

Investigating multi-decadal climate model opposite response to forcings.



INTERCOMPARISON

CLIMATE SYSTEM

FORCINGS

MULTI-MODEL

SUMMARY

I'm comparing the different climate model responses to see how each model behaves differently and whether you can exploit those differences. We can better understand the climate system through studying why these models are actually behaving differently. By quantifying the uncertainties in our forecasts, we can provide robust information that is useful for others.



FULL NAME

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EXPERTISE

Climate Intercomparison

Can you explain why/how your expertise is related to climate change?

Melissa Seabrook: I wasn't actually involved in climate science until I'd finished my master's in computational cosmology. At that time, I was looking at large-scale simulations of galaxies to investigate their evolution and morphological changes. Although I really enjoyed the research, I struggled with its lack of a real-world application. I switched my focus to climate modelling and ended up in decadal climate prediction at the Met Office about five years ago.

One half of my job is working on operational climate prediction through the Met Office being WMO Lead Centre for Annual to Decadal Climate Prediction! I get to be involved in the briefing where we translate science into an operational service and a consequent press release. The different perspectives on what is interesting to the users of our climate information bring, is challenging but eye-opening at the same time. The other half is to work on my research, where the EXPECT project helps fund my PhD design based on personal interests.

How is your research contributing to filling the gaps in understanding and predicting regional climate changes and extreme weather?

M-S: I try to figure out how changes in multi-decadal circulation link to extreme events. By analysing how climate models respond to forcing such as volcanic outbursts and greenhouse gases, we can check how similar the models are. Each model has a different underlying structure, so opposite responses to the forcing cause suspicion.

Right now, one of the big problems is that none of the models captured the cooling trend that has been observed in the Pacific Ocean. It's a very puzzling phenomenon that needs further investigation by looking at patterns in atmospheric circulation and physical relationships (Figure 1).

However, trust in these models should not dwindle as they perform well in other regions of the world and capture global warming signals especially well. Presenting that robust information with quantified uncertainties is useful for others.

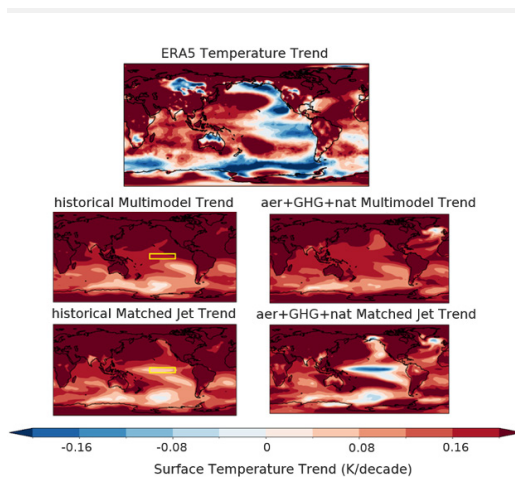


Figure 1: Temperature trends for 1979-2014 for observations (top) and models (middle), and a sub-selection of models which have the observed Pacific Jet Trend. Historical (all-forcing, left) models are not able to capture the tropical Pacific cooling trend even when the Pacific jet trend is close to observed. The addition of single forcings (natural +Greenhouse Gas + aerosol), however is able to capture this trend when Pacific jet matching is applied.

What are the key solutions/recommendations?

M-S: I try to do as much outreach as I can. Either by doing some visits to schools to talk about climate change, or participating in citizen panel talks about climate change (Figure 2). It's important not to phrase it in a negative light, but to have a positive take-home message at the end.

Going from 'what is going on' to 'what solutions are out there' and 'what do we need to do in order to reach solutions'. In the citizen panels, you always get a few people who don't believe in climate change.

It's very difficult for me to understand why they think that. It could be mistrust of science and the government. And although some people are very set in their ways and will not really listen to what you're telling them, on a few occasions I have managed to persuade someone that climate change is real, which was incredibly rewarding. It's easy to get stuck in your bubble of thinking that everyone around you thinks the same thing. But that's definitely not the case.



Figure 2: Participating in an outreach stall for Climate Services Week in 2022 hosted at the Met Office

LOOKING FORWARD



By looking at the large differences between low and high emission scenarios, it is highlighted that we actually do have an opportunity to make a difference. The ability to see the impact on life that we can have by making these different decisions is really important. Better model understanding, especially of the large uncertainties associated with them, helps explain how our world responds to these forcings. Its transparent outputs can then stimulate collaborations between scientists and policymakers.

WHY A SCIENCE EXPLAINER



Through short, focused questions, project researchers share what they study, why it matters, and how their investigations lead to real-world findings.



By opening up the day-to-day challenges and thinking behind climate research, these explainers make science more accessible, transparent, and trustworthy for other researchers and decision-makers alike.



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