Coastal Sea-Ice Break-Up Events in Beringia

PRESENTER:

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BACKGROUND: Landfast ice is defined as ice that is attached to the shore. A break-up event is when landfast ice breaks off the shore, and drifts to sea. Many Arctic communities rely on landfast ice to perform various activities including hunting and fishing. It is therefore important for the safety of these communities to understand the stability of the ice, and how it may change in the future.

Beringia Communities

Figure1. Map of Beringia with the studied communities as red dots

METHODS

1. Identified 6 Arctic Communities concerned with this phenomenon.
2. Used sea ice concentration from satellite observations and model outputs.
3. Used a simple algorithm to find sudden drops in ice.
4. Used wind speed data to verify cause of drops.
5. Looked at long-term trends.
6. Compared results between model and observations.

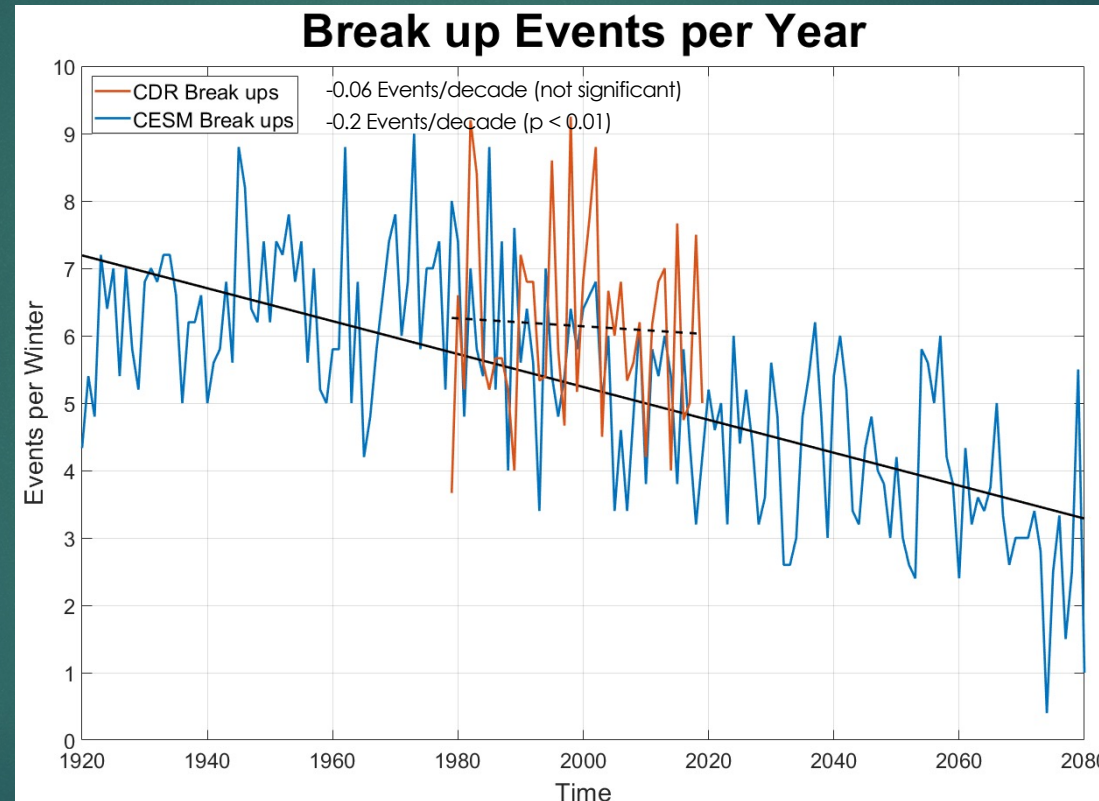# Landfast ice in the Arctic is becoming more unstable.

Figure 2. Mean Number of break-up events per year for the 6 considered locations identified from the Climate Data Record (solid orange line) and Community Earth System Model Large Ensemble version 1 (solid blue line) with their linear regressions (black dotted and solid lines respectively).

Mean winter length decreases by **5.3** days/decade and **9.8** days/decade in CDR and CESM respectively (p < 0.01)
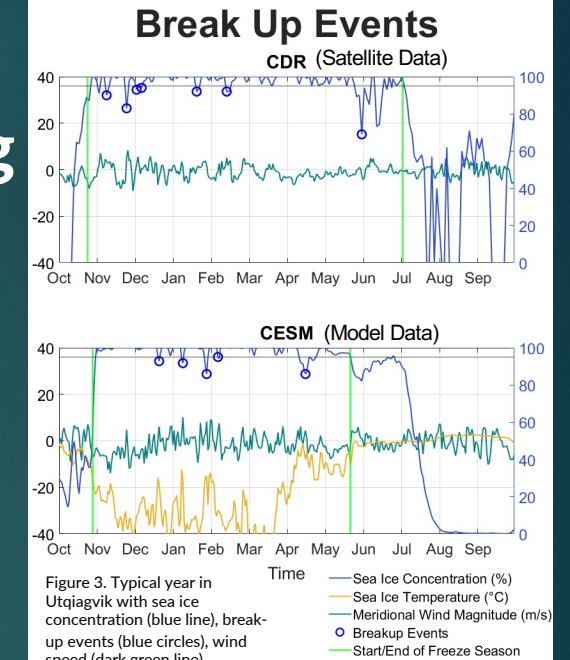
Break Up Events

Figure 3. Typical year in Utqiagvik with sea ice concentration (blue line), break-up events (blue circles), wind speed (dark green line), temperature (red line), and start and end of winter (green lines)

Results/Discussion

- Events are caused by off-shore wind.
- Models reasonably simulate break-up events.
- Break-up events in the context of climate change increase due to thinning of ice (less stable), or decrease from shorter winters.
- Which effect is more important depends on location
- Effect on community is key

- No landfast ice in CESM
- Only one ensemble member used
- Mismatch in resolution and grid definition between datasets

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