Research Questions

- Are Arctic sea ice anomalies predictable?
- Are Arctic sea ice anomalies impacting the large-scale atmosphere?

Motivation

- Arctic warming at twice the rate of global average (Arctic amplification; Fig. 1), associated with rapid sea ice loss9 (Fig. 2).
- Link to midlatitude extreme weather proposed5.
- The path towards a “Blue Arctic” enhances interest in sea ice prediction also from actors outside academia1.

Data Sets and Methods

Data sets:

- National Snow and Ice Data Center satellite sea ice data.
- ERA-Interim reanalysis atmospheric data.

Time period:


Region:

- Arctic (66.5-90.0°N) for lead/lag correlations.
- High- and midlatitudes (40.0-90.0°N) for lead/lag regressions.

Methods:

- Lead/lag correlations and regressions.

Conclusions

- Winter and summer Arctic sea ice extent can largely be predicted from preceding season; spring and autumn conditions not.
- Impacts of anomalous Arctic sea ice on deep atmospheric temperature and circulation mainly confined to summer.

Lead/Lag Correlations

- Significant memory from winter and summer sea ice to next season (Fig. 3a).
- Significant memory from annual sea ice minimum (September) only until December (Fig. 3a).
- Late spring/early summer temperatures important for late summer/early autumn sea ice conditions (Fig. 3b-c).

Lead/Lag Regressions

- Anomalous low Arctic sea ice in July associated with a general warming of the high-latitude troposphere and weakening of high-latitude easterlies in May-September, with a maximum in September (Fig. 4a-e).
- Signals almost gone by October (Fig. 4f).
- Impact of sea ice retreat on the atmospheric column mainly confined to the surface from October (Figs. 3 and 4).

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References


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