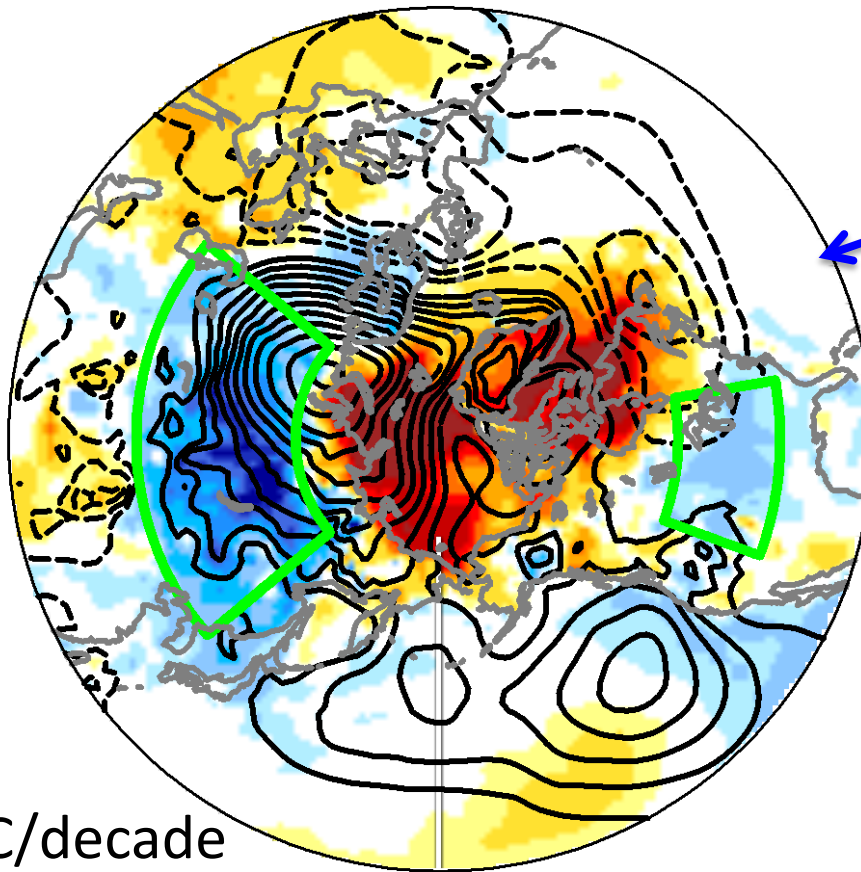


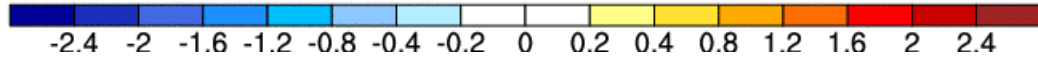
What Caused the Recent “Warm Arctic, Cold Continents” Trend Pattern in Winter Temperatures?



ERA-Interim 1990/91-
2013/14
winter 2m-T/SLP trend

*Sun et al. Geophys. Res. Lett.,
Submitted*

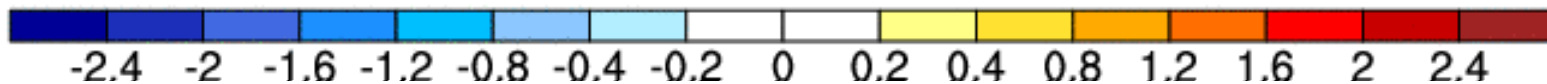
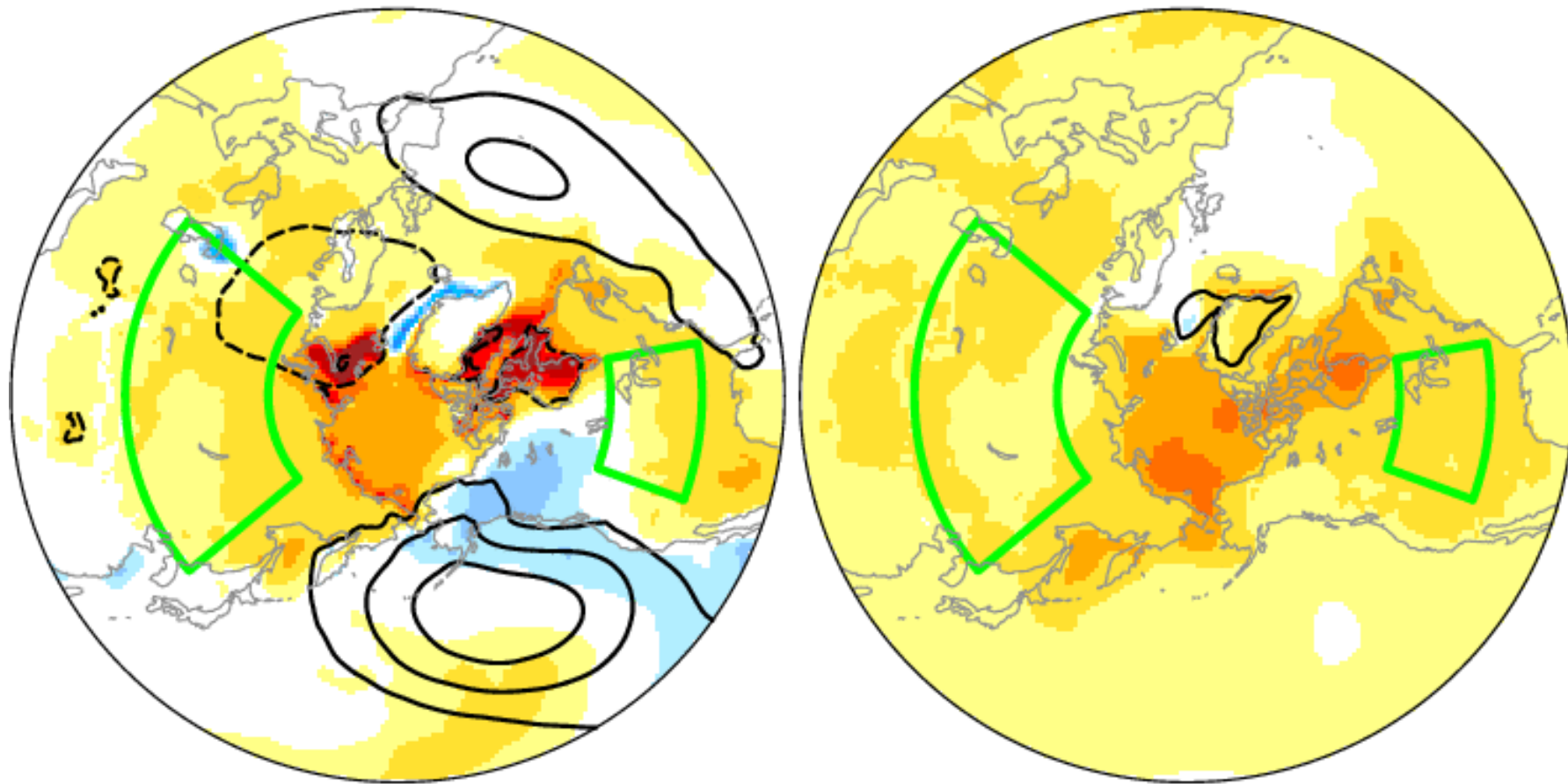
°C/decade



Lantao Sun, Judith Perlwitz and Martin Hoerling
CVCWG, February 9, 2016

1990/91-2013/14 DJF 2m-T/SLP trend (CI: 0.5 hPa decade⁻¹)

AMIP ensemble mean (70) CMIP ensemble mean (58)



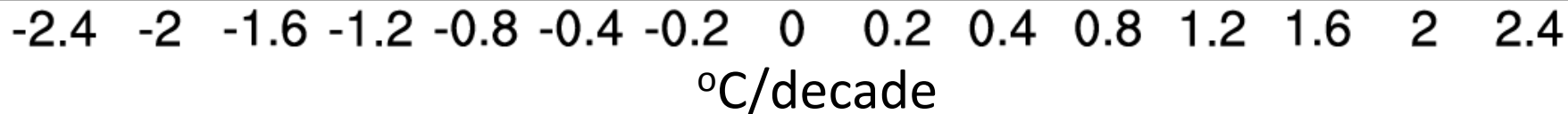
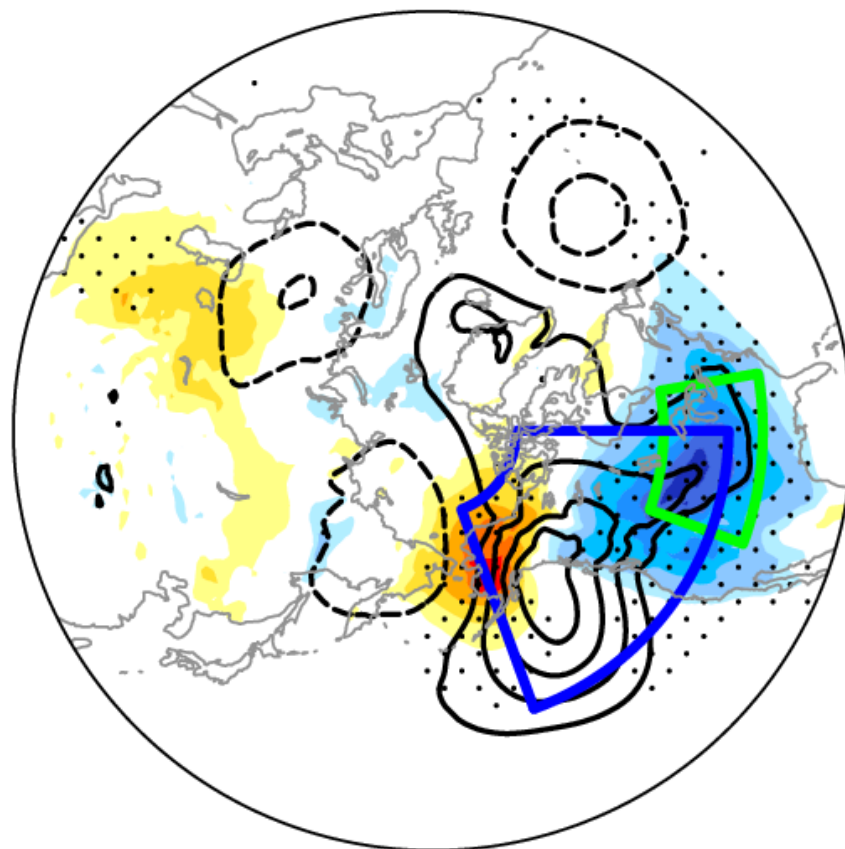
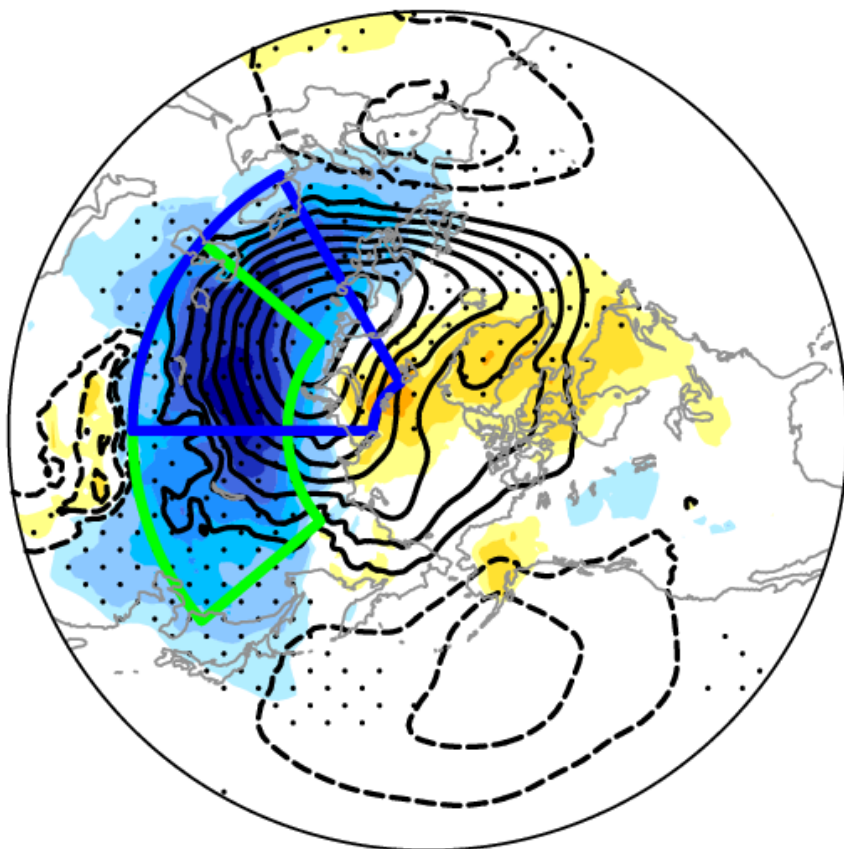
°C/decade

Mechanism of the Winter Temperature Cooling Trend over Mid-latitude Continents

AMIP SLP trend pattern associated with mid-latitude cooling

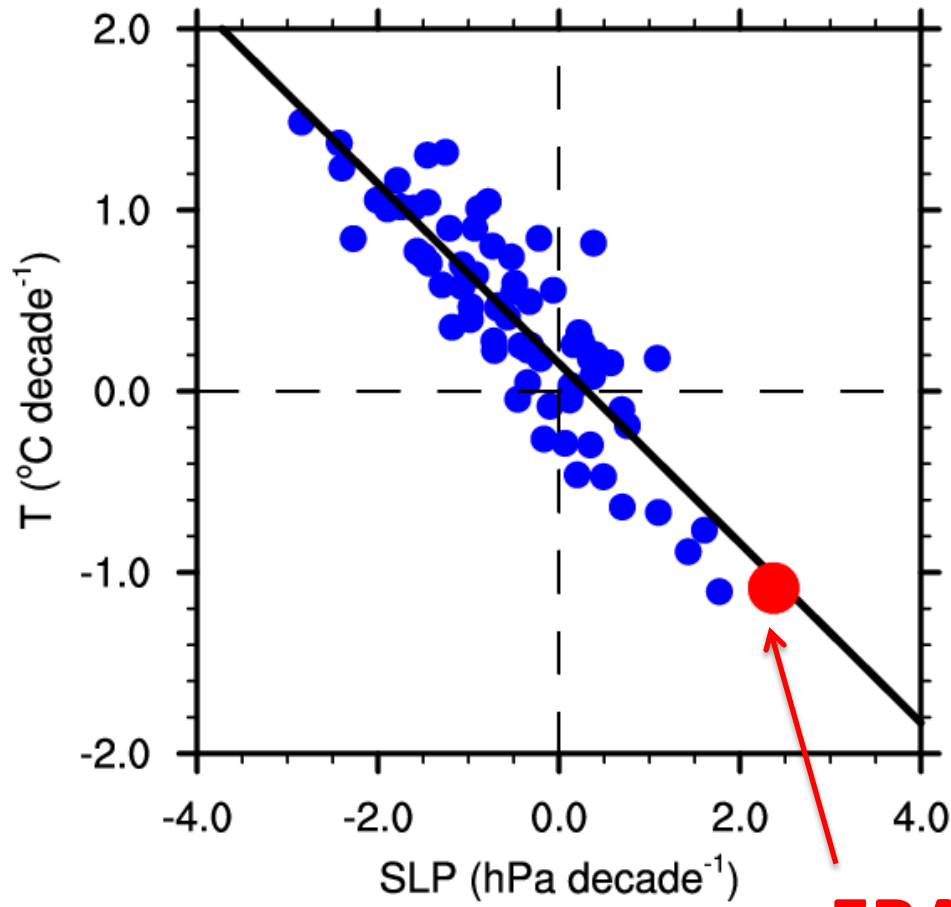
a) Central/East Asia

b) Central North America

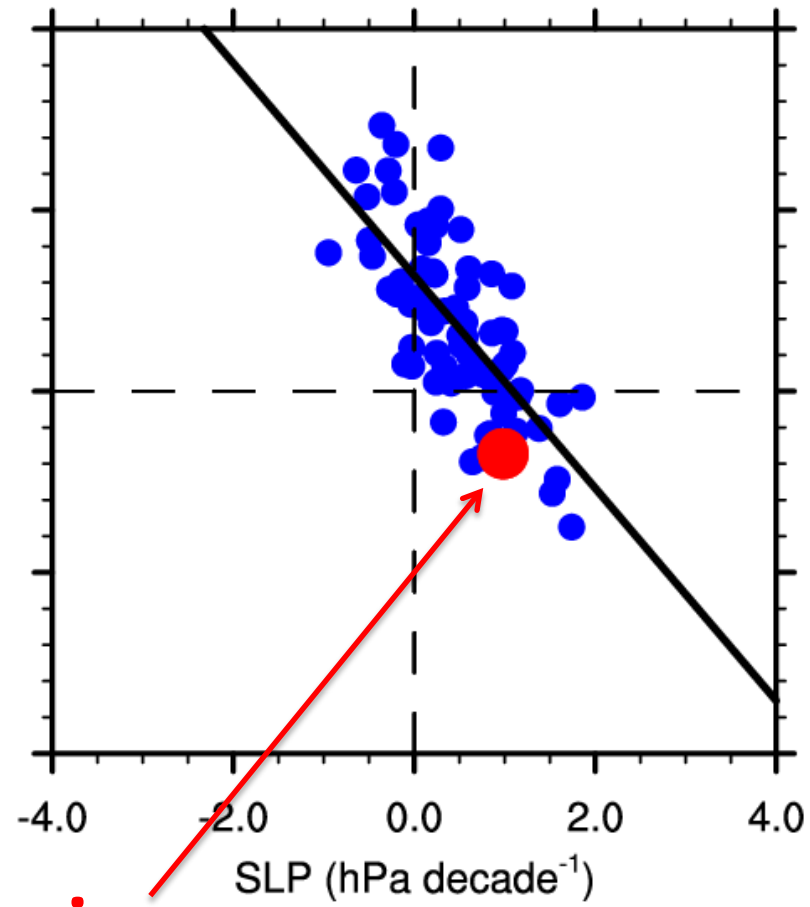


2m-T/SLP trend for individual ensembles

c) Central/East Asia (corr = -0.86)



d) Central North America (corr = -0.72)



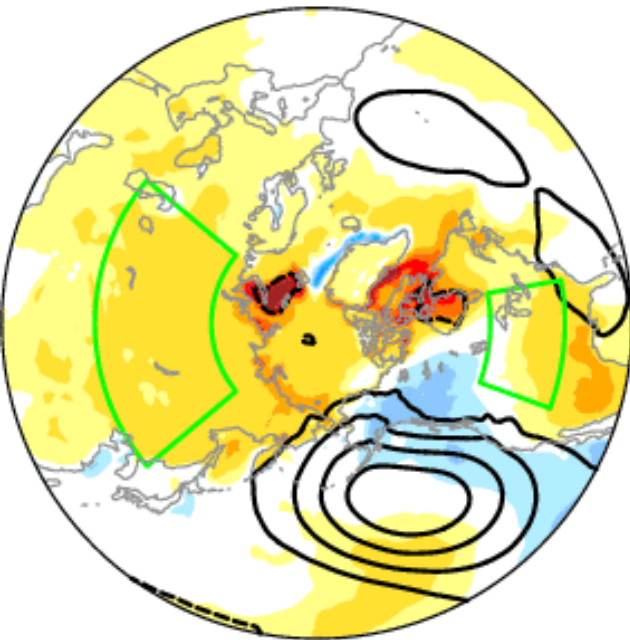
ERA-Interim

Impact of Recent Arctic Sea Ice Loss on the Atmosphere

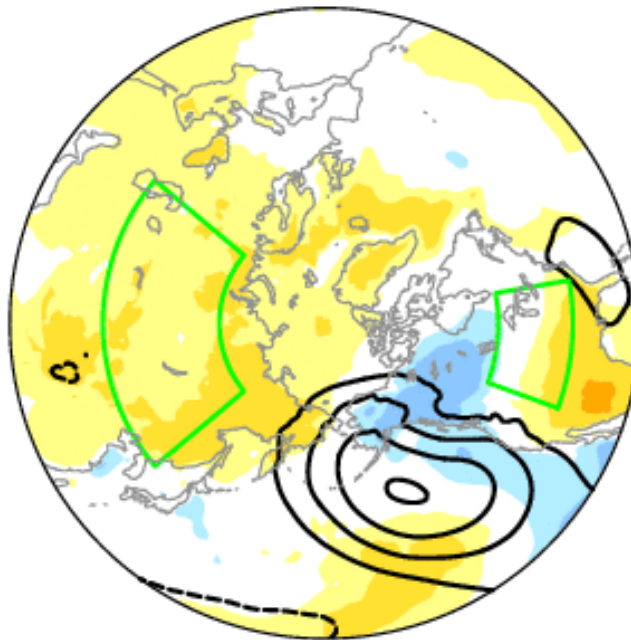
1990/91-2013/14 DJF 2m-T/SLP trend (CI: 0.5 hPa decade⁻¹)

- **AMIP**: observed GHGs, SST and sea ice conditions.
- **CLIM_POLAR**: observed SST, GHGs and sea ice 1979-1989 climatology
- **Δ ICE = AMIP – CLIM_POLAR**

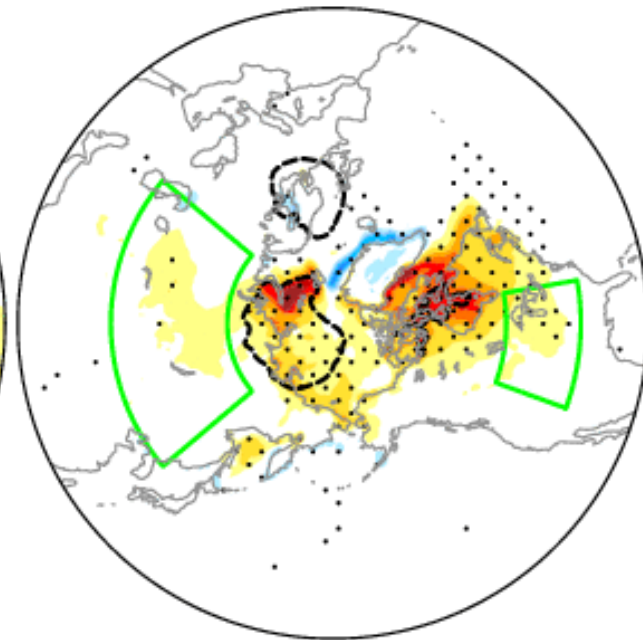
AMIP (50)



Clim_Polar (50)



Δ ICE (50)



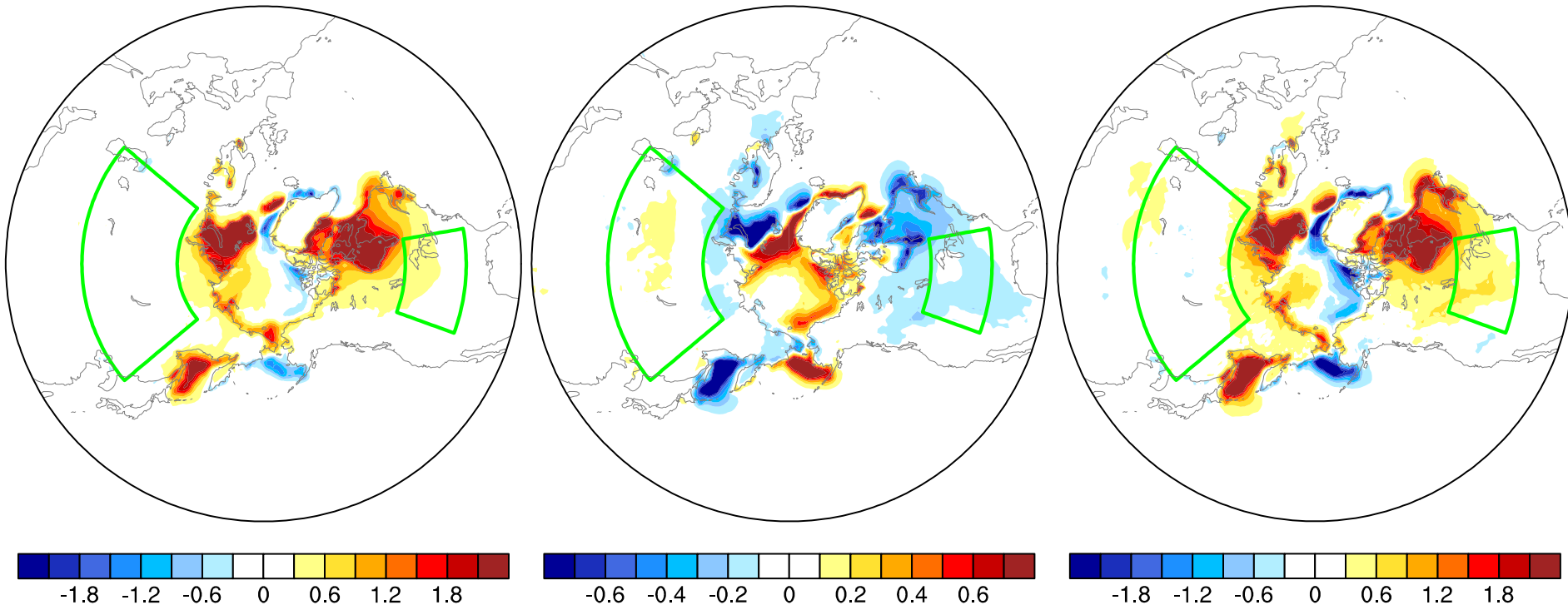
In agreement with the modeling study of Screen et al., (2013); Li et al., (2015).

DJF 2m-T Response to Arctic sea ice loss: 2004/05-2013/14 average

Mean Response

Daily variability

Cold Extremes



Decrease in daily temperature variability is consistent with
Screen (2014) and Screen et al. (2015).

Take home Message

1. Arctic sea ice loss is responsible for “Warm Arctic”, but not for “Cold Continents”
2. Recent “Cold continents” regime is an extreme event of natural decadal variability.
3. Arctic amplification *does* affect mid-latitude weather, however by *reducing* daily variability and *reducing* cold extremes.

SUPPLEMENTARY FIGURES

Does recent Arctic change significantly influence mid-latitudes?

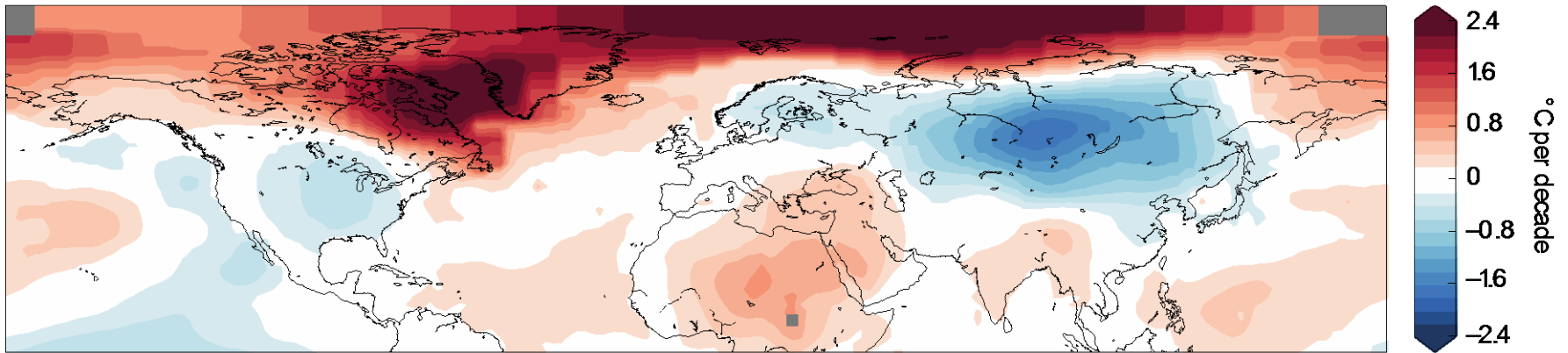
YES

- Honda et al., 2009
- Overland et al., 2011, 2015
- Francis and Vavrus, 2012, 2015
- Liu et al. 2012
- Tang et al. 2013
- Cohen et al., 2013; 2014
- Overland and Wang, 2015
- Kim et al., 2014
- Mori et al., 2014
- Nakamura et al. 2015
- Kug et al. 2015

NO

- Barnes 2013
- Screen and Simmonds 2013
- Screen et al. 2013
- Barnes et al 2014
- Gerber et al. 2014
- Barnes and Screen 2015
- Sorokina et al. 2015
- Hassanzadeh et al., 2014, 2015
- Perlwitz et al. 2015
- Li et al. 2015
- McCusker et al. 2016

DJF surface temperature trends (1990–2013)



Cohen et al. (2014) *Nature Geoscience*

Temperature trend over N America and C/E Asia

