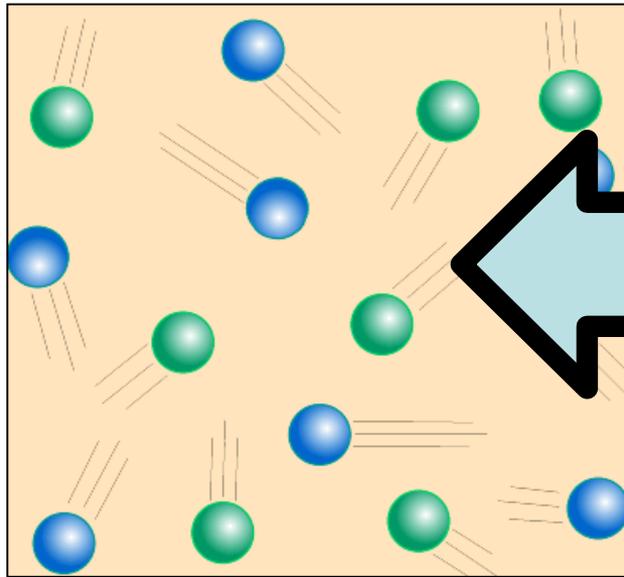


Higher Temperature
Lower Density
Lower Pressure

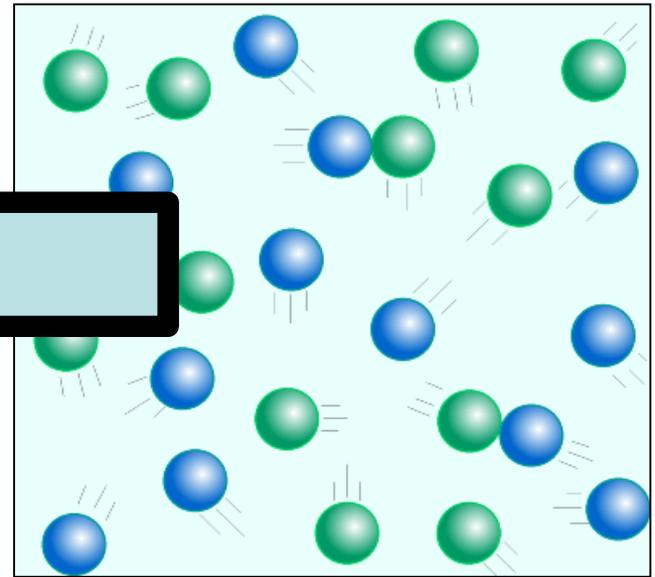


Lower Temperature
Higher Density
Higher Pressure

Think of it this way...matter naturally wants to move from where it is crowded to where it is less crowded. This concept is true for all of science.



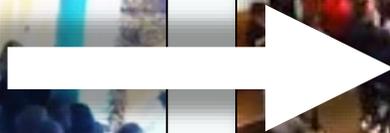
Higher Temperature
Lower Density
Lower Pressure



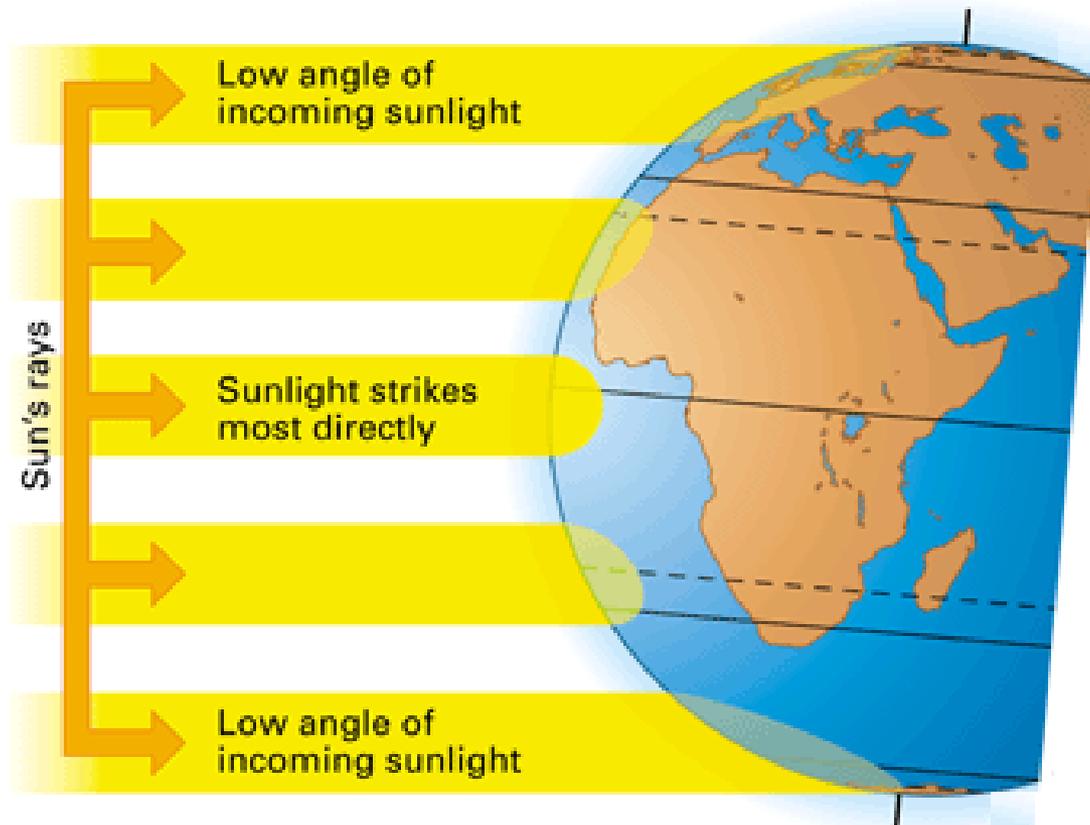
Lower Temperature
Higher Density
Higher Pressure



Particles naturally want to move from where they are more crowded to where they are less crowded.



Which areas of the earth have air that is low pressure (low density)? Why? What about high pressure (high density)?



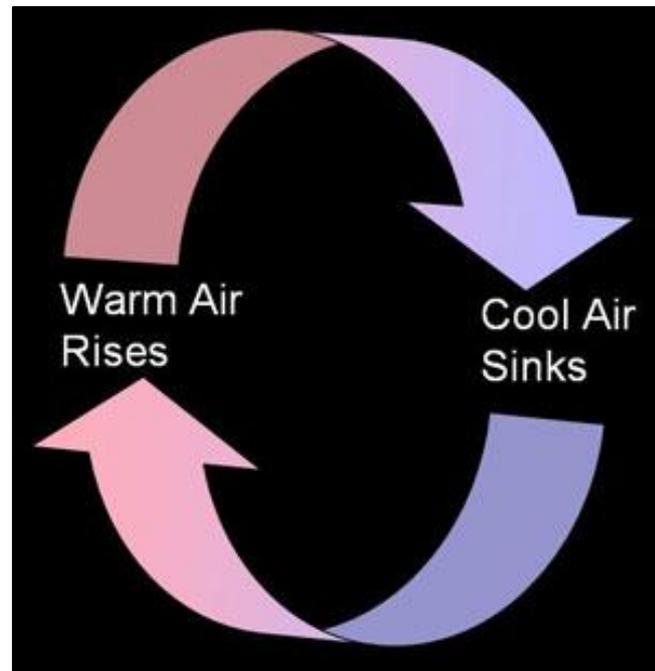
Distributed Summarizing:

Turn to a seat partner and describe how wind moves.

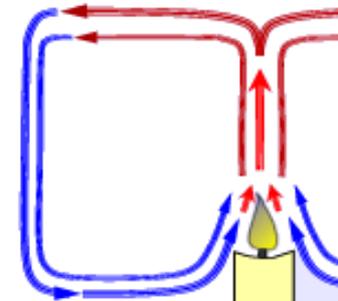
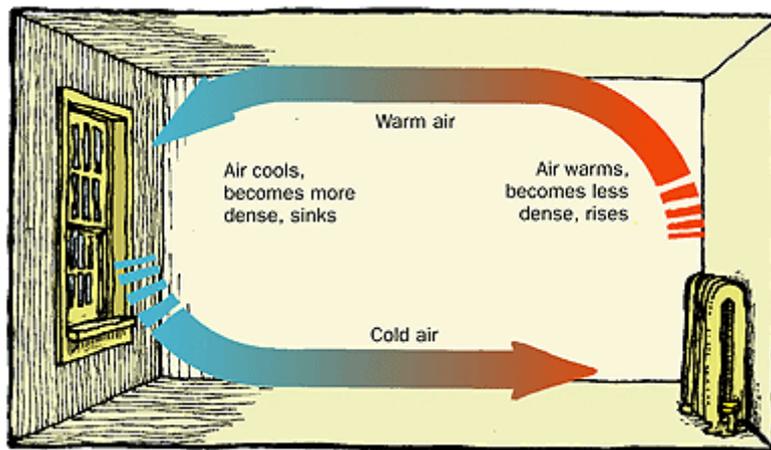
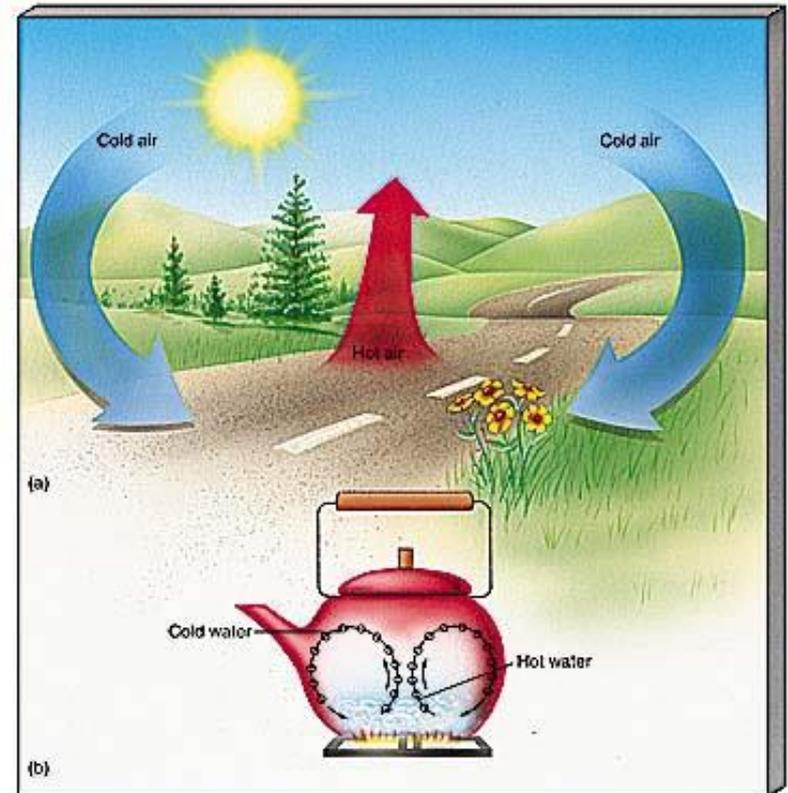
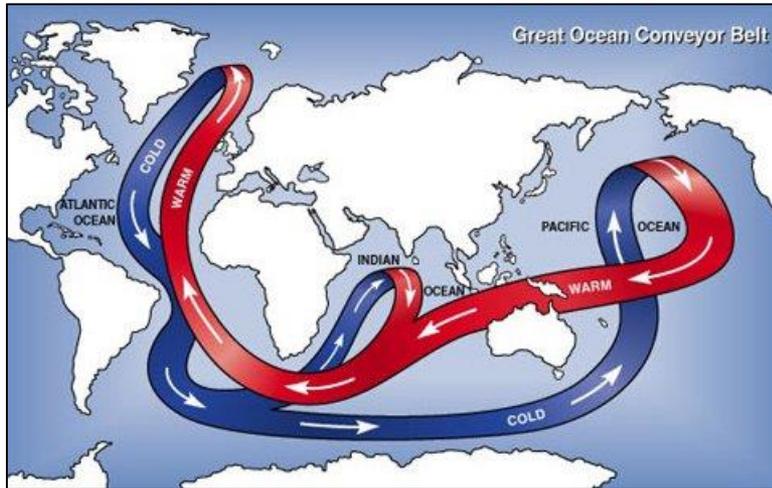
Together discuss the following question: What makes wind travel at faster speeds?

Differences in density and pressure cause wind and air movement. The movement of air occurs in convection currents.

Convection currents are simply the transfer of heat by the circulation or movement of the heated parts of a liquid or gas.

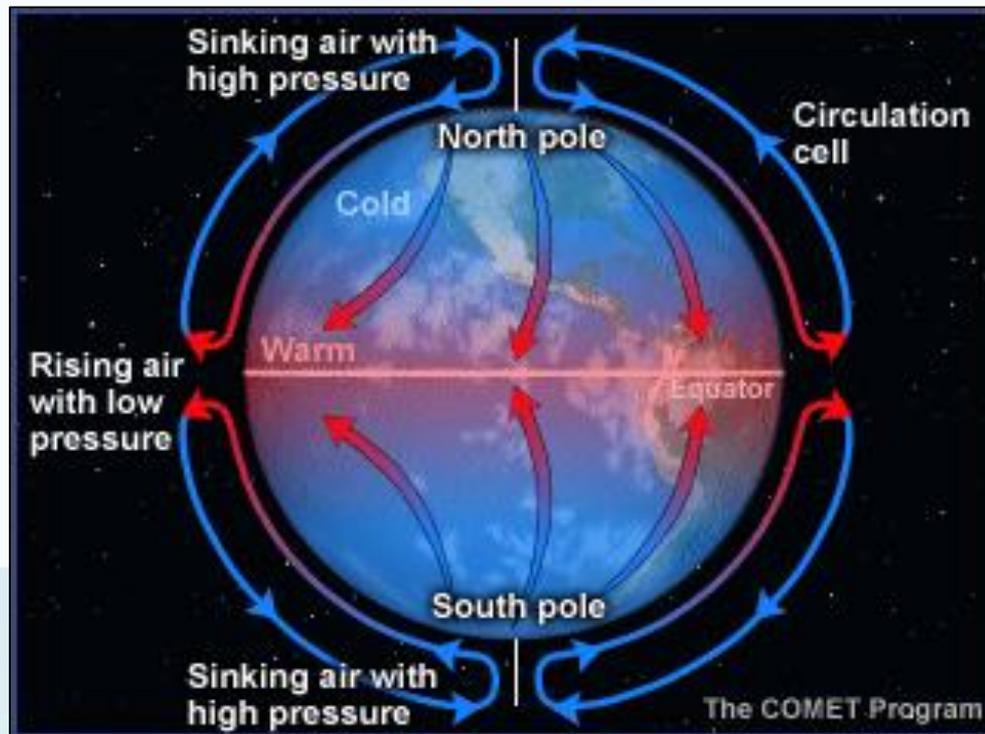


Everyday Examples of Convection Currents



<http://www.healthyheating.com/Definitions/heat-transfer-convection.htm#.VD7SIfmjOSo>

Large Convection Currents are formed because of the temperature differences between the equator and the poles. This produces global wind systems.



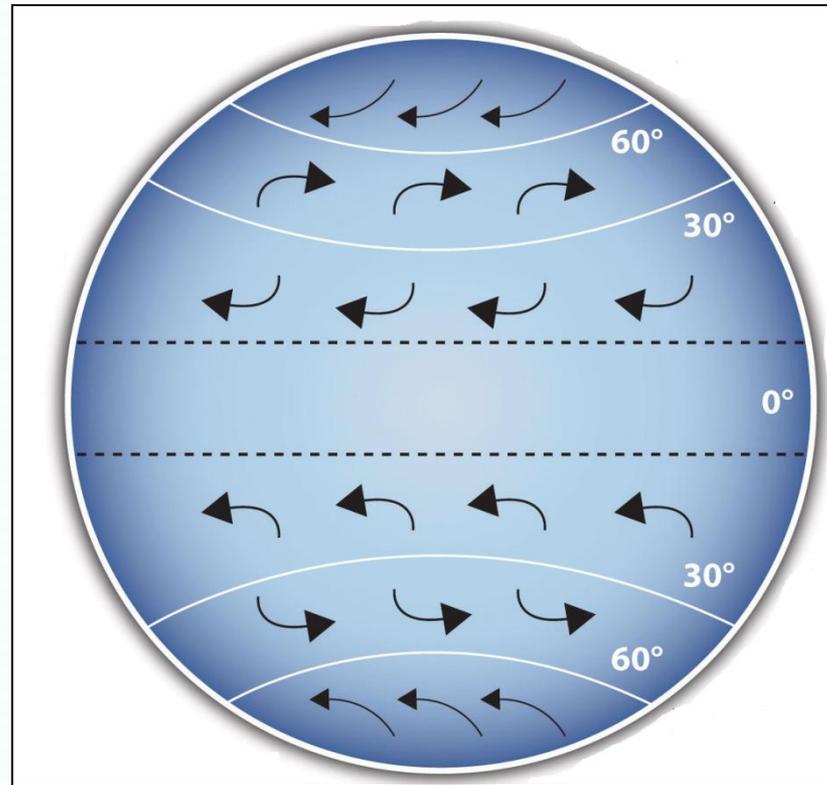
The sinking of cold, dense air and the rising of warm, less dense air do not explain everything about wind.

What other factor have we discussed previously that affects the direction of winds on the earth's surface?

Surface winds and surface currents are affected by the rotation of the Earth (the Coriolis Effect)

Because Earth rotates toward the east, winds appear to curve to the right in the northern hemisphere and to the left in the southern hemisphere

The effect of the earth's rotation (Coriolis Effect) on Winds



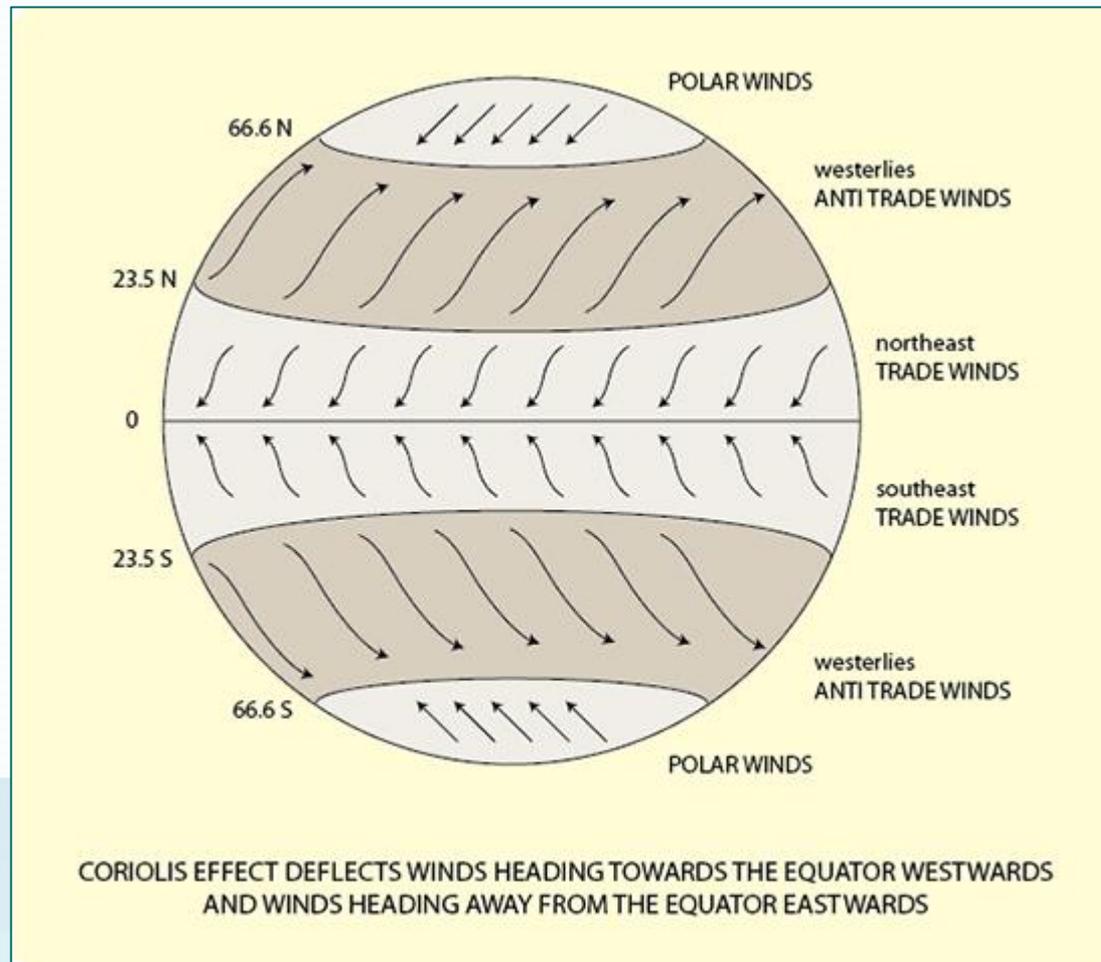
http://www.classzone.com/books/earth_science/terc/content/visualizations/es1904/es1904page01.cfm?chapter_no=visualization

http://www.classzone.com/books/earth_science/terc/content/visualizations/es1905/es1905page01.cfm?chapter_no=visualization

The flow of air caused by unequal heating of the Earth's surface and the rotation of the Earth (Coriolis Effect) creates distinct wind patterns on Earth's surface.

These wind systems not only influence the weather, they also determine when and where ships and planes travel most efficiently.

Below is a diagram showing the global wind patterns that distribute heat and moisture around the globe.



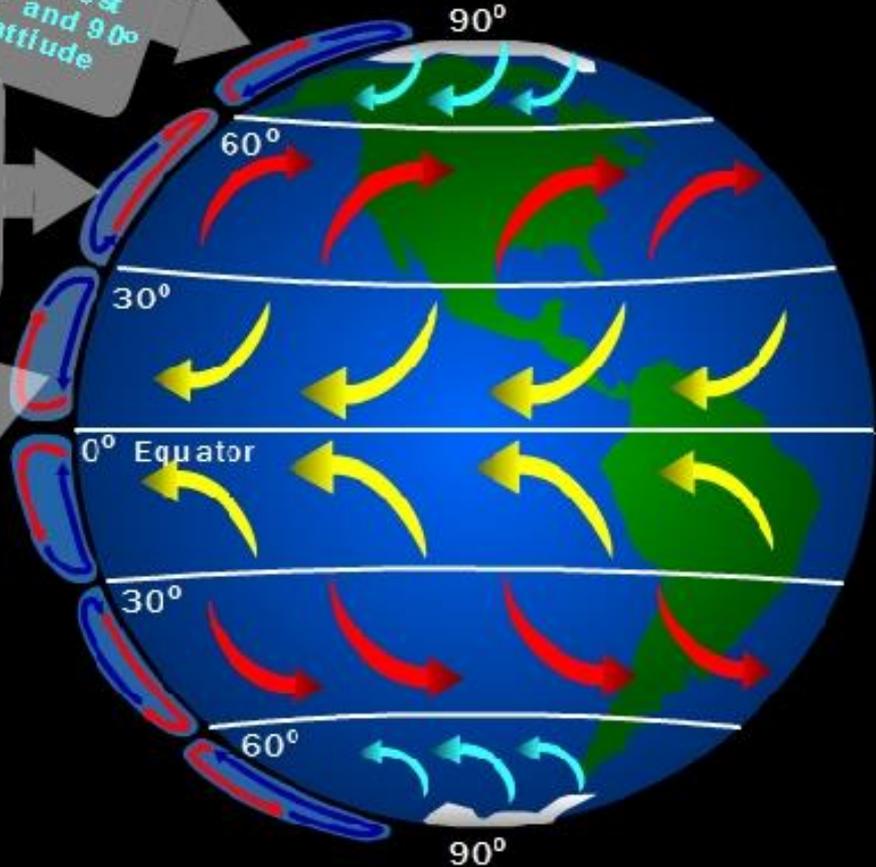
GLOBAL WINDS

EASTERLIES
Winds that blow from east to west between 60° and 90° degrees latitude

WESTERLIES
Winds that blow from west to east between 30° and 60° degrees latitude

TRADEWINDS
Winds that blow from east to west between 0° and 30° degrees latitude

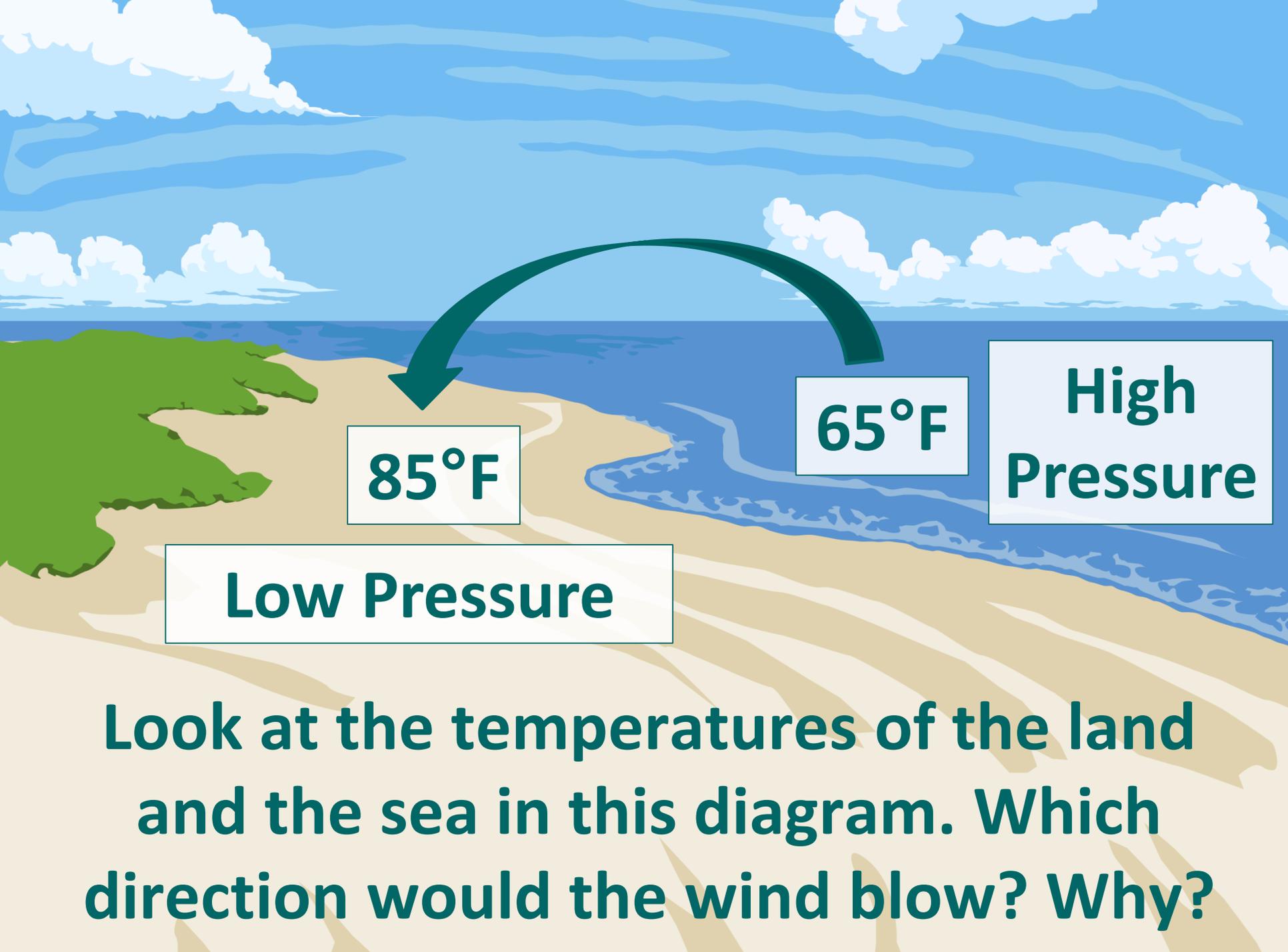
- = Warm Air
- = Cold Air
- ↶ = Tradewinds
- ↷ = Westerlies
- ↶ = Polar Easterlies



Distributed Summarizing:
Turn to a seat partner and
describe the factors that
influence global wind
patterns.

Global wind systems determine the major weather patterns for the entire planet.

Smaller wind systems affect local weather. Two such wind systems are sea breezes and land breezes.



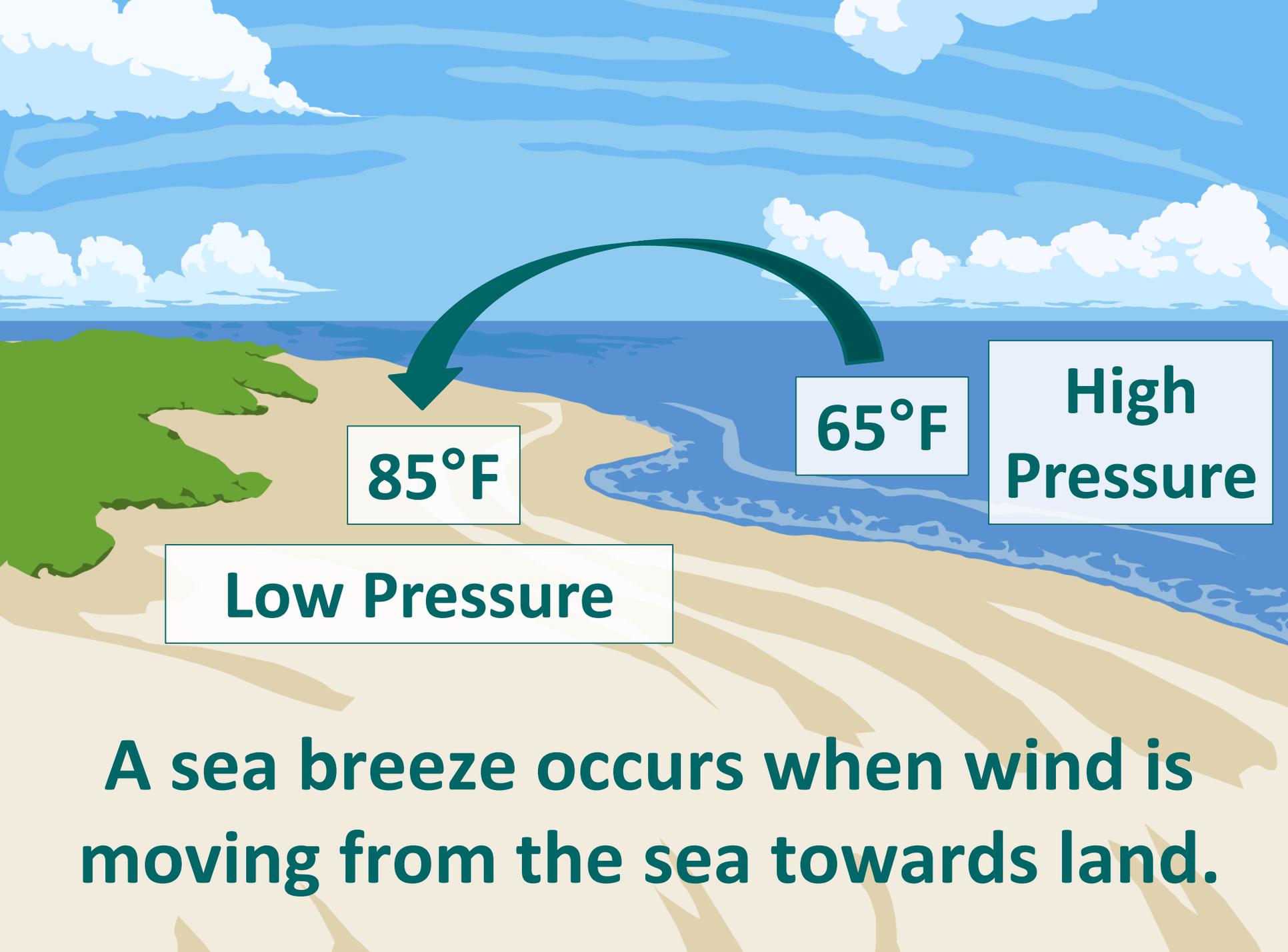
85°F

Low Pressure

65°F

High
Pressure

Look at the temperatures of the land and the sea in this diagram. Which direction would the wind blow? Why?



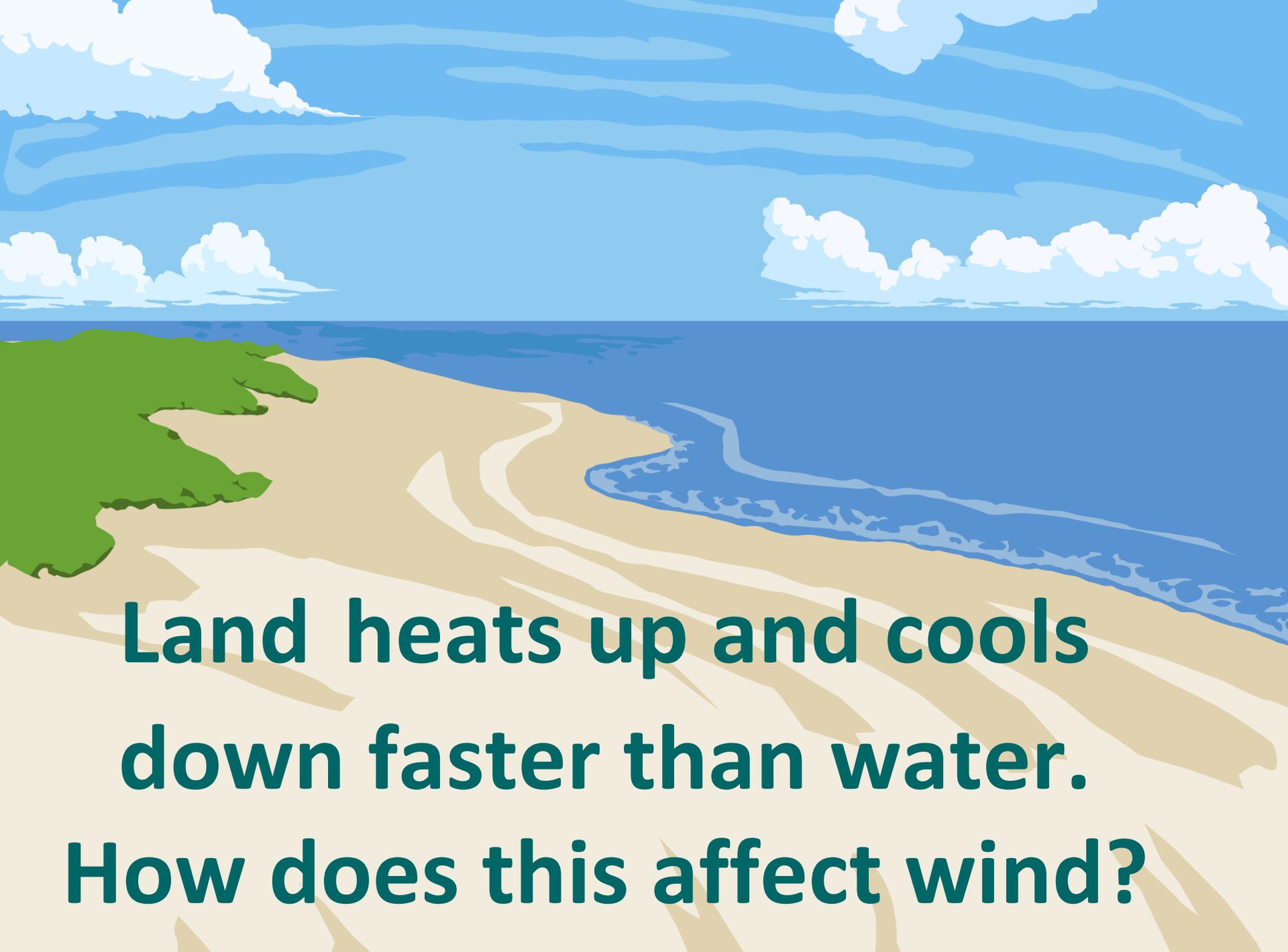
85°F

Low Pressure

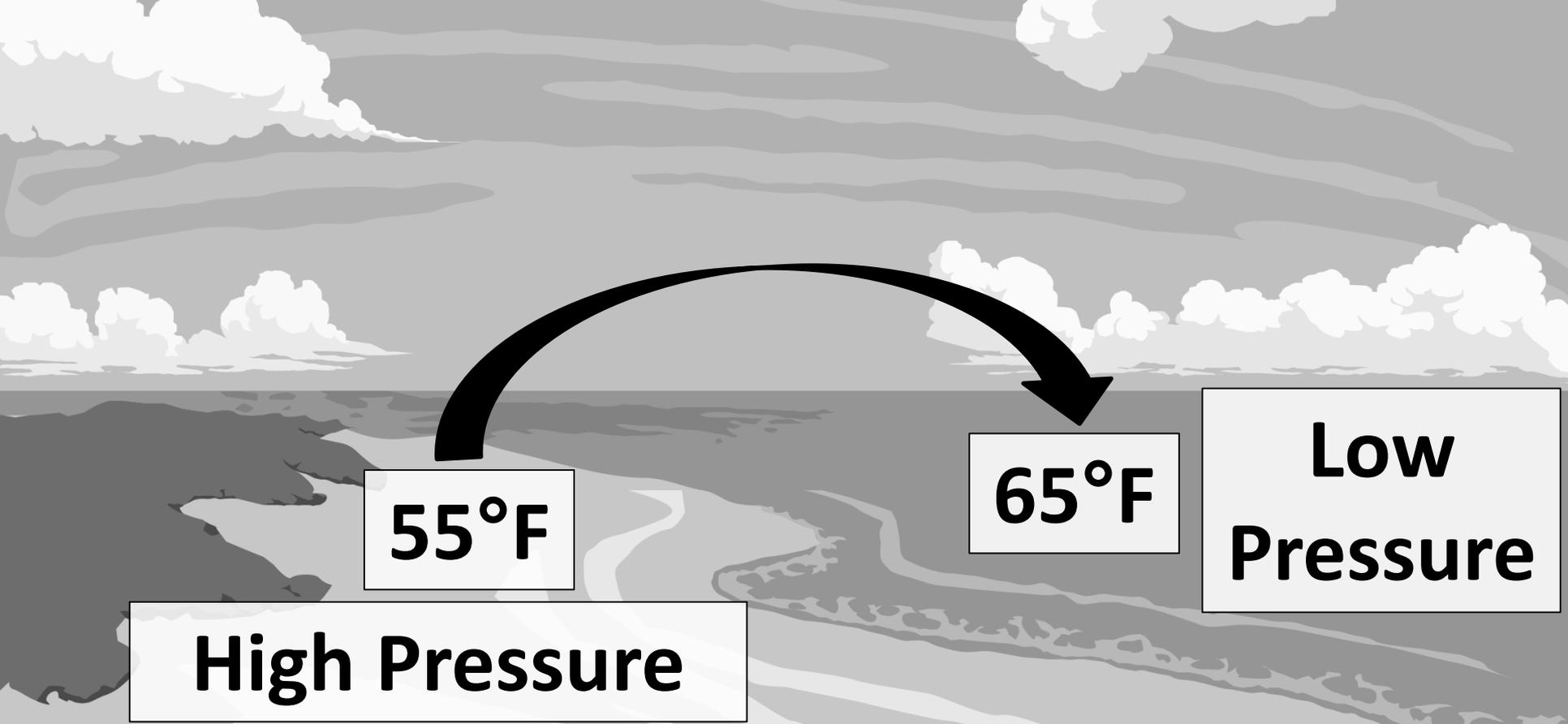
65°F

**High
Pressure**

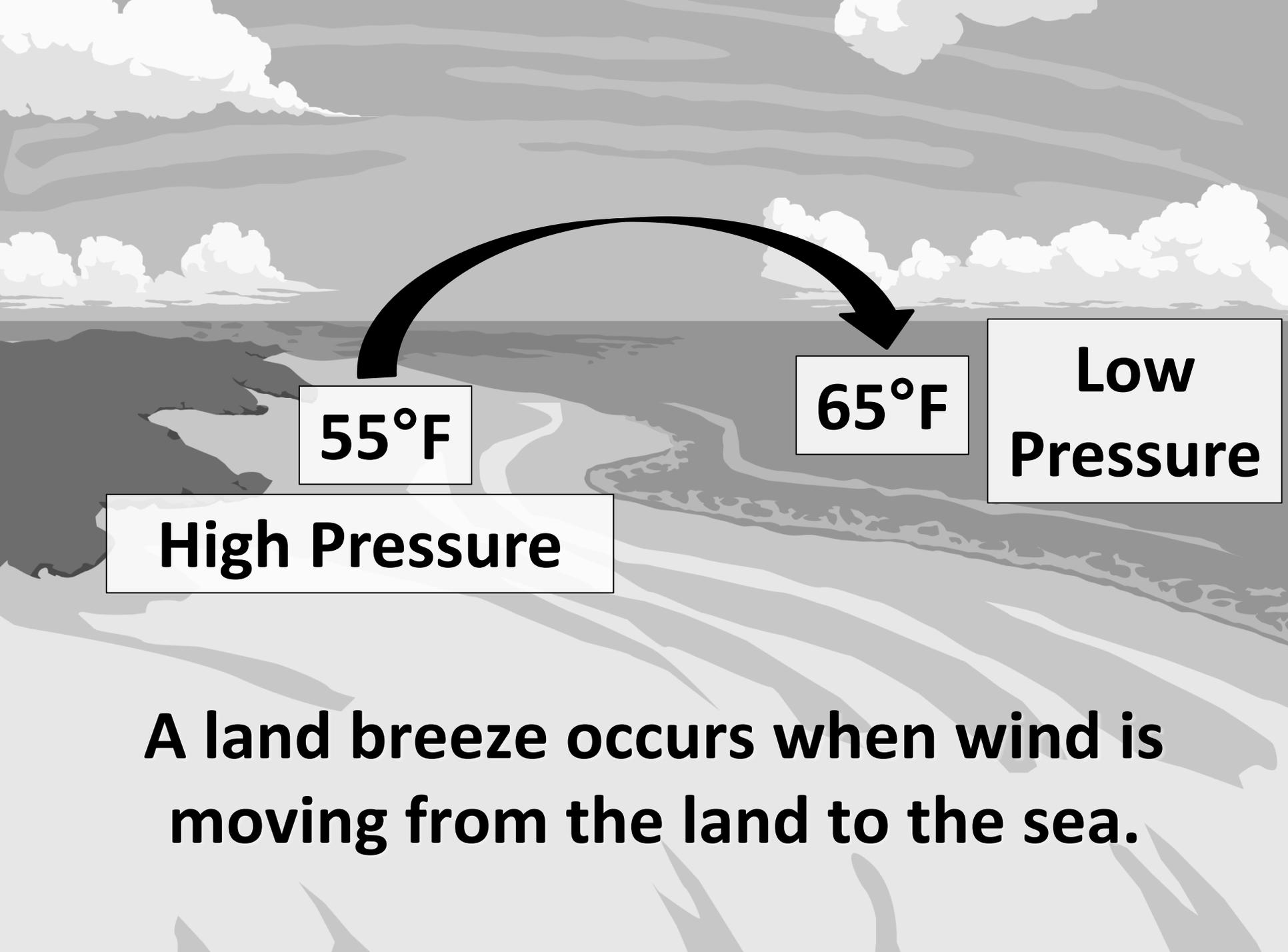
A sea breeze occurs when wind is moving from the sea towards land.



**Land heats up and cools
down faster than water.
How does this affect wind?**



At night when the earth's surface is no longer being heated by the sun, the land cools much more rapidly than ocean water. What happens to the wind?



55°F

High Pressure

65°F

Low Pressure

A land breeze occurs when wind is moving from the land to the sea.



How do sea breezes and land breezes affect local weather?

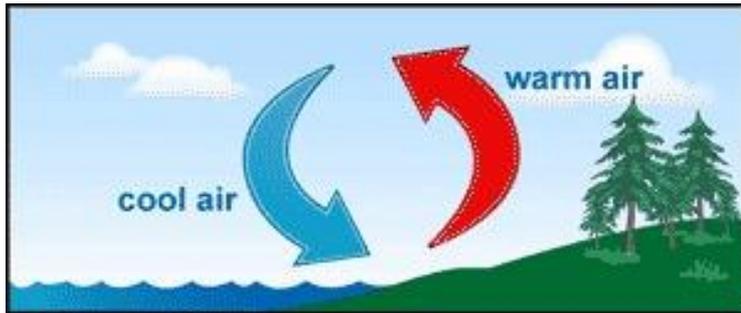
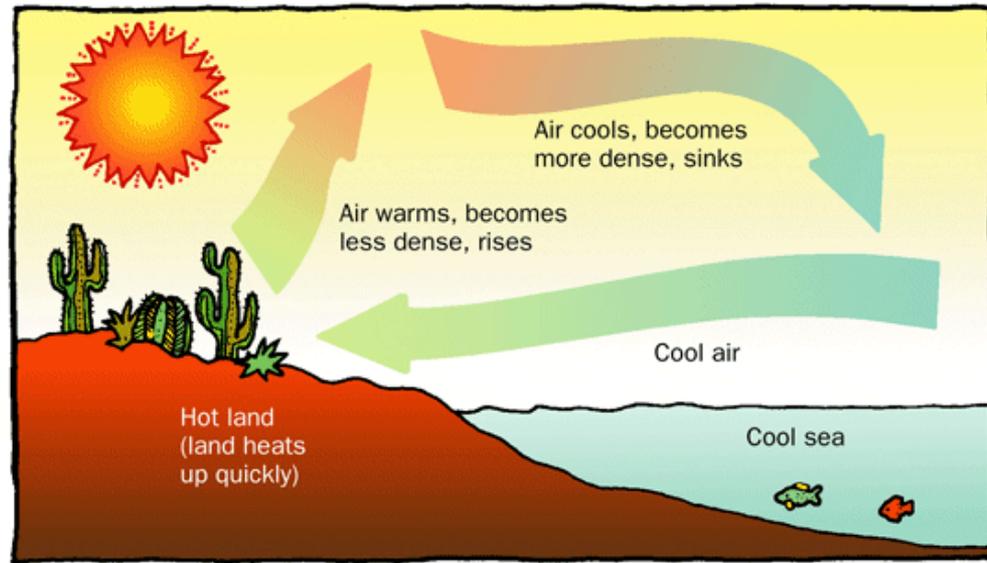
<http://www.nc-climate.ncsu.edu/edu/k12/.breezes>

Sea Breeze and Land Breeze

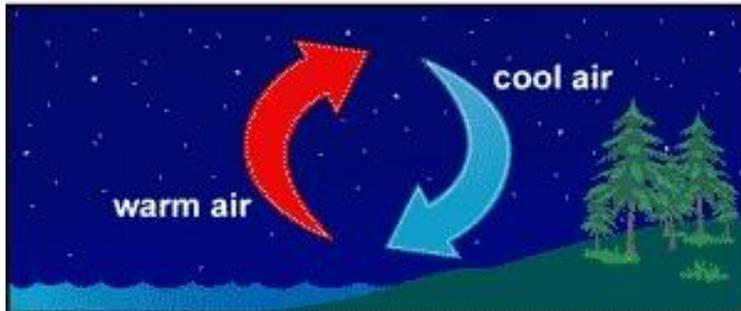
<https://www.youtube.com/watch?v=ZQV72Yzmjyc>

http://www.classzone.com/books/earth_science/terc/content/visualizations/es1903/es1903page01.cfm?chapter_no=visualization

Sea Breeze



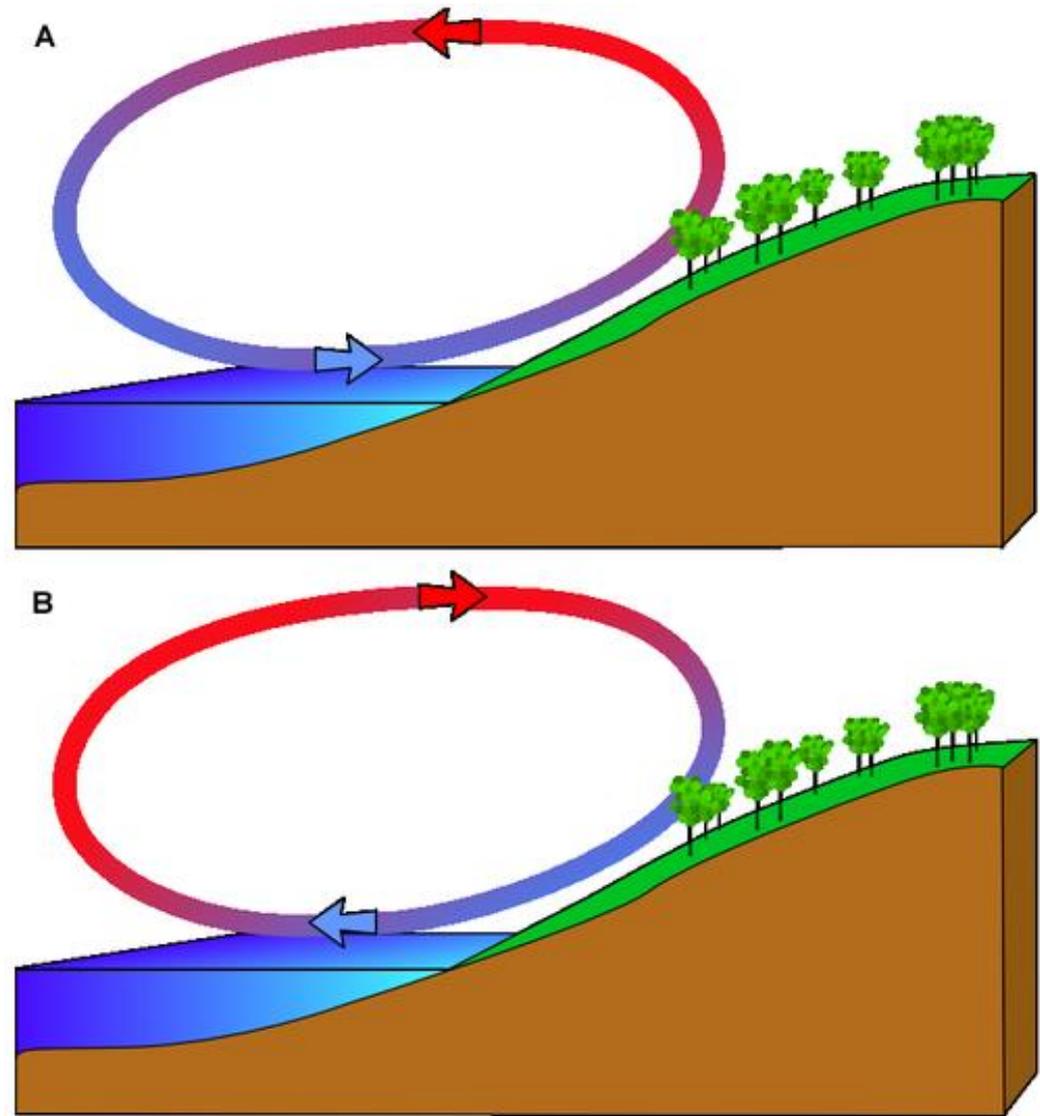
DAY TIME



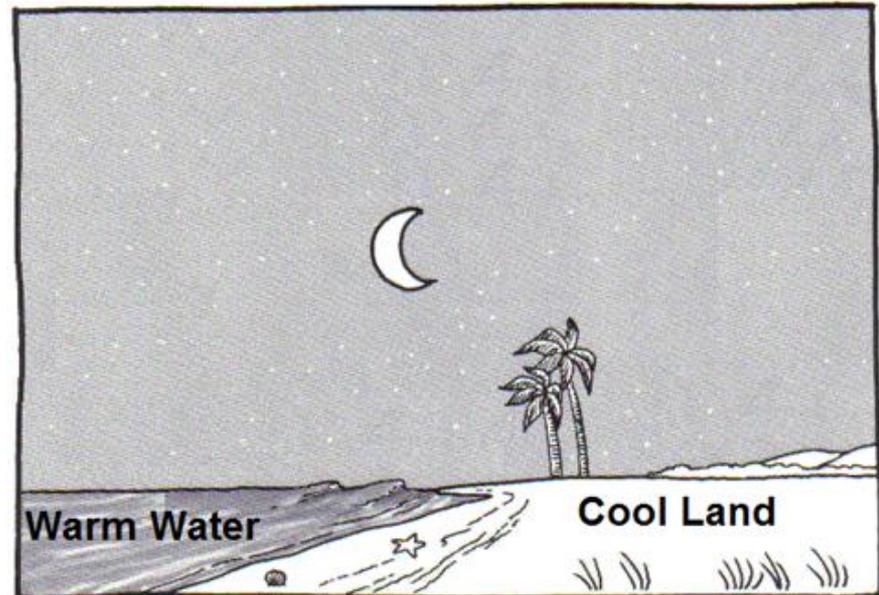
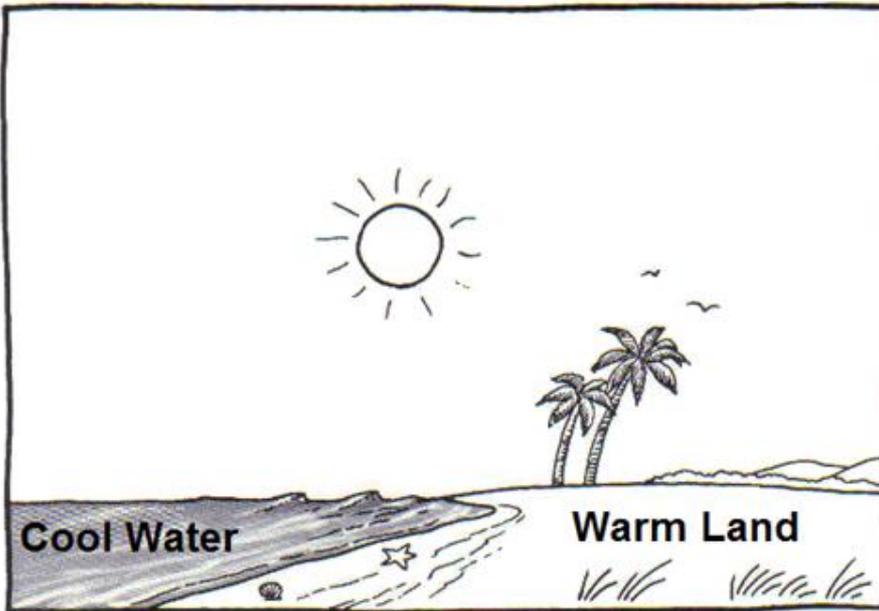
NIGHT TIME

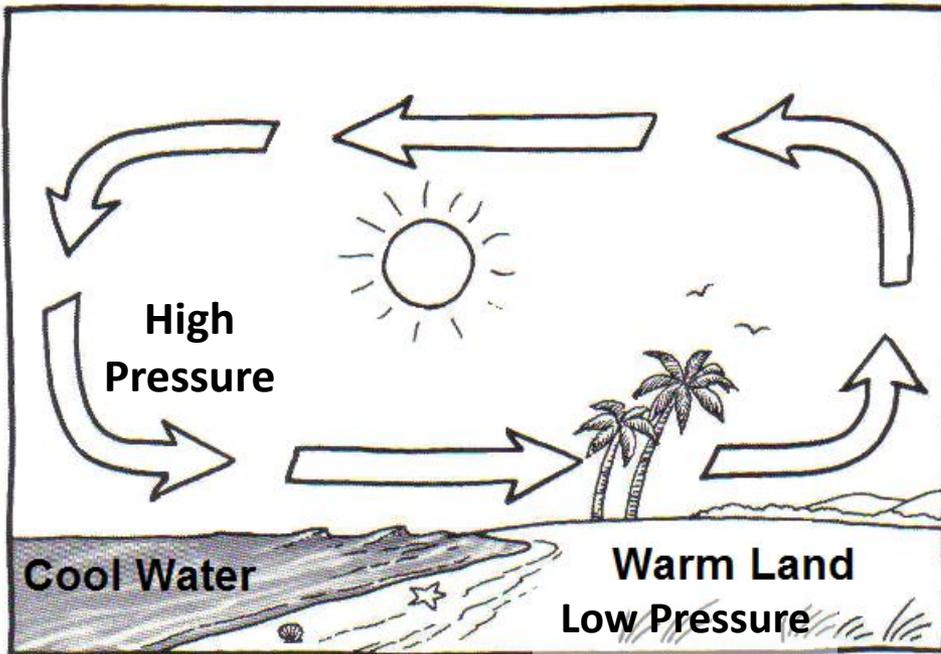
Land Breeze

Identify which diagram illustrates a Sea Breeze and a Land Breeze. Explain why. Include high and low air pressure in your explanation.



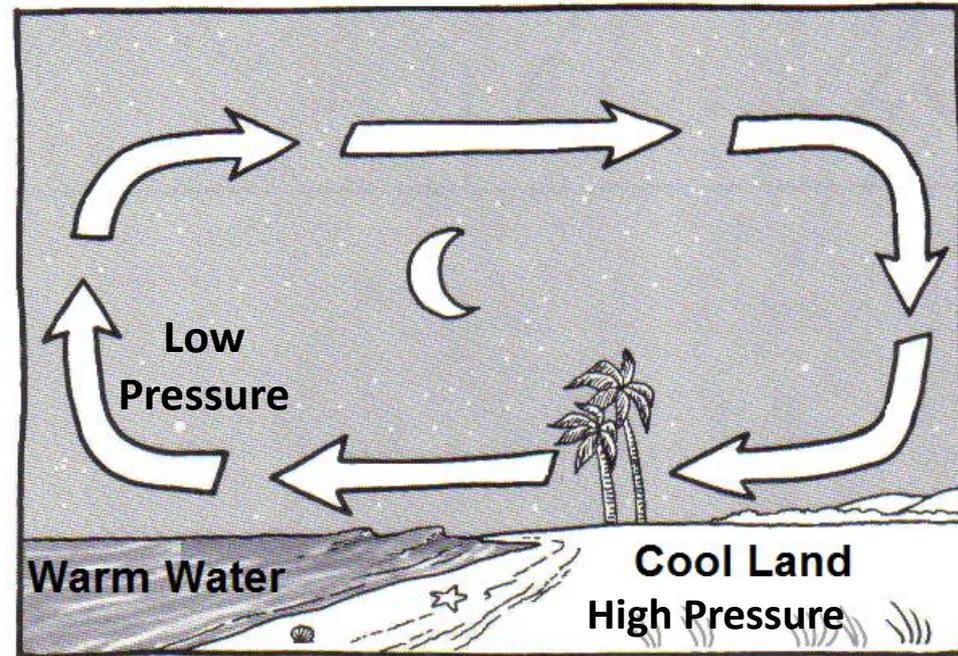
Label and draw the following in the diagrams on your notes: sea breeze, land breeze, high pressure, low pressure, arrows showing the direction of the wind.





Sea Breeze

Land Breeze



Summarizing Strategy:

Wind Movement

Name _____ Date ____ Period ____

Use the diagrams below to draw and label illustrations of wind movement. Your drawing should include: Low Pressure (L), High Pressure (H), Cool, Warm, and arrows showing the direction of wind movement.



Describe the other factor that influences the earth's global wind systems.