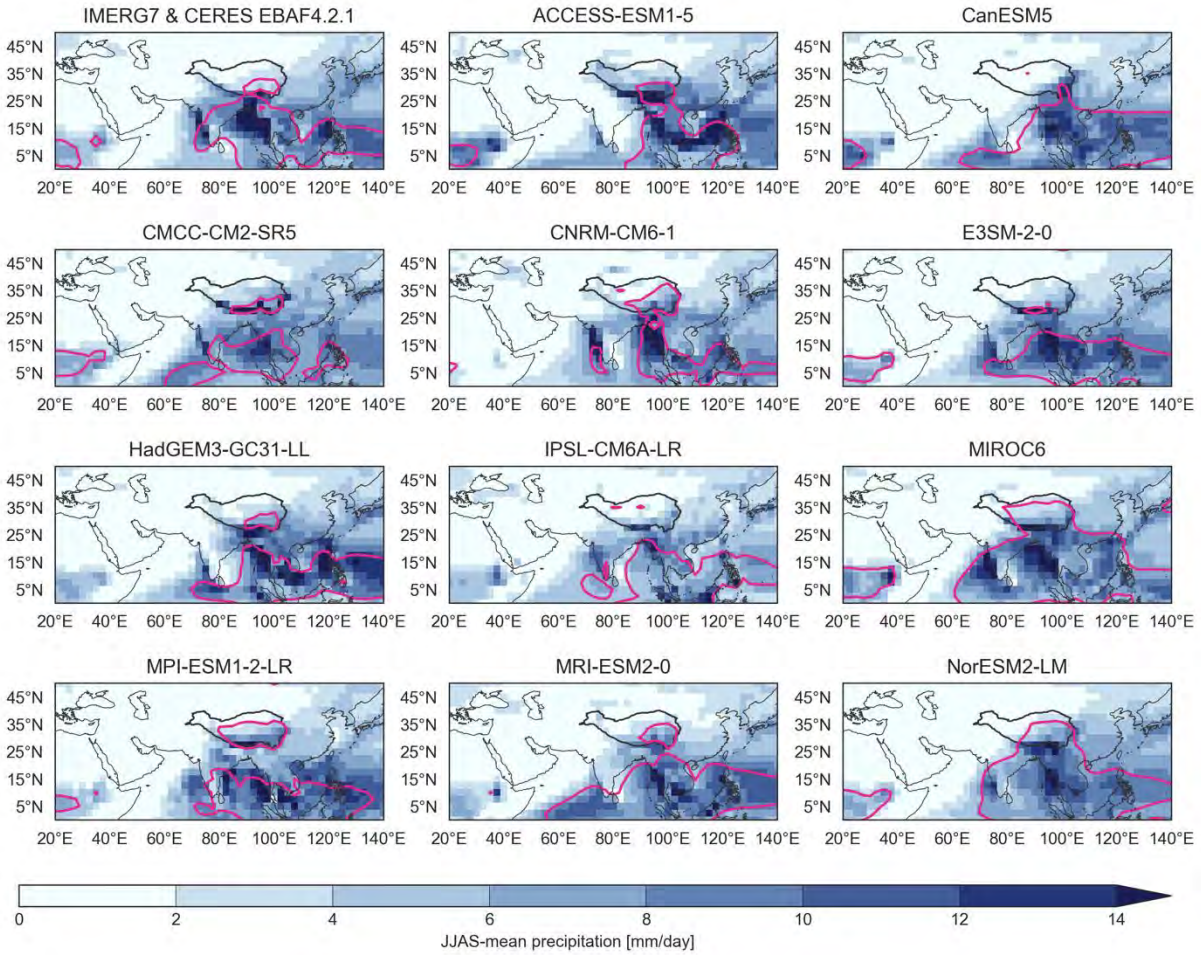
LEADER MONSOONS

Co-leads:
Jonathon Wright
Franklin Tat-Fan Cheng

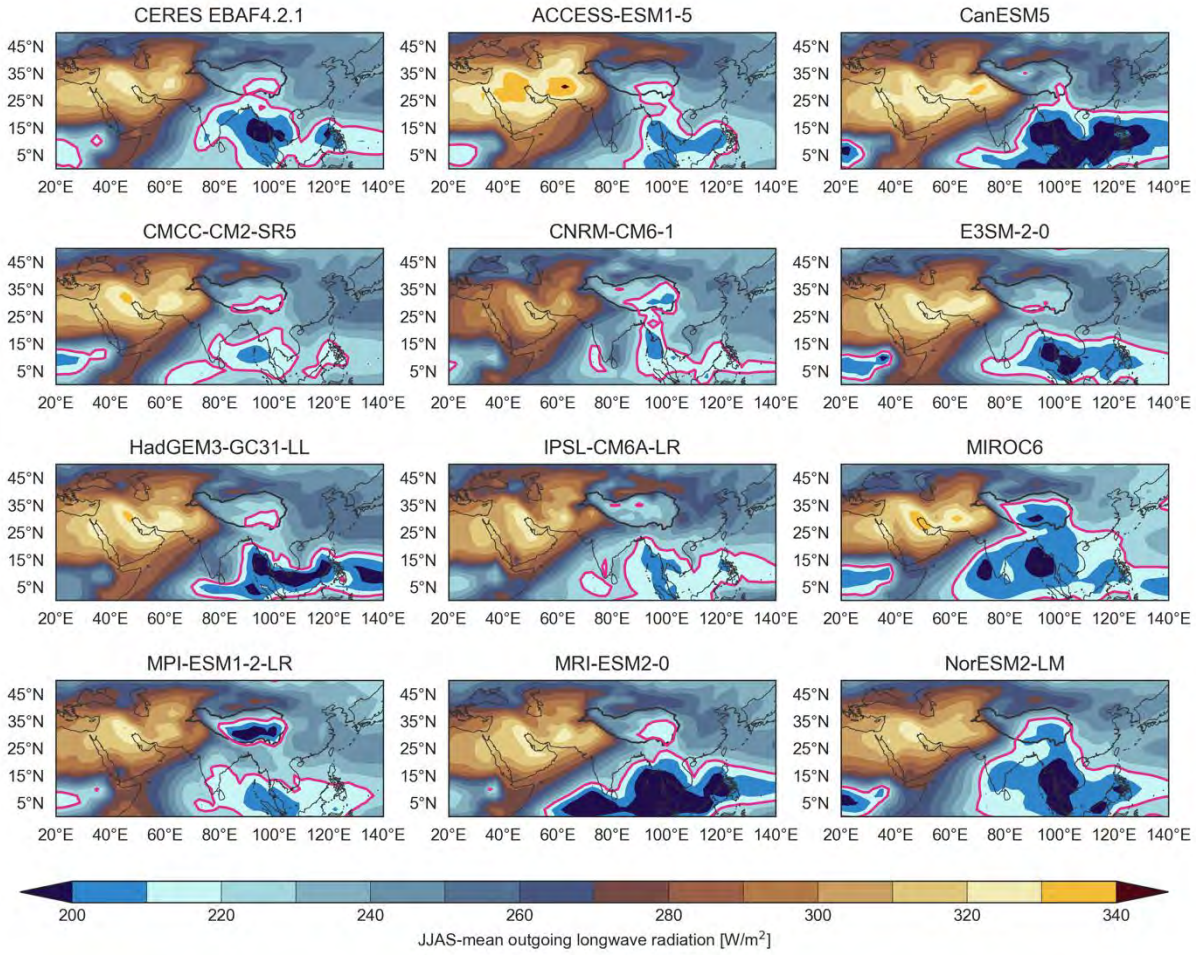
So far:

1. Large-scale circulation of the Asian monsoons
   - SASM overturning
   - EASM evolution
2. Forced response in monsoon climatologies

Asian monsoon – diversity across ensembles



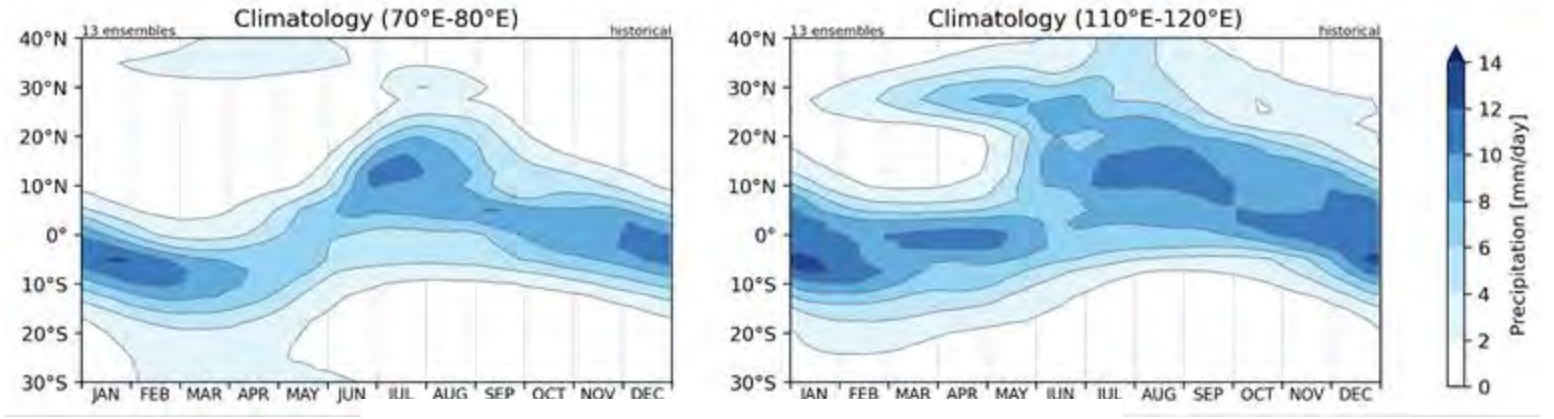
Precipitation



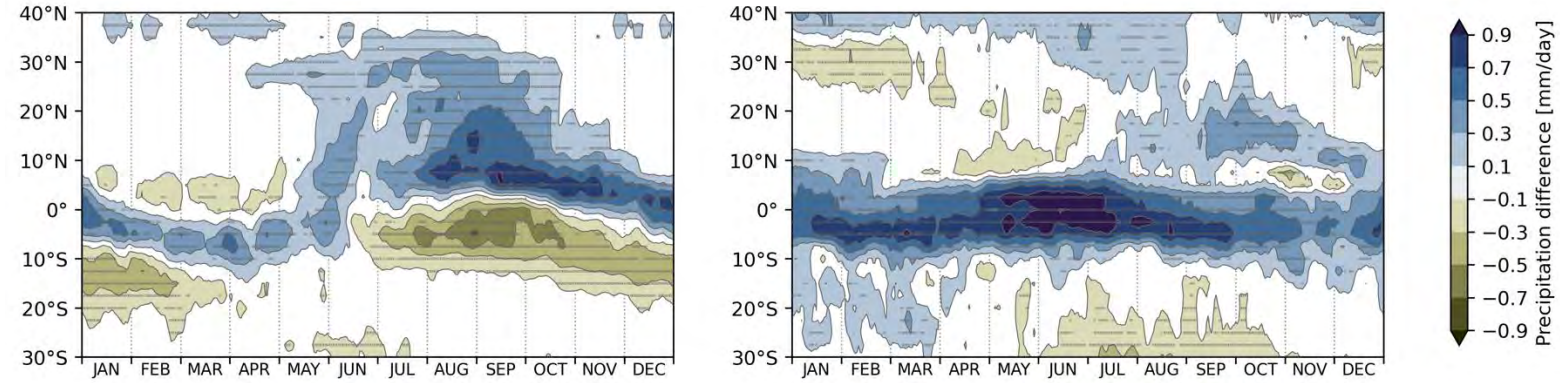
OLR

Precipitation

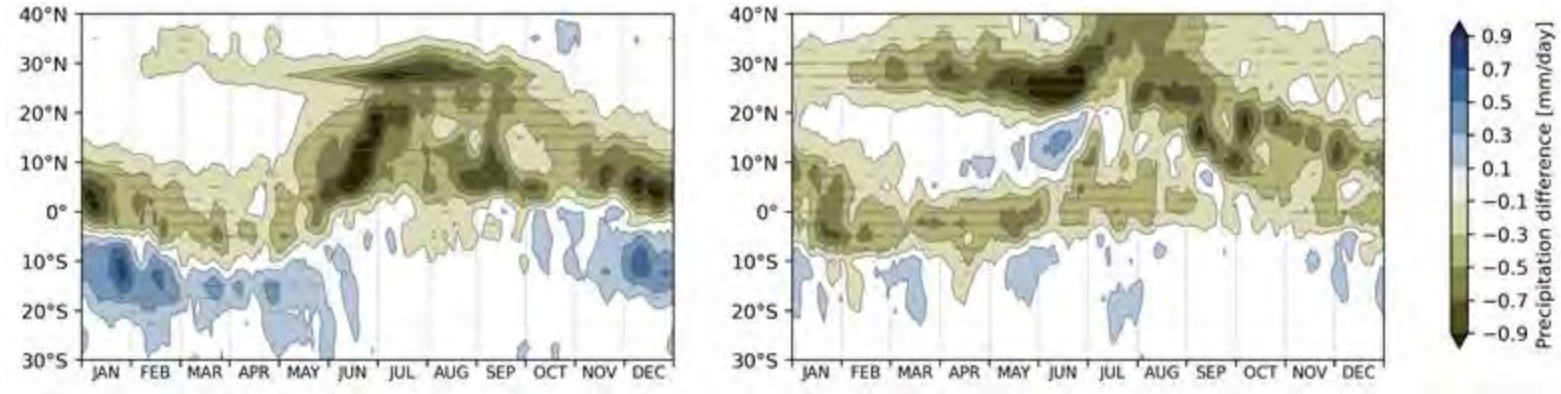
- Left for SASM
- Right for WNPSM / EASM
- Greenhouse gases increase precipitation in the SASM and WNPSM
- Aerosols decrease precipitation in all regional monsoons



Multi-ensemble mean GHGs response

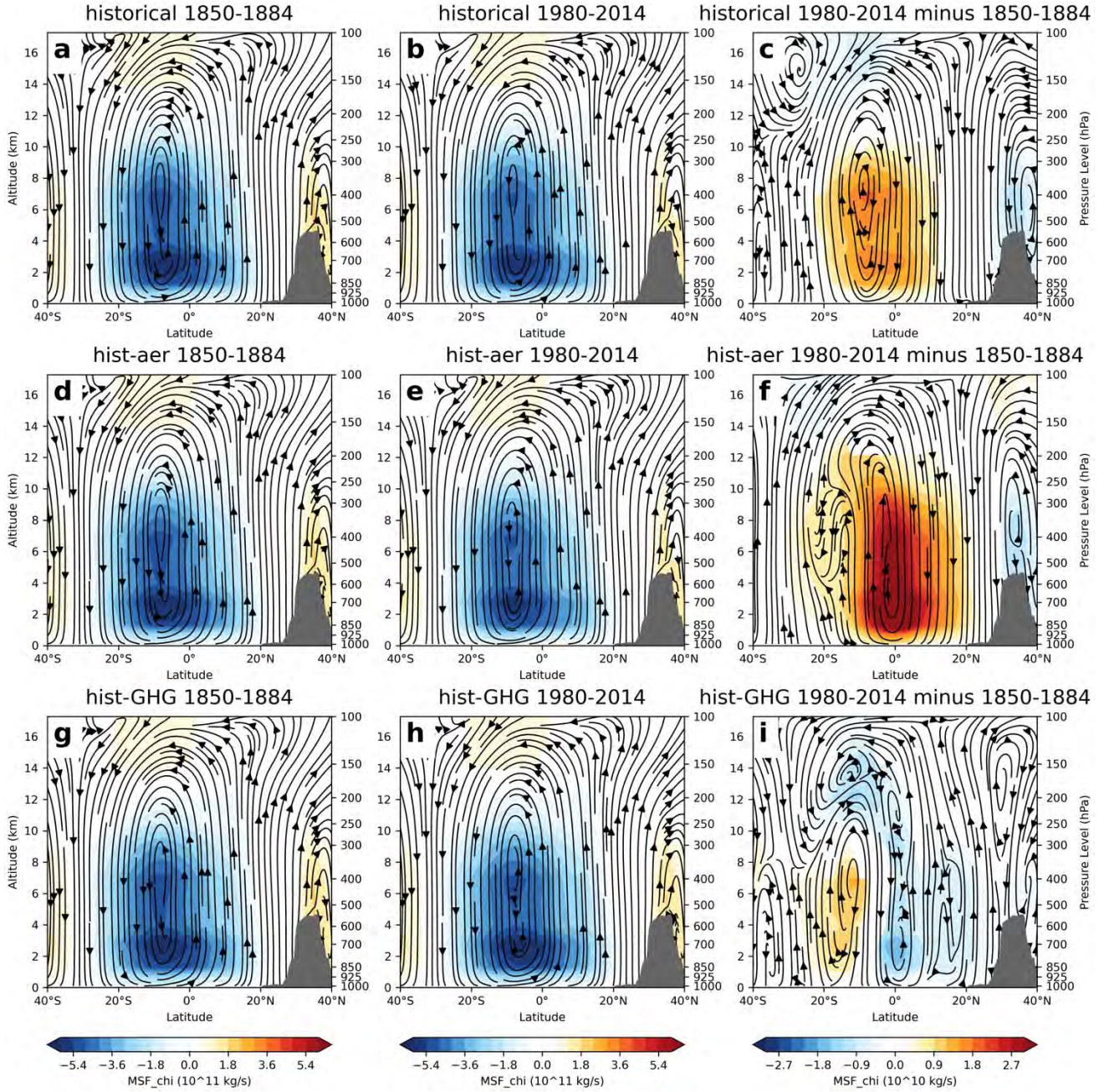


Multi-ensemble mean aerosol response



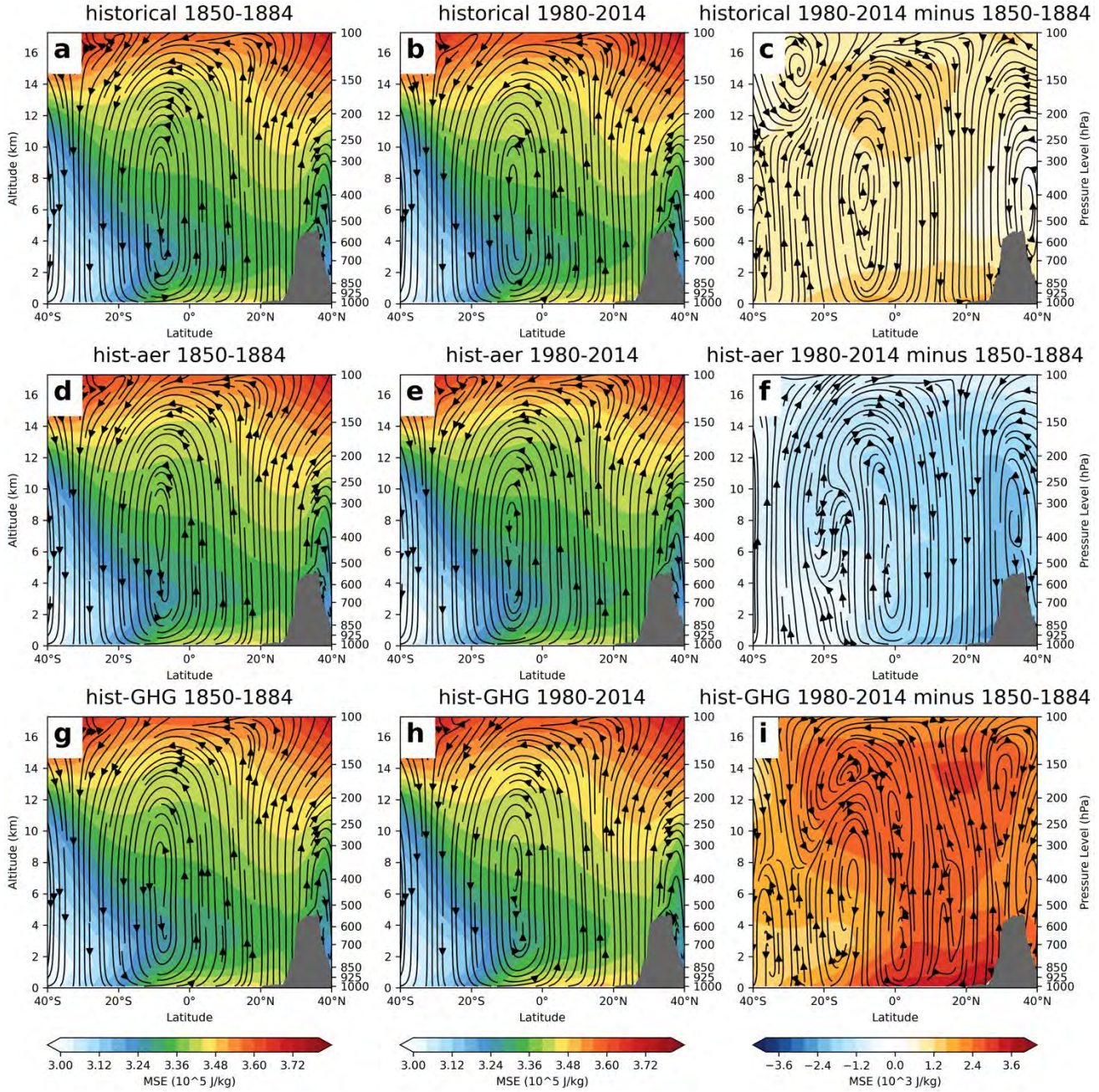
Monsoon overturning

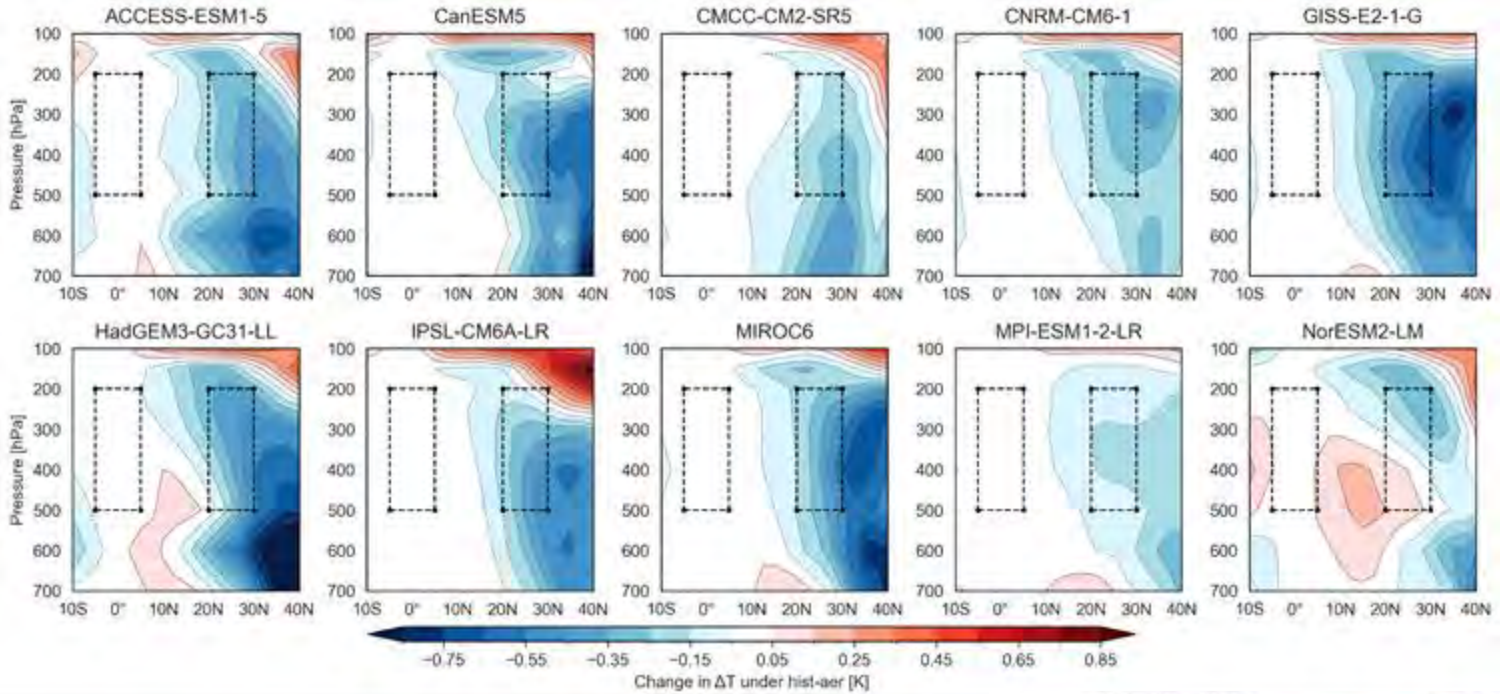
- Regional Hadley cell based on divergent meridional winds (streamlines)
- 60-100°E
- Present-day minus pre-industrial
- Overturning weakens in hist-aer
- Overturning intensifies and shifts north in hist-GHG, also more confined in NH



Monsoon overturning

- Changes in moist static energy best explain the dynamic changes
- Reduced near-surface MSE in hist-aer
- Increased near-surface and upper-level MSE in hist-GHG
- Historical simulations similar to sum of hist-aer and hist-GHG
- Changes in MSE more like hist-GHG but changes in overturning more like hist-aer

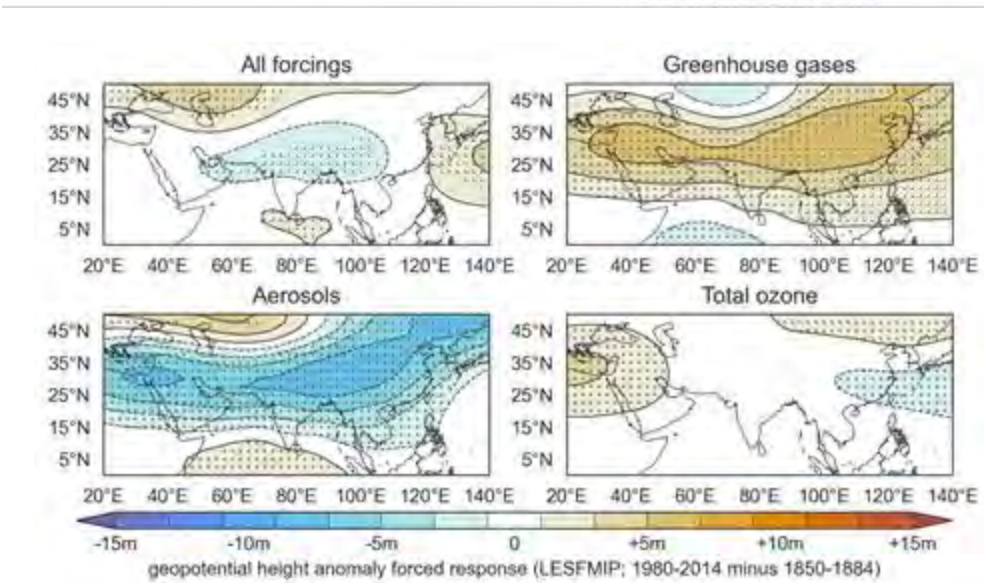


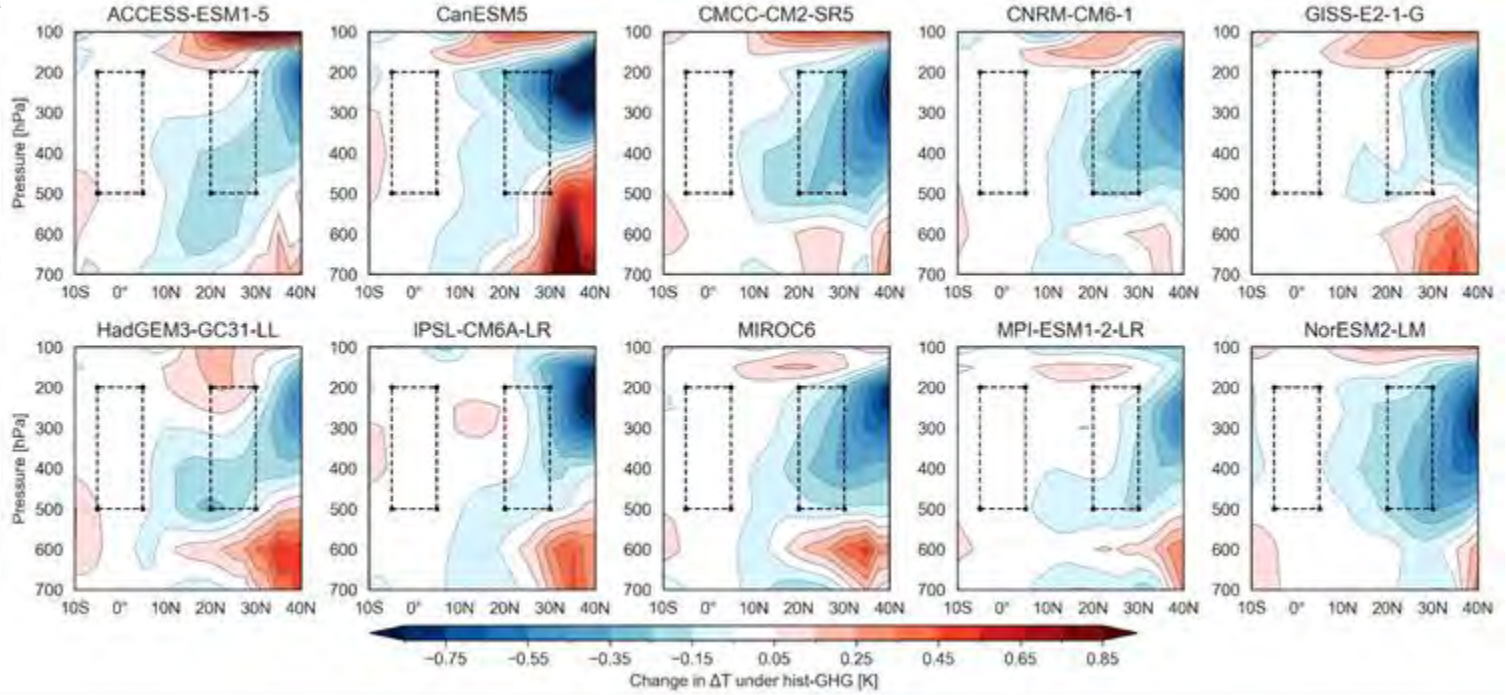


Reductions in upper-tropospheric gradients in both hist-aer and hist-GHG, but for different reasons

hist-aer: less heating of the upper troposphere due to reduced convection / sensible heating

hist-GHG: strongest warming at equator reduces the gradient





Next:

1. Consolidate work so far
2. Monsoon-related extremes
3. Multi-scale variability