A TWO-DIMENSIONAL STUDY OF BLOCK ONSET LOCATIONS USING A ONE-DIMENSIONAL INDEX AND GIS.

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INTRODUCTION

- Previous studies from this research group have used a one-dimensional index for the detection of blocking. These blocking events are archived at http://weather.Missouri.edu/gcc. Only the longitude of block formation was archived.

- These studies have shown that the Pacific Ocean Region, the east Atlantic and Europe in the Northern Hemisphere. In the Southern Hemisphere, the Pacific Ocean Region is where most blocking occurs, and the peak occurrence is around the dateline.

INTRODUCTION

- A comparison of this work with those who use two-dimensional blocking indexes shows that there is general agreement in the longitudinal occurrence of blocking.

- As of this year, the latitudinal occurrence of blocking is now archived and these values have been entered for the entire block archive.

MOTIVATION AND GOALS

- Given the increased use of Geographic Information System (GIS) and the ease of using this software, the latitude and longitude of blocking events can be entered in spite of the use of a one dimensional block identification index.

- Further, information such as duration and intensity can also be plotted in this software by changing the coloration, size, and shape of the markers used to identify blocking. This will allow for analysis, for example, of where and what season the most intense blocking events form.

DATA

- The blocking events (1970 – present) are archived in the Atmospheric Science Program at the University of Missouri. The data can be downloaded from the website shown in the Introduction.

- The data available are location, duration, block intensity (BI), longitude and latitude of block formation, date of onset and termination.

METHODS

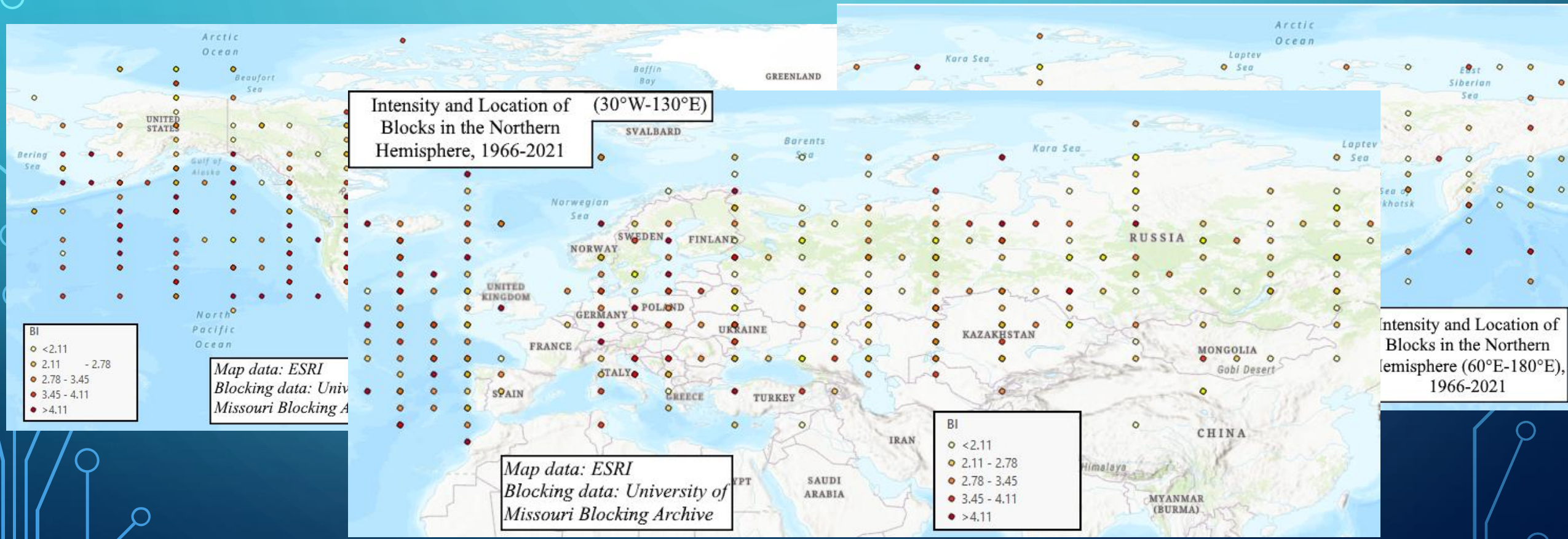
- In order to examine the occurrence of blocking, we plotted the occurrence of all blocking events onto a map of the Northern and Southern Hemisphere. We compared the results here to those who used two dimensional indexes - mainly Tibaldi and Molteni (1990).

- Plots were produced differentiating between weak, typical, and strong blocking events as well as blocking events of typical persistence versus more and less persistent events.

- Years were stratified by ENSO Phase following Lupo et al. (2019)

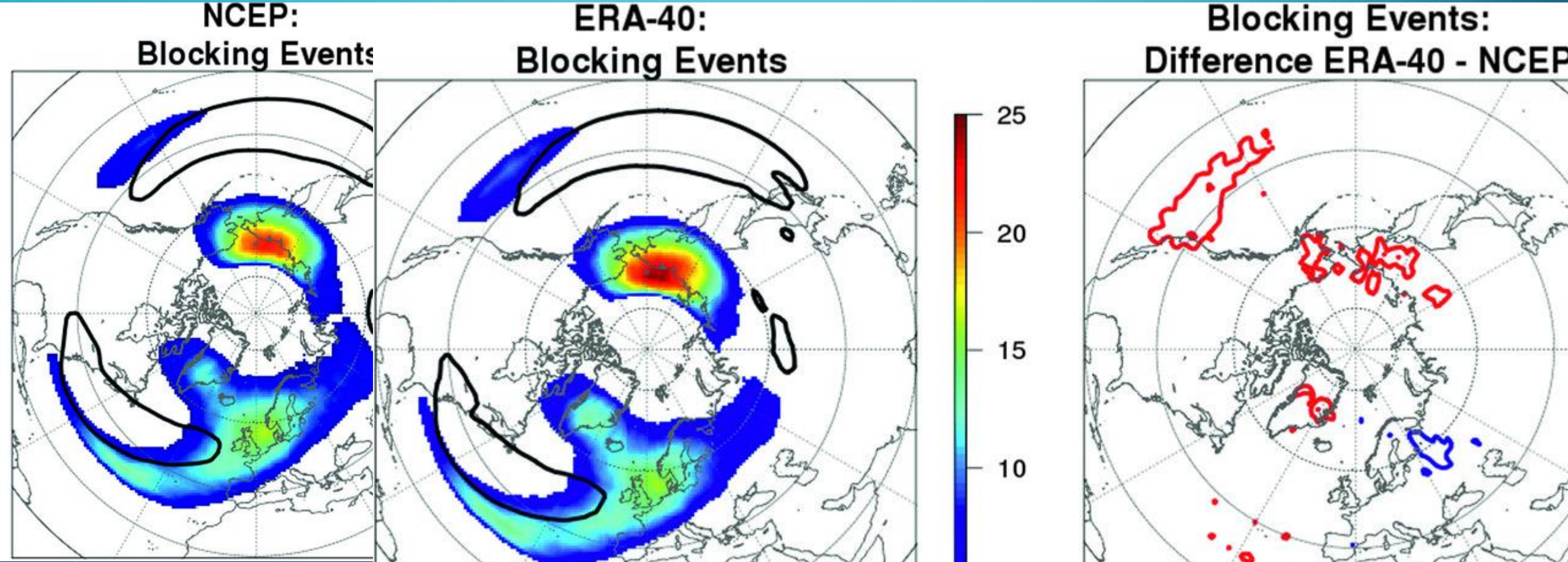
RESULTS

- Blocking in the Northern Hemisphere (our archive):



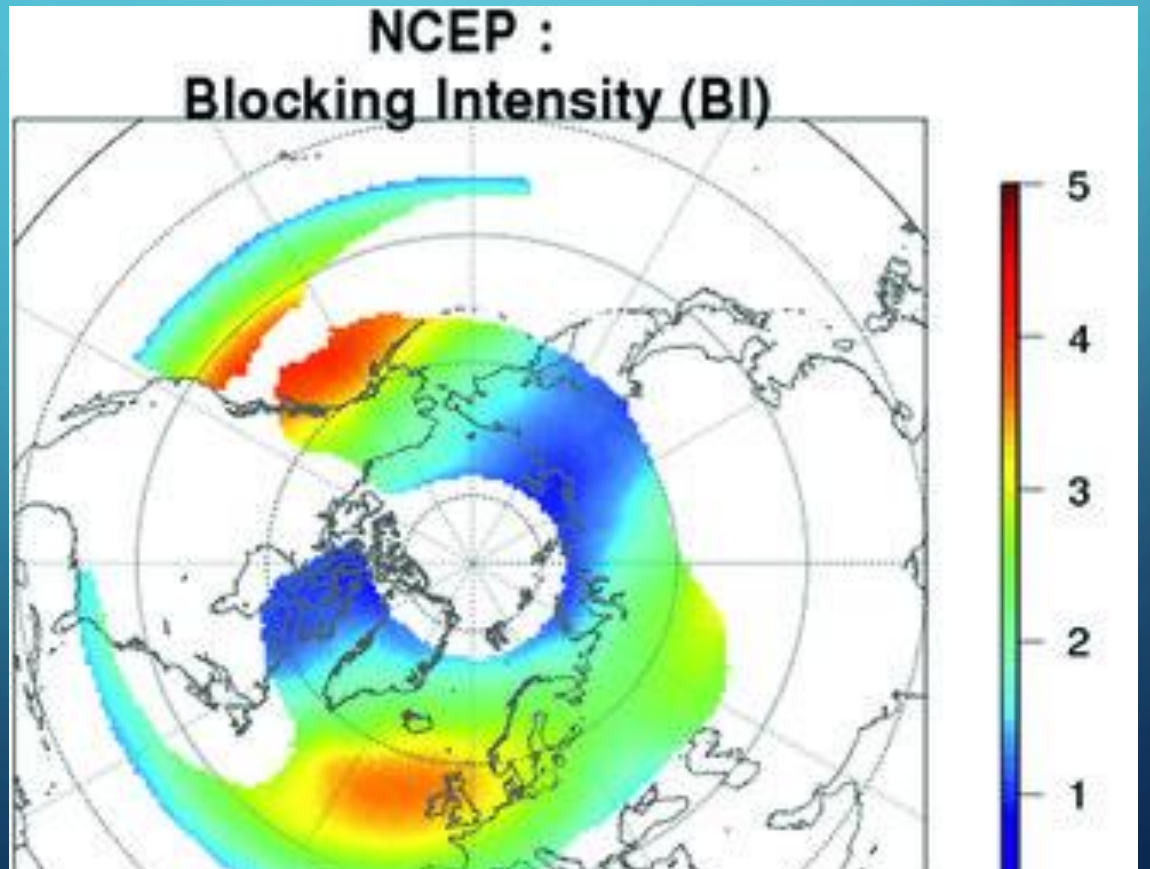
RESULTS

- From Davini et al. (2012)



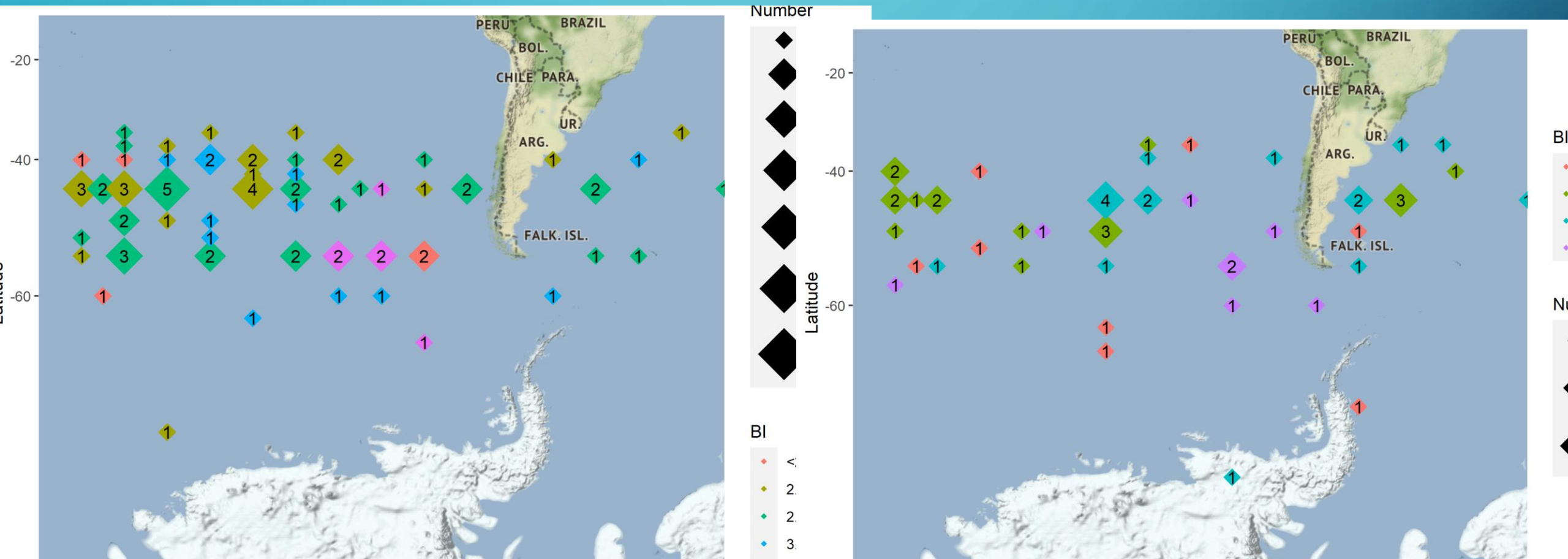
RESULTS

- From Davini et al. (2012) BI: (strongest blocking in our results are in the Eastern Pacific and eastern Atlantic)



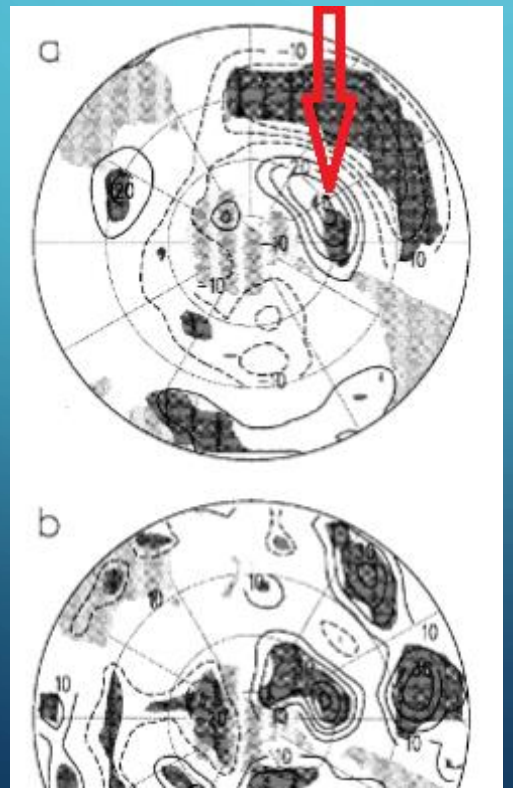
RESULTS

- Results for the SH: (left) El Nino and (right) La Nina



RESULTS

- Blocking in the Southern Hemisphere:
  - From Sinclair (1996) →
  - Below from Renwick (1998) –more events in
  - El Nino years



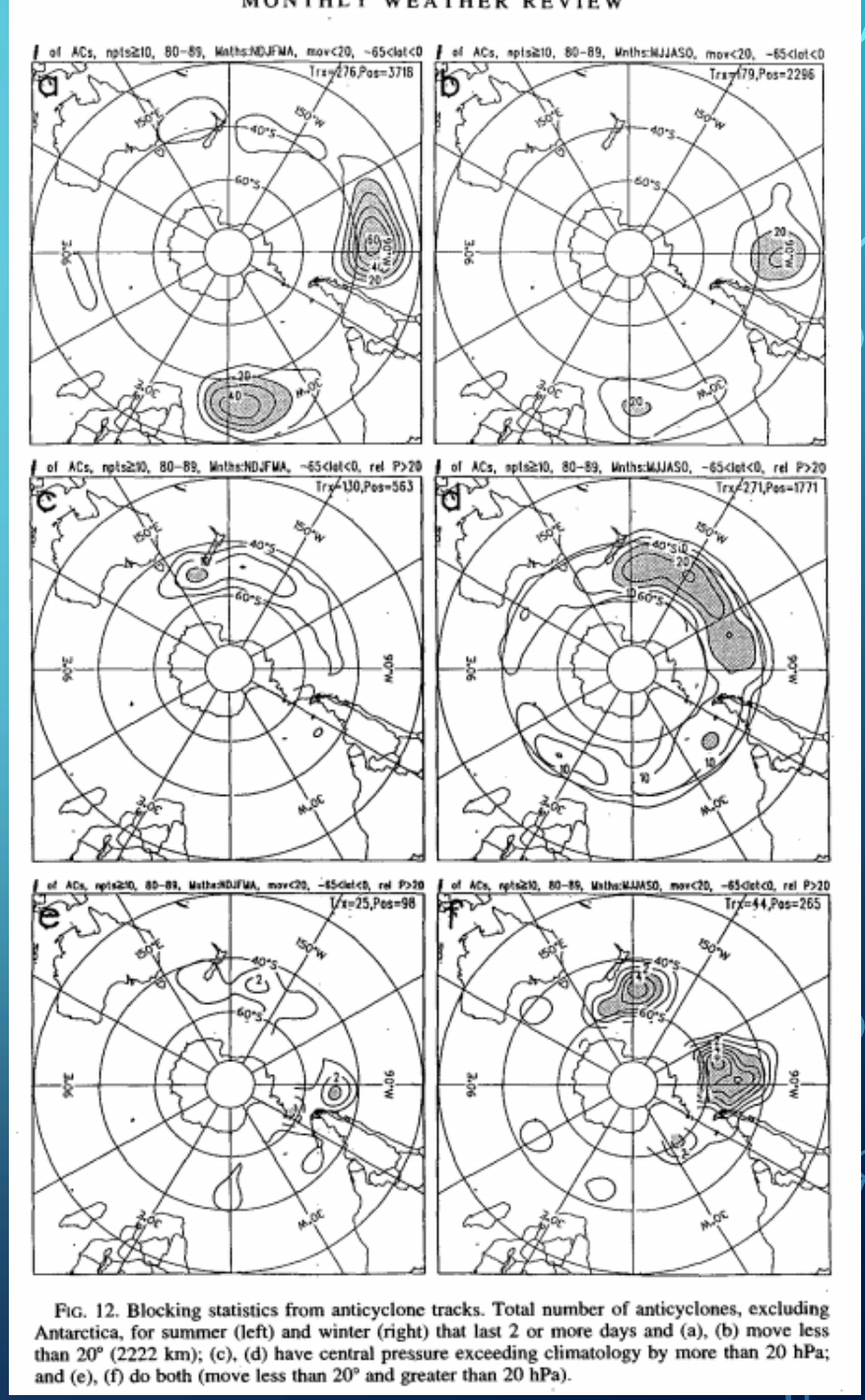


FIG. 12. Blocking statistics from anticyclone tracks. Total number of anticyclones, excluding Antarctica, for summer (left) and winter (right) that last 2 or more days and (a), (b) move less than 20° (2222 km); (c), (d) have central pressure exceeding climatology by more than 20 hPa; and (e), (f) do both (move less than 20° and greater than 20 hPa).

SUMMARY AND CONCLUSIONS

- A preliminary analysis of where blocking occurs in the Northern and Southern Hemisphere using our one dimensional blocking index and comparing to two dimensional blocking index is performed by plotting these events on maps and differentiating by BI and duration is performed.

- In the NH – blocking occurrences match up well and the strongest blocking events occur over the east Pacific Ocean and east Atlantic.

SUMMARY AND CONCLUSIONS

- In the SH – more blocking occurs over the East Pacific and Atlantic and this matches with other climatological studies. Also, we found more blocking events during El Nino years, especially in the East Pacific.

- More intense blocking tends to form over the East Pacific Ocean and East Atlantic, a result similar to the NH but previously not shown.

THE END

- Questions?
- Comments?
- Criticisms?
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