

Quantitative impact of the pattern effect on historical warming

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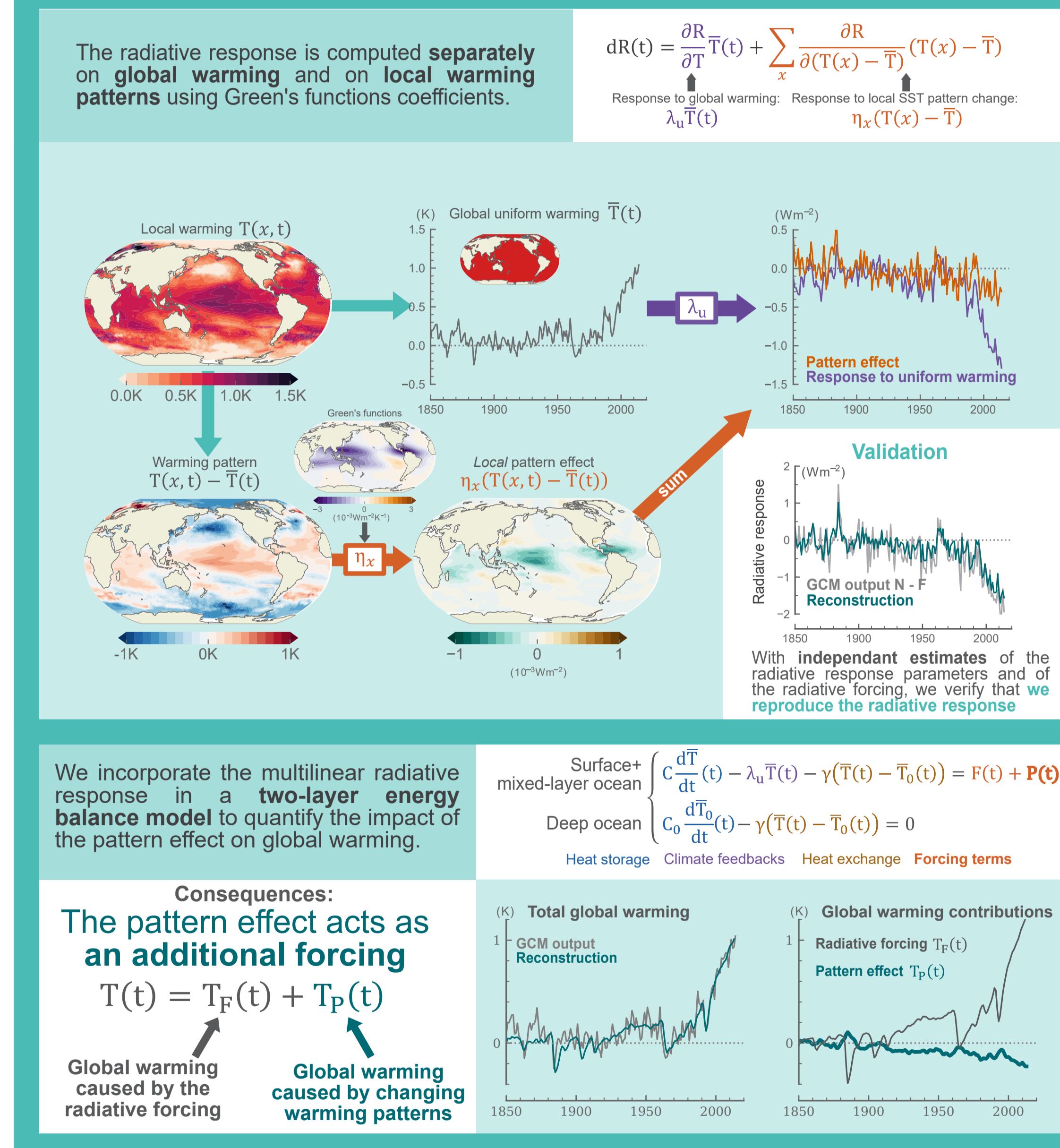
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CONTEXT

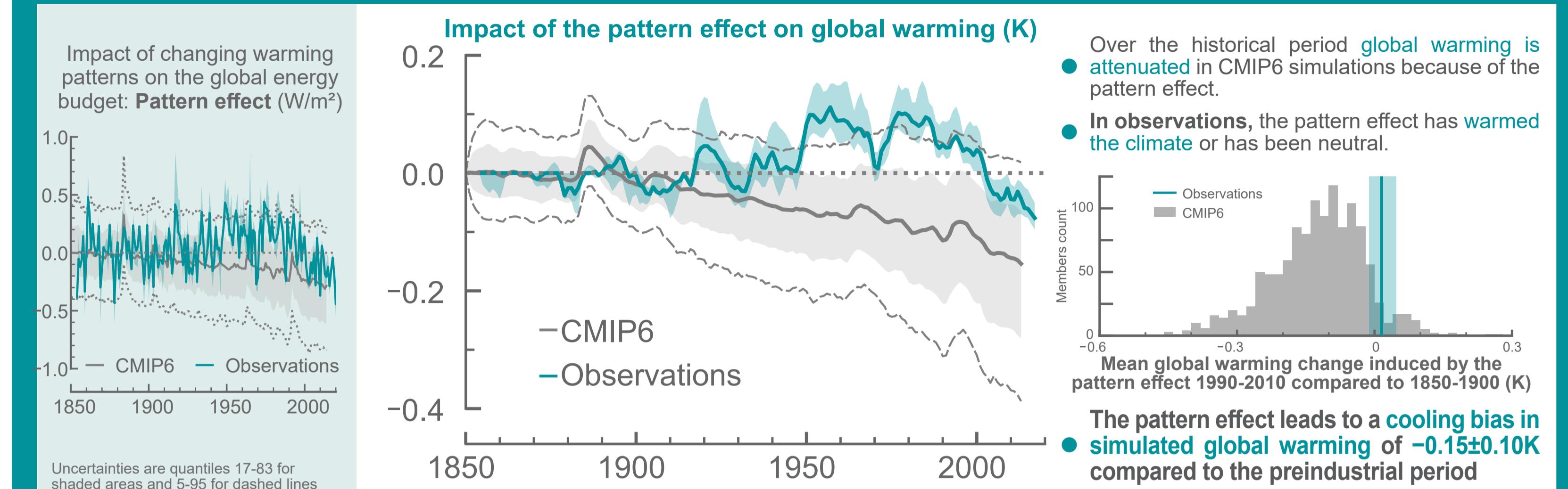
The spatial patterns of surface warming influence the Earth's response to radiative forcing as they affect climate feedbacks: **this is called the "pattern effect"**. While the latest generation of climate models accurately simulate global warming since the industrial revolution, recent studies highlight that they generally fail to replicate the observed warming patterns. These biases should translate into biases in the Earth energy imbalance, which eventually influences the rate of global warming. **In this study, we use a novel analytical method to explore such potential biases and to quantify the impact of the pattern effect on historical global warming.**

METHOD

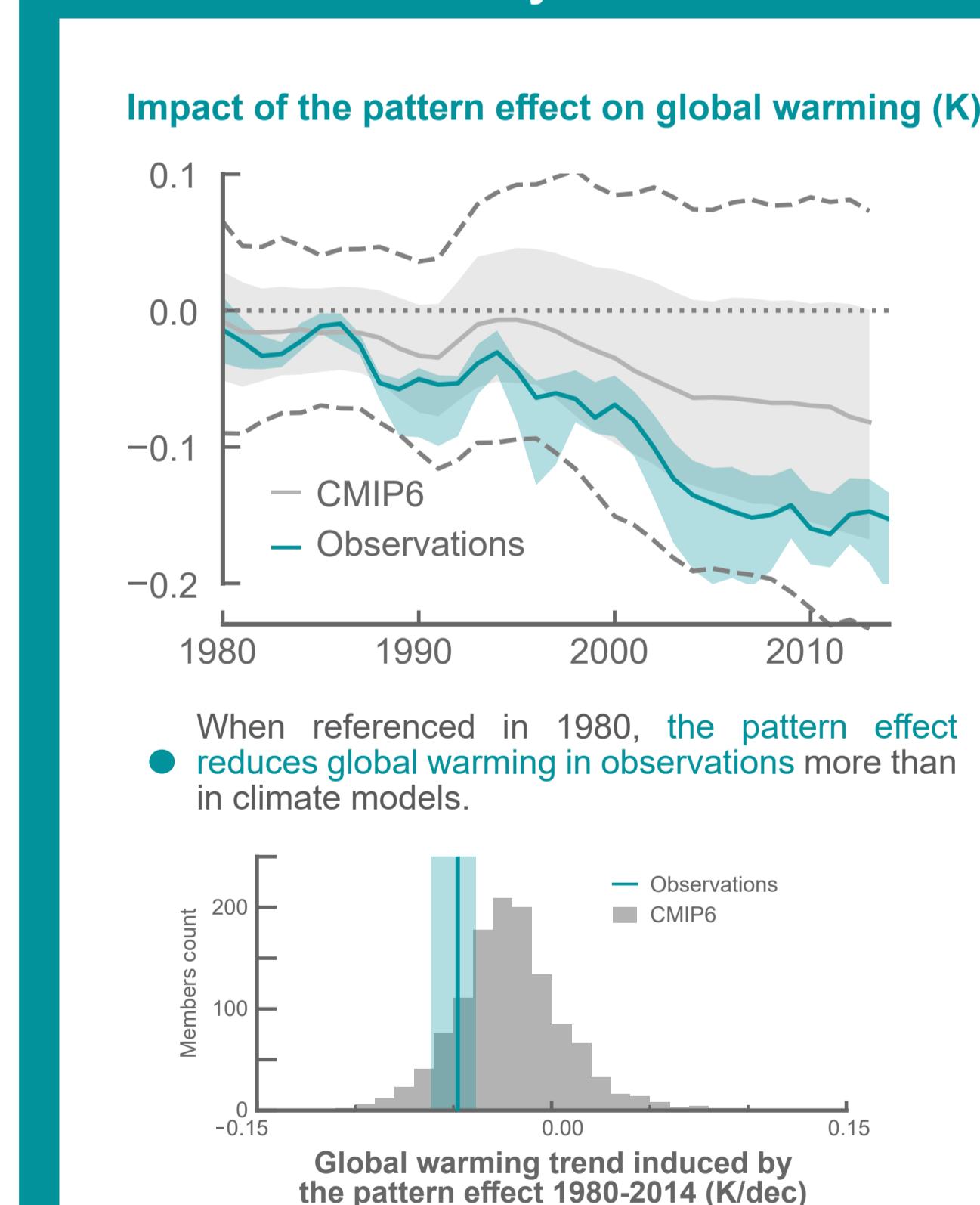


RESULTS

Over the full historical period, the pattern effect has reduced global warming in climate model simulations but not in observations



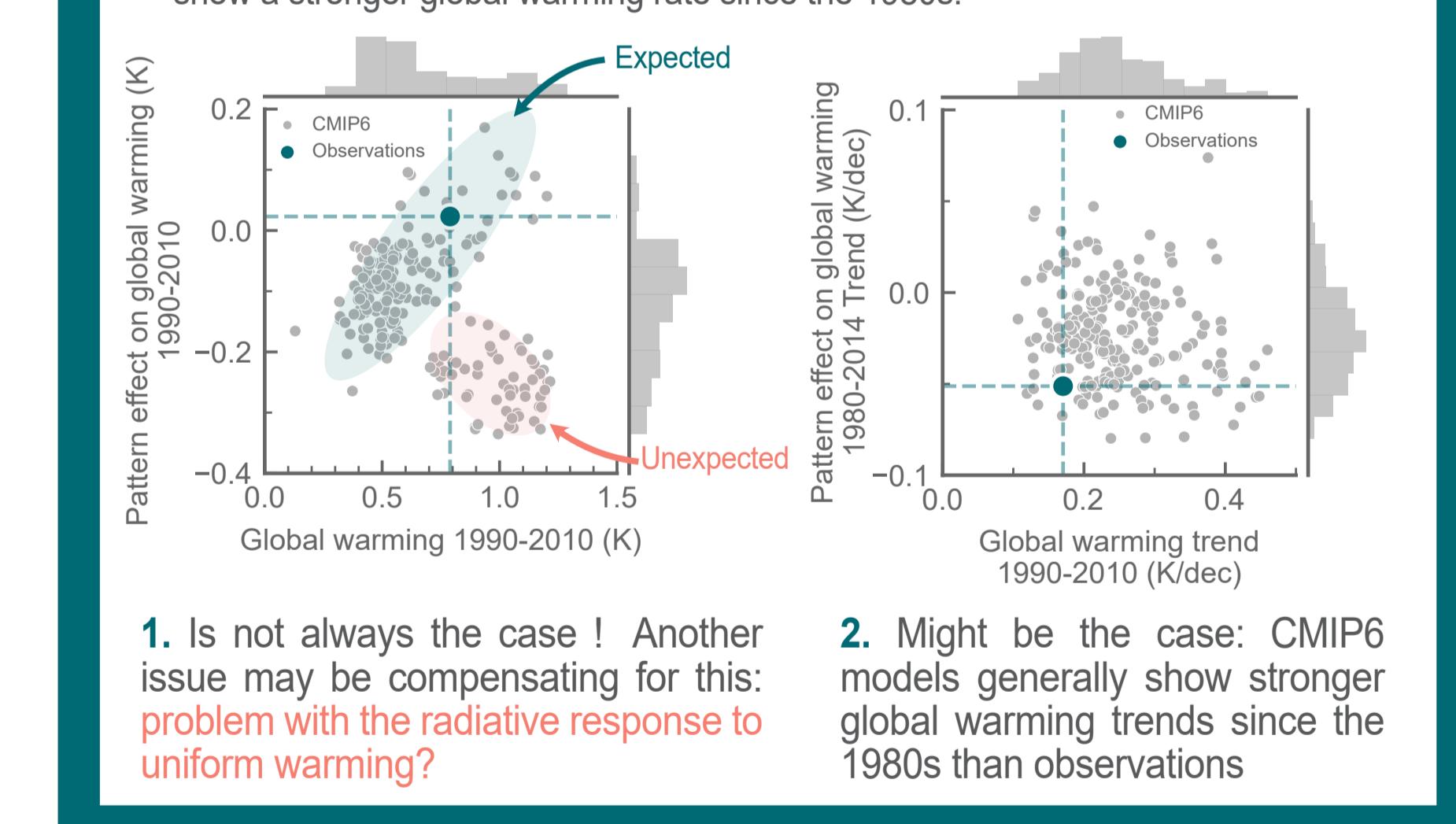
The pattern effect has reduced global warming more in observations than in climate models only since the 1980s



The cooling trend since 1980 induced by the pattern effect that is stronger in observations than climate models is **only part of the story !**

CONSEQUENCES

Our analysis has two consequences **1.** historical simulations should have less overall global warming than observations, and **2.** historical simulations should show a stronger global warming rate since the 1980s.



MORE INFOS

Contact me at r.guilcas@outlook.com

Read a **paper** on the decomposition of the radiative response in *Journal of Climate*: Meyssignac, Guillaume-Castel & Roca

Read a **preprint** on the method to quantify how the pattern effect affects global transient warming: Guillaume-Castel & Meyssignac

Meyssignac, B., Guillaume-Castel, R., & Roca, R. (2023). Revisiting the global energy budget dynamics with a multivariate Earth energy balance model to account for the warming pattern effect. *Journal of Climate*, 36(23), 8113-8126.