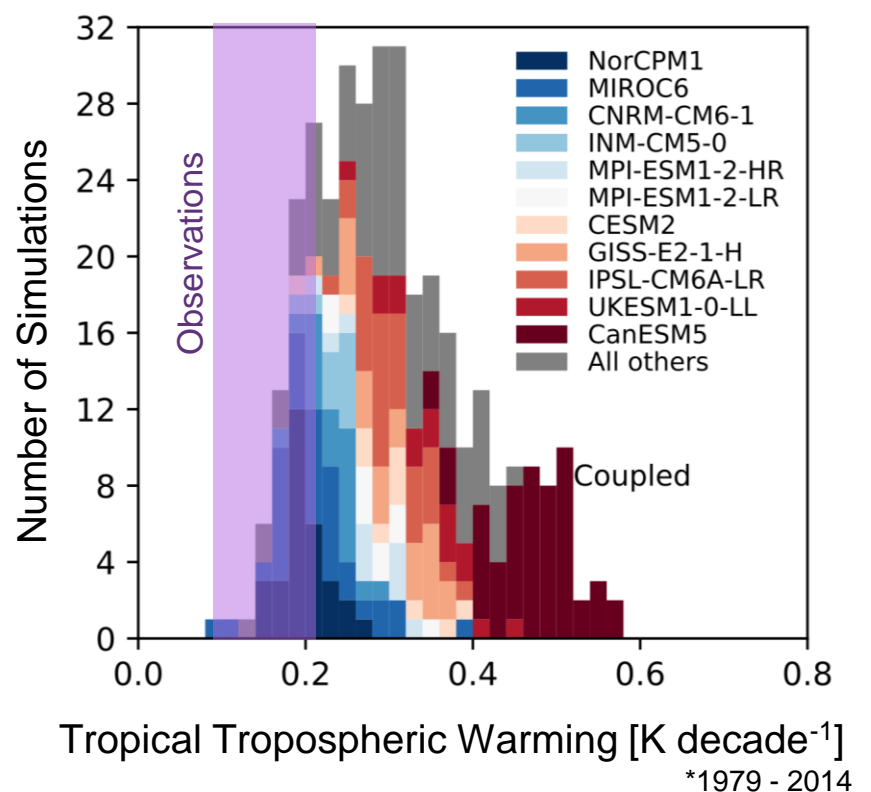


Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

Observed warming is muted compared to ~90% of simulations

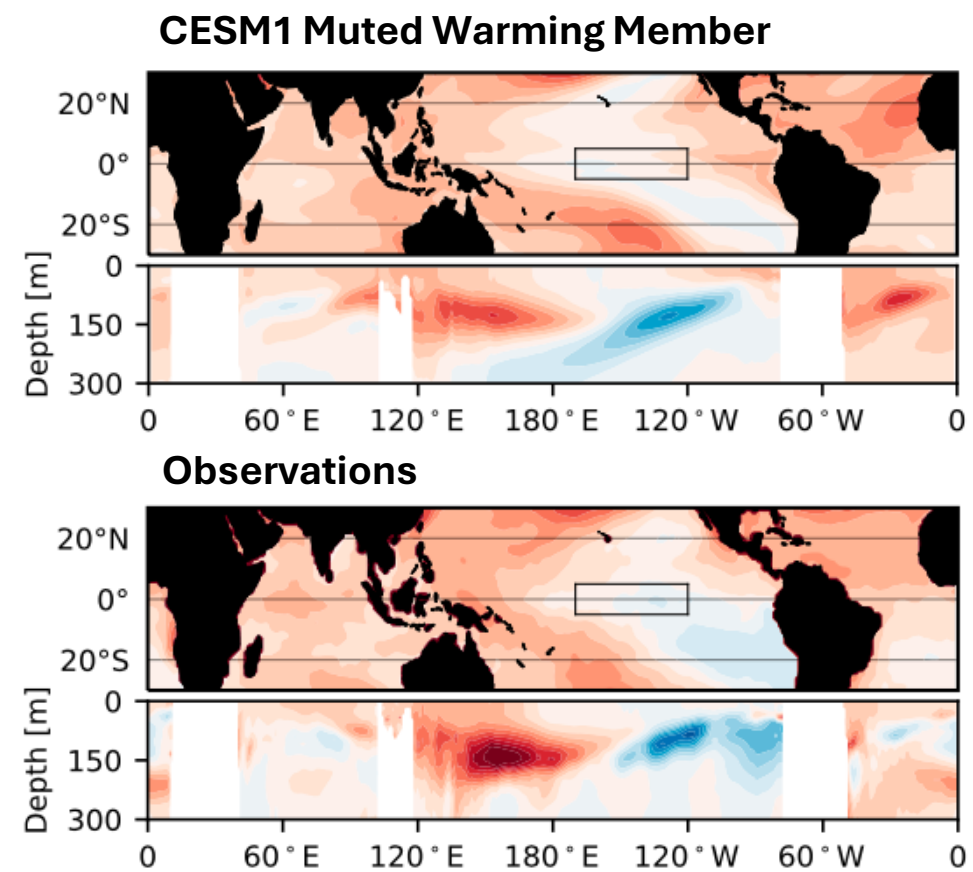
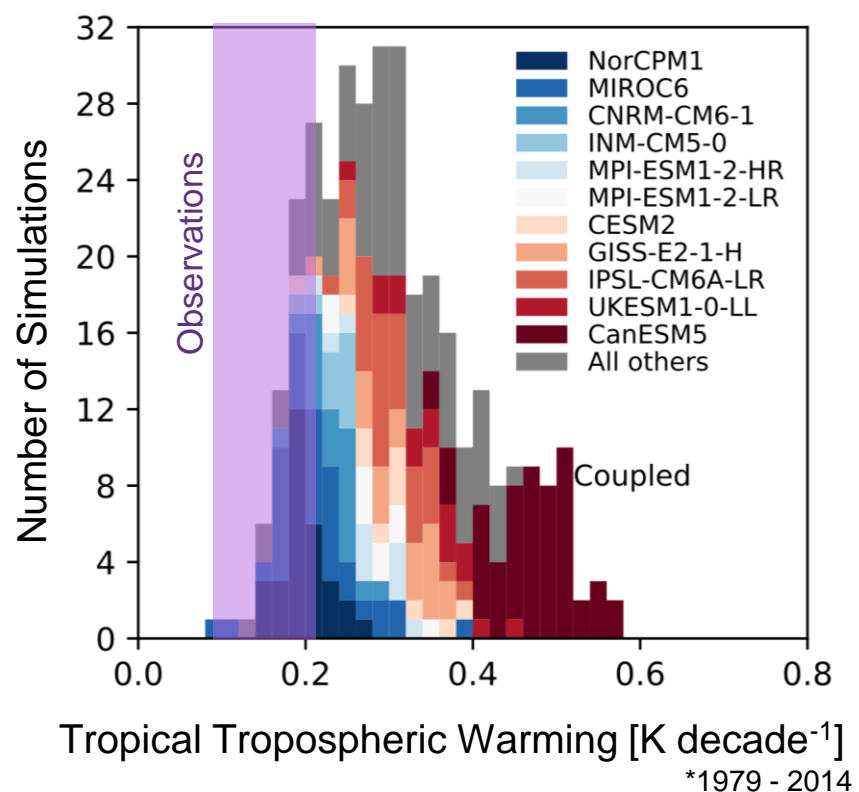


Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

Observed warming is muted compared to ~90% of simulations

Pattern of warming indicates internal variability suppressed observed warming

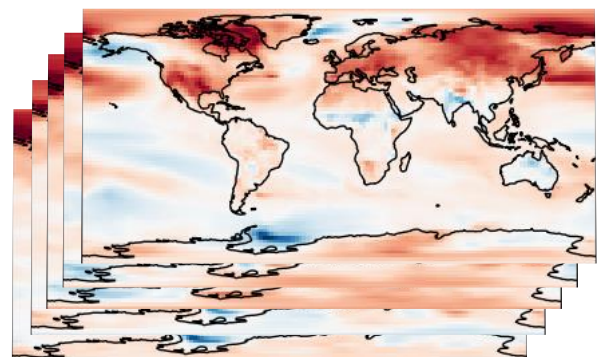


Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

Task ML to estimate internal variability

Model Warming Patterns

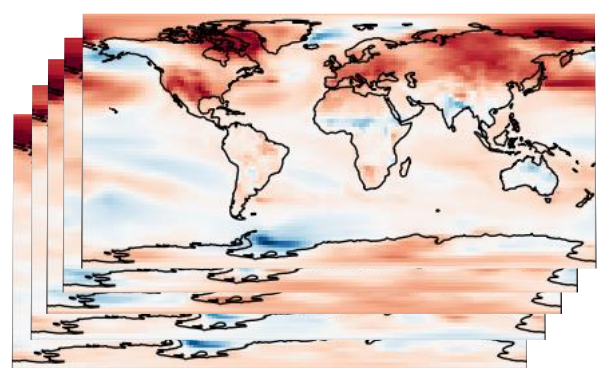


Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

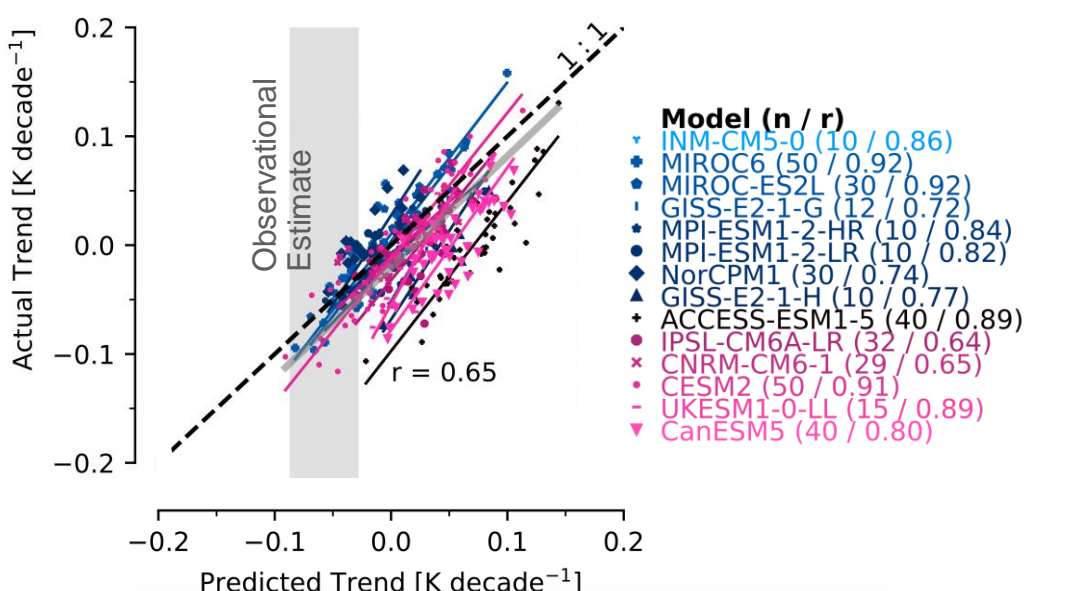
Task ML to estimate internal variability

Model Warming Patterns



Internal Variability Impact

Tropical tropospheric warming (1979 - 2014)

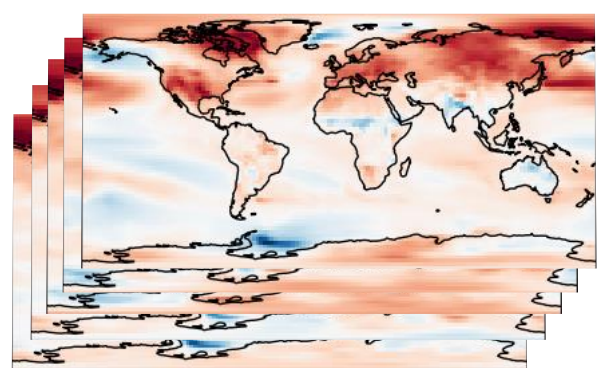


Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

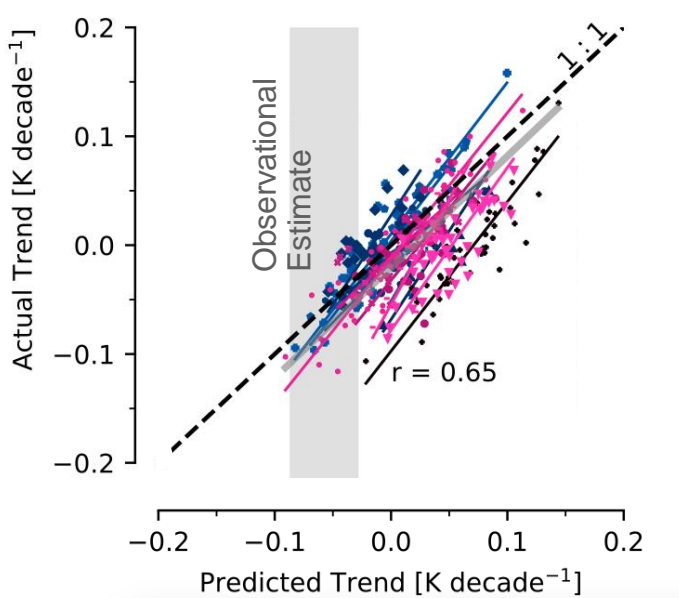
Task ML to estimate internal variability

Model Warming Patterns

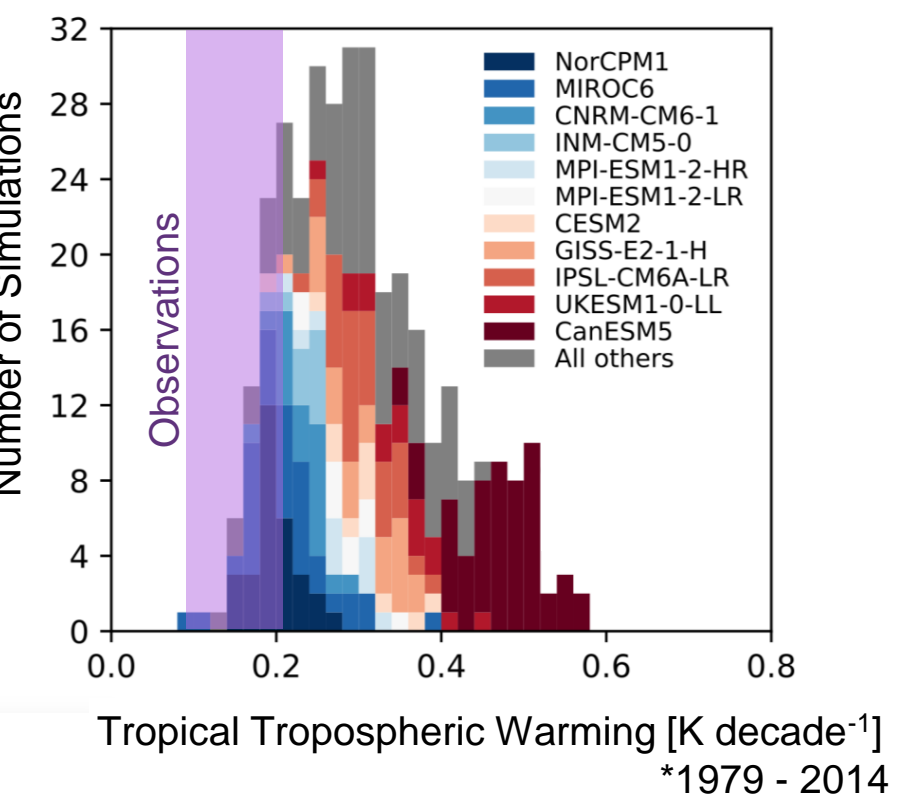


Internal Variability Impact

Tropical tropospheric warming (1979 - 2014)



Internal Variability Helps Explain Model-Satellite Differences



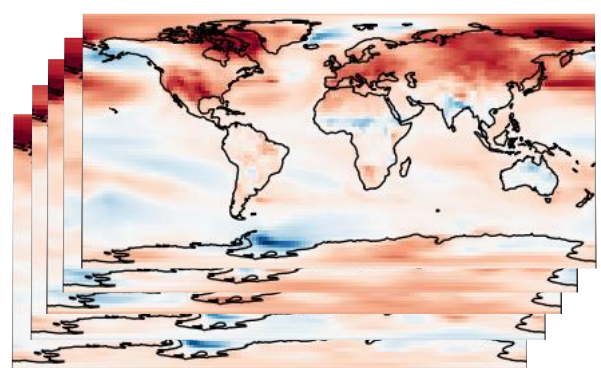
Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

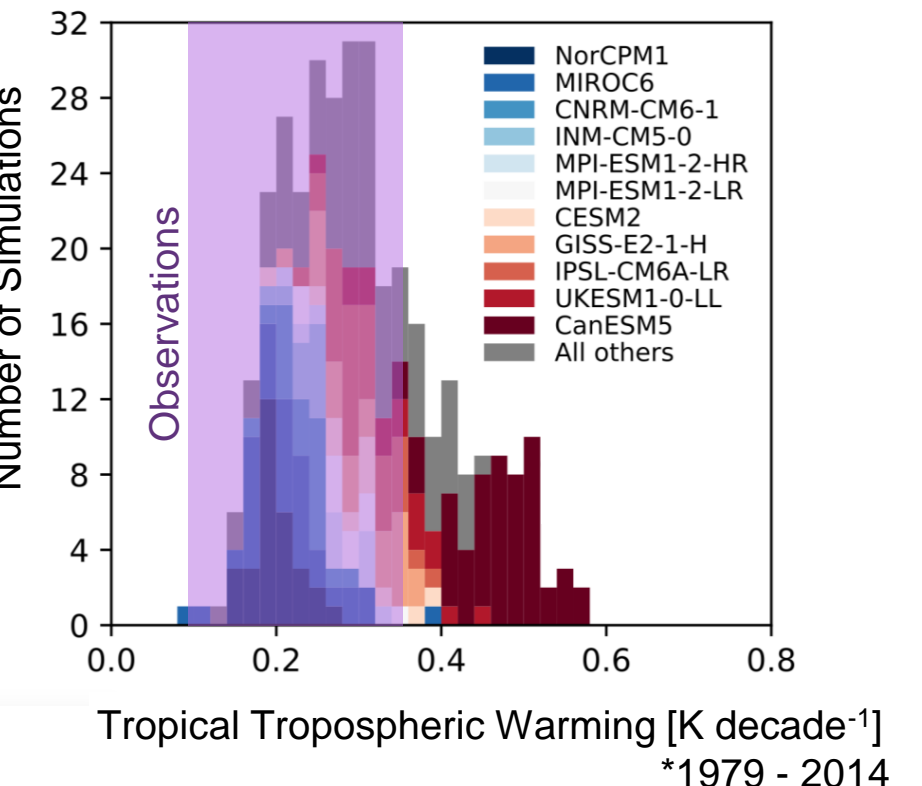
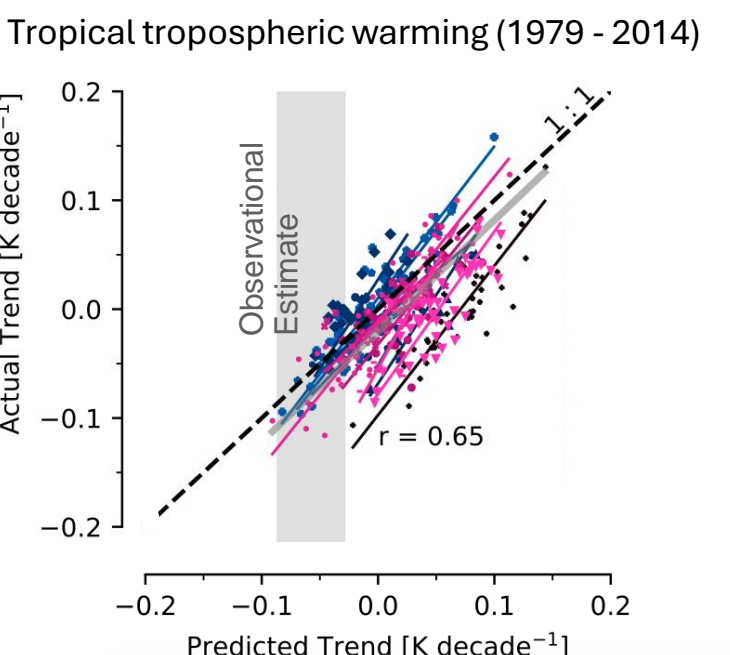
Task ML to estimate internal variability

Internal Variability Helps Explain Model-Satellite Differences

Model Warming Patterns



Internal Variability Impact

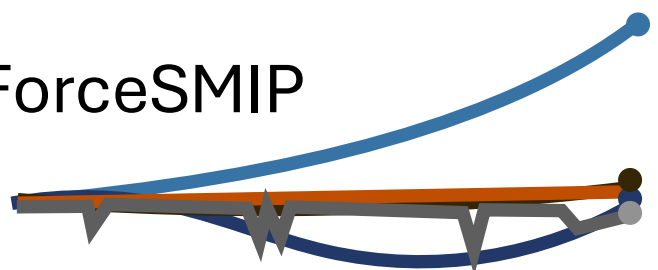


Persistent Differences in Simulated and Observed Tropical Tropospheric Warming

Stephen Po-Chedley, Ben Santer, John Fasullo, Stephan Fueglistaler, Nick Siler, Qiang Fu, Elizabeth Barnes, Zack Labe, Mark Zelinka, Céline Bonfils, Philip Cameron-Smith, Jeff Painter

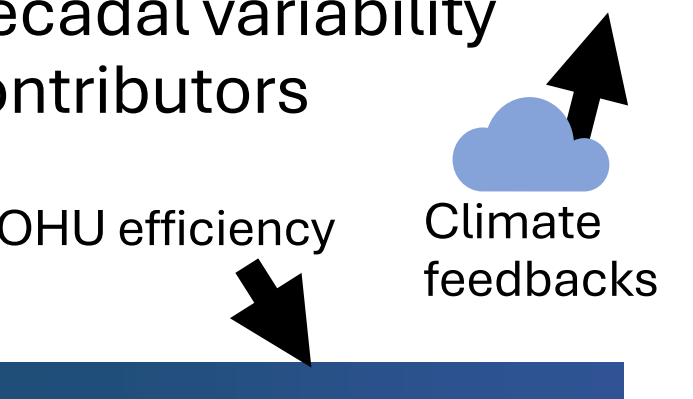
Ongoing Work...

ForceSMIP



:: Project to estimate forced/unforced climate response

Decadal variability contributors



Observational inter-consistency

