# Ice and Climate

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Photo: Vince Cooper, UW

Global warming has been observed across multiple datasets



## Which region of the Earth is warming most?



NASA Earth Observatory/Joshua Stevens; NOAA National Environmental Satellite, Data, and Information Service



NASA's Scientific Visualization Studio

#### Tropics? Arctic? Antarctic?

## Arctic amplified warming



Temperature Trend 1979-2014 (°C decade<sup>-1</sup>)

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Satellites allow us to visualize ice



Modis image



#### Kivalina is on a Barrier Island, Exposed to Pacific Storms



The Arctic is an ocean surrounded by land

The Antarctic is a continent surrounded by ocean

#### Why is the Arctic warming faster than the Antarctic?



into the Arctic at the surface

drive flow away from Antarctica

#### Arctic, receives heat from the south



 Heat from CO<sub>2</sub> is carried northward by ocean surface currents, accelerating Arctic warming

adapted from Nick Beaird & Kyle Armour

#### Southern Ocean, heat is transported northward



Heat from CO<sub>2</sub> is carried northward by ocean surface currents,
slowing warming around Antarctica

adapted from Nick Beaird & Kyle Armour

### Summary

- Climate change: driven by increasing CO<sub>2</sub> concentrations in the atmosphere
- Polar warming: the Arctic is warming faster than the rest of the planet
- Climate feedbacks: in the Arctic, these amplify the initial warming to support faster warming than elsewhere
- Polar sea ice and ice sheets are rapidly changing, with important effects on local ecosystems