

# Atmospheric Circulation Response to Projected Changes in Arctic Sea Ice and Snow Cover

Experiments with the “High Resolution”\* NCAR Atmospheric General Circulation Model (CAM3)

*Clara Deser, Robert Tomas, Masha Tsukernik (NCAR)  
Michael Alexander (NOAA)*

*\* 1.4° latitude x longitude; 26 levels*

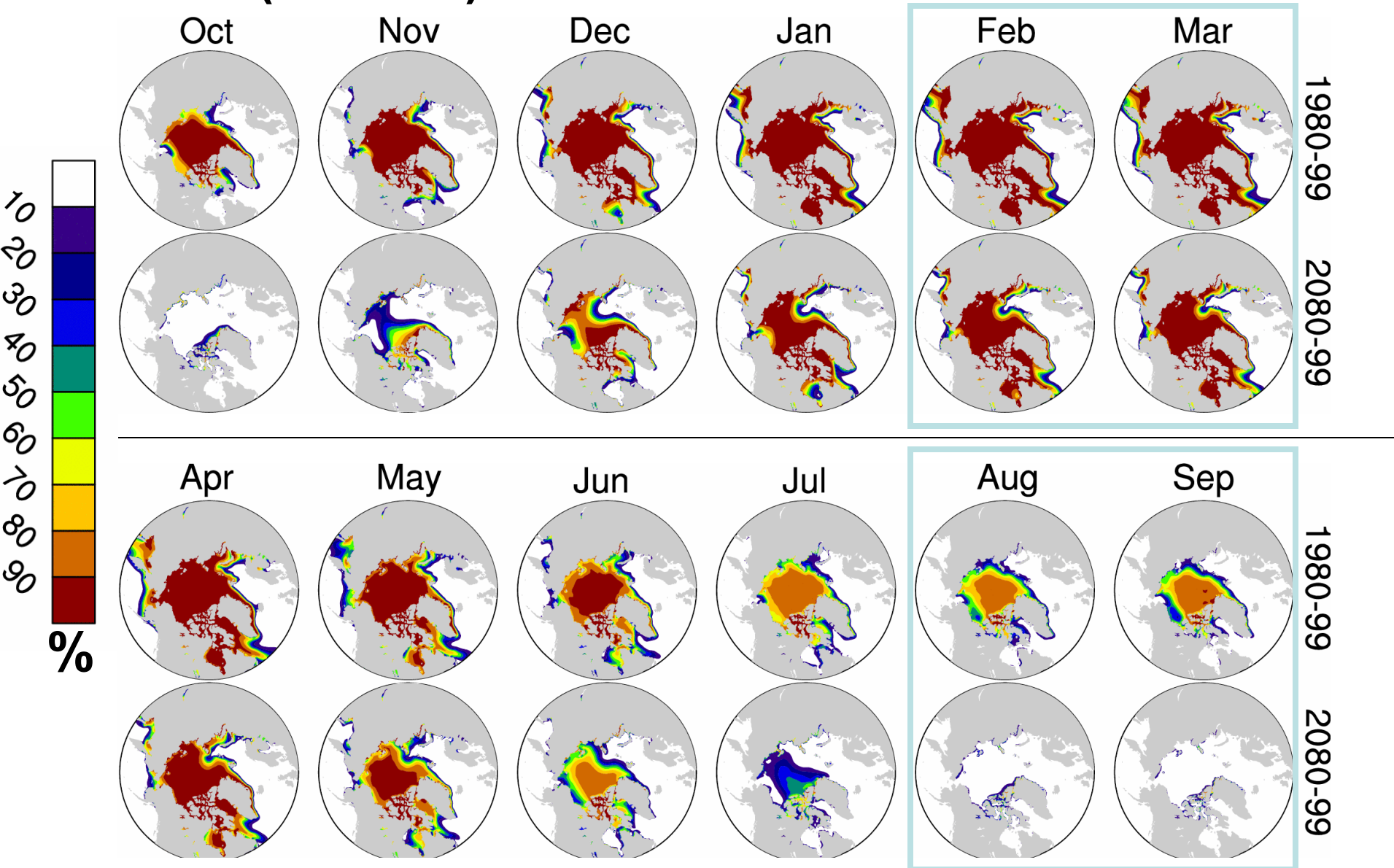
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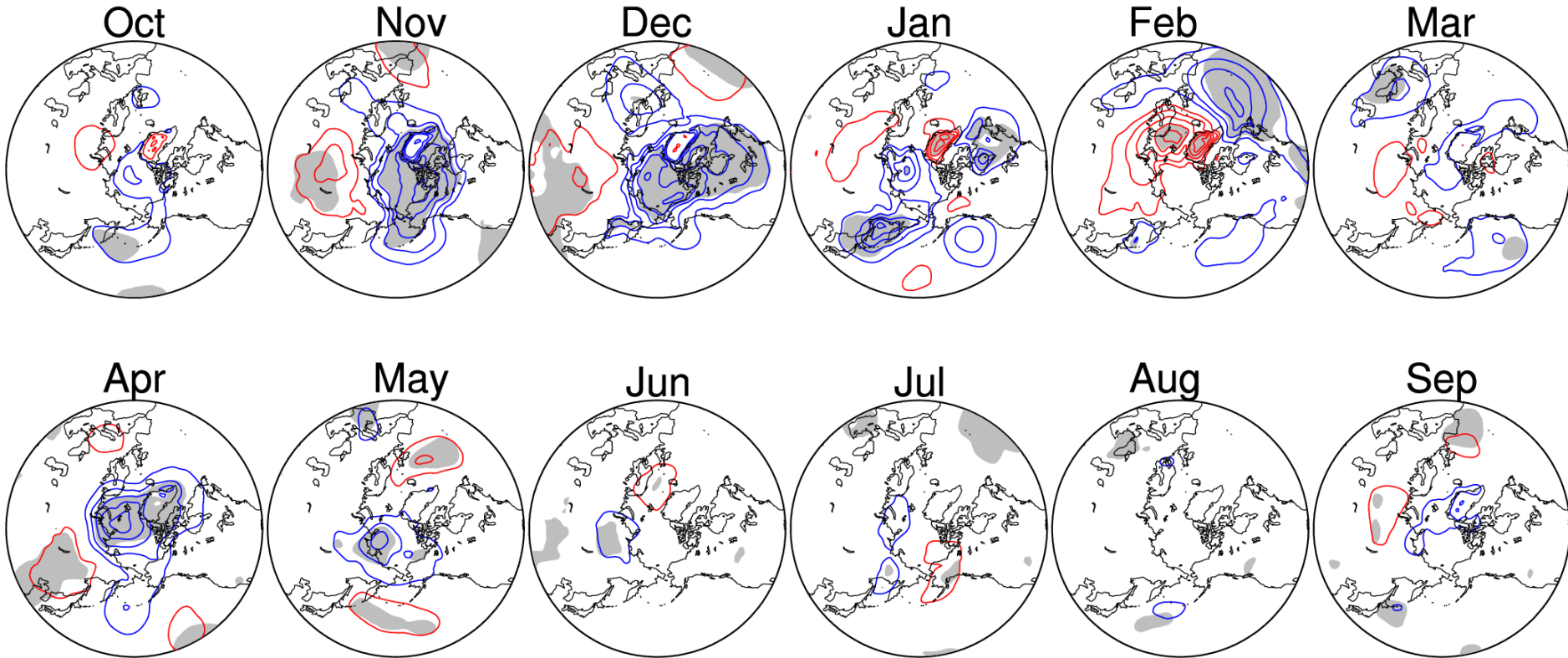
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- How big, and what pattern?
- How important compared to greenhouse gas forcing?
- Feedback on sea ice and snow cover?

# Sea Ice Concentration from a Coupled Climate Model (CCSM3): 1980-1999 vs. 2080-2099



# Sea Level Pressure Response (2080-2099 minus 1980-1999) (contoured every 1 hPa; shading for significance)



**Blue: SLP decrease**

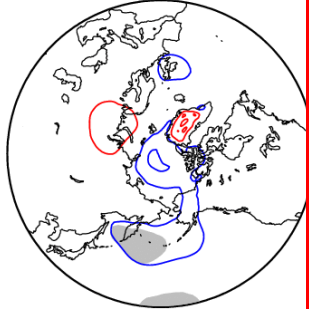
**Red: SLP increase**

# Sea Level Pressure Response

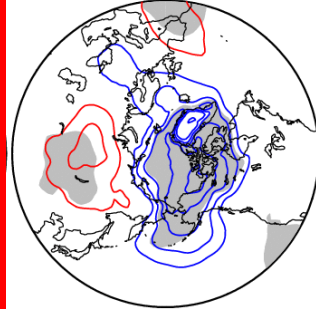
(2080-2099 minus 1980-1999)

*(contoured every 1 hPa; shading for significance)*

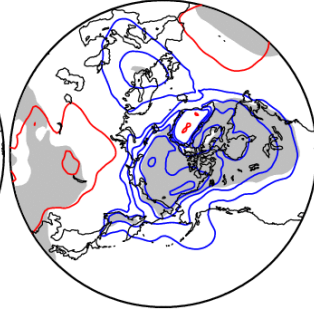
Oct



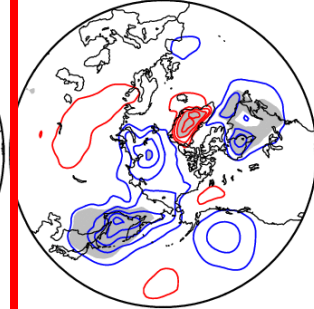
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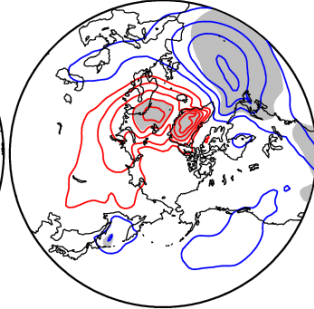
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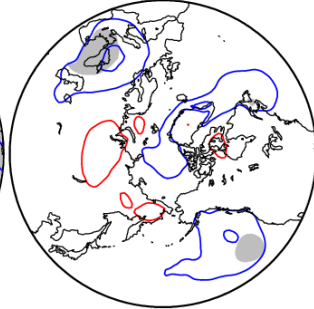
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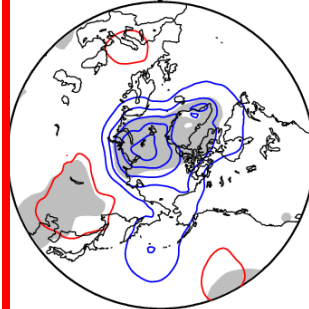
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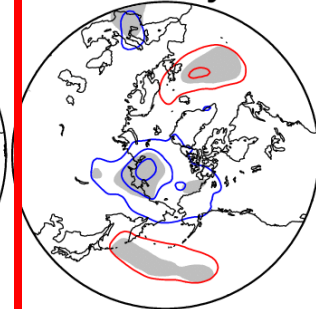
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Apr



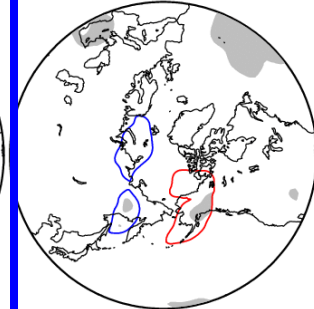
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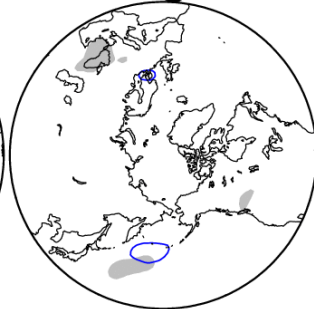
Jun



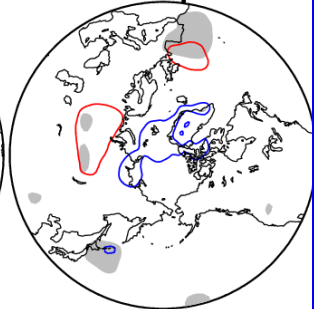
Jul



Aug



Sep



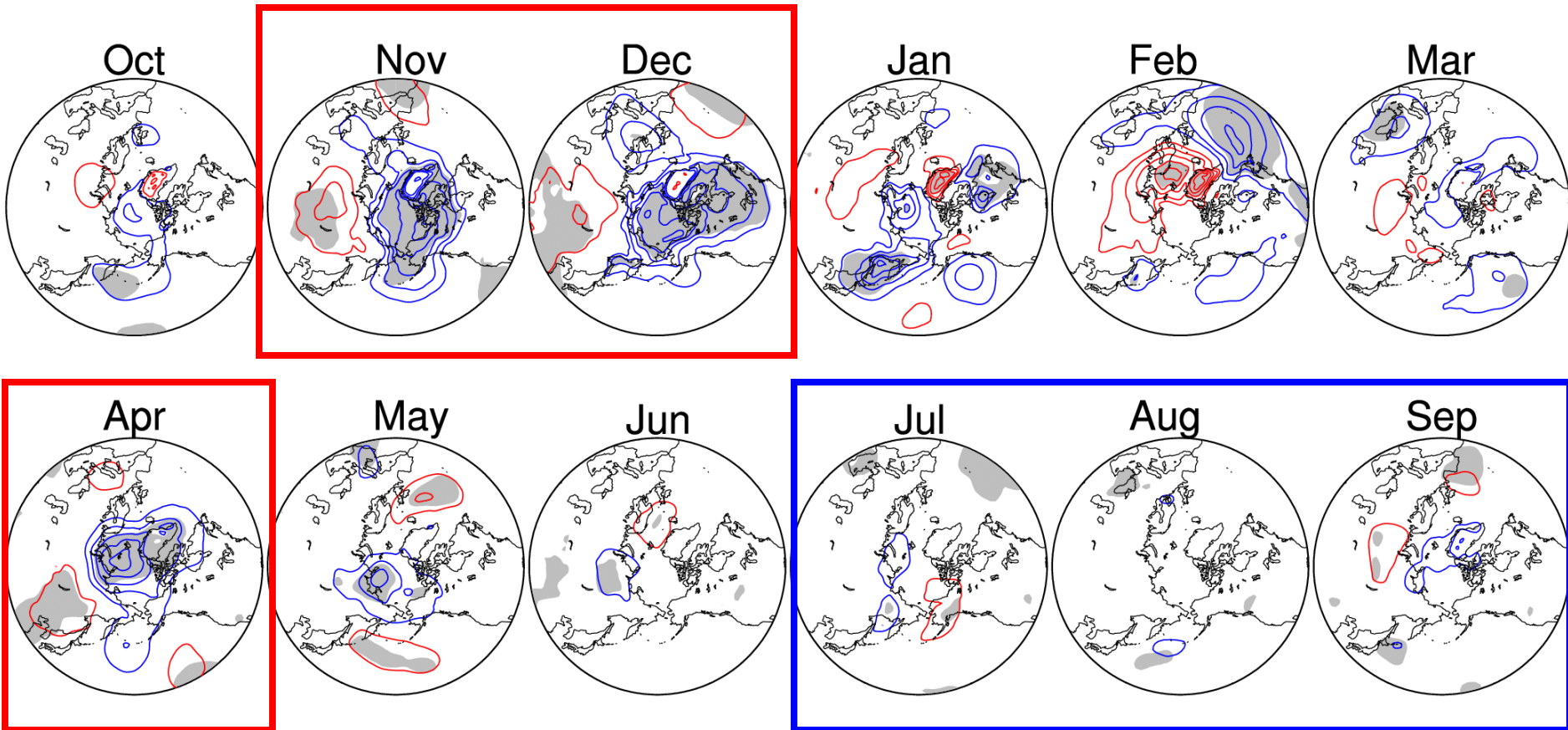
*Large response in fall, spring*

*Small response in summer*

# Sea Level Pressure Response

(2080-2099 minus 1980-1999)

(contoured every 1 hPa; shading for significance)



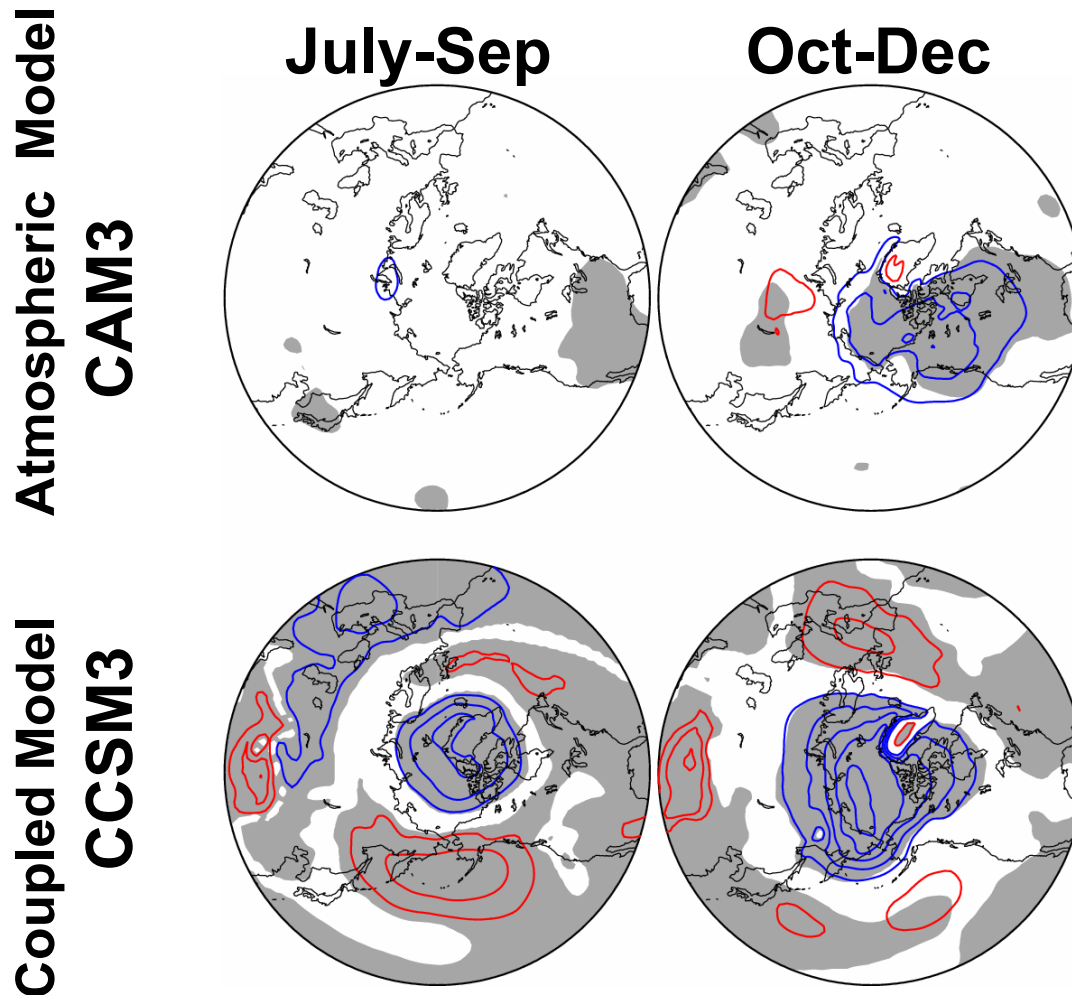
*Large response in fall, spring*

*Small response in summer*

*Vertical structure: baroclinic in fall, barotropic in winter & spring*

# Atmospheric Circulation Response to Sea Ice vs. Response of Coupled Model to Anthropogenic Forcing

*Sea Level Pressure 2080-99 minus 1980-99*



*Not much correspondence!*

# Atmospheric Circulation Response to Projected Changes in Arctic Sea Ice and Snow Cover

## NEXT STEPS

- Sea ice forcing: impact of concentration vs. thickness?
- Snow cover forcing: extent vs. depth?
- Circulation response: role of intrinsic patterns?
- How important compared to greenhouse gas forcing?
- Coupled atmosphere-mixed layer ocean response?
- Feedback on sea ice and snow cover?



# Precipitation Response (2080-2099 minus 1980-1999)

*(contoured every 0.25 mm/day; shading for significance)*

