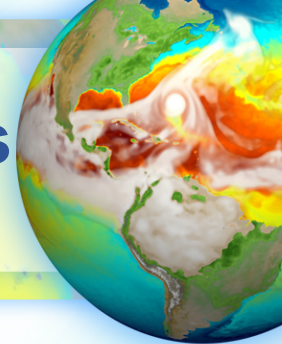


Evaluation of E3SMv1 Simulated Surface Winds Over the Southern Ocean and the Antarctica



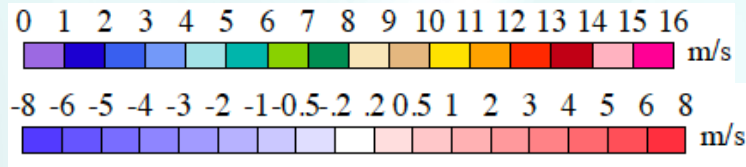
Wuyin Lin¹, Doo-Young Lee², Shixuan Zhang³,
Qi Tang⁴, Hyein Jeong², Mark Pettersen², and Shaocheng Xie⁴

1. Brookhaven National Laboratory
2. Los Alamos National Laboratory
3. Pacific Northwest National Laboratory
4. Lawrence Livermore National Laboratory

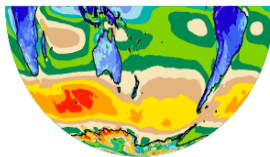
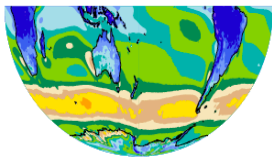
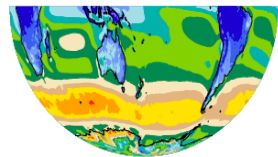
Overview

- Surface winds over Southern Ocean and Antarctica exert strong influence on oceanic meridional circulation, dense water formation, and surface mass and energy balance;
- To evaluate surface winds over southern ocean and Antarctica simulated by E3SMv1
- Focus on climatology and interannual variability, the association with SH primary modes of variability and El Nino Southern Oscillation
- A set of simulations selected to analyze the coupling effect and sensitivity to resolution

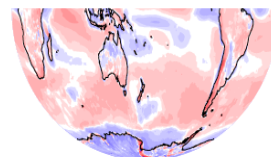
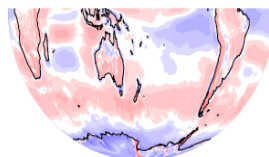
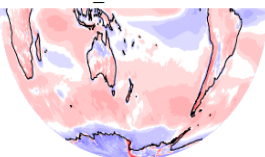
Surface Wind Speed



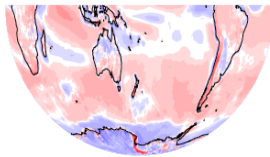
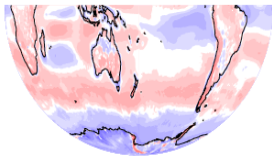
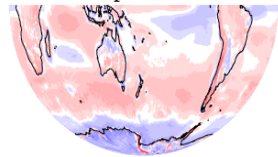
ERA5



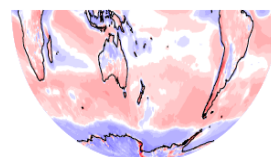
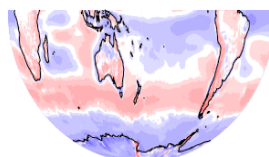
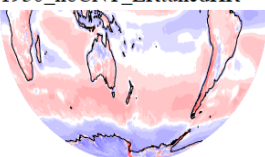
DECKv1b_H1



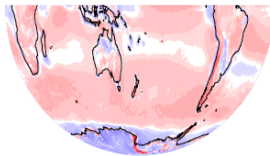
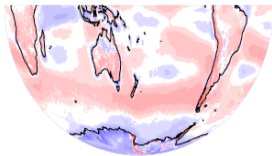
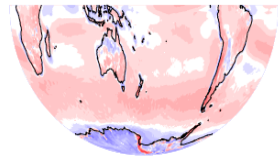
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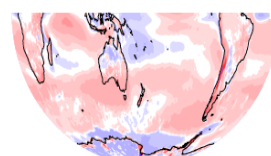
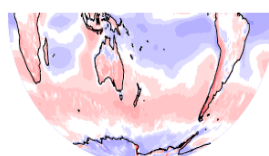
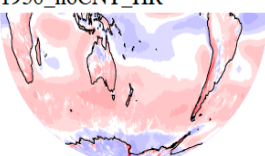
1950_noCNT_LRtunedHR



DECKv1b_A1



1950_noCNT_HR



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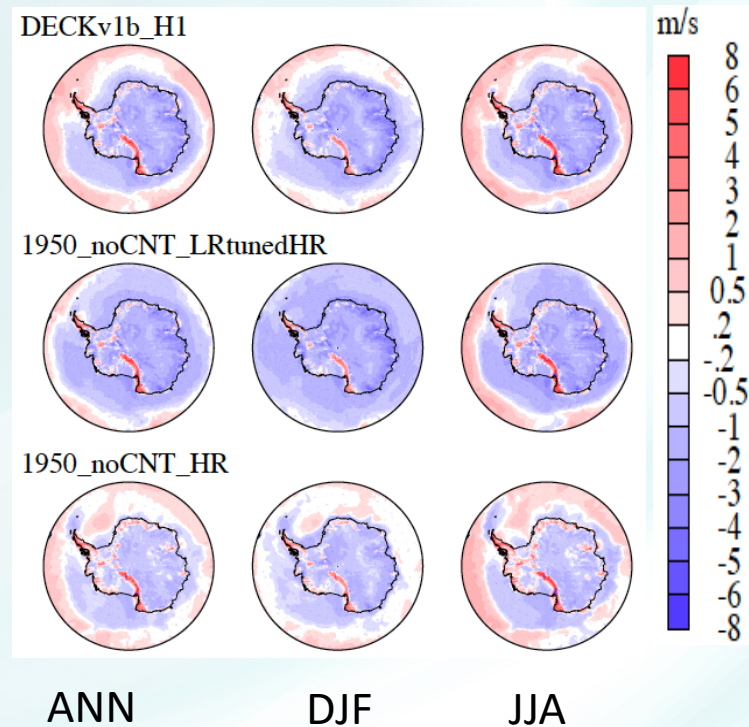
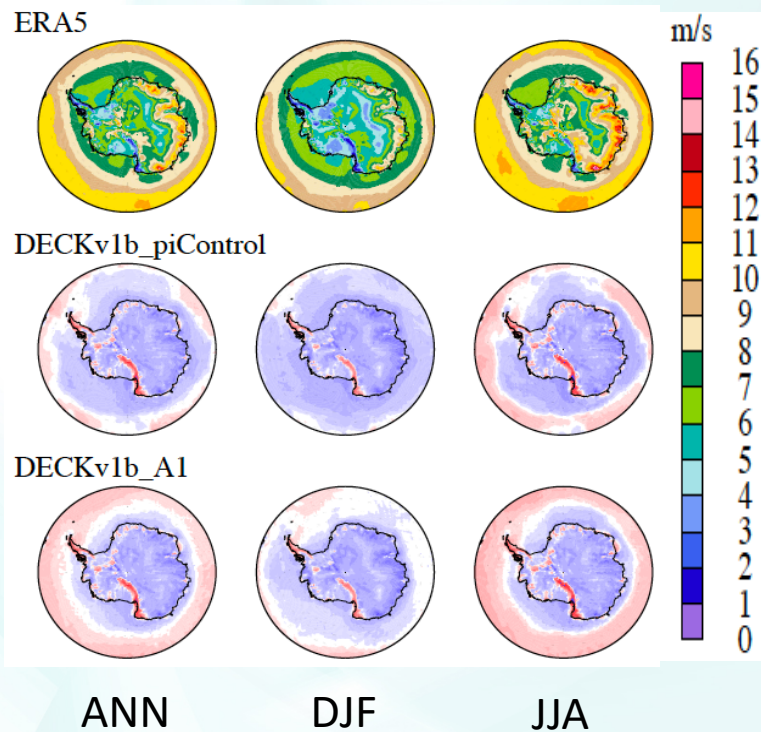
JJA

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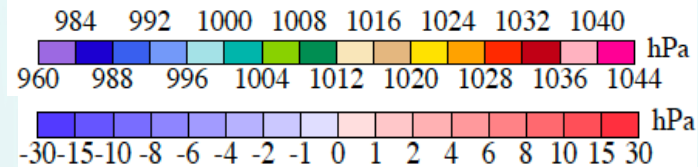
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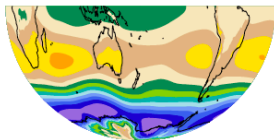
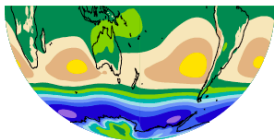
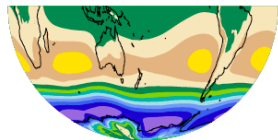
Polar Surface Wind Speed



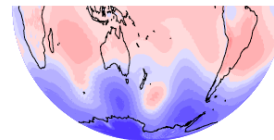
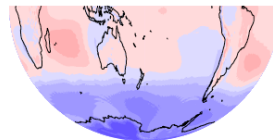
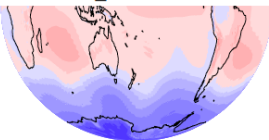
Sea Level Pressure



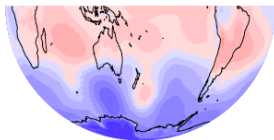
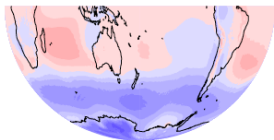
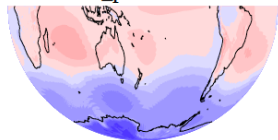
ERA5



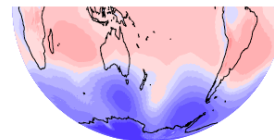
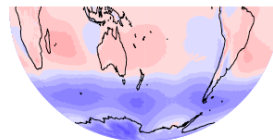
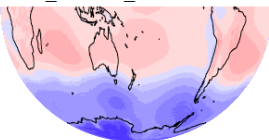
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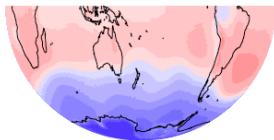
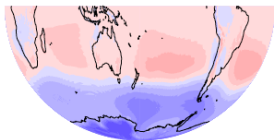
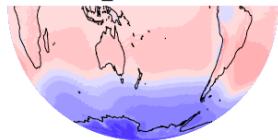
DECKv1b_piControl



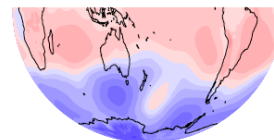
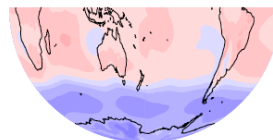
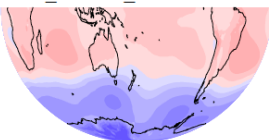
1950_noCNT_LRtunedHR



DECKv1b_A1



1950_noCNT_HR



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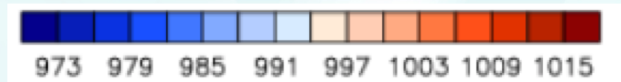
JJA

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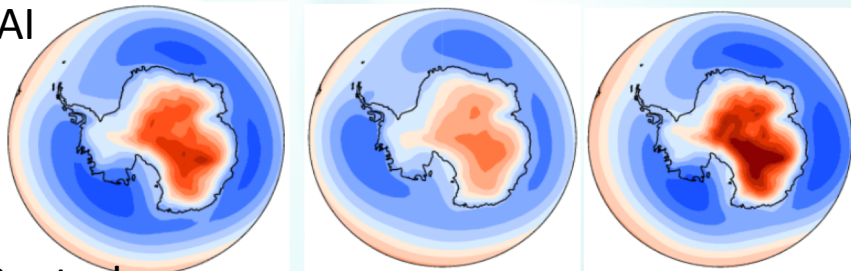
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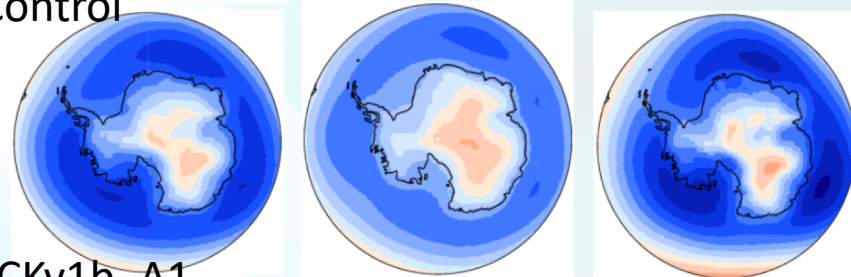
Polar Sea Level Pressure



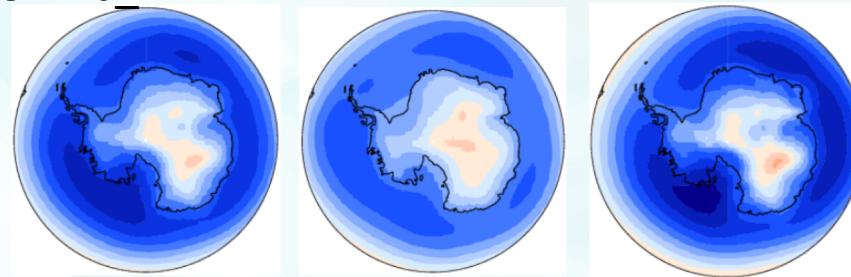
ERA-I



piControl



DECKv1b_A1

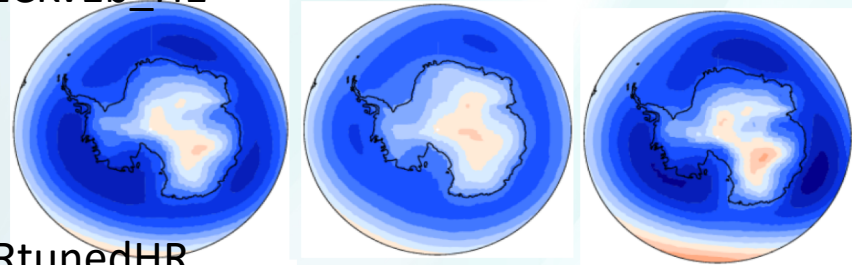


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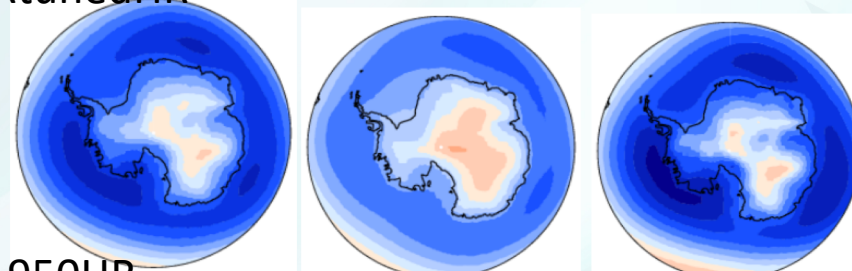
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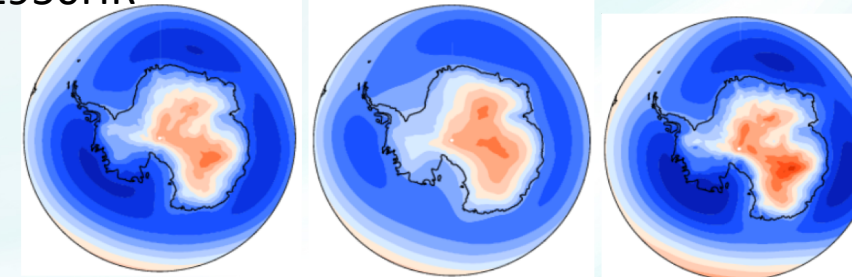
DECKv1b_H1



LRtunedHR



1950HR



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DJF

JJA

Z700 EOFs (SAM, PSA & PSA2, JJA)

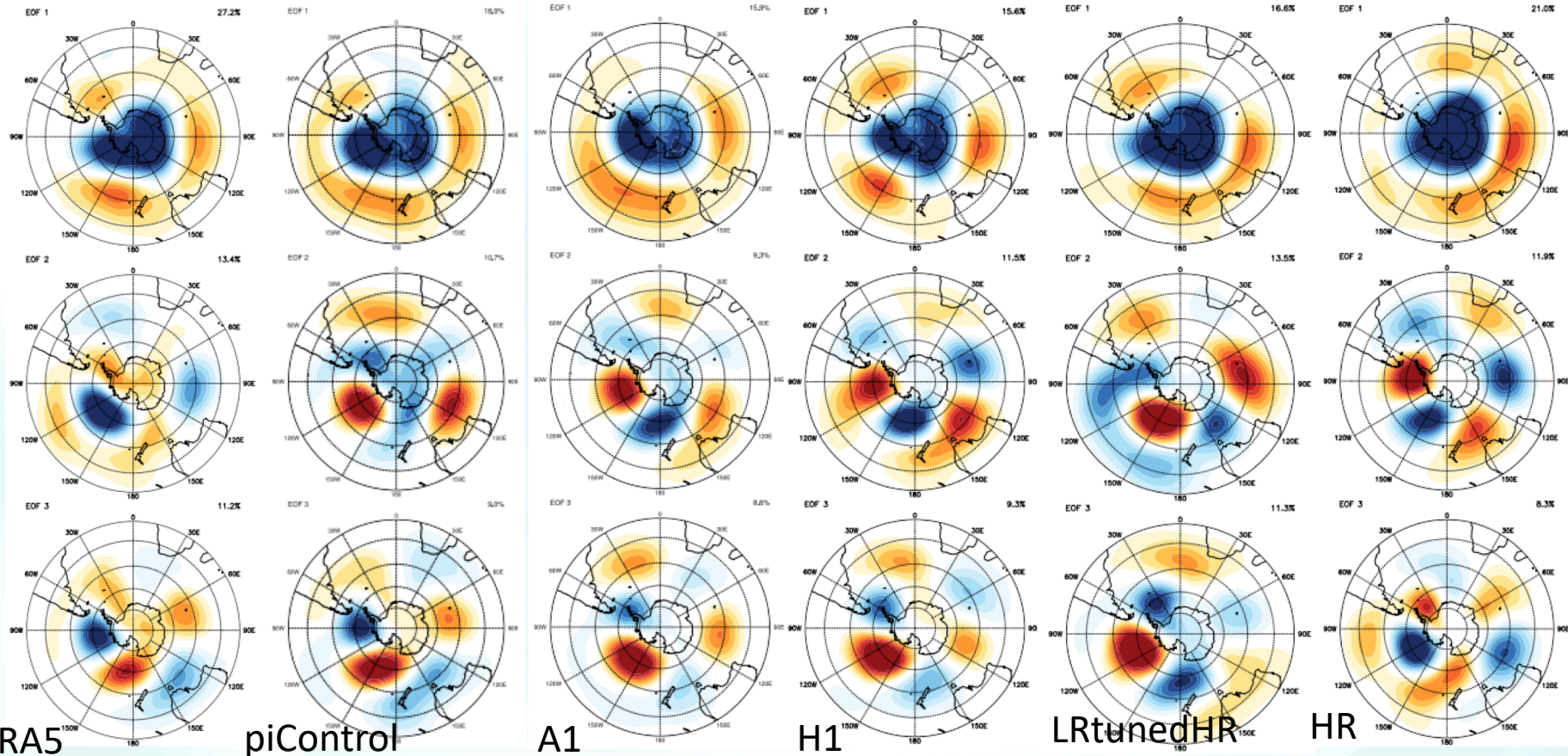
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Z3: 700hPa : 1978-2014

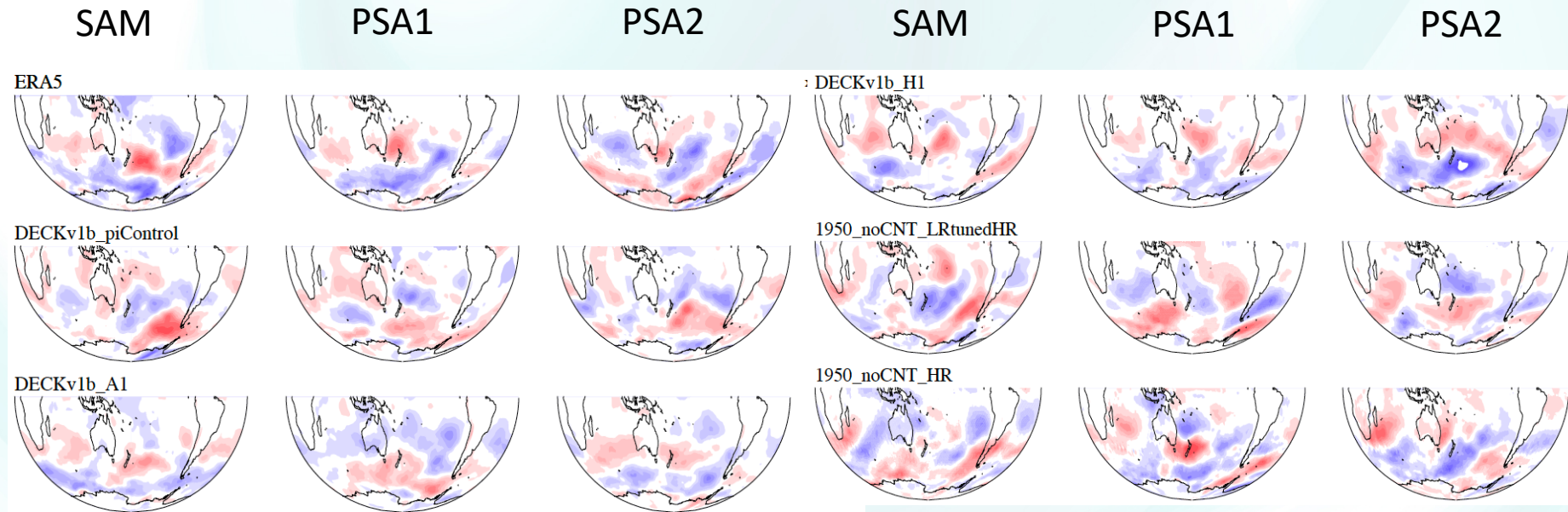
Z3: 700hPa : 1978-2014

Z3: 700hPa : 26-55

Z3: 700hPa : 26-55



Monthly Zonal Wind Regressed on Z700 EOFs (JJA)



There exist significant association, but difference between model and obs are large.
Stronger signals are produced in coupled modes.

Summary

- ❖ All simulations have stronger winds in midlatitudes but weaker over Antarctica;
- ❖ High resolution broadly reduces wind speed biases over the Antarctica and the surrounding oceans;
- ❖ Sea level pressure biases suggest stronger simulated SAM; but model SAM accounts for less interannual variability;
- ❖ Among this set of simulations, it is not evident that high-resolution model produces stronger subpolar low centers compared to low-res simulation;
- ❖ Large discrepancies on SH primary modes of variability between ERA5 and simulations based on EOF analysis of Z700. Further analysis to be done on the association of surface winds with leading atmospheric modes of variability (SAM, PSA1, PSA2, ZW3) and ENSO, along with investigation of potential sources of the biases.