

# **Socioeconomic Tipping Points: Policy Implications of Arctic Climate Change**

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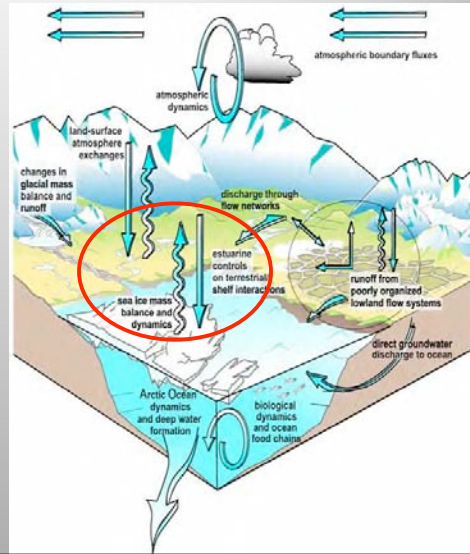
**Changes in Arctic Climate and Sea Ice**

# Arctic Climate System

## Changes Amplified

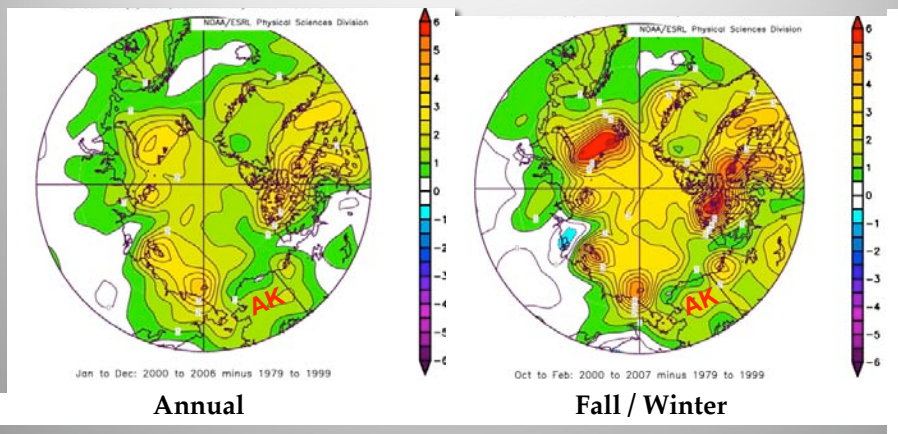
### Theoretical Feedback:

- More heat
- Less snow & ice
- More heat absorbed
- and so on ...



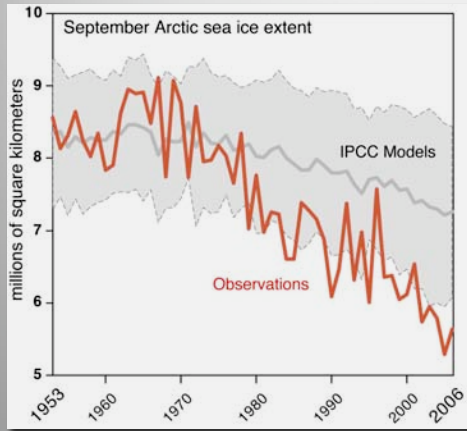
# Arctic Amplification is Emerging:

## Surface Temperature is Increasing



Warming up to 5 degrees C (9° F)  
Freezing-season length decreasing

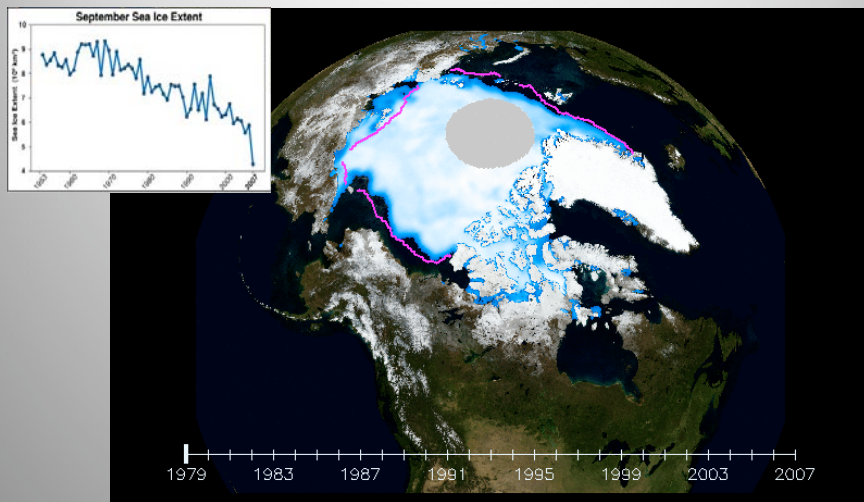
# Arctic Amplification is Emerging: Sea Ice is Decreasing...



...Faster than Forecast

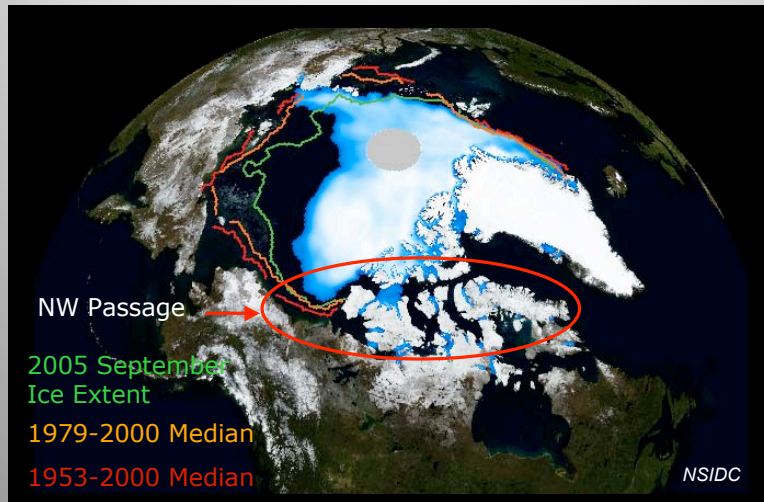
10.7% per decade decrease in satellite era

## Sea Ice Plummeted in 2007 23% Below Previous Record



## Sea Ice Plummet in 2007

**23% Below Previous Record**

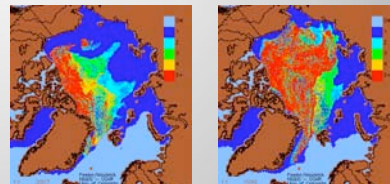


## Sea Ice Plummet in 2007

**"A Perfect Storm"**

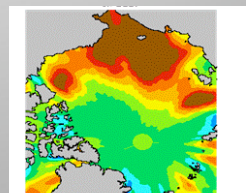
### Preconditioning

- Less old, perennial ice
- Warmer Atlantic and Pacific waters in the Arctic
- Unusual weather conditions (atmospheric circulation) warmth and winds in 2007



### Feedback effect:

Open ocean >> sunlight absorption >> enhanced melting



## Future Trajectory of Sea Ice?

- a) Reversal from 2007 “anomaly”?
- b) Gradual decrease?
- c) Rapid disappearance?

Have we reached the **Tipping point**?

Summer 2008 shaping up for another low  
**Extensive**, mostly **Seasonal** ice

## Impacts of Changes in Arctic Climate and Sea Ice

### Environmental

**Marine:** Ocean Changes, Marine Ecosystems

**Terrestrial:** Vegetation Changes,  
Permafrost Thaw, Coastal Erosion,  
Arctic Glaciers

Greenland and Sea-Level Rise

### Socioeconomic



# Maribeth Murray

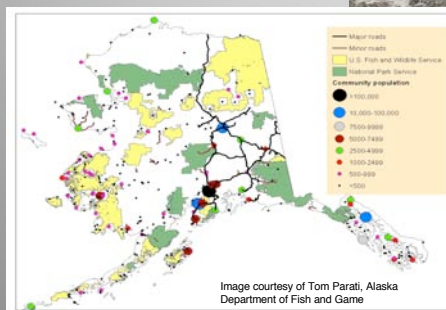
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## Human Dimensions of Climate Change

# Human Response to Arctic Climate Change

### Observational Scale

- Local
- Regional
- National
- International



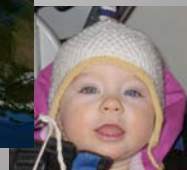
### Types of Response

- Individual
- Cultural
- Scientific
- Regulatory
- Economic
- Political



## Some Impacts of Arctic Change

- Changes in physical system
- Cumulative impacts on ecosystems
- Immediate & cumulative impacts on society



## Observations of Local Response

### Immediate Impacts from 2007

- Travel was unsafe
- Hunters had to wait for south wind
- Marine mammals had then moved
- Hunters had to travel very long distances
- Ice keeps air temperature down—acts as a refrigerator
- Meat was prone to rot and infestation

Observational data courtesy of Ken Stenek, Shishmaref, Alaska, March 13, 2008.

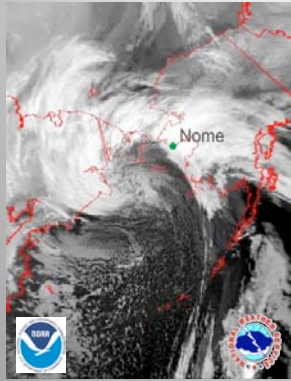
### Some Cumulative Impacts

- Fuel costs continue to rise
- Subsistence is less successful
- Purchased food is more necessary
- Diminished health returns
- Need for increased income
- Increased out-migration
- Rural communities more vulnerable
- Urban centers more vulnerable

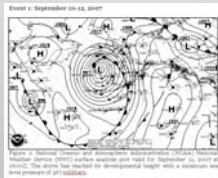


[http://www.ipy.org/index.php?/ipy/detail/working\\_with\\_inupiaq\\_hunters\\_in\\_shishmaref\\_alaska/](http://www.ipy.org/index.php?/ipy/detail/working_with_inupiaq_hunters_in_shishmaref_alaska/)

# Impacts at the Regional Scale Storms in the Bering Sea - September 2007



From: Atkinson, D.E., 2007. Windspeed exceedance during the September 2007 storms in the Bering Sea region. Report to the U.S. Department of Agriculture, Anchorage, AK. October 13, 2007.



# National and International Dimensions



Photo from Canadian Coast Guard





# Craig Fleener

Gwich'in Council International

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**Opportunities and Costs  
to Local Communities**

## Thank You

Questions?

Special Thank You to Senator Stevens' Office

