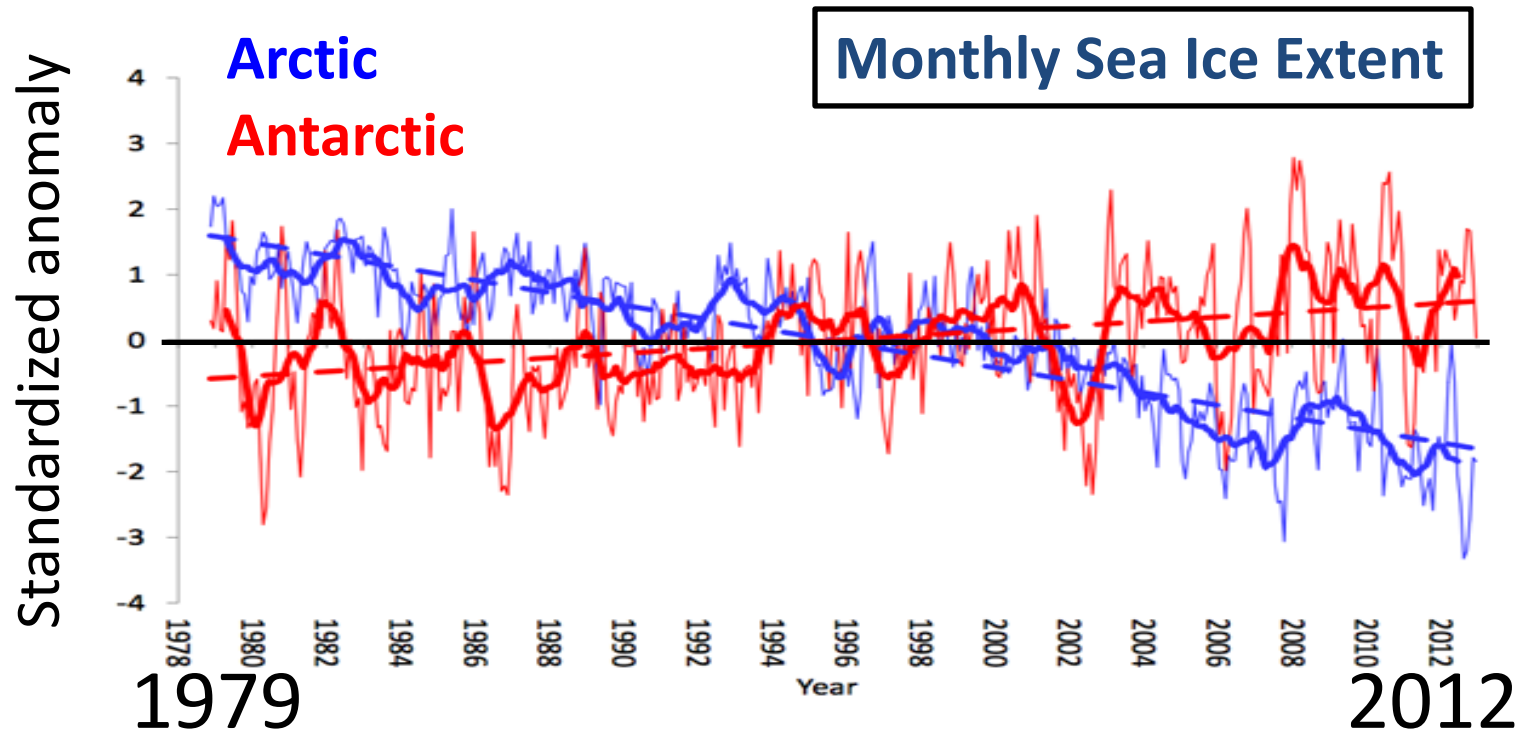
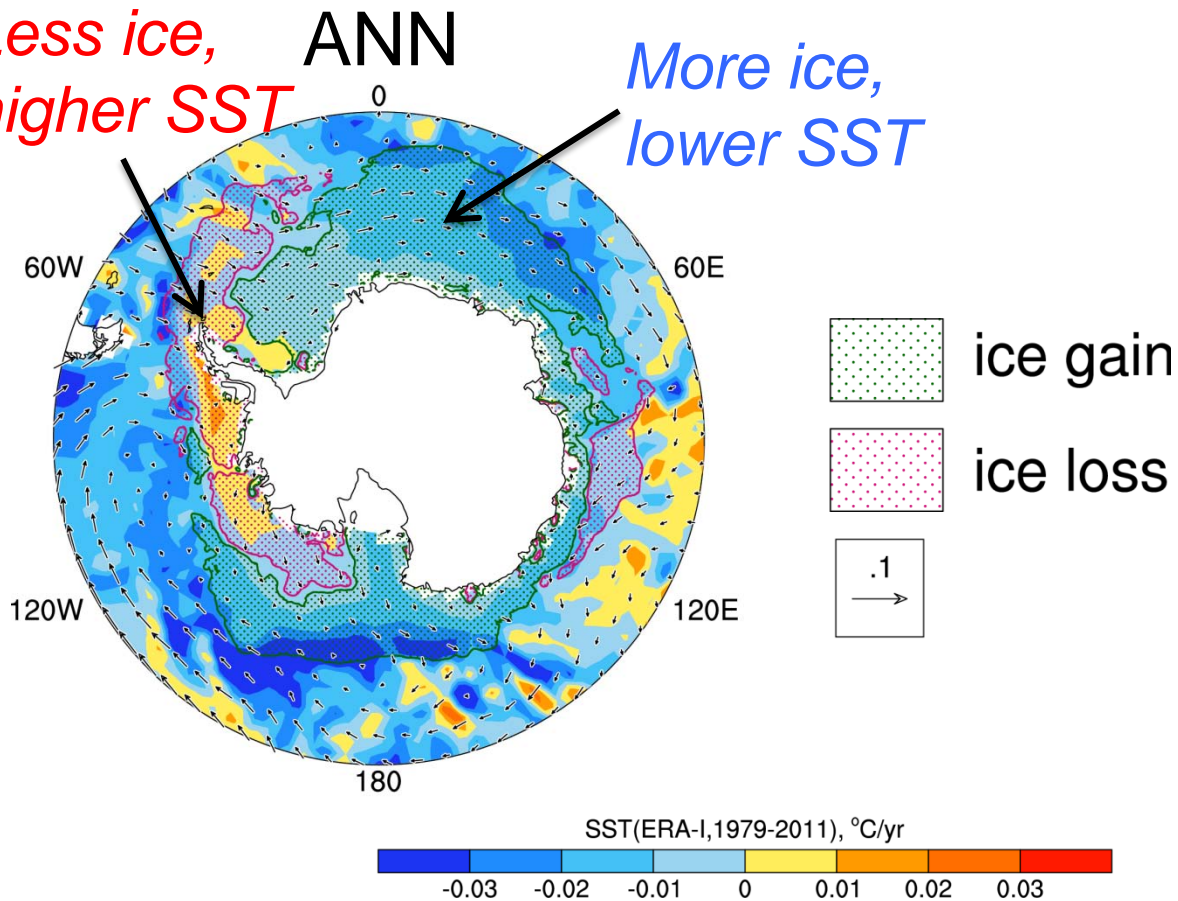


Recent Antarctic sea ice trends in the context of Southern Ocean surface climate variations since 1950



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Climate Analysis Section (CAS), NCAR
Submitted to *Geophys. Res. Lett.*

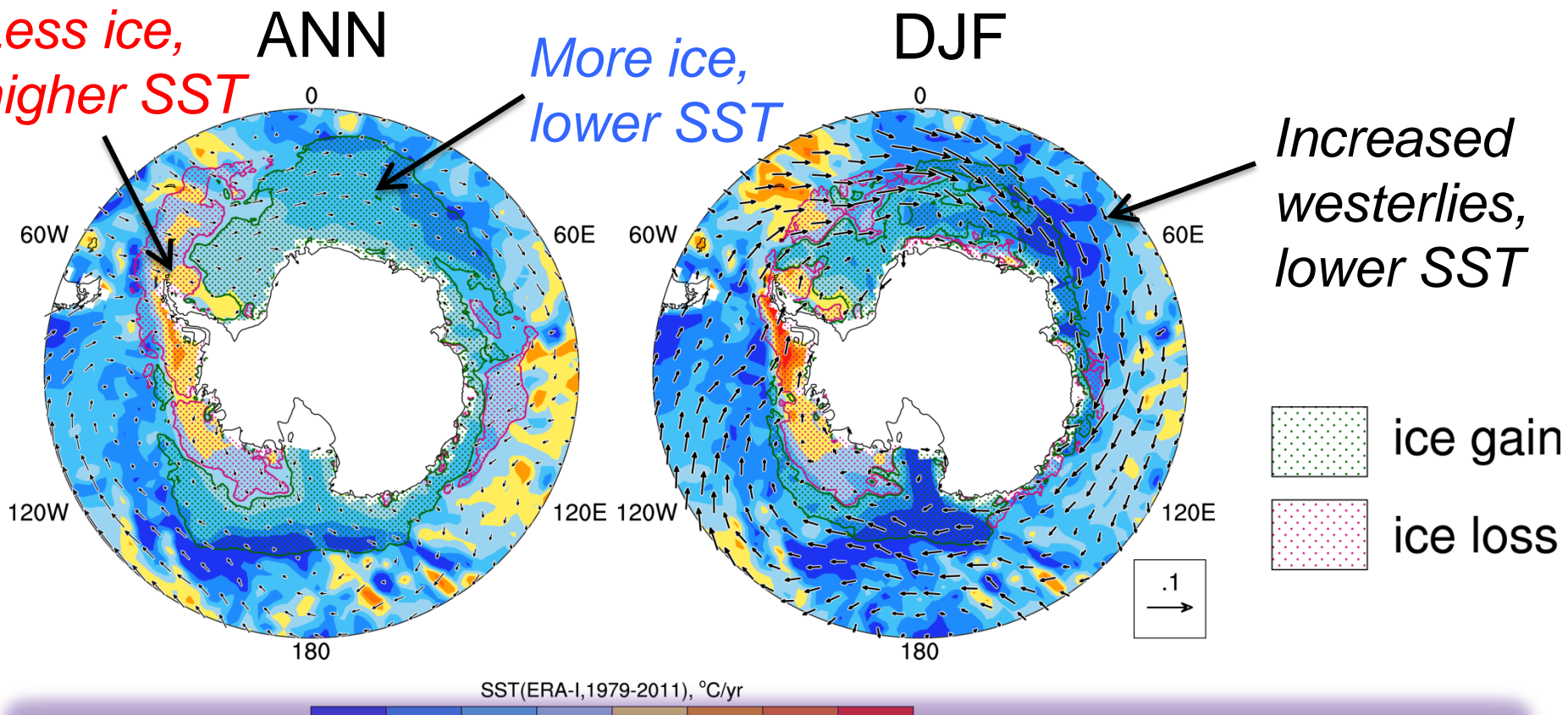
1) Context for recent sea ice trends (1979-2011)



ERA-I SST & wind

NSIDC sea ice concentration (*bootstrap v2*)

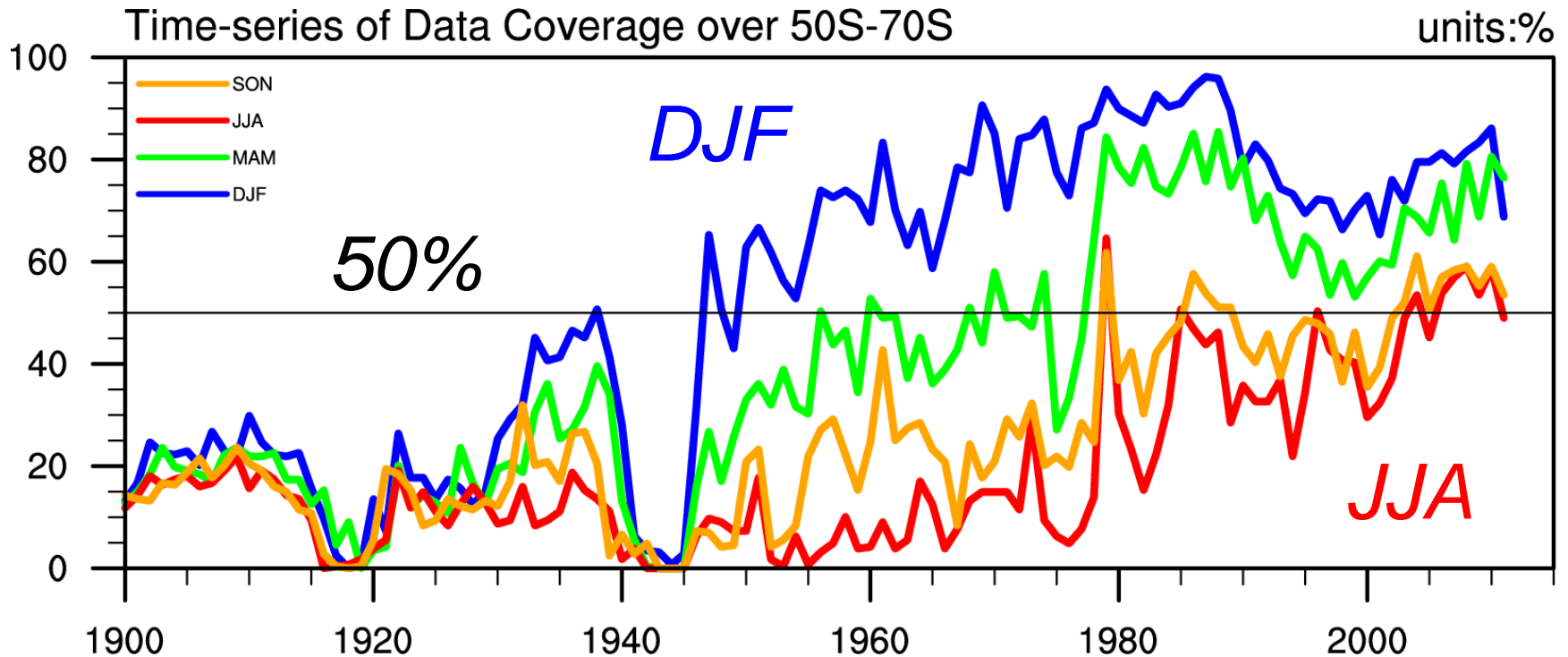
1) Context for recent sea ice trends (1979-2011)



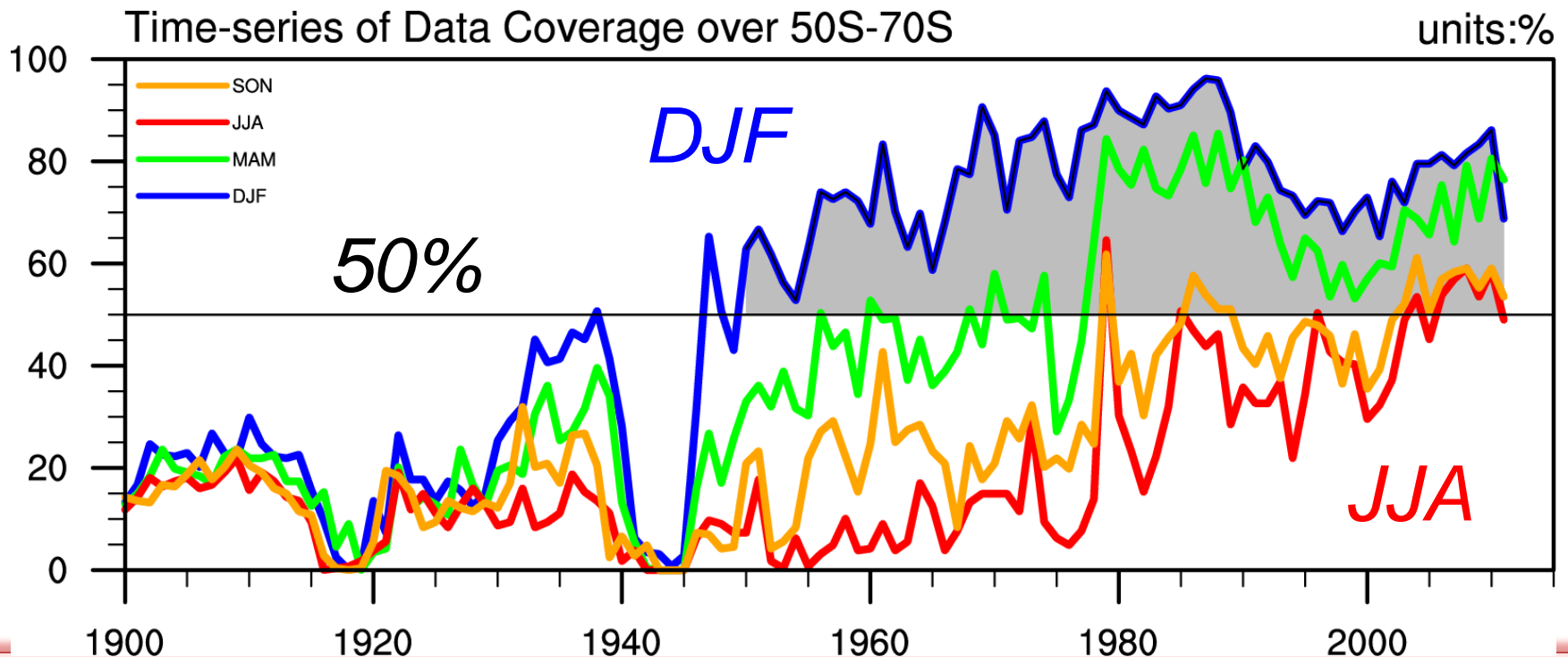
2) How far back in time can we extend the analysis of Southern Ocean surface climate trends using real data, not reanalyses?

Southern Ocean SST data coverage from HadSST3 (no spatial or temporal smoothing/interpolation)

Percentage of grid boxes



Southern Ocean SST data coverage from HadSST3 (no spatial or temporal smoothing/interpolation)



Limit our subsequent analysis to DJF after 1950

Revisiting 1979-2011 trends with conventional datasets: **similar to ERA-I but noisier**

cooling

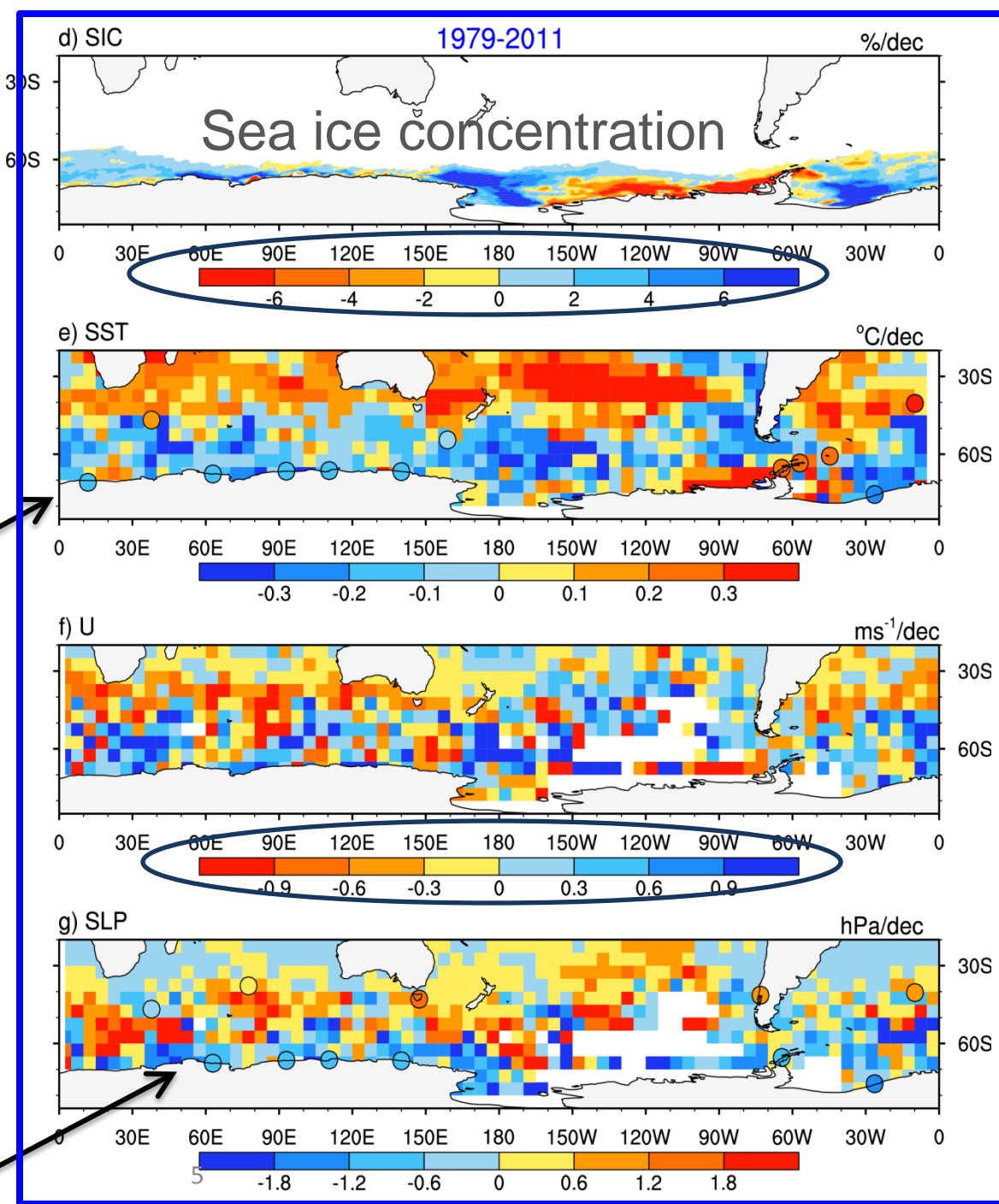
HadSST3
Station
Air T

westerly

Zonal wind
(ICOADS)

increased Δ

SLP
(ICOADS)
Station
SLP



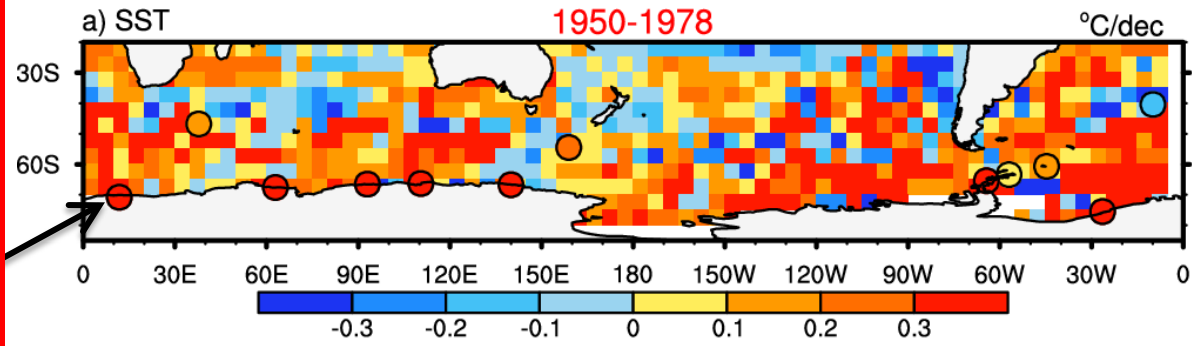
Earlier Trends

1950-1978

warming

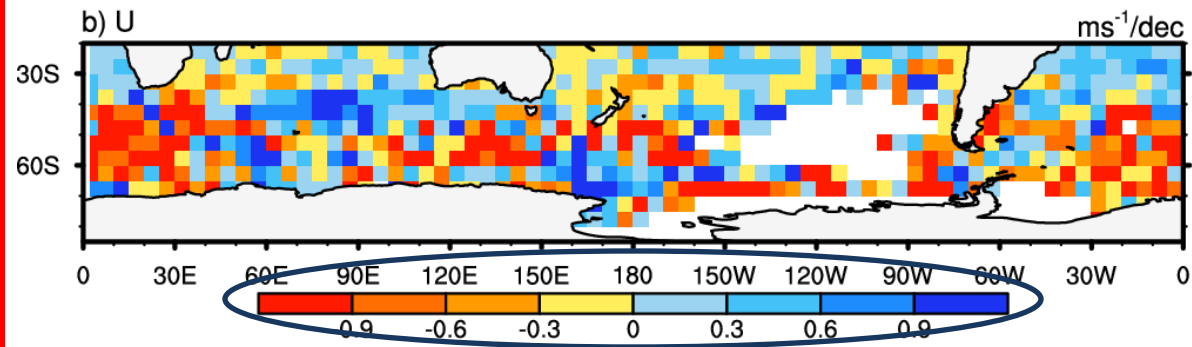
SST
(HadSST3)

Station
Air T



easterly

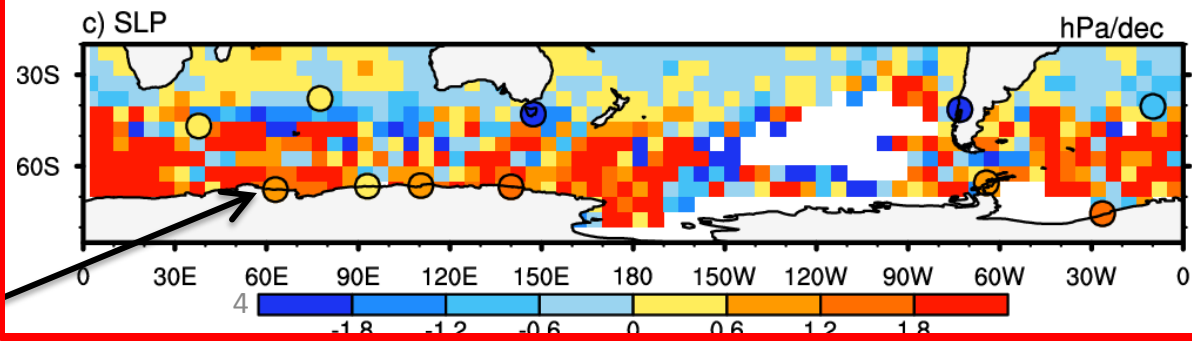
Zonal wind
(ICOADS)



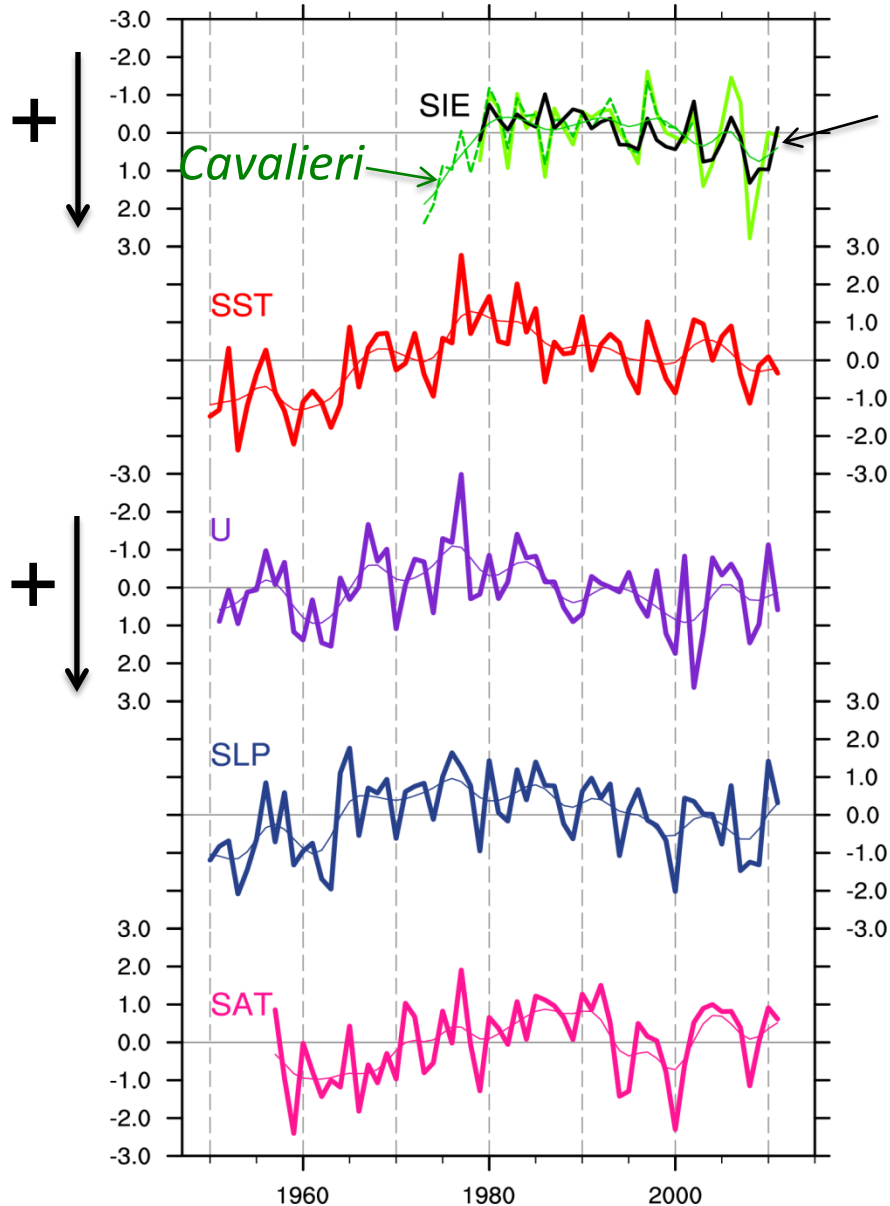
decreased Δ

SLP
(ICOADS)

Station
SLP



Southern Ocean Surface Climate Records (DJF)



Annual sea ice extent

SST & U : 50S-70S
SLP : 55S-80S
SAT : 10 stations south of 50S

Average

Physically-consistent
multi-decadal variability

All correlation coefficients
significant at the 95%
confidence level

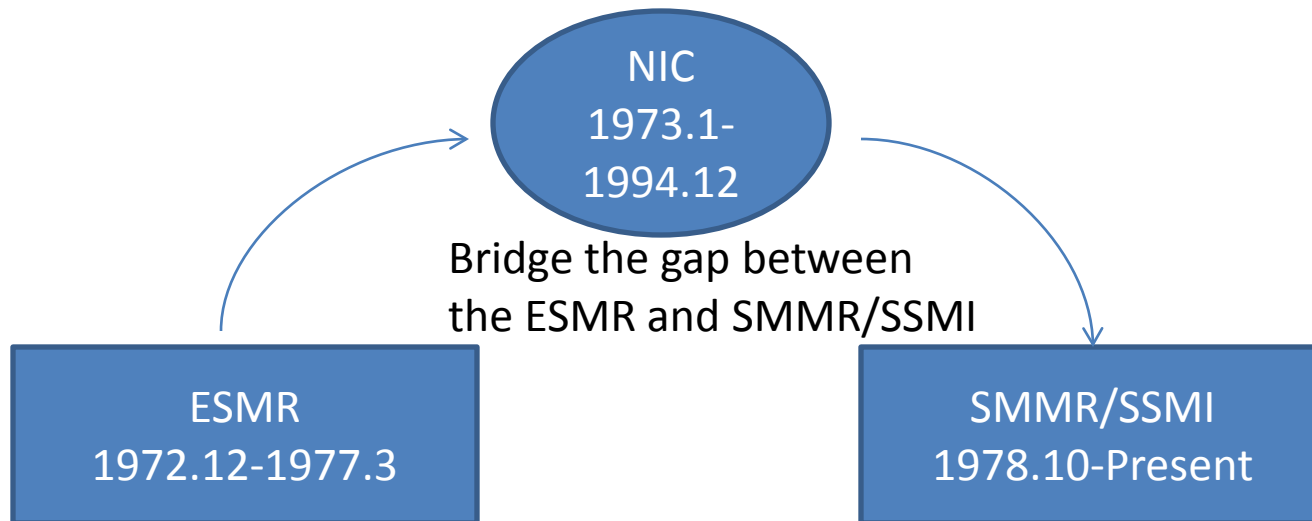
Summary and future work

- Recent expansion of Antarctic sea ice agrees well with decreasing SSTs over the Southern Ocean, and is accompanied by intensified westerly winds and a strengthened meridional SLP gradient.
- Independent data provide strong evidence for a reversal in the sign of the trends before and after ~1980.
- Future work will be aimed at understanding the proximate causes for the temporal evolution of surface climate trends over the Southern Ocean since 1950 (in particular, the role of the tropics).

Thank You

Contact: tingting@ucar.edu

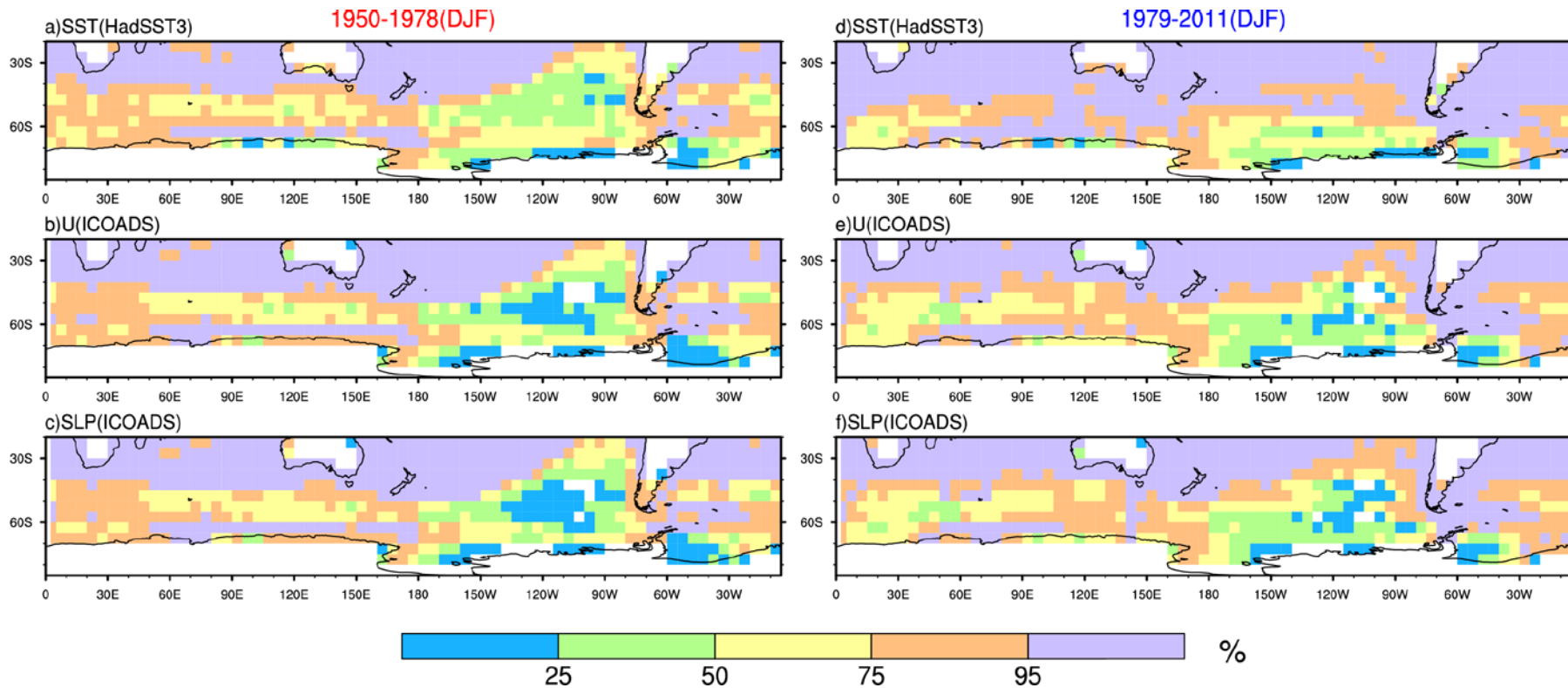
The data sets used in compiling the three sea ice records include those from the Nimbus 5 Electrically Scanning Microwave Radiometer (ESMR), and NIC, and the combined Nimbus 7 Scanning Multichannel Microwave Radiometer (SMMR)/Defense Meteorological Satellite Program (DMSP) Spatial Sensor Microwave Imager (SSMI).



More detailed information:

Cavalieri, D.J., C.L. Parkinson, and K.Y. Vinnikov (2003), 30-year satellite record reveals contrasting Arctic and Antarctic decadal sea ice variability, *GRL*, 30, doi:10.1029/2003GL018031

% of years with data



Comparison of DJF SST trends between the periods 1950-1978 and 1979-2011

