ENSO and SAM Influence on Regional Climate: Antarctic Peninsula vs. West Antarctica

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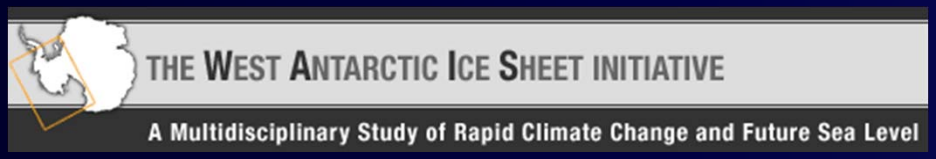
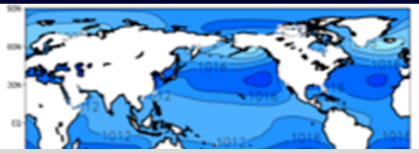


Overview

1. The Amundsen-Bellingshausen Seas Low (ABSL)
2. ENSO and SAM relationship with ABSL during austral spring (September – November; SON)
3. ENSO and SAM relationship with Antarctic Peninsula climate during SON
4. Significance of combined ENSO/SAM events on regional circulation
5. Varying circulation features associated with warm events across West Antarctica in SON

The Amundsen-Bellingshausen Seas Low (ABSL)

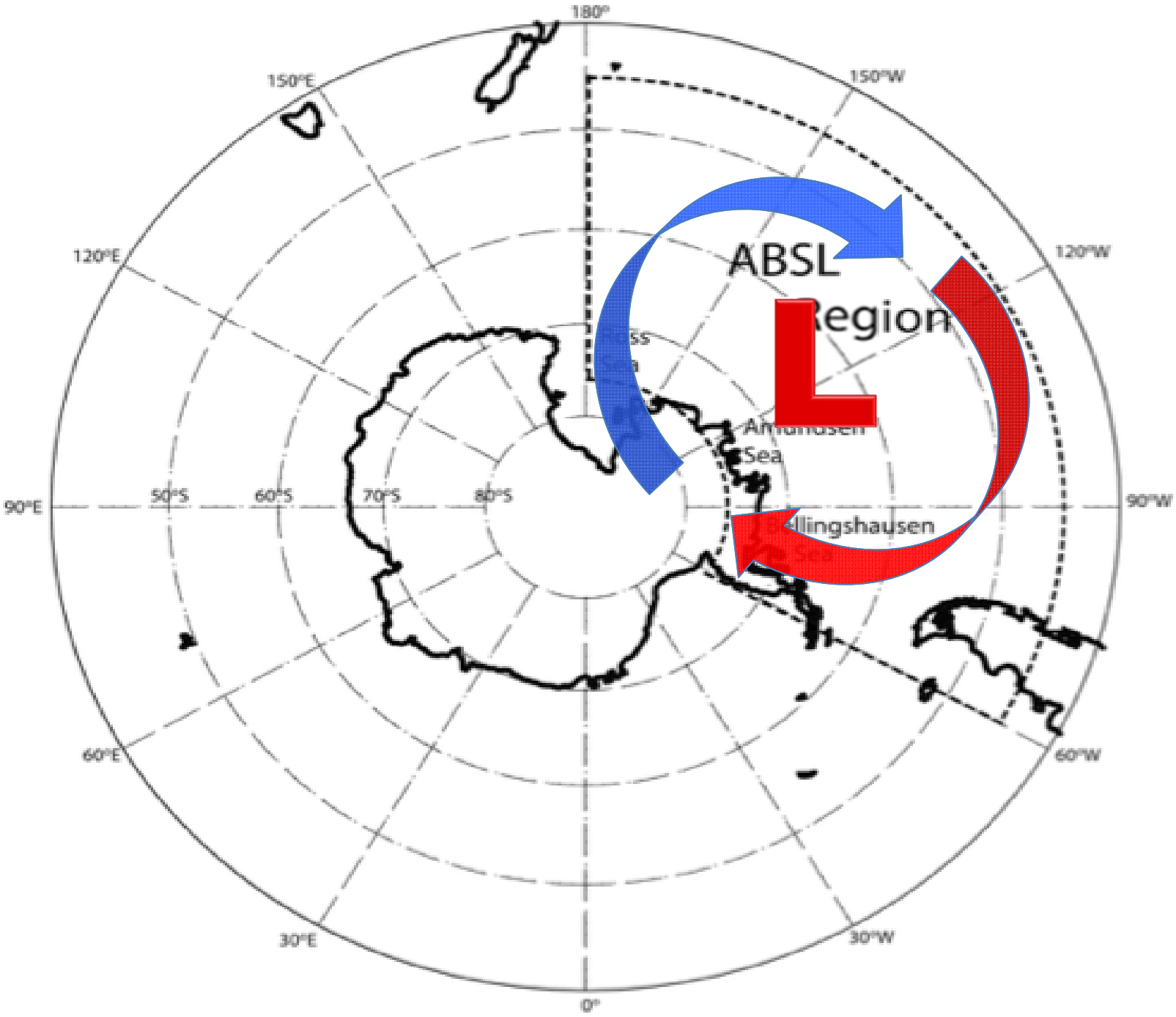


*<u>The ABSL is important because</u>:

1. It is the dominant atmospheric circulation feature along the coast of West Antarctica

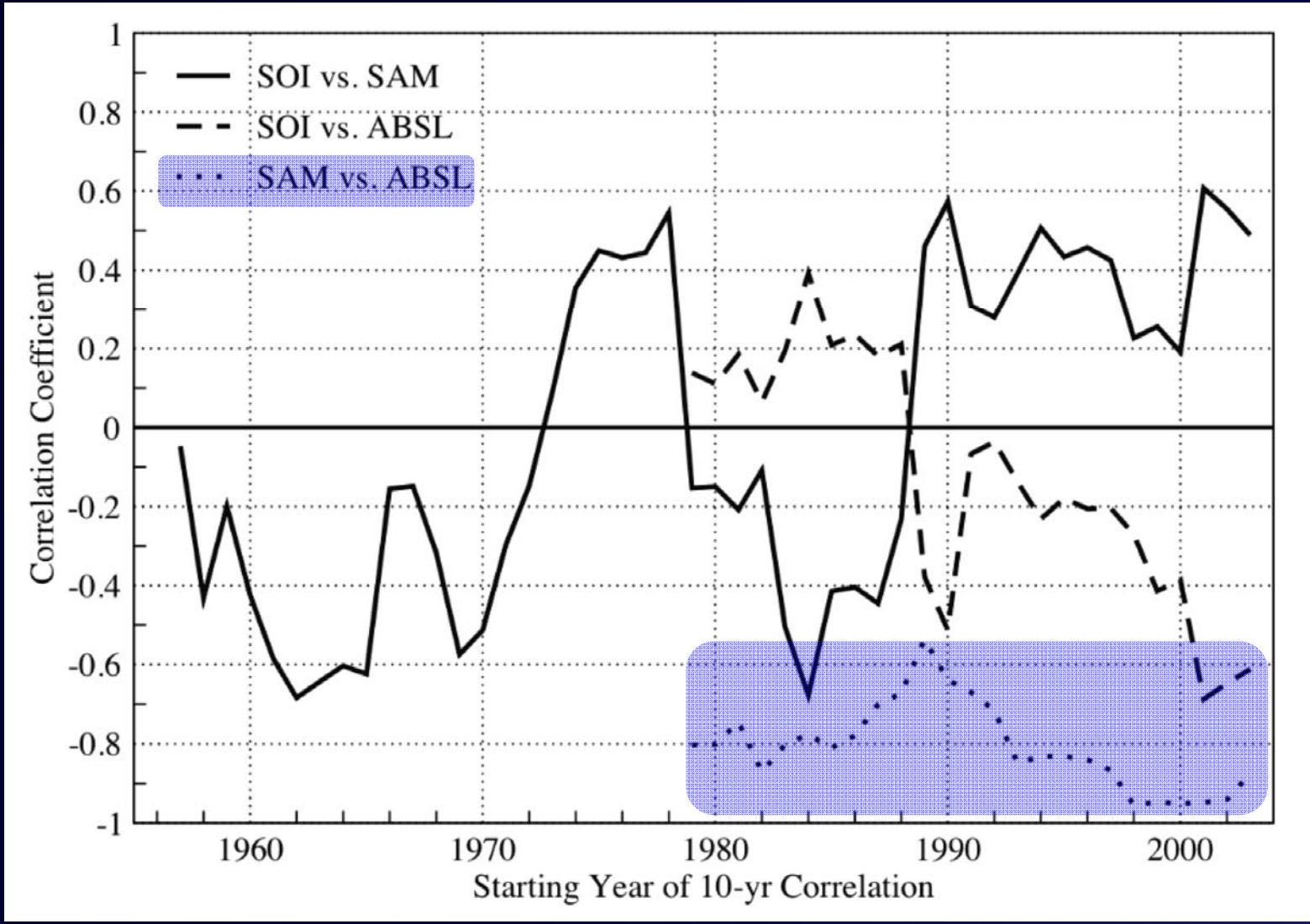
2. Its position and intensity significantly influences temperature advection and sea ice across the Antarctic Peninsula and West Antarctica

high latitude South Pacific (55°-75°S), mainly across the Amundsen and Bellingshausen Seas (180°-60°W)


180°
150°E
150°W
120°E
120°W
90°E
90°W
60°E
60°W
30°E
30°W
0°
50°S
60°S
70°S
80°S
ABSL
Region
L
Sea
llingshausen

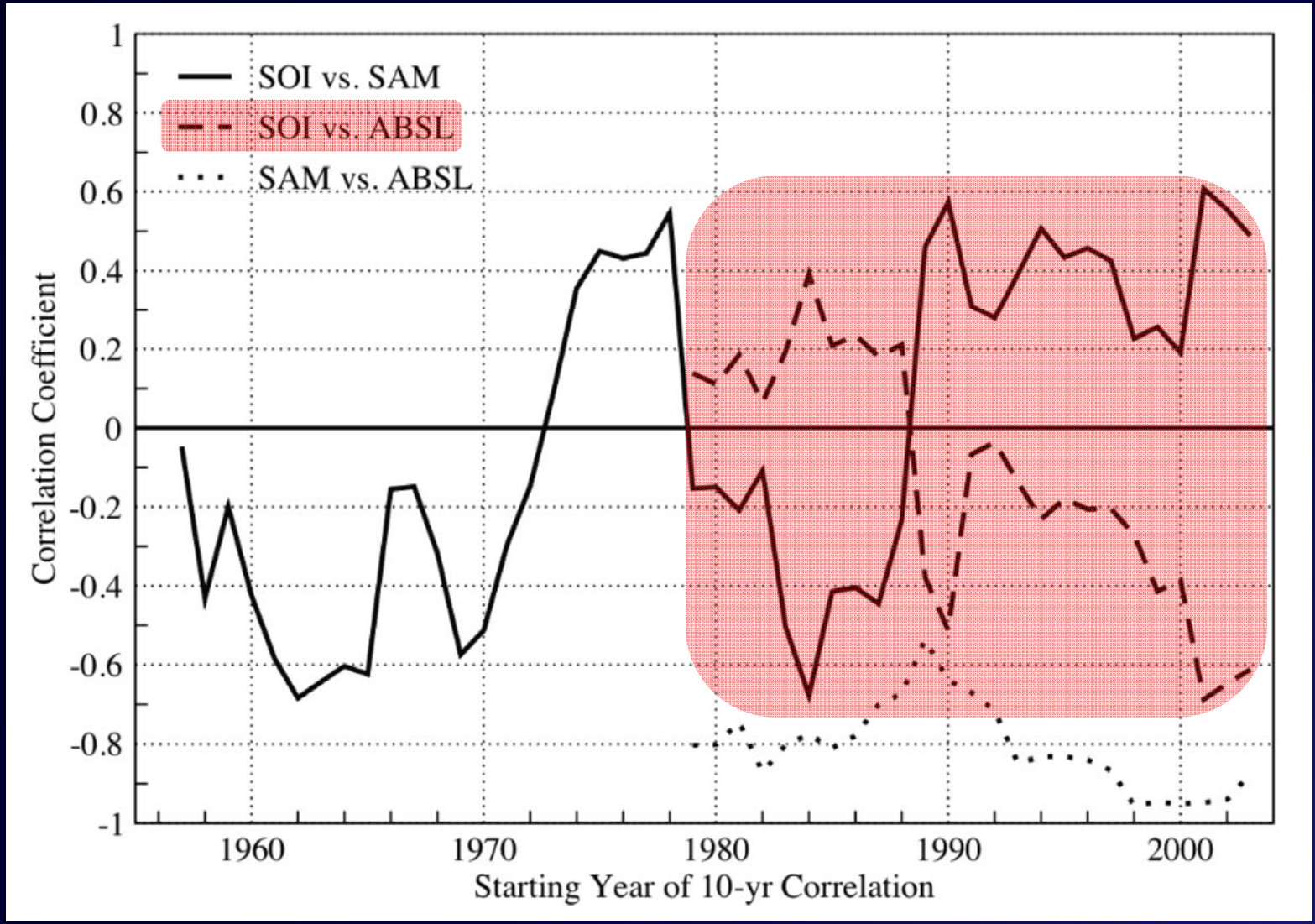
ENSO and SAM relationship with ABSL magnitude (minimum pressure) during SON

SOI, SAM, and ABSL MSLP
10-Year Running Correlations (SON)



From Clem and Fogt, *JGR,* in press

SOI, SAM, and ABSL MSLP
10-Year Running Correlations (SON)

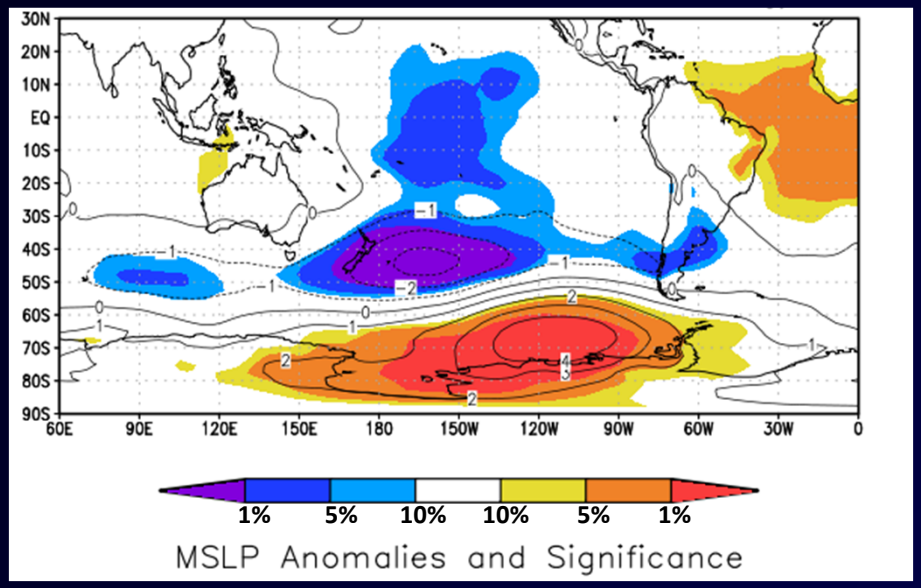


From Clem and Fogt, *JGR,* in press

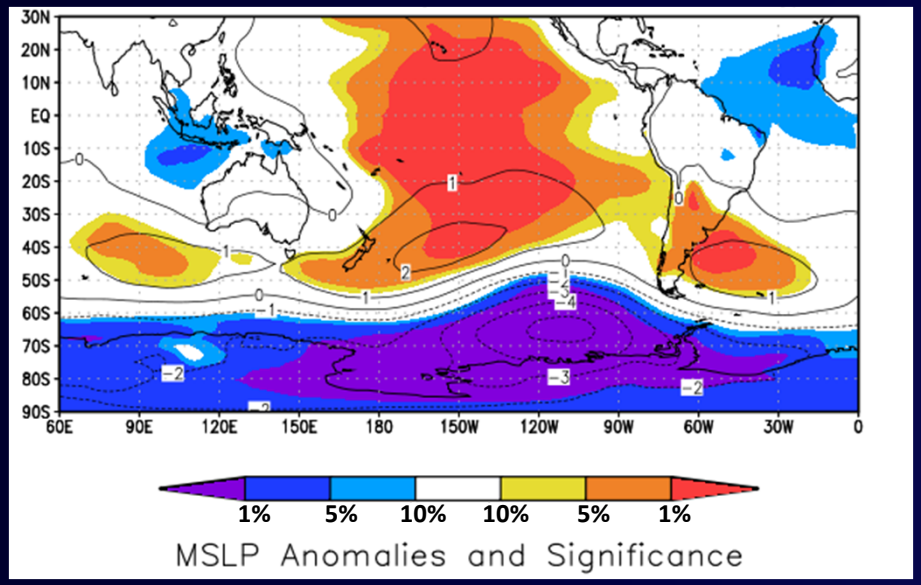
ABSL pressure anomaly composites:

An independent investigation on the atmospheric conditions driving ABSL pressure variations

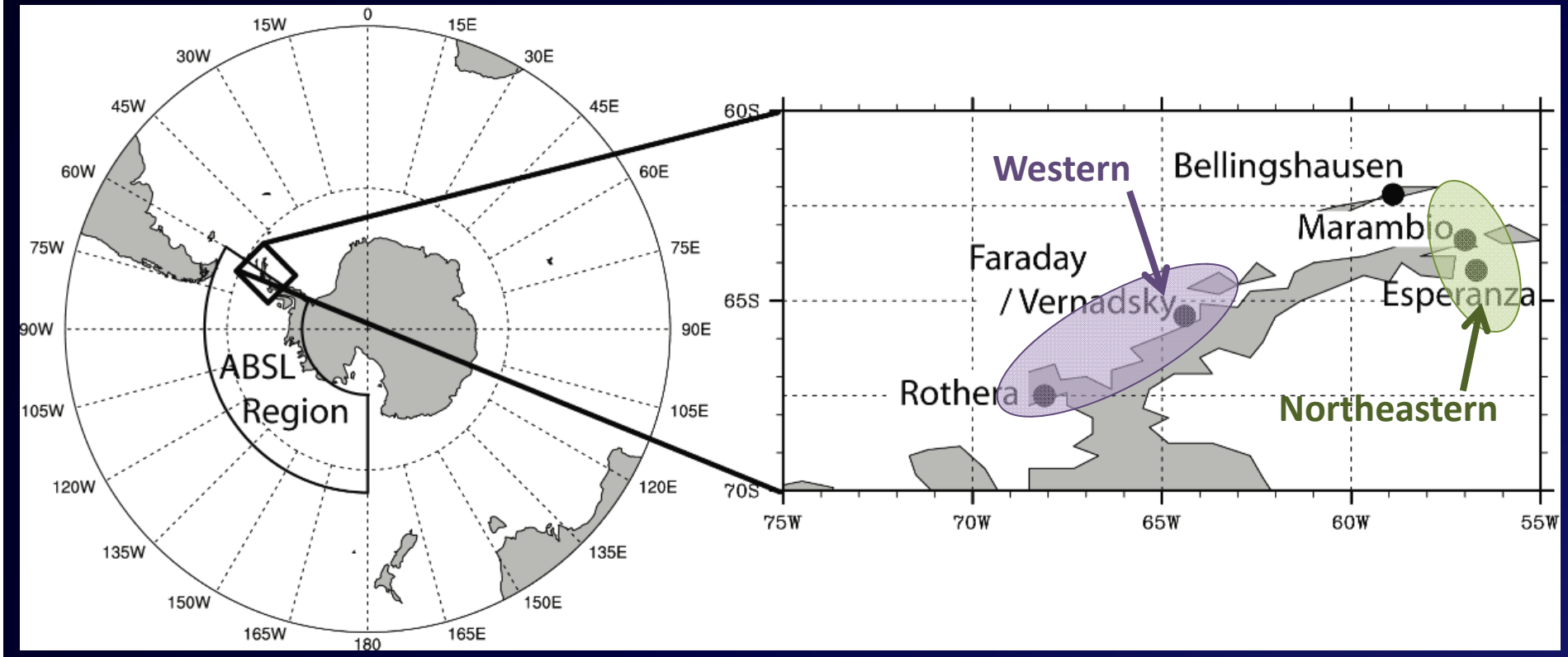
ABSL Weak/Strong Events vs. Climatology (SON)



5 weakest ABSL events



5 strongest ABSL events

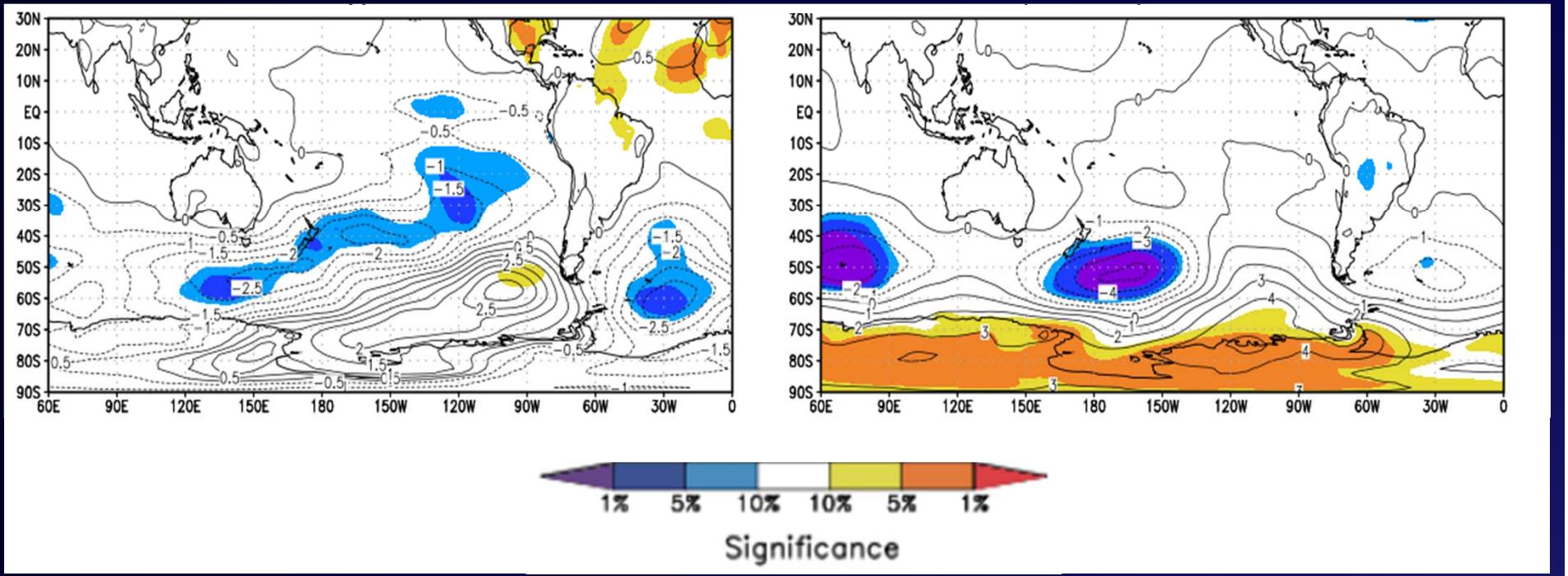

0
15W
15E
30W
30E
45W
45E
60W
60E
75W
75E
90W
90E
105W
105E
120W
120E
135W
135E
150W
150E
165W
165E
180
ABSL
Region
60S
65S
70S
75W
70W
65W
60W
55W
Western
Bellingshausen
Marambio
Faraday
/ Vernadsky
Esperanza
Rothera
Northeastern

Ant. Peninsula Cold Events vs. Climatology (SON)

MSLP Anomalies

West Peninsula

Northeast Peninsula



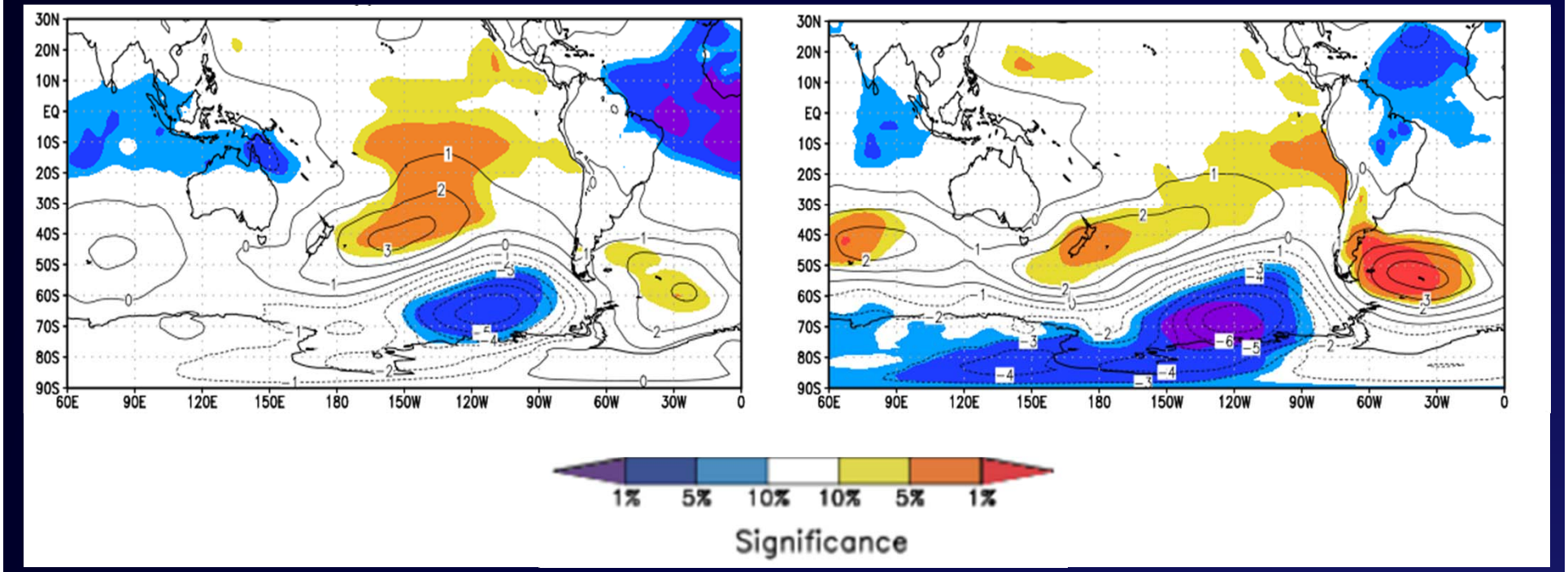
Modified from Clem and Fogt, *JGR,* in press

Ant. Peninsula Warm Events vs. Climatology (SON)

MSLP Anomalies

West Peninsula

Northeast Peninsula



Modified from Clem and Fogt, *JGR,* in press

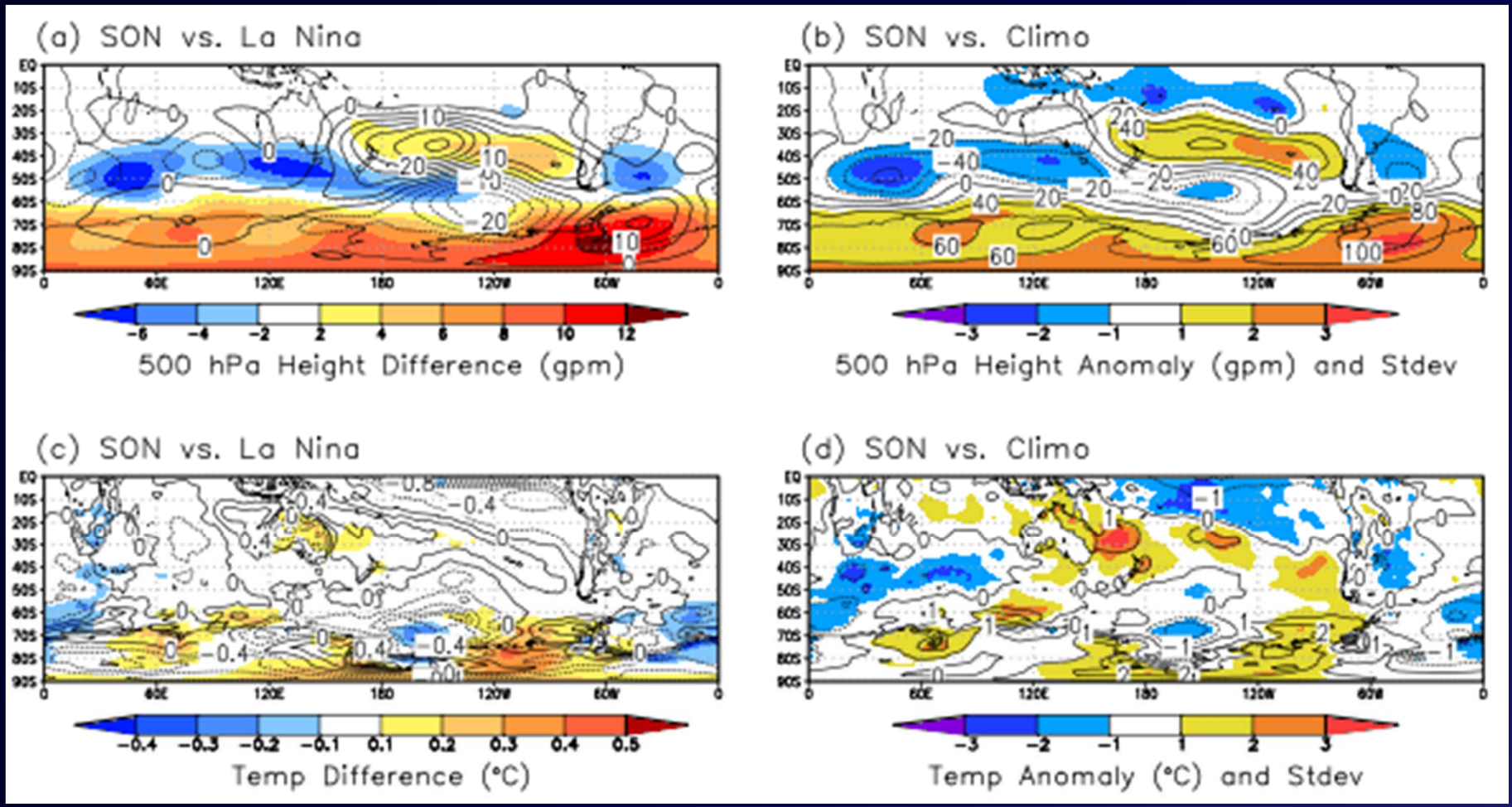
Significance of ENSO/SAM combinations:

Case study of 1988 SON La Niña/SAM-

1988 La Niña/SAM- Anomalies and Significance

Compared to SON La Niña

Compared to SON Climatology



Modified from Clem and Fogt, *JGR,* in press

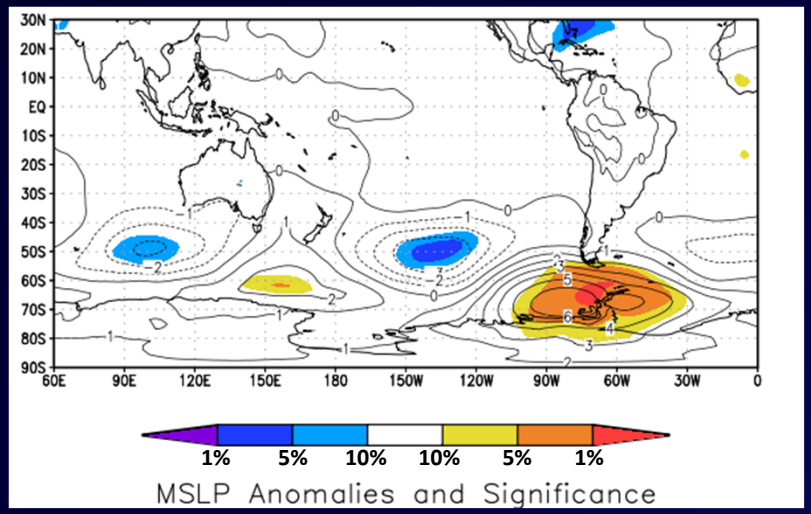
West Antarctica temperature anomaly composites:

An independent investigation on the atmospheric conditions driving WAIS surface temperature variations

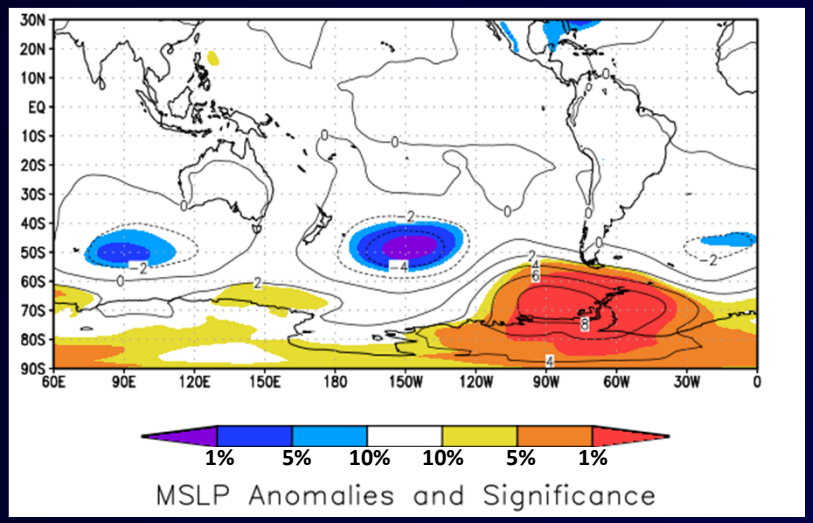
West Antarctica Warm Events vs. Climatology (SON)

Mean Sea Level Pressure (MSLP)

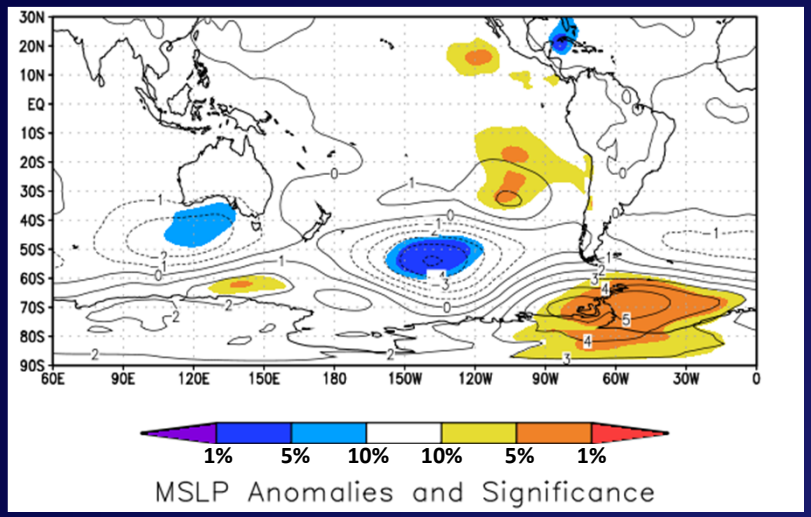
72°S-85.5°S, 75°W-156°W (**ALL**)



115.5°W-156°W (**Western**)



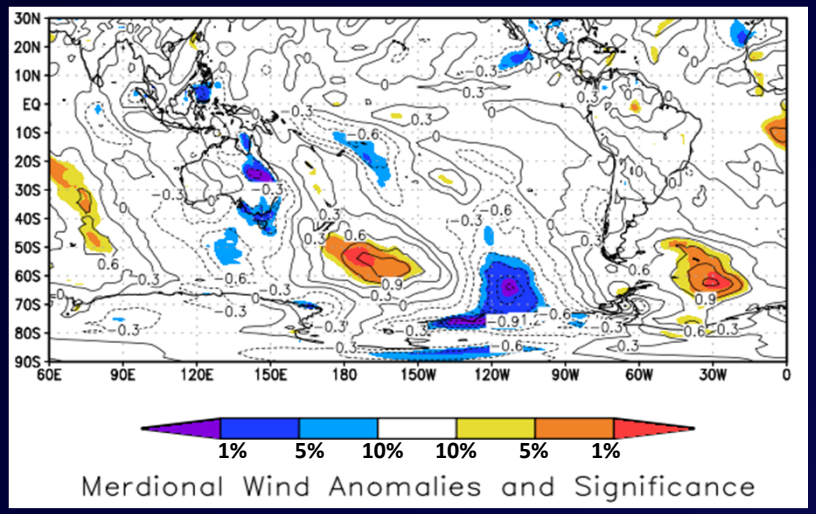
75°W-115.5°W (**Eastern**)



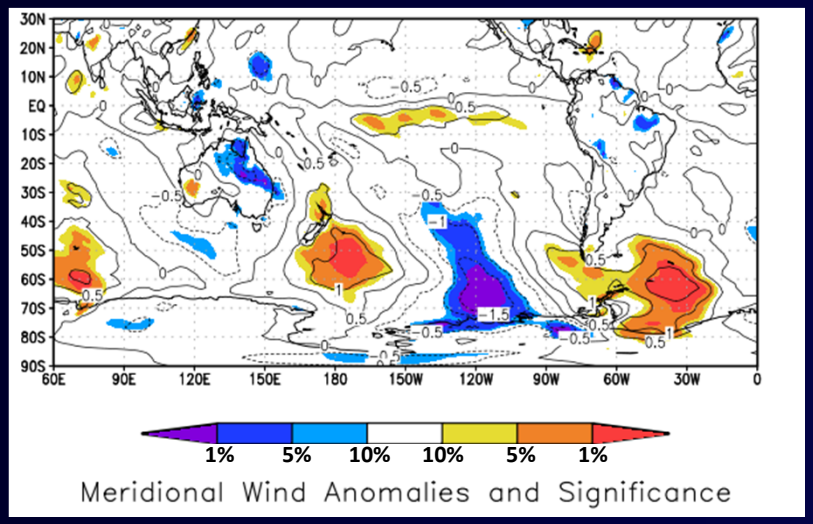
West Antarctica Warm Events vs. Climatology (SON)

Meridional Wind

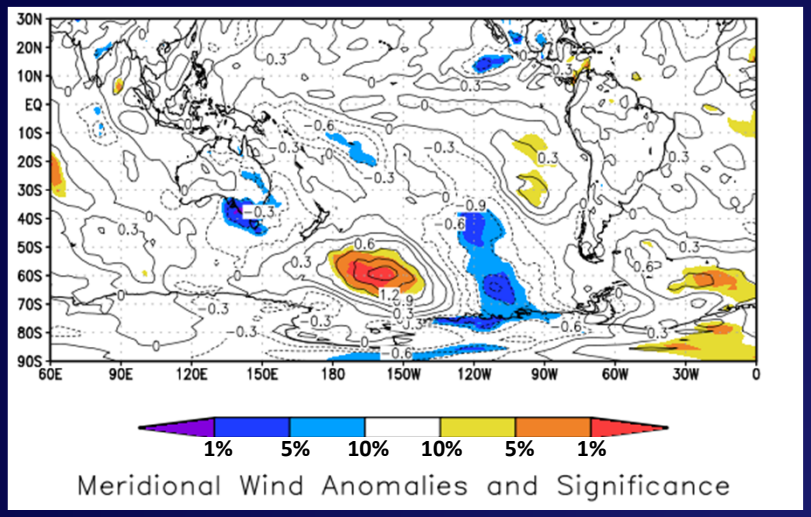
72°S-85.5°S, 75°W-156°W (**ALL**)



115.5°W-156°W (**Western**)



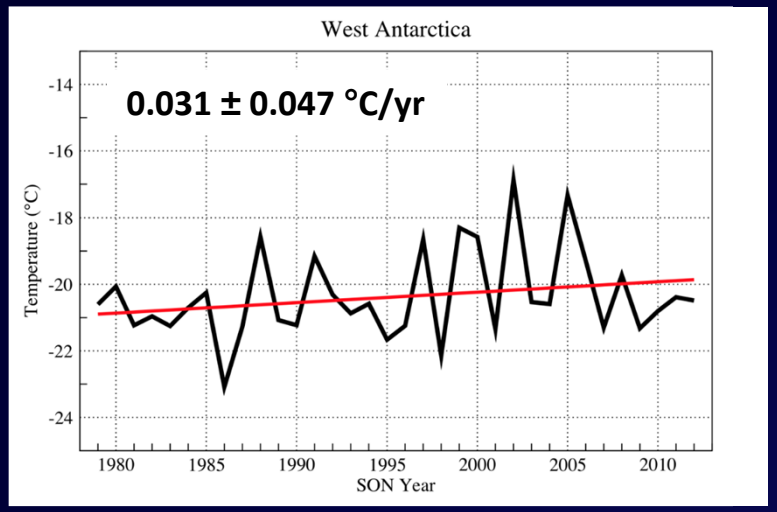
75°W-115.5°W (**Eastern**)



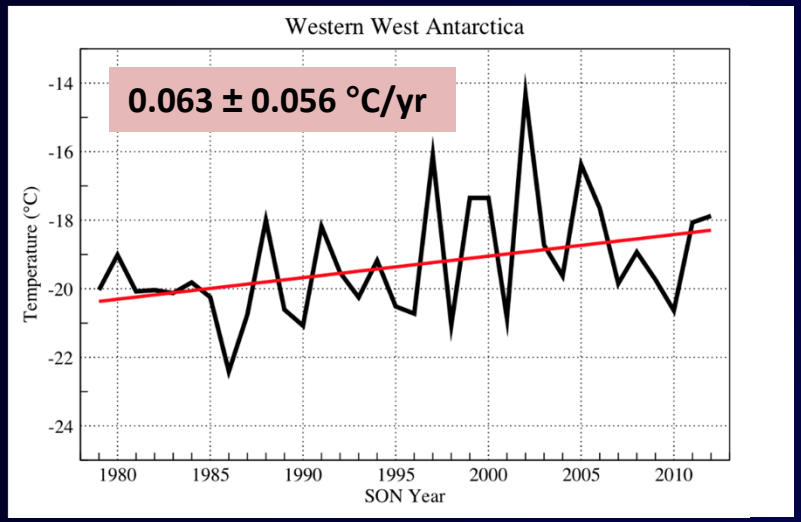
West Antarctica ERA-Int. Temperature Trends (SON)

1979-2012
Temperature
&
Slope ± 95% CI

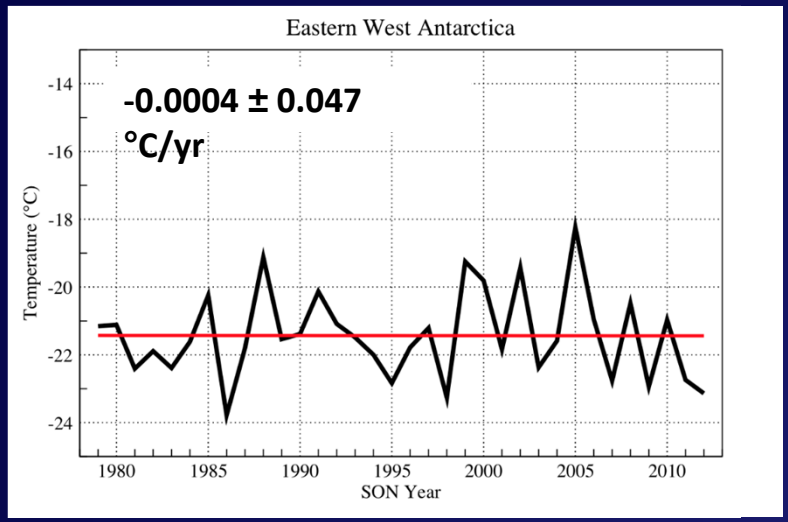
72°S-85.5°S, 75°W-156°W (**ALL**)



115.5°W-156°W (**Western**)



75°W-115.5°W (**Eastern**)



Summary

1. The ENSO/SAM phase relationship in SON is related to the ENSO/ABSL magnitude relationship

2. ENSO has a persistent relationship with W. Peninsula temperatures in SON

3. SAM has a persistent relationship with N.E. Peninsula temperatures in SON

4. More work is needed to determine the role of the tropics in the warmest SON events across West Antarctica

5. The **location** of the regional circulation anomalies plays a greater role than their magnitude in driving SON temperature variations across West Antarctica

Thank You!

Questions down the road? Email me at kc268406@ohio.edu

- ABSL: 55°S-75°S, 180°W-60°W
  - Weakest: 1980, 2002, 1992, 1991, 1994
  - Strongest: 2010, 1998, 1999, 1989, 2008
- W. Peninsula: Faraday, Rothera
  - Warm: 2008, 2010, 1989, 1985, 1988
  - Cold: 1982, 1987, 1980, 1981, 1986
- N.E. Peninsula: Esperanza, Marambio
  - Warm: 2001, 2008, 2010, 2005, 1985
  - Cold: 1997, 1980, 1994, 2007, 1979
- W. Ant (all): 72°S-85.5°S, 75°W-156°W
  - Warm: 2002, 2005, 1999, 2000
  - Cold: 1986, 1998, 1995, 2001
- W. Ant (west): 115.5°W-156°W
  - Warm: 2002, 1997, 2005, 2000
  - Cold: 1986, 1990, 2001, 1998
- W. Ant (east): 75°W-115.5°W
  - Warm: 2005, 1988, 1999, 2002
  - Cold: 1986, 1998, 2012, 2009