

# Interdecadal Climate Variability over Antarctica and Linkages to the Tropics\*

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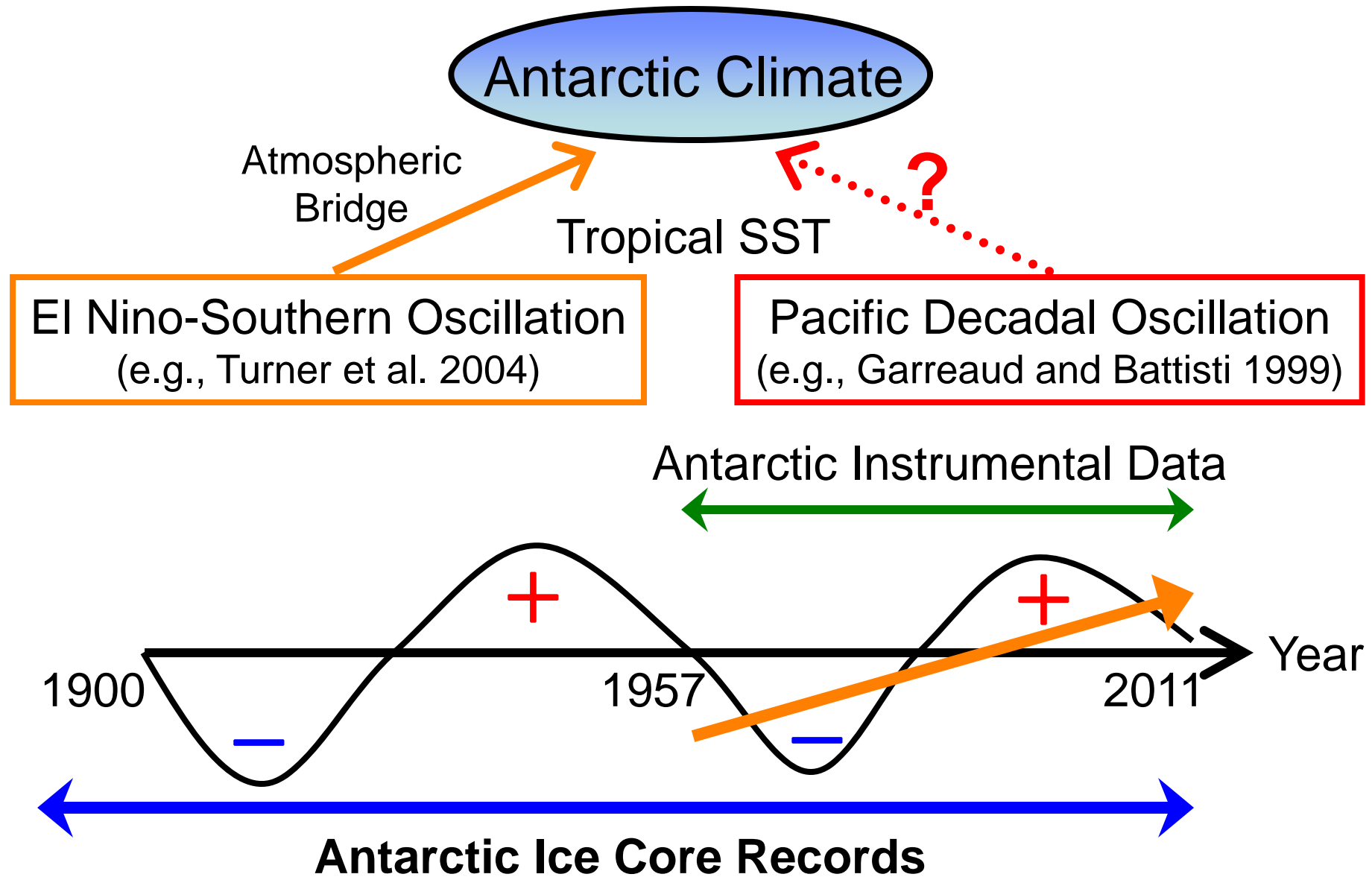
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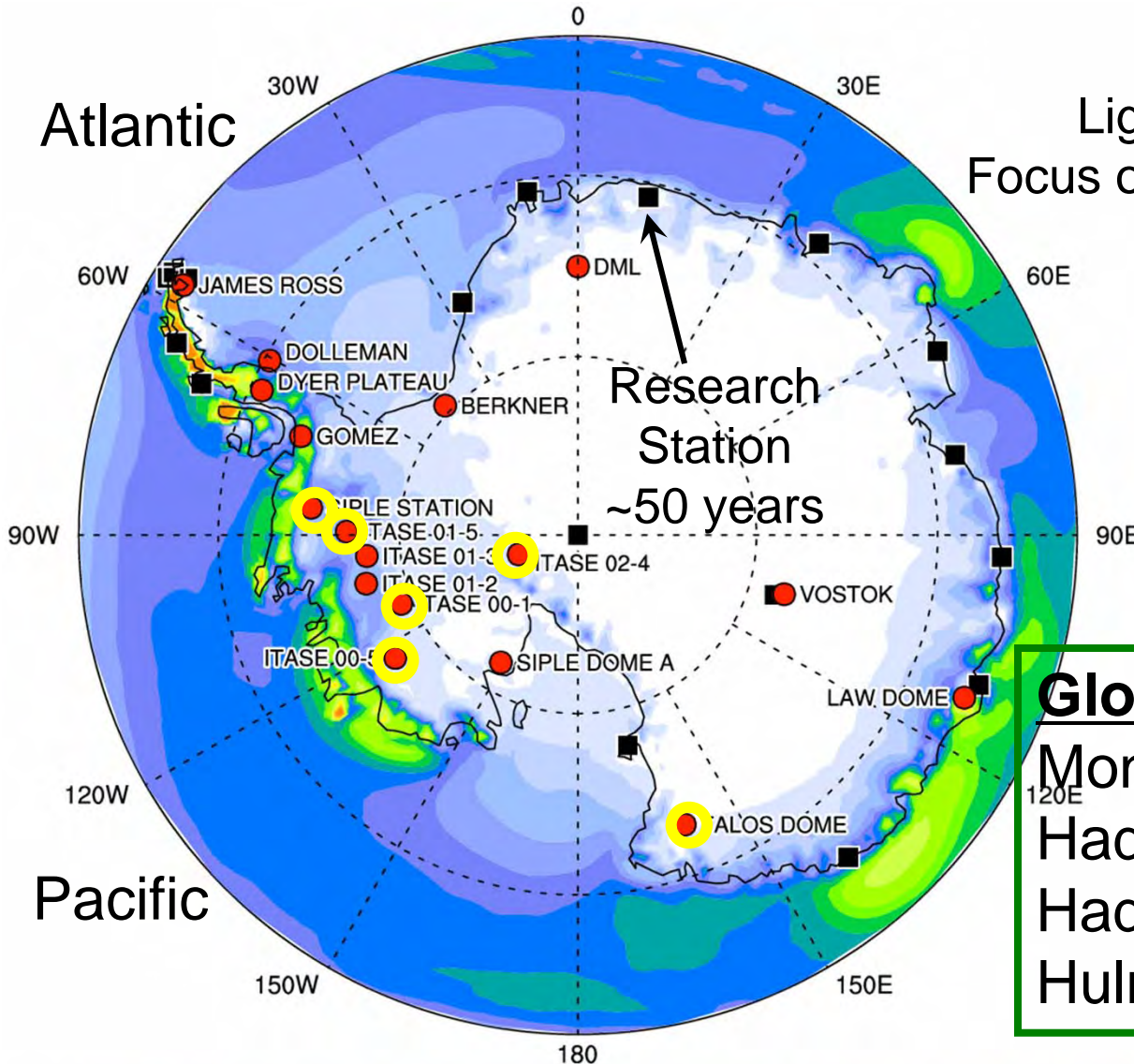
\* Manuscript will be available shortly

# Interdecadal Climate Variability and Trend





# Analysis of Low-frequency Antarctic Climate Variability



Detrend &  
Light Temporal Smoothing  
Focus on time scales beyond ENSO

## Ice Cores

$\delta^{18}\text{O}$  or  $\delta\text{D} \propto \text{Temp}$   
Annual

1900~1981: 17 cores

1799~1981: 6 cores

## Global Instrumental Data

Monthly → Annual

HadISST (1870-2010)

HadSLP2 (1850-2004)

Hulme Precip (1900-98)



Surface Mass Balance (mm water/year)

# One-Point Correlation Analysis

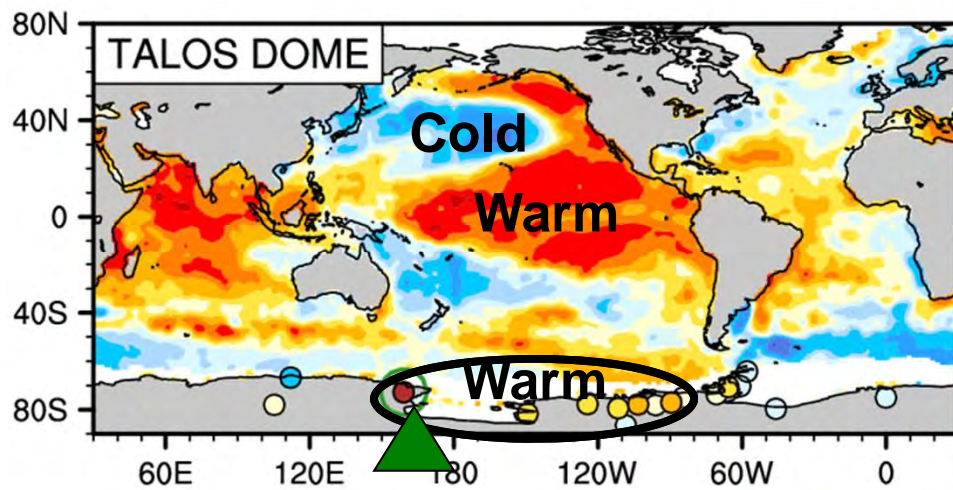
Individual Ice Core Record

Temporal  
Correlation  
1900-1981

Global Sea Surface Temperature

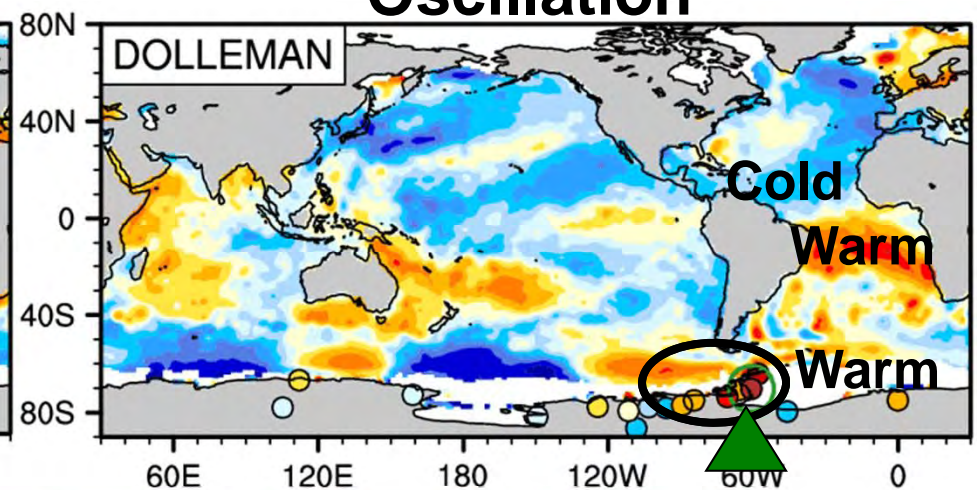
# Ice Core-Global SST One-Point Correlation Map (1900-1981)

## Pacific Decadal Oscillation



↑  
95% Significance

## Atlantic Multidecadal Oscillation



↑  
95% Significance

# Objective Analysis of Antarctic-Tropical Linkages

## One-Point Correlation Analysis

Antarctic Ice Core

Tropical Sea Surface  
Temperature

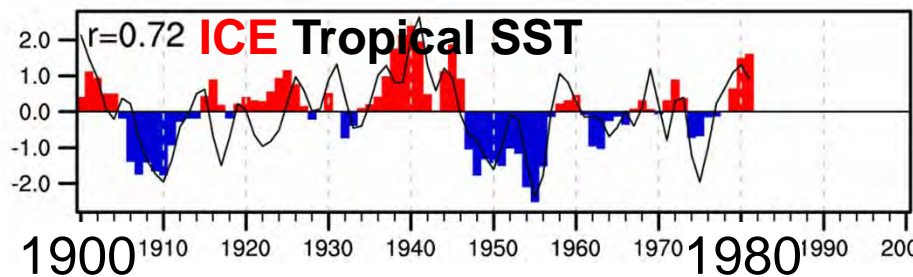
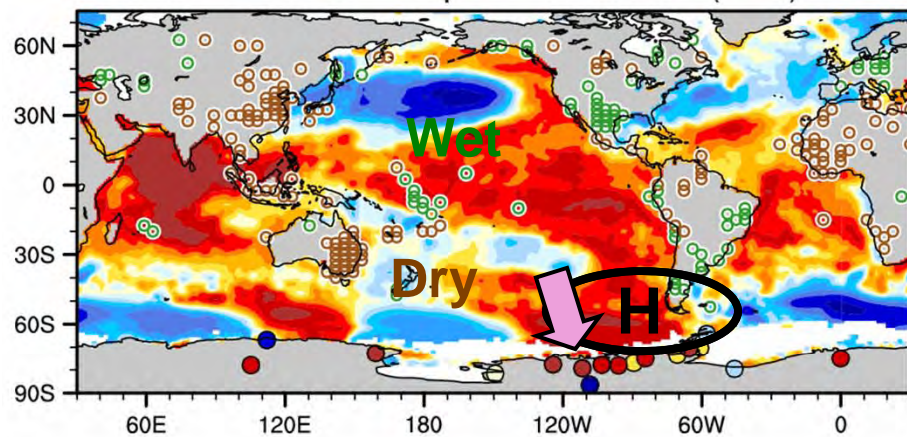
Objective Analysis  
**Singular Value Decomposition (SVD) Analysis**  
(Bretherton et al. 1992)



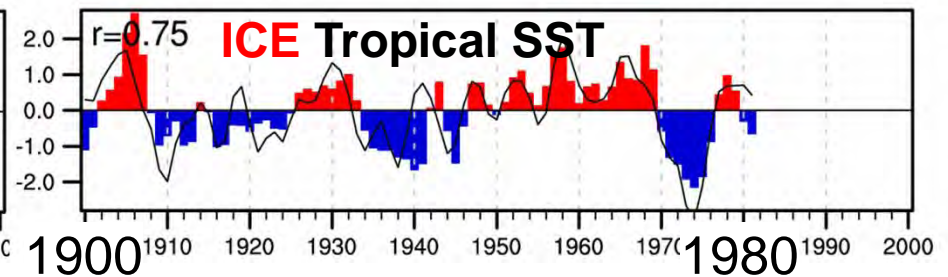
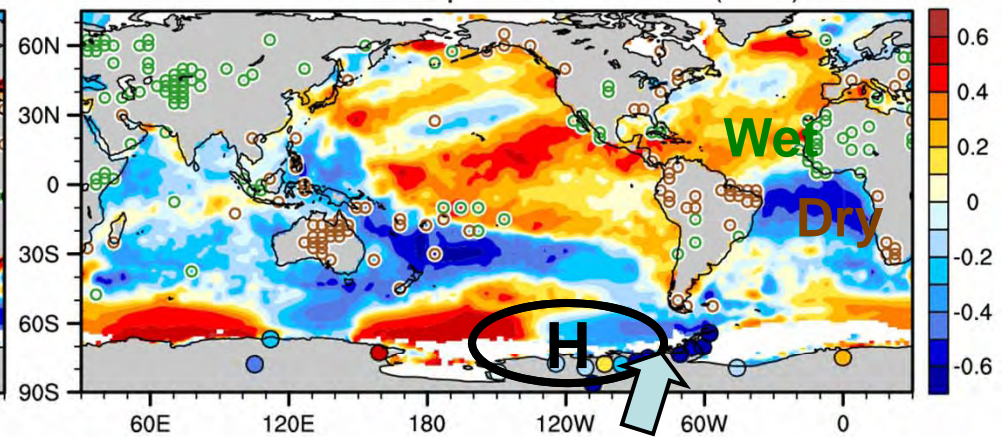
# SVD Analysis of Ice Core and Tropical SST (1900-1981)

Correlation: Ice Core, Sea Surf Temp & Precipitation (Wet/Dry)

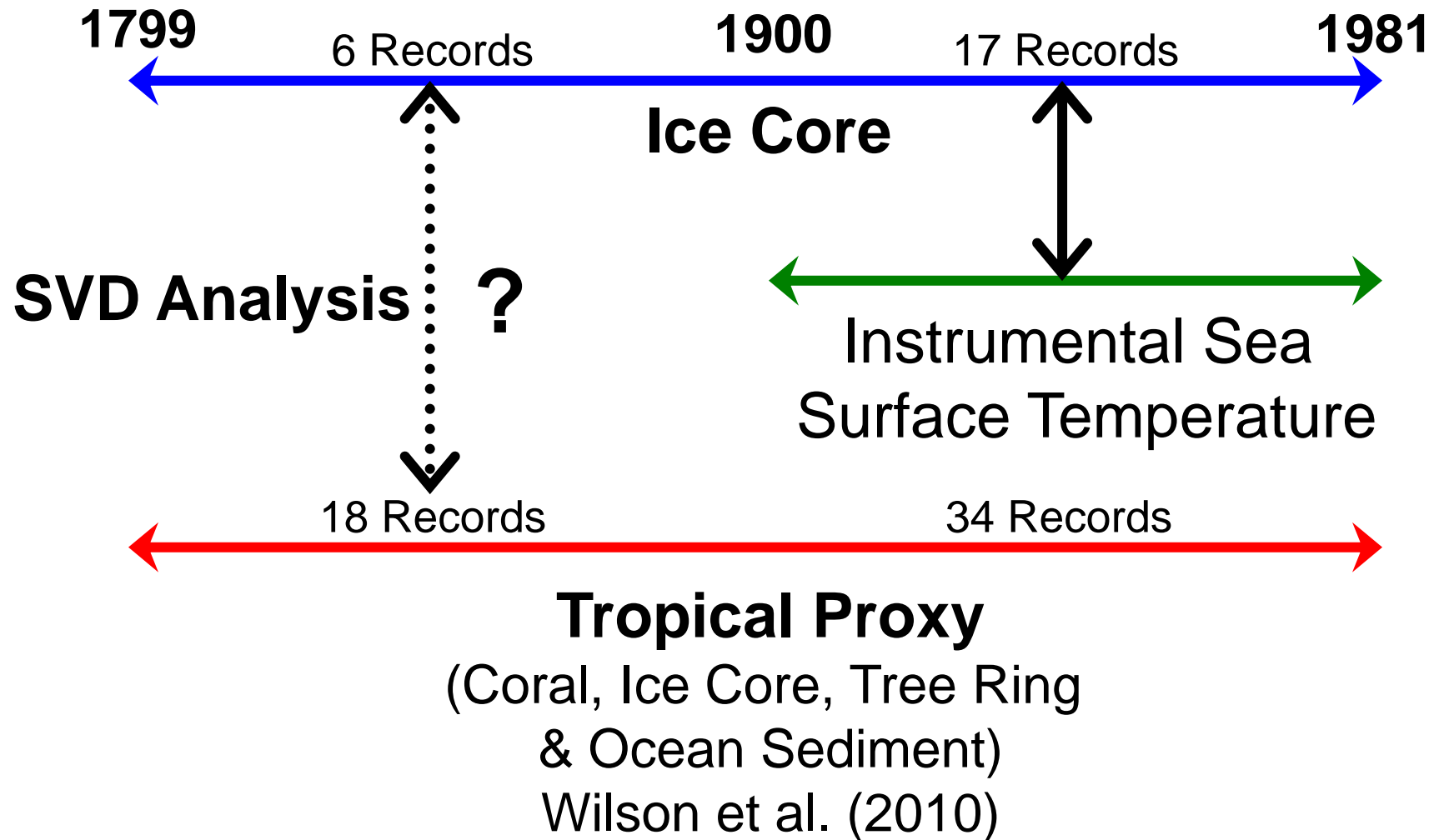
## SVD Mode 1 (50%) Pacific Decadal Oscillation



## SVD Mode 2 (25%) Atlantic Multidecadal Oscillation



## Going Further Back in Time...



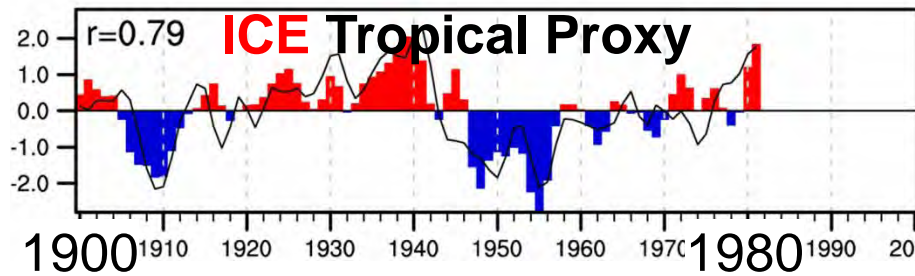
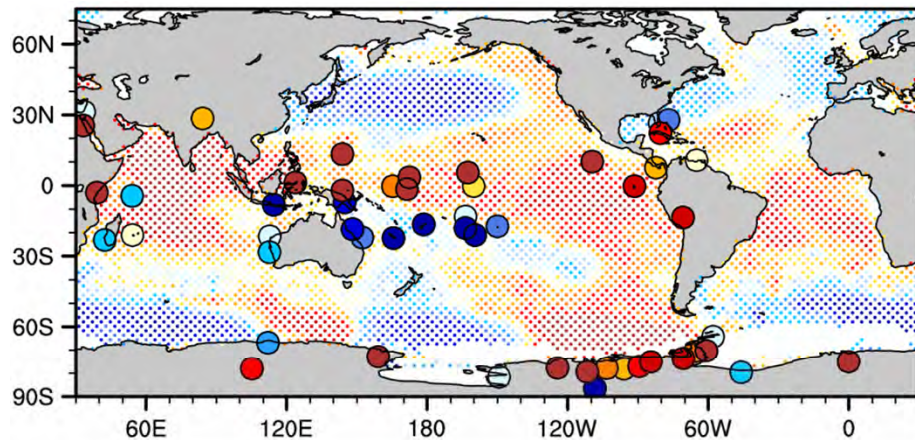


# SVD Analysis of Ice Core and Tropical Proxy (1900-1981)

Correlation: Ice Core, Tropical Proxy & Sea Surf Temp

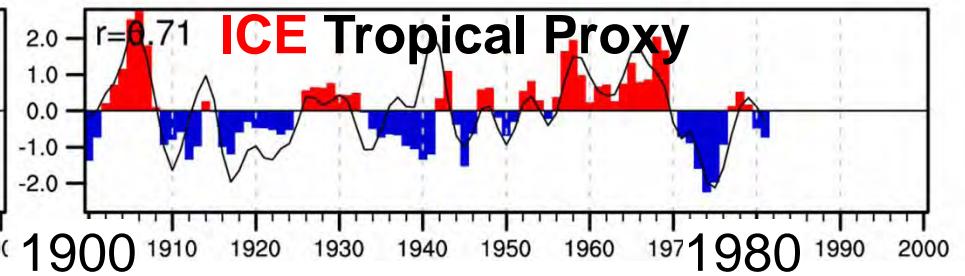
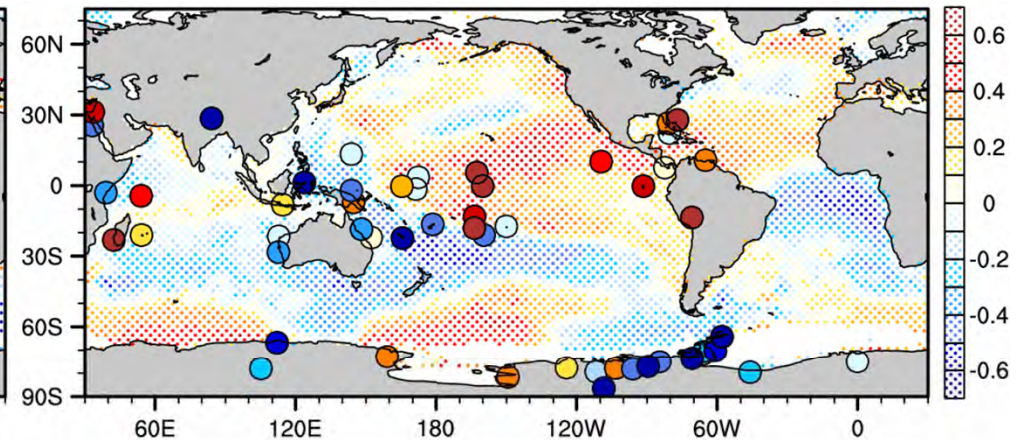
## SVD Mode 1 (30%)

Pacific Decadal Oscillation



## SVD Mode 2 (22%)

Atlantic Multidecadal Oscillation

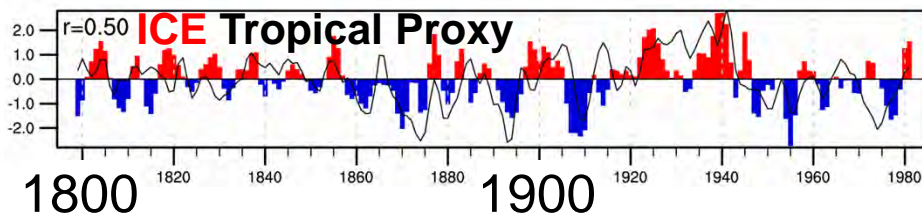
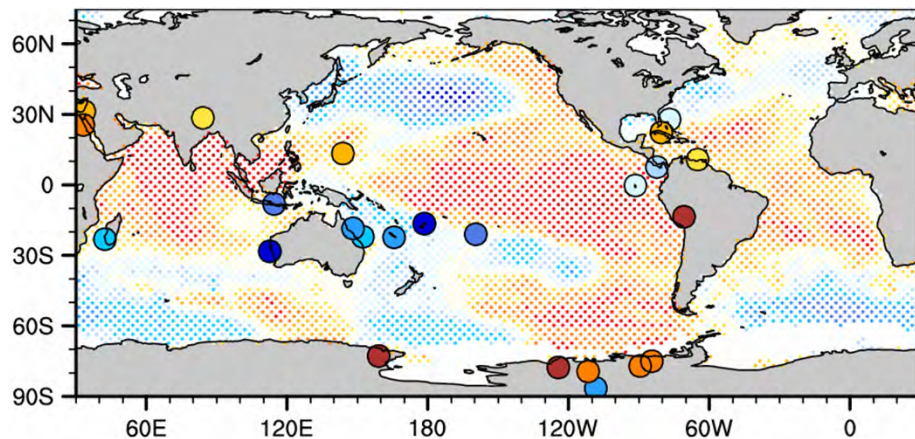


# SVD Analysis of Ice Core and Tropical Proxy (1799-1981)

Correlation: Ice Core, Tropical Proxy & Sea Surf Temp

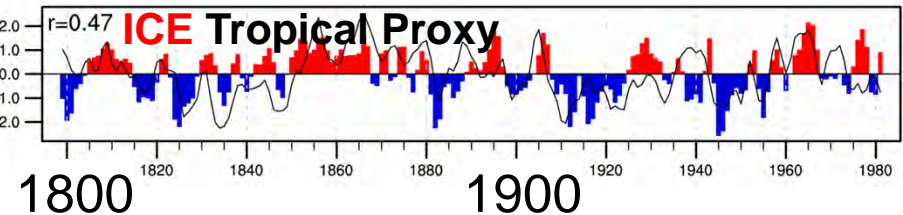
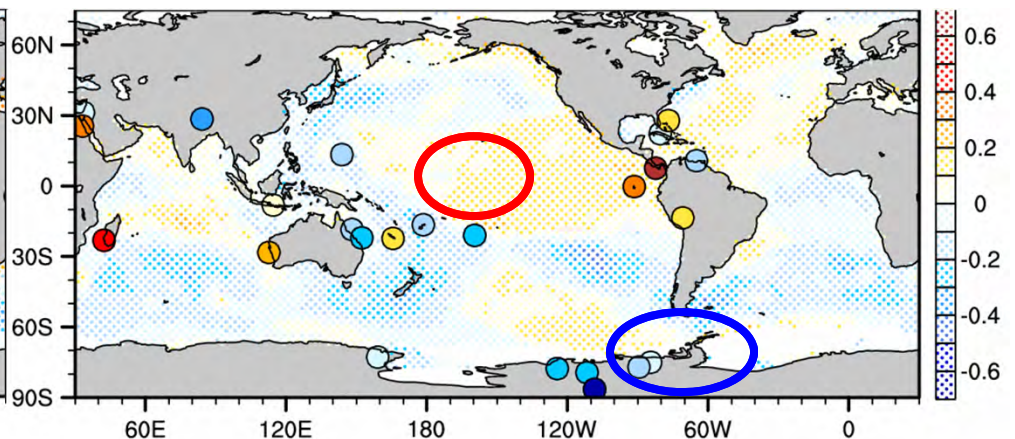
## SVD Mode 1 (52%)

Pacific Decadal Oscillation



## SVD Mode 2 (13%)

Atlantic Multidecadal Oscillation?

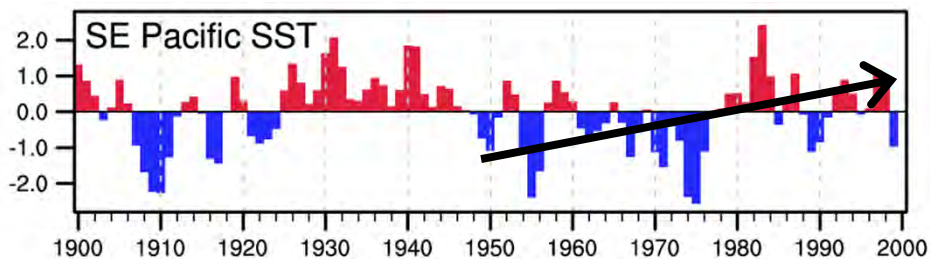




# Summary

- Antarctic climate is strongly linked to the sea surface temperature variations in the tropical Pacific and Atlantic on decadal-interdecadal time scales.
- The decadal changes in tropical sea surface temperature force atmospheric teleconnections and affect Antarctic temperature.

## Pacific Decadal Oscillation



## Atlantic Multidecadal Oscillation

