

"It is difficult to get a man to understand something, when his salary depends upon his not understanding it!"

-Upton Sinclair

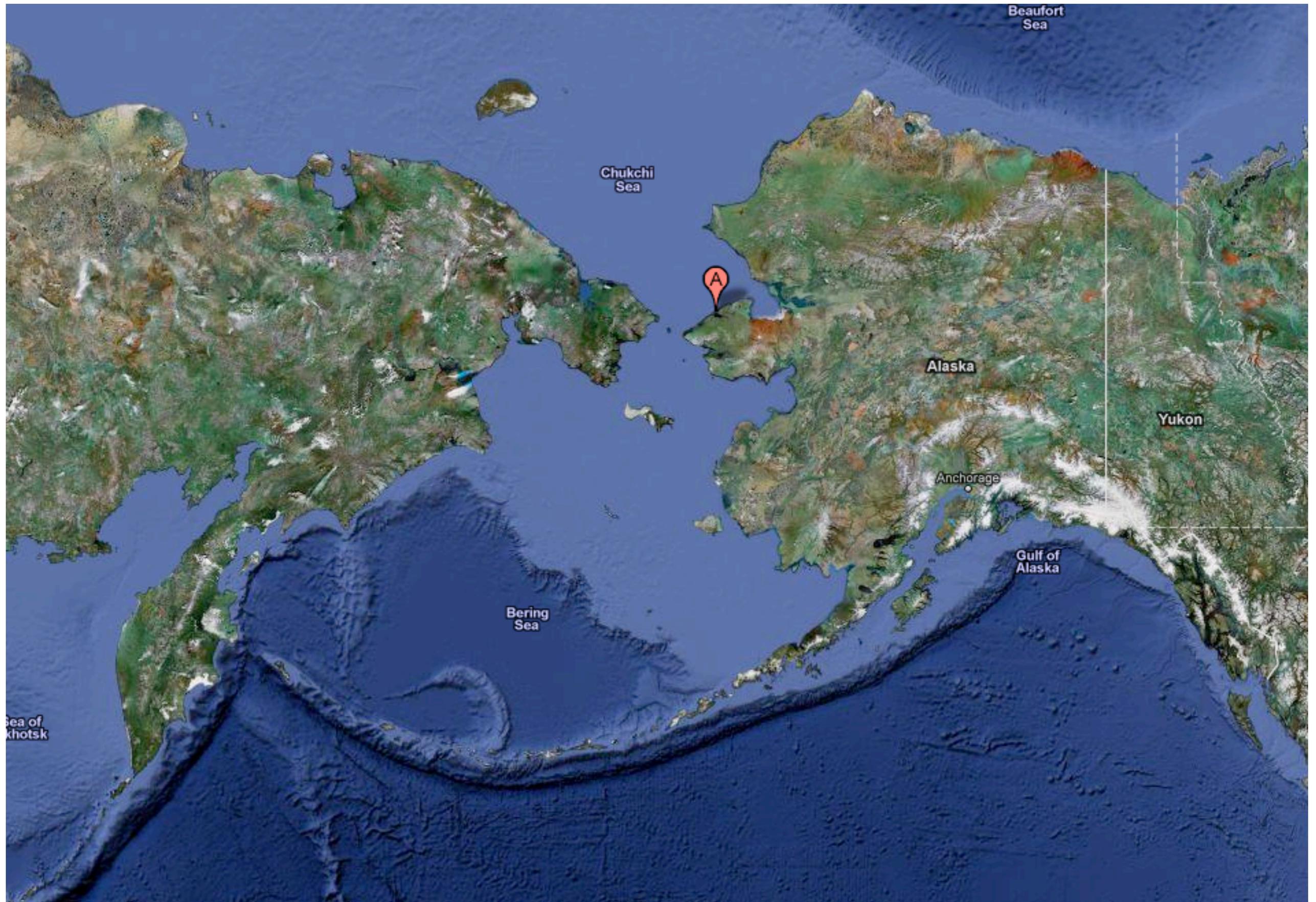
The Climate of Man *(and woman)*

discussion of Elizabeth Kolbert's article in the New Yorker

Plan ...

- Key points
- Context
- Scientific issues/terms
- Discussion points

Shishmaref





Shishmaref Inlet

Shishmaref

Shishmaref Airport

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Direct Impact of Climate Change



Direct Impact of Climate Change

before





Direct Impact of Climate Change

before



after





Historical Context

- First rigorous study of climate change by National Academy of Science in **1979**.
Global temperatures could rise between 2.5-8 degrees Fahrenheit
- “We may not be given a warning until the CO2 loading is such that an appreciable climate change is inevitable.”
- GFDL (Princeton) + NASA GISS (above Tom’s Restaurant -- Broadway and 112th)

Updates on Science

- 1998 hottest year on record, but 2010 on pace to break it
- 2005 and 2009 tied for second warmest years ever
- top 10 warmest years have all occurred since 1998

Permafrost

- permafrost = permanent frost (> 2 years, Alaskan permafrost has been frozen since start of last glacial cycle = 120,000 years!!!!)
- thermokarsts (holes formed by melting)
- talik - technical term for melted permafrost
- “active layer” melted region on top, supports life
- cryoturbation - organic matter pushed down into frozen region = carbon reservoir
- drunken trees

Drunken Trees



Why is permafrost important?

- permafrost is an integrating thermometer, averaging out weather noise, so revealing slow changes
- permafrost carbon storage = 450 Gtons (1.4 million Empire State Buildings)
- cumulative anthropogenic carbon emissions to date are about 270-500 Gtons
- could substantially amplify climate change (possible climate time bomb)

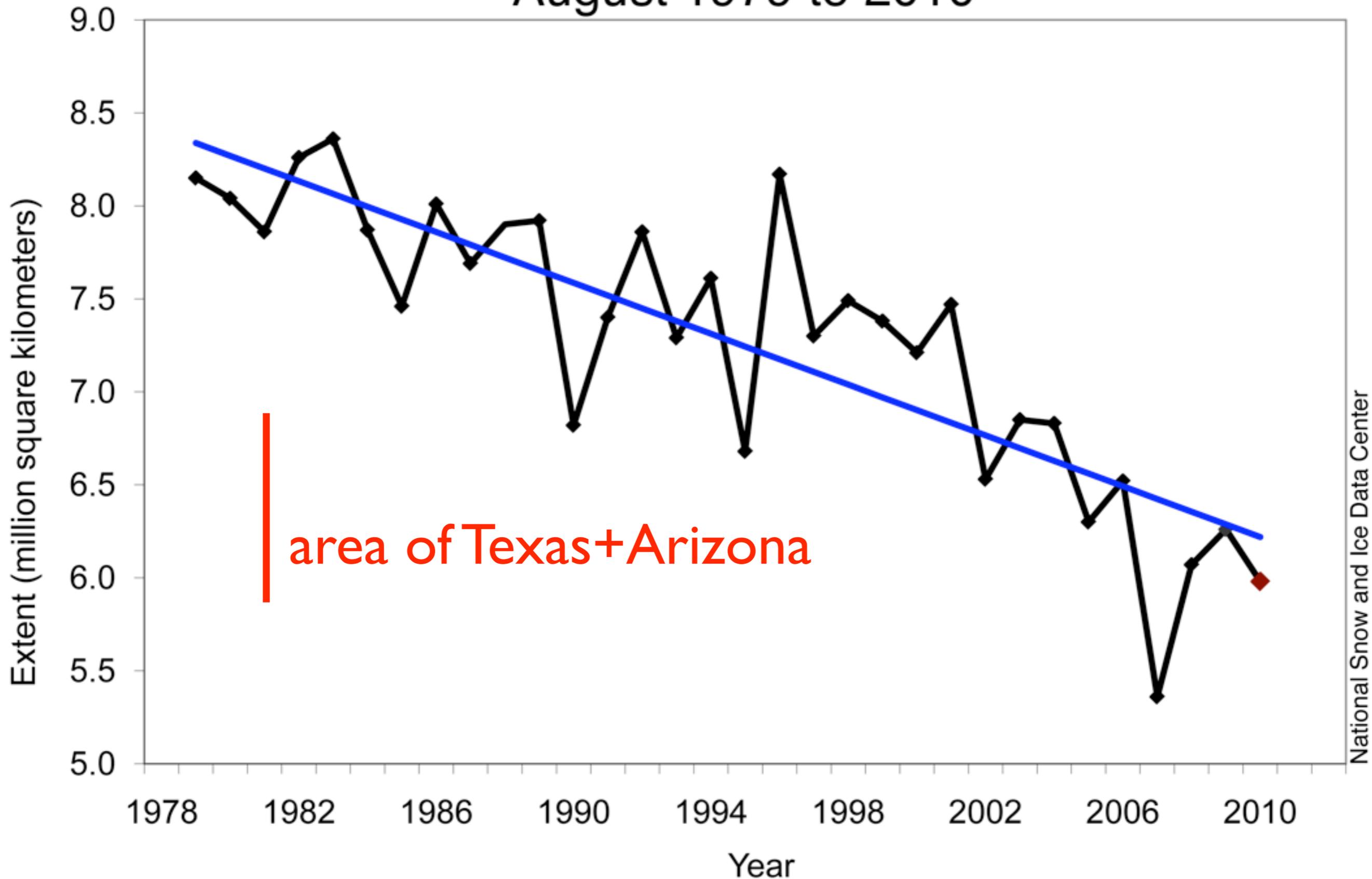
Climate Feedbacks

- positive:
 - permafrost melting - carbon release
 - ice albedo
- negative:
 - if climate change kills us all, no more anthropogenic forcing
 - CO₂ induced plant growth
 - lapse rate feedback

Arctic Sea Ice Loss

- seasonal ice versus perennial ice (different characteristics, saltiness, albedo)

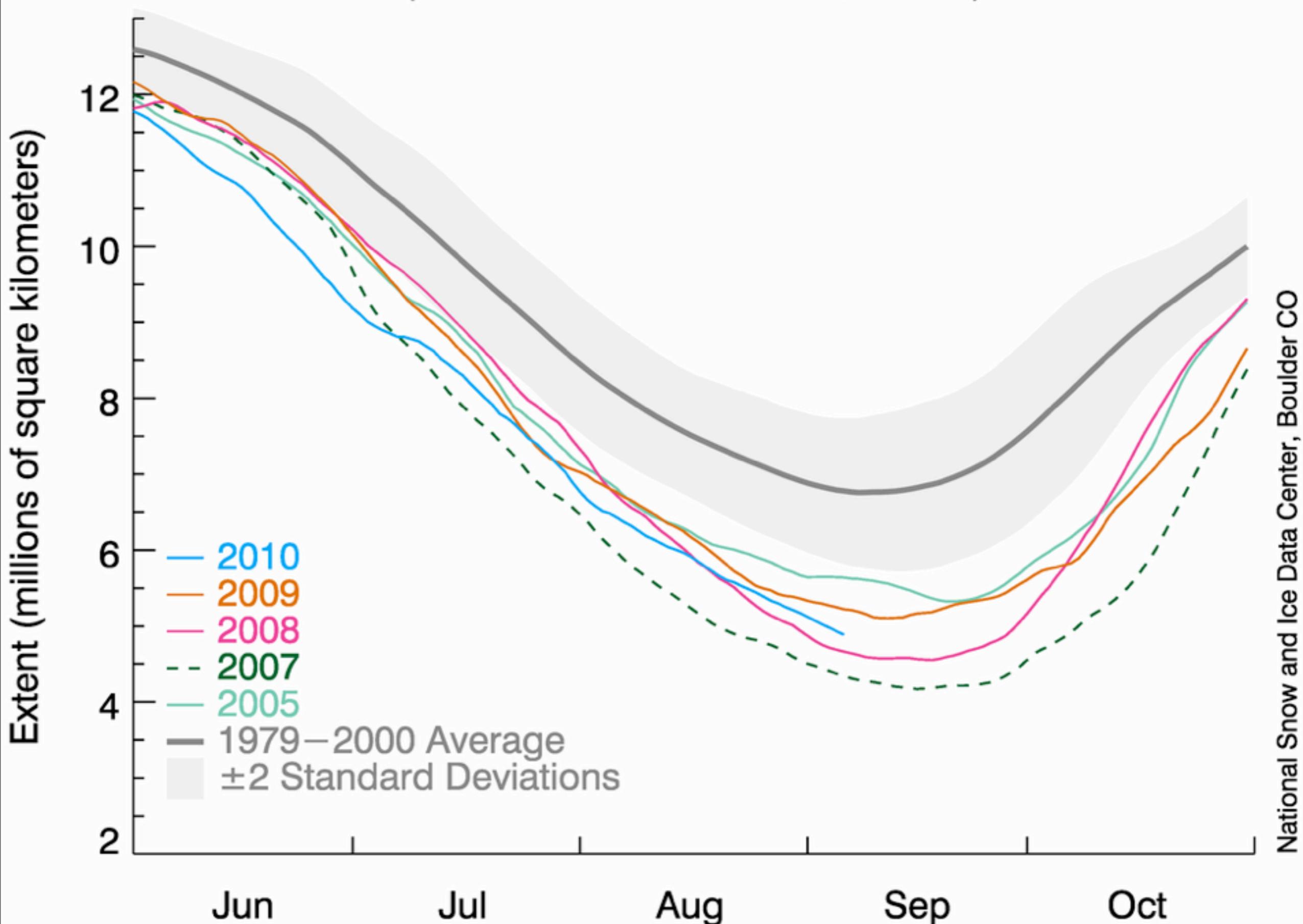
Average Monthly Arctic Sea Ice Extent August 1979 to 2010



National Snow and Ice Data Center

Arctic Sea Ice Extent

(Area of ocean with at least 15% sea ice)



Natural Climate Variability

- could current changes be natural (not driven by anthropogenic forcing)?
- climate has varied a great deal in past
- concern of a tipping point -- glacial cycles caused by relatively small changes in Earth's orbit
- Holocene = today, Eemian = last interglacial sea level was 15 feet higher then (why? not sure, could be collapse of West Antarctic Ice Sheet, runoff from Greenland)
- Younger Dryas (named after plant!) 12,800 years ago the earth rapidly refroze, stayed there for 1200 years) afterwards, rapid warming, Greenland warmed 20 degrees in a decade!

Are these changes reversible?

- last time Earth was this warm, Greenland was ice free -- the ice sheet is maintained by thermal inertia
- albedo makes Arctic very sensitive

Typo!

- Glaciers don't move at rates of miles per hour! Jakobshaven glacier is fast at 20 m/day. It accelerated to 34 m/day (8 miles/year)!
- Has since slowed down ... driven by warm water pushed by winds. But may be case study for the BIG ice sheets of West Antarctica.

What to Do?

- Awareness? This isn't new!
 - dramatic impacts far away
 - long term problem
 - direct misinformation campaigns
- Political problem
 - What does climate change have to do with abortion? Is it anti-corporation?
 - Global issue. Requires global solution.

Climate Reparations

- Should you be responsible for your parents emissions?

External Costs: Failure of the Markets

- cost of goods and services should reflect all costs
- put a price on carbon, the price it will cost future* generations to remediate effects

*future = you

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