
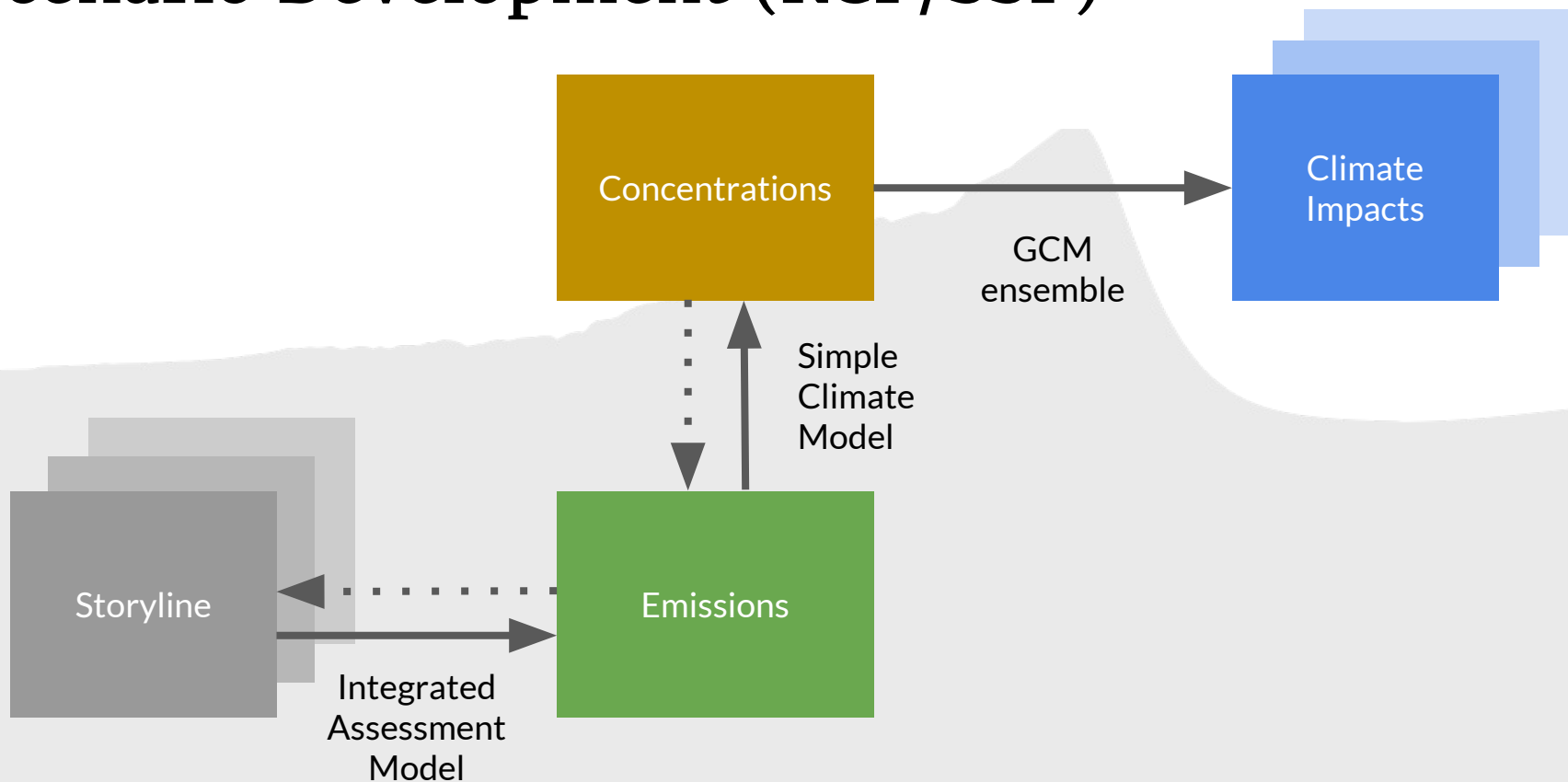


Community Experiments for the IPCC 1.5 degree report



Benjamin M. Sanderson, Yangyang Xu, Claudia Tebaldi,
Michael Wehner, Brian O'Neill, Alexandra Jahn, Angeline
Pendergrass, Flavio Lehner, Warren G. Strand, Lei Lin, Reto
Knutti and Jean Francois Lamarque

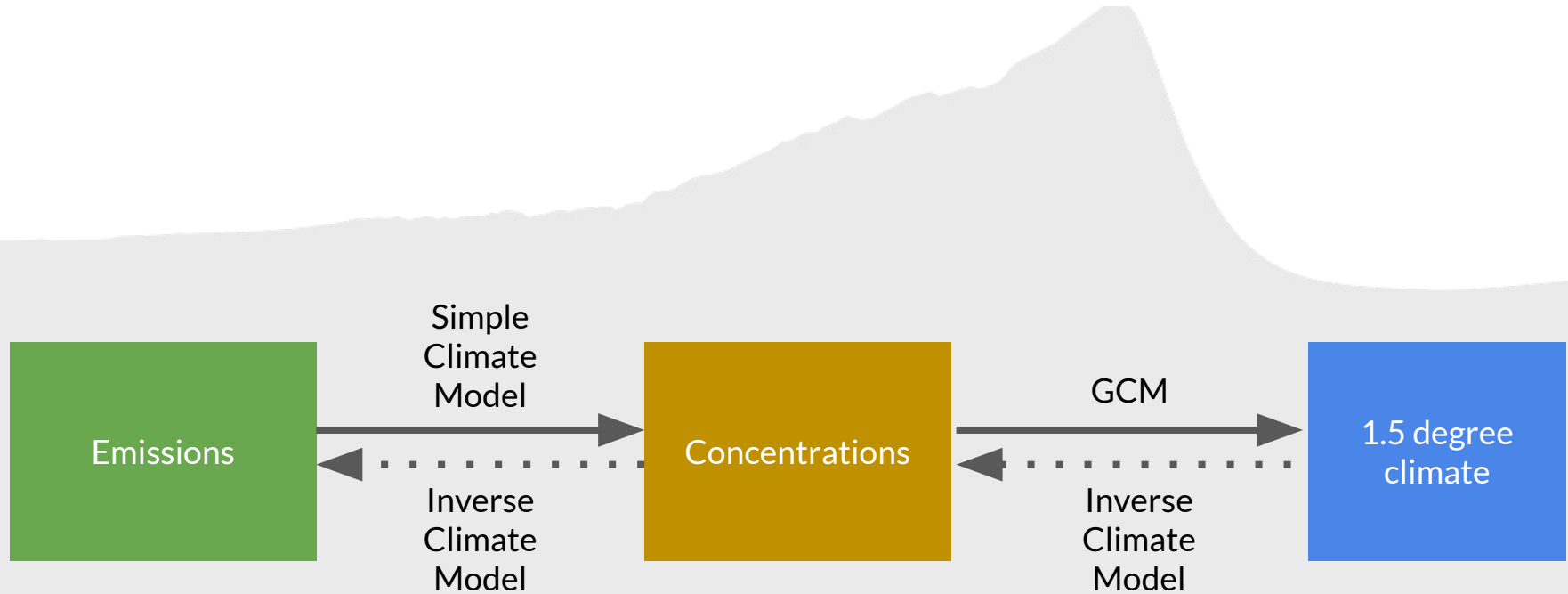
Scenario Development (RCP/SSP)



Paris Agreement II.21

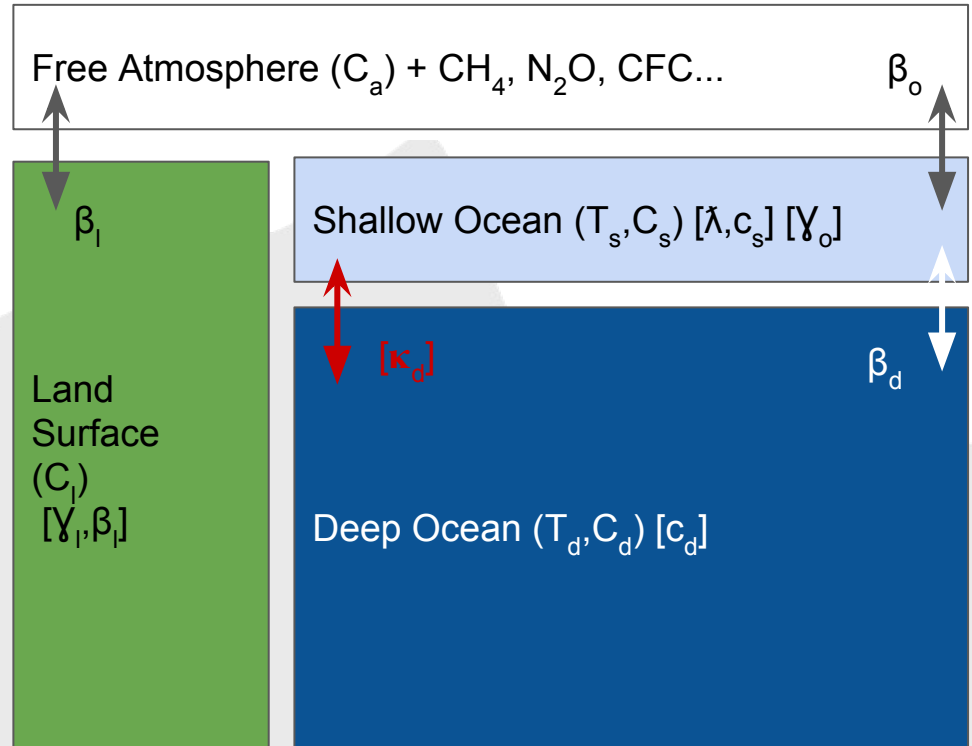
Invites the Intergovernmental Panel on Climate Change to provide a special report in 2018 on the **impacts of global warming of 1.5 °C** above pre-industrial levels and related global greenhouse gas emission pathways

“Inverse” Scenario Development

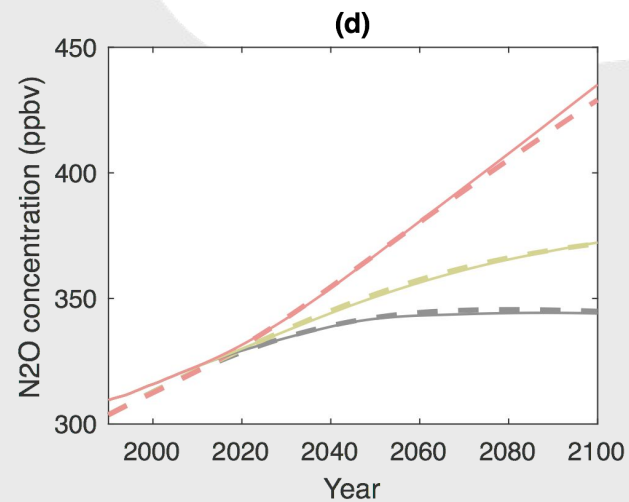
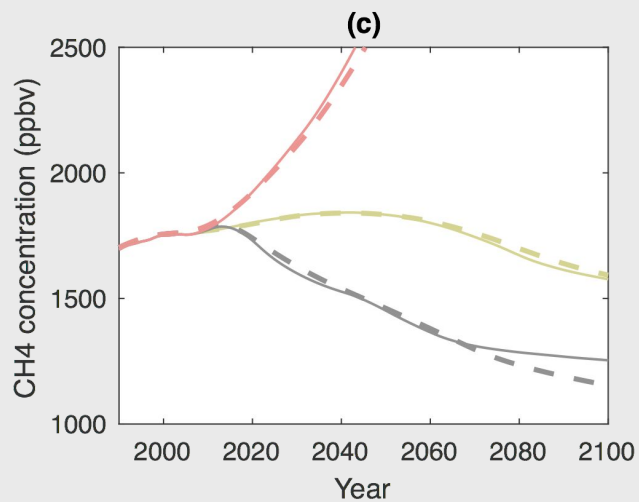
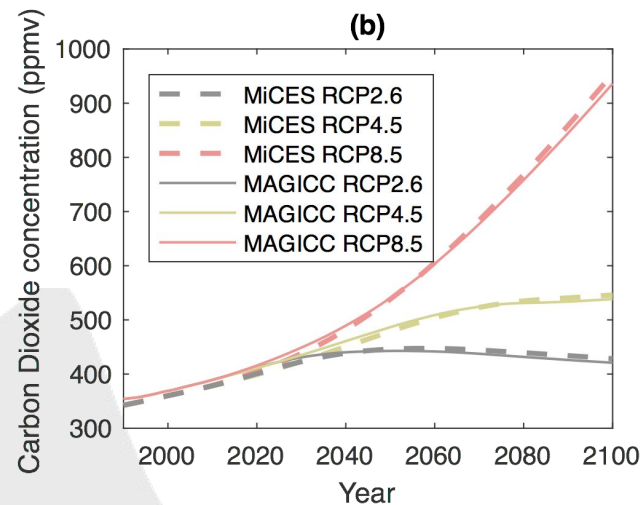
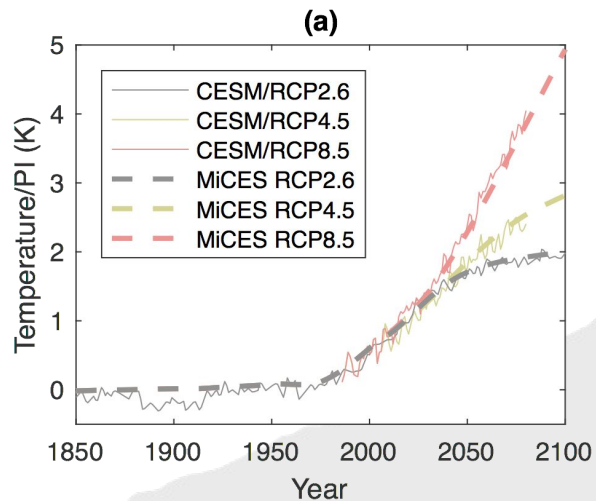


MICES

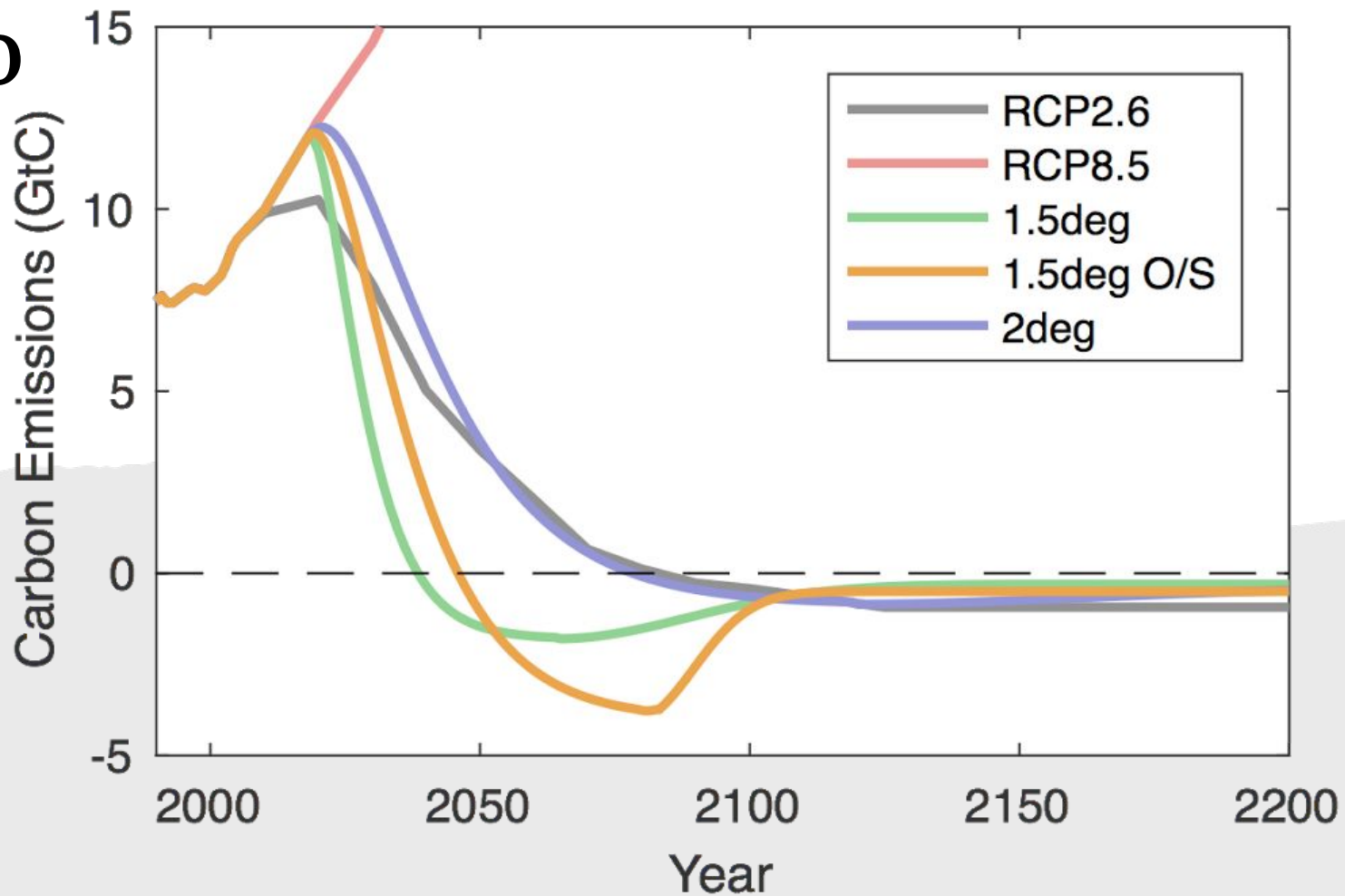
“Minimal Complexity
Earth Simulator”



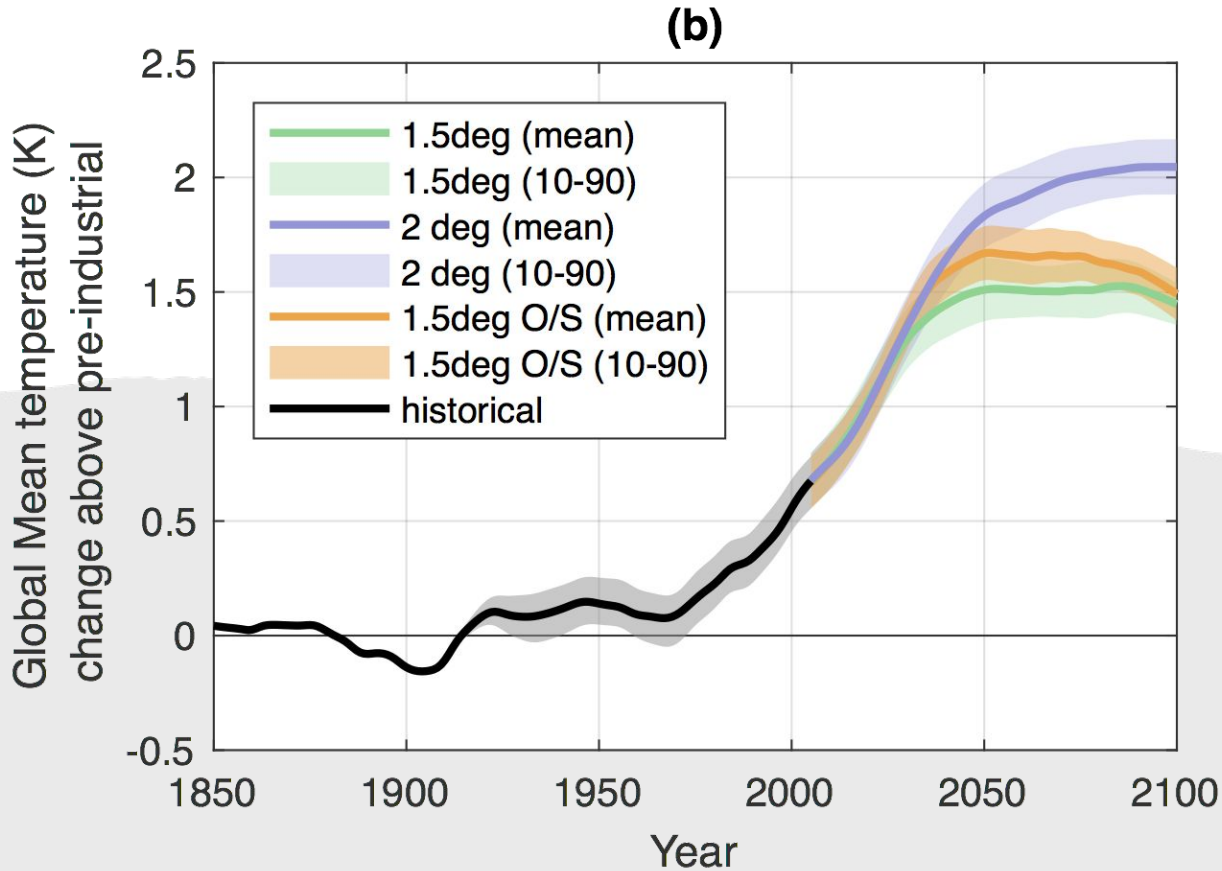
CESM Calibration



Scenario Design

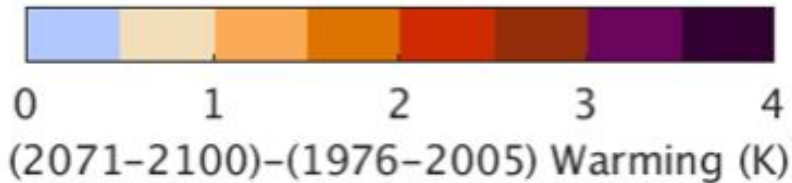
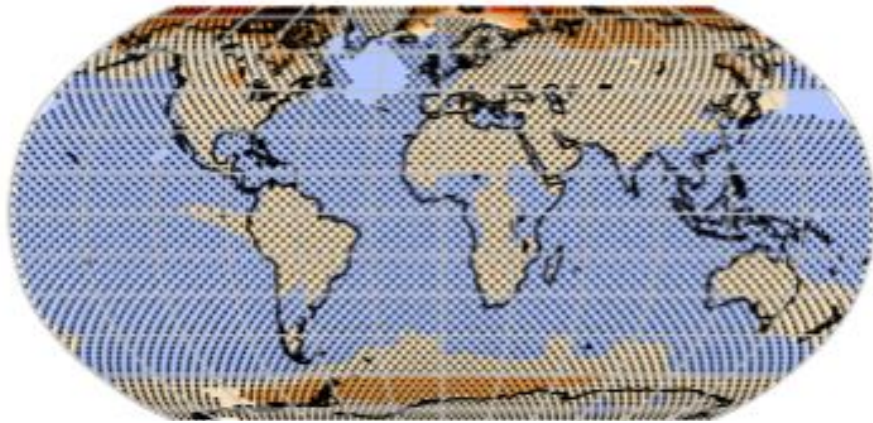


CESM low emission ensemble

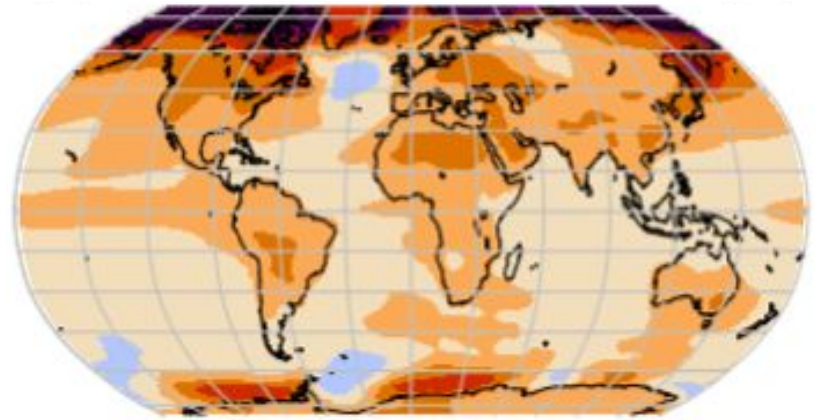


2071-2100 Mean Climate

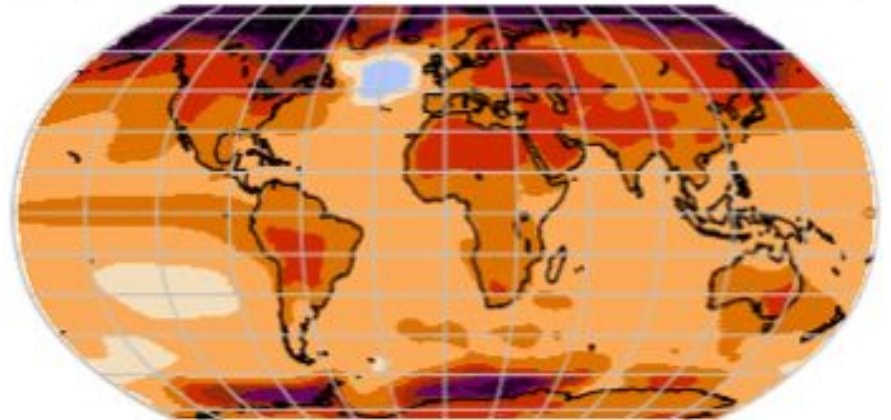
Difference



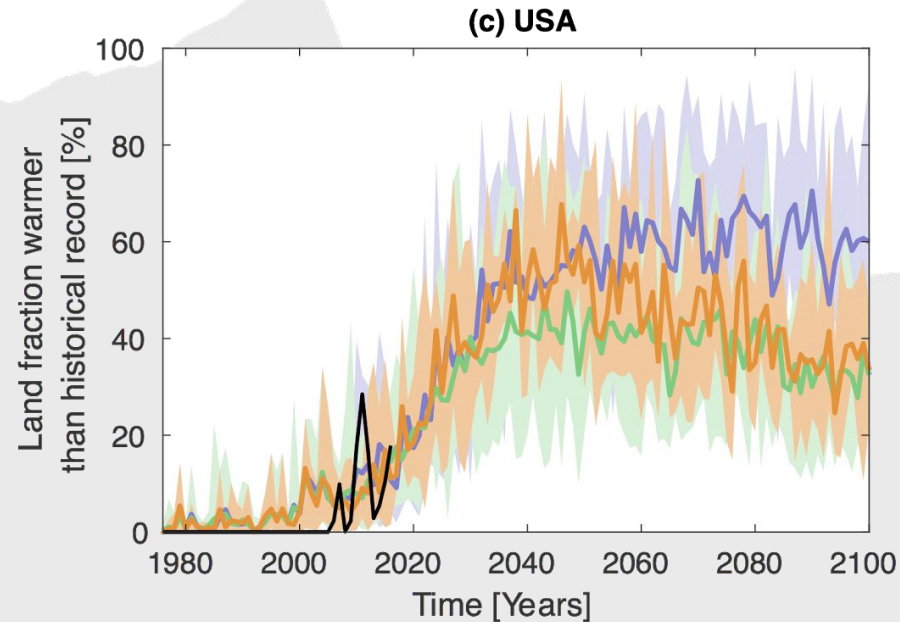
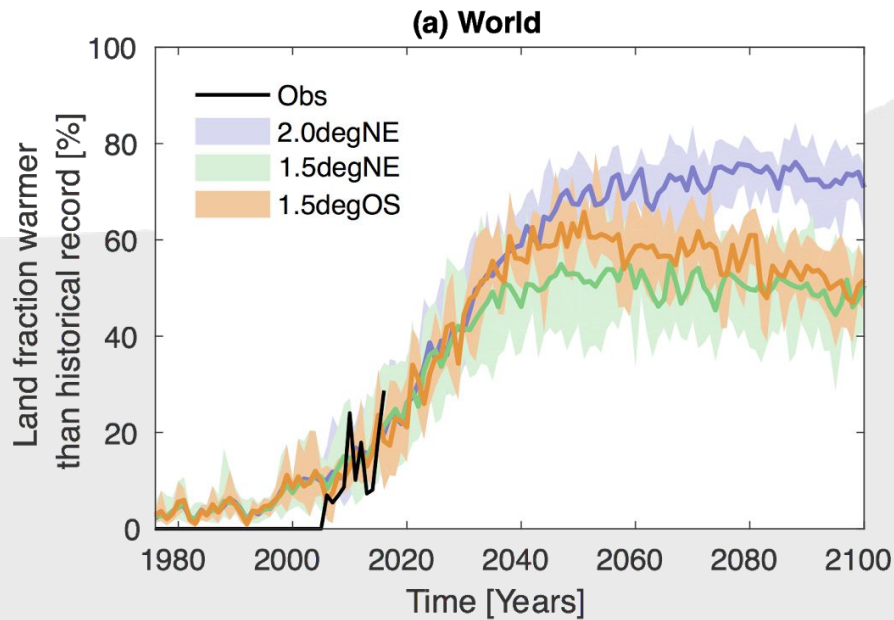
1.5 Degrees



2 Degrees

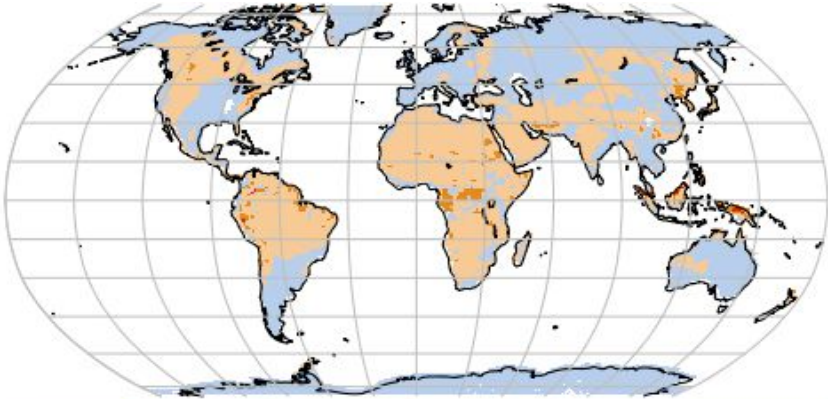


Temperature Record Exceedence



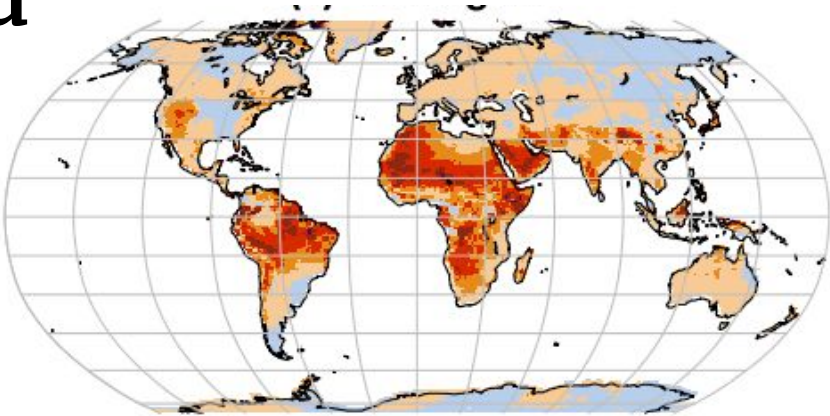
Temperature Record Exceedence

Difference

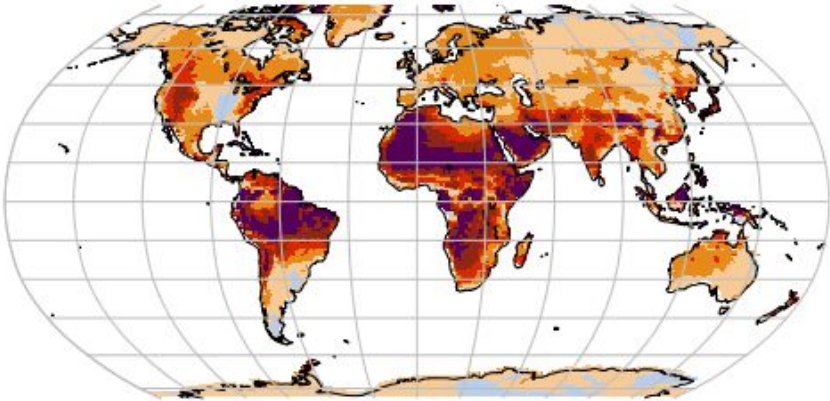


Expected number of historical 1 in 20 year
3 day heat events between 2071 and 2100

1.5 Degrees

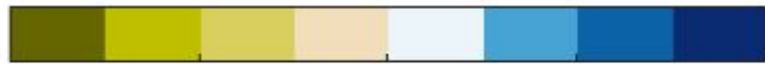
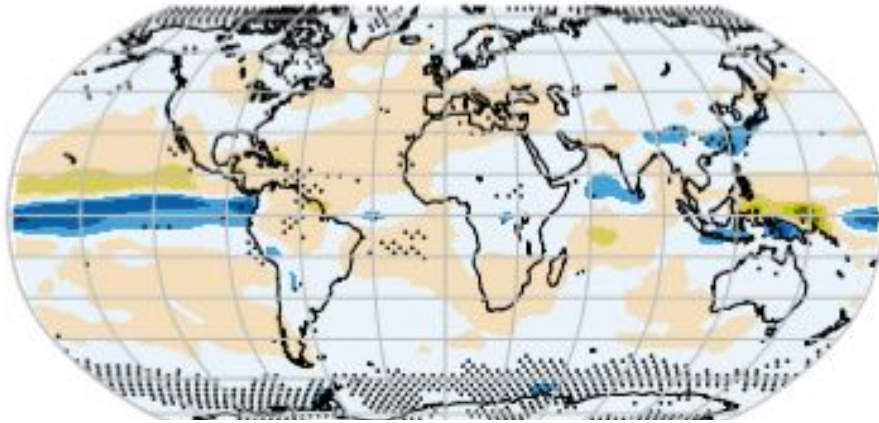


2 Degrees



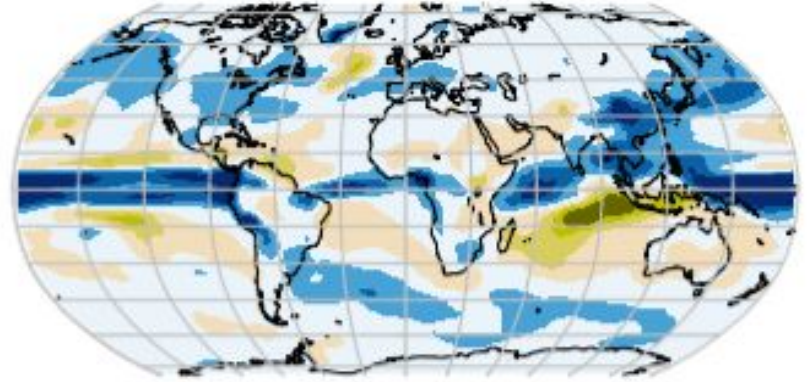
2071-2100 Mean Climate

Difference

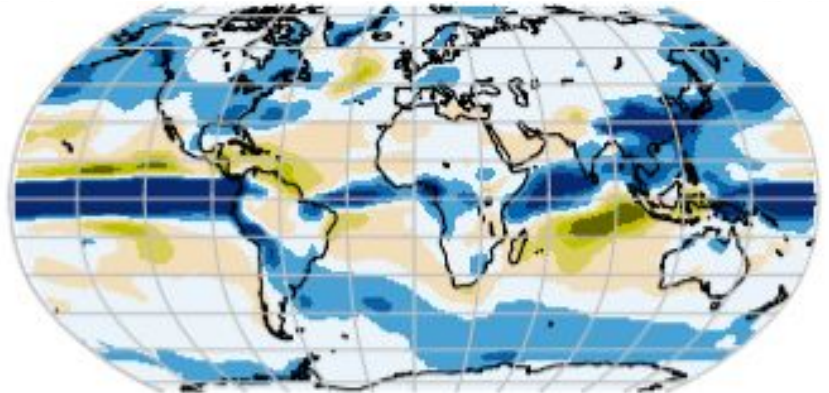


-20 -10 0 10 20
(2071-2100)-(1976-2005) ΔP (mm/month)

1.5 Degrees

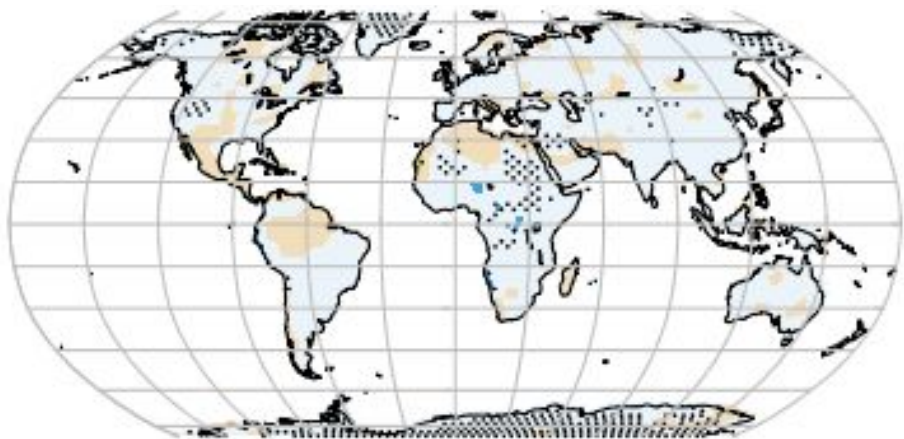


2 Degrees



Extreme Precipitation

Difference

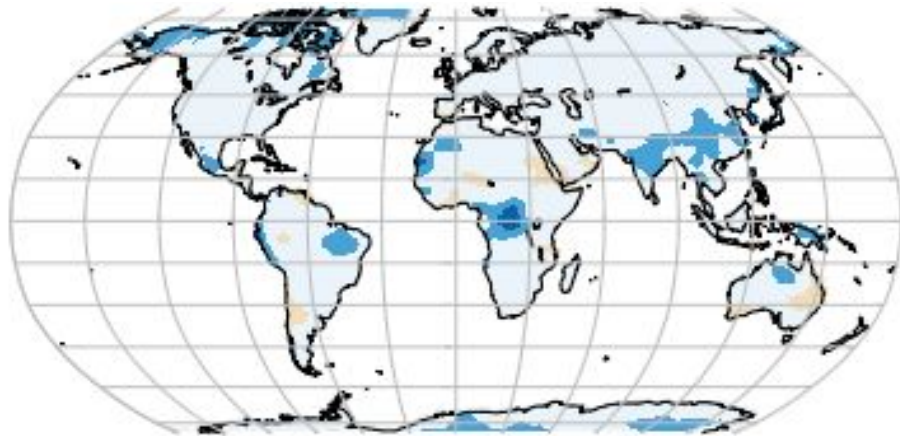


-50 0 50

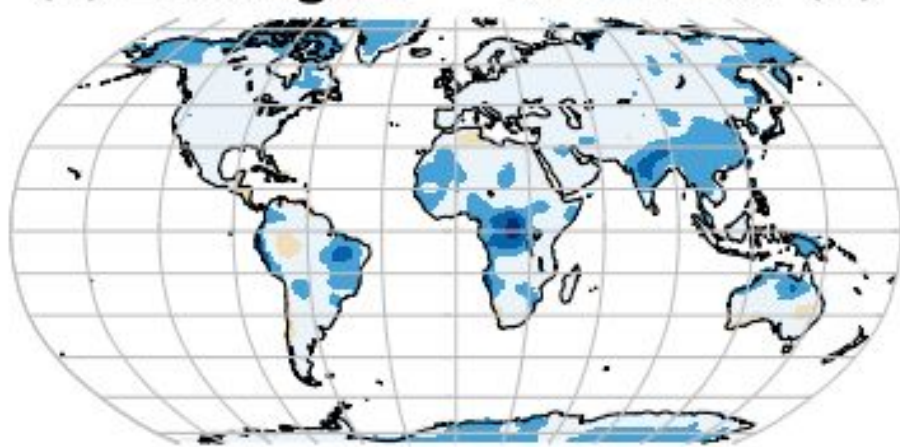
(2071-2100)-(1976-2005)

Change in expected max daily Extreme Precipitation intensity (%)

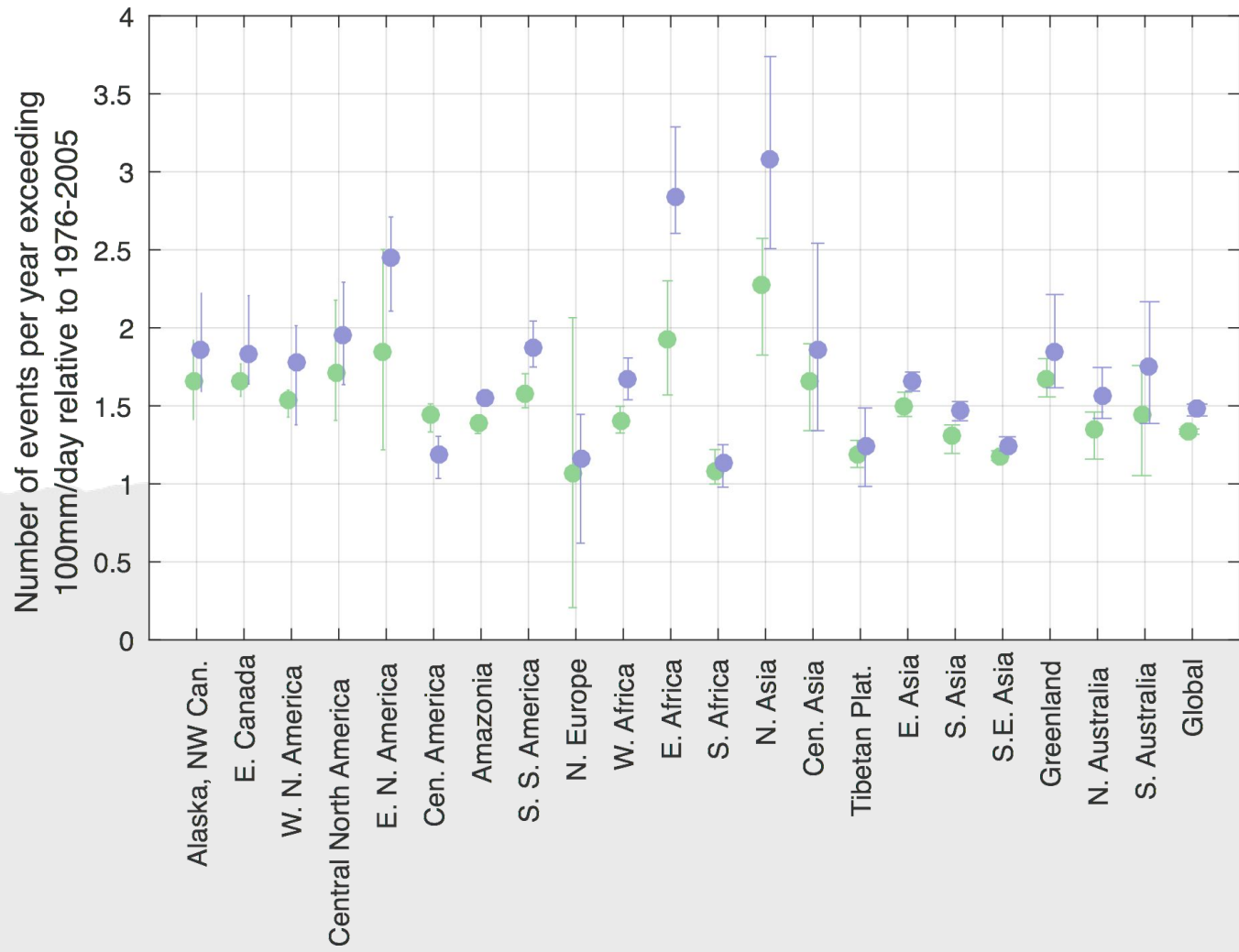
1.5 Degrees



2 Degrees

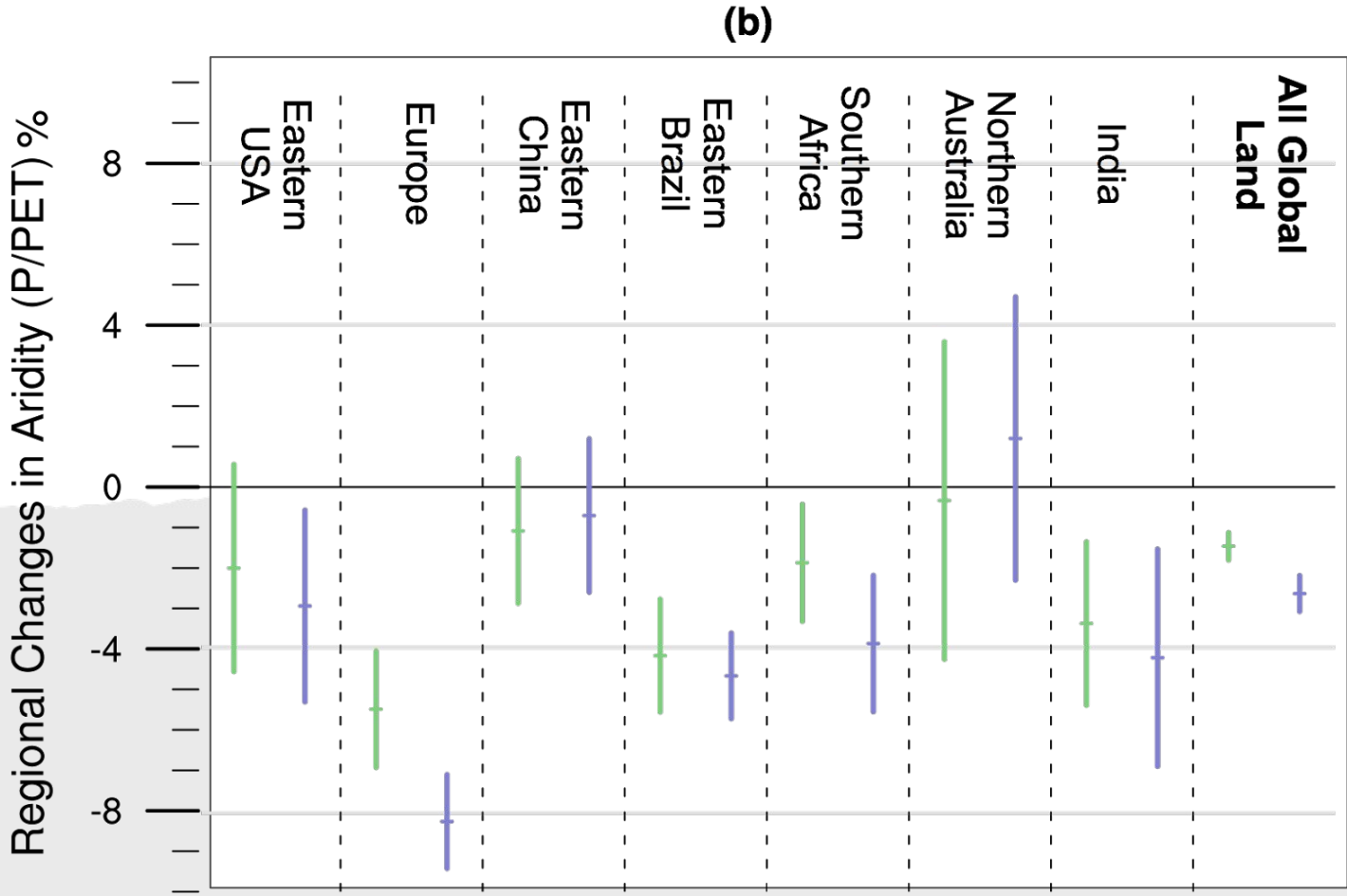


Extreme Precip (regional)



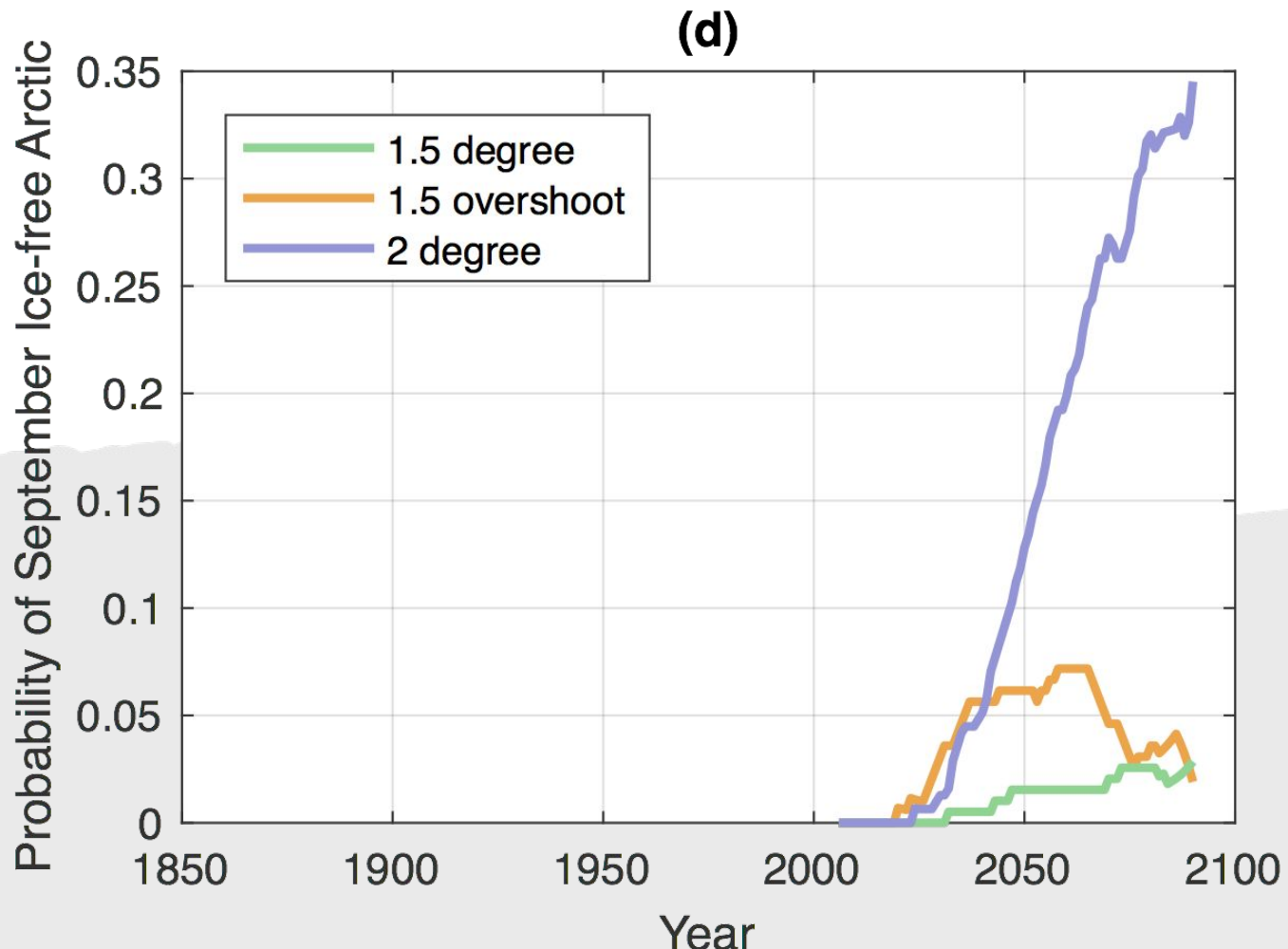
Aridity

Europe and Southern Africa show large differences



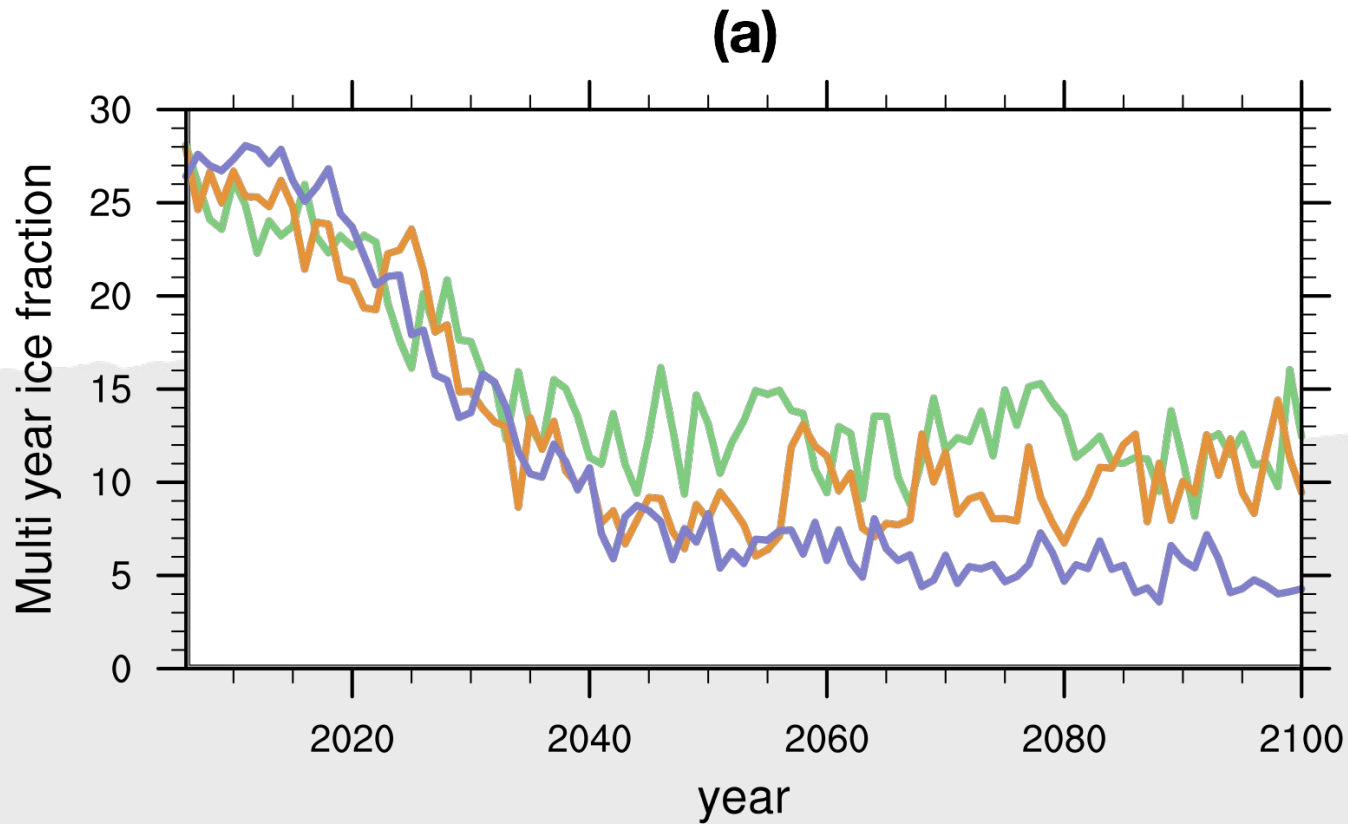
Sea Ice

2 degrees results
in regular ice-free
Arctic years



Sea Ice

50 percent less
multi-year ice in a
2 degree climate



Conclusions

- Demonstrated framework for producing targeted coupled simulations for specific global mean temperature goals.
- 1.5 degrees in CESM requires net zero emissions by 2040, 2 degrees allows 40 years longer.
- 1.5 degree simulation shows 50 percent reduction in global temperature record exceedence relative to 2 degrees
- Specific regions benefit from reduced extreme precipitation and aridity in 1.5 relative to 2 degrees
- 1 in 3 years have an ice free Arctic by 2100 in the 2 degree world, relative to 1 in 20 years for 1.5
- Temperature and Precipitation impact differences are disproportionately present in Africa and South America

Scenario Optimization

