

# Causes of Arctic amplification

- What do we know?

- It's observable; mostly in SON/DJF; past/future
- Intrinsic property of climate variability and forced (GHG) response
- Multiple processes in models
- Recent trends partly due to internal variability (inc in sea ice trends)
- Sea ice loss played a role (but how much?)

- What are main open questions?

- Role of non-GHG external forcings

- Are models and nature in agreement (same processes)? Right answer for wrong reasons?
- (Non)-Independence of feedbacks, links to dynamics
- Role of sea ice loss versus poleward heat transport
- Changes in circulation a cause or consequence of AA (or both)

# Consequences of Arctic amplification

- What do we know?
  - All components of system potentially important
  - Tug of war between high and low lat forcings
  - Sea ice loss, surrounding ocean warming
  - Potential global impacts
  - thermodynamic and dynamic response
  - Response sensitive to pattern of forcing
  - Model hierarchy useful
- What are main open questions?
  - Response is uncertain
  - S/N issue
  - No consensus in dynamical processes

# Causes of Antarctic amplification

## - What do we know?

- Warming is slowly compared with the Arctic
- Signal is regionally dependent; got by AMIP
- Pattern changes of temperature is robust; sparse observations
- Background upwelling causes slow warming, warming north of ACC, other contributors
- large internal variability, tropical teleconnection, ozone, sea ice
- Importance of feedback processes different from Arctic

## - What are main open questions?

- Models are not able to catch the increasing trend of sea ice
- Modeled and observed trends of sea ice are inconsistent since 1979
- Wind trends and its impacts are uncertain
- Trends of freshwater forcing and its impacts are uncertain; sources
- Lack of sea ice thickness observation

# Consequences of Antarctic amplification

- What do we know?
  - Warming of the Southern Ocean
  - Delay positive feedbacks in global warming
- What are main open questions?
  - Tug of war
  - Long term changes in sea ice
  - Impacts on ocean circulation and sea level

# Outputs

- Nature special collection
  - 8 papers
  - Across Nature, Nature Geoscience, Nature Climate Change and Nature Communications
  - Collating ideas over summer
  - ½ page summary/abstract of the paper, which should include tentative title and tentative author list
  - Could be new science article (All), Review (NG, NCC), Perspective (NG, NCC), Commentary (NG, NCC)

## 2.1 Review Article

A Review Article is an authoritative, balanced survey of recent developments in a research field. Although Review Articles should be recognized as scholarly by specialists in the field, they should be written with a view to informing nonspecialist readers. Thus, Review Articles should be presented using simple prose, avoiding excessive jargon and technical detail. Review Articles are approximately 3,000–5,000 words and typically include 4–6 display items (figures, tables or boxes). References are limited to 100; citations should be selective. Footnotes are not used. The scope of a Review Article should be broad enough that it is not dominated by the work of a single research institution, and particularly not by the authors' own work.

Most Review Articles are invited by the editors: considerations when commissioning Review Articles include – in addition to assessing the interest and importance of each individual topic – the balance of subject coverage in the journal, the timeliness of the topic to be reviewed, and the limited number of slots available (around 12 a year, or one per issue).

Given the competition for space, authors wishing to propose an unsolicited Review Article are strongly advised to submit a brief synopsis through our [online submission](#) system before preparing a manuscript for formal submission. The synopsis should outline the topics that will be covered, list any recent, key publications in the area, and state the last time the topic was reviewed (if it has been reviewed previously).

## 2.2 Perspective

A Perspective is intended to provide a forum for authors to discuss models and ideas from a personal viewpoint. They are more forward looking and/or speculative than Review Articles and may take a narrower field of view. They may be opinionated but should remain balanced and are intended to stimulate discussion and new experimental approaches.

Perspectives follow the same formatting guidelines as Reviews. These articles are peer-reviewed and edited substantially by *Nature Climate Change*'s editors in consultation with the author. As with Review Articles, many Perspectives are invited by the editors, and similar considerations apply when commissioning, so it is again advisable to send a pre-submission enquiry including a synopsis before preparing a manuscript for formal submission.

# Ideas

- Review paper on causes of Polar Amplification (Bitz lead)
- Perspective piece on consequences of Arctic amplification (Screen lead)
  - Separability of GHG and sea ice responses
  - Tug-of-war; seasonal and multi-decadal aspects of who “wins”
  - Implications of model biases (too much tropical warming?; too little sea ice loss?)