

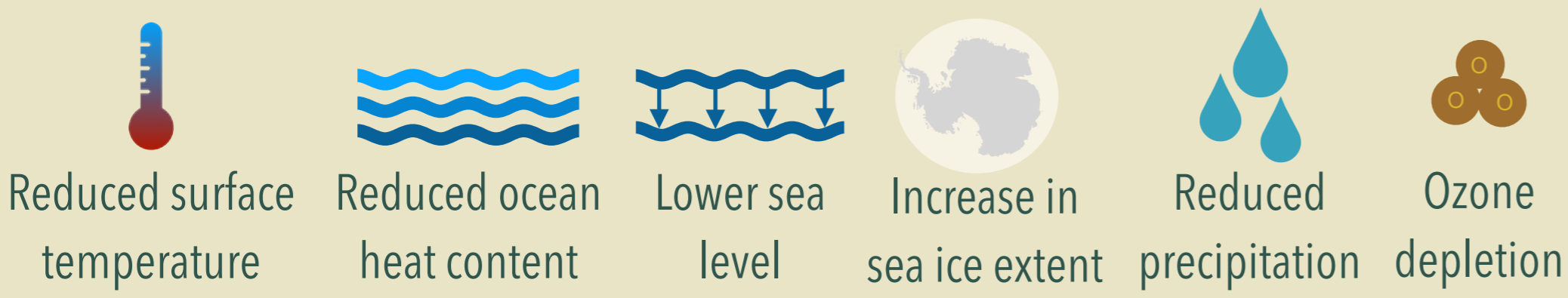
Future volcanic cooling *very likely* underestimated in climate projections used by IPCC



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1 Why study volcanic eruptions?

Explosive volcanic eruptions can cause **global surface cooling** and **complex climate responses**.



Understanding future climate effects of volcanoes allows:

- Better constrains of future global surface temperature to **inform climate policies**
- Better preparedness for **future climate hazards** caused by volcanic eruptions

3 How do our volcanic futures compare with that used in IPCC?

Most climate simulations (in IPCC) assumed that volcanoes inject an **average of 0.7 ± 0.06 Tg per year of sulphur dioxide** into the upper atmosphere.

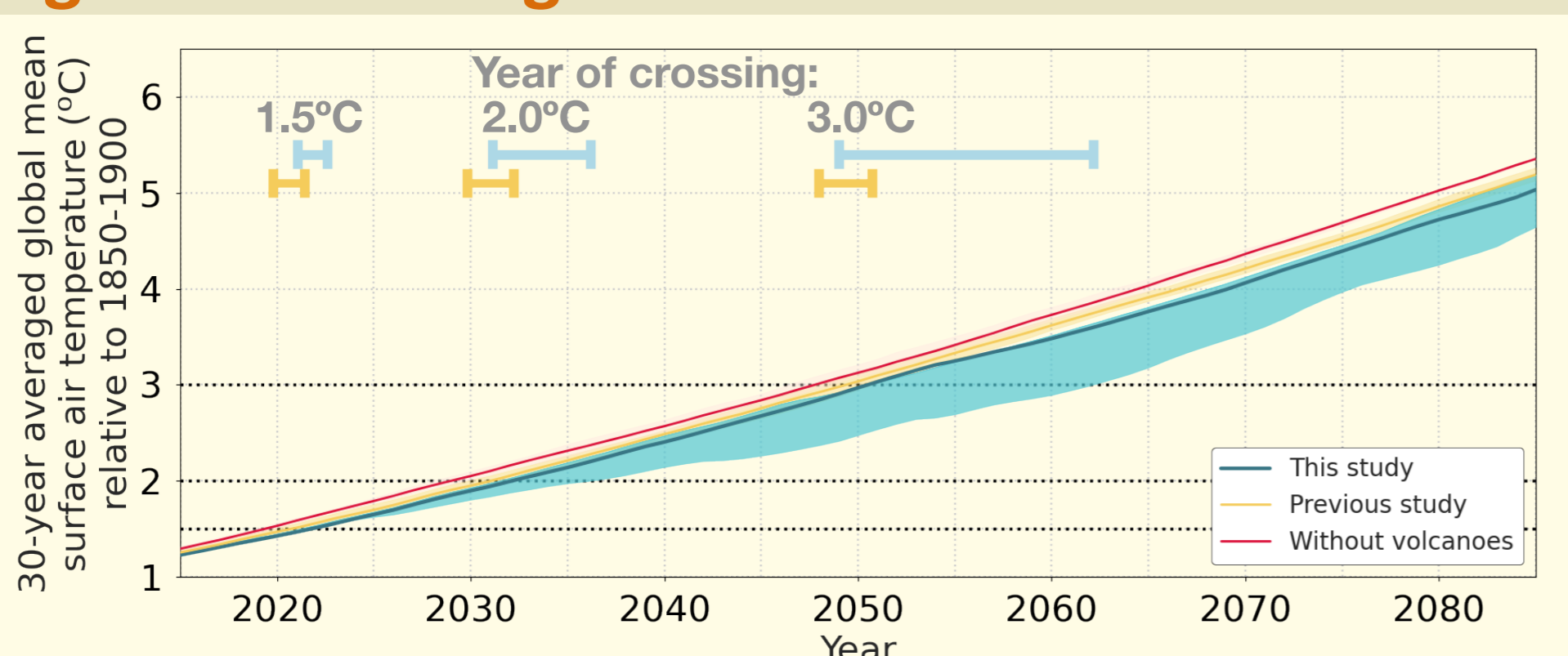
Out of our 1000 futures, 950 have higher volcanic injections.

95% chance of a future with higher sulphur flux than previously assumed.

5 Future temperature projections

Volcanic eruptions can **delay** the crossing of key policy-relevant temperature limits by 2-7 years in a worst case future warming scenario.

Volcanic eruptions **do not offset the overall global warming trend**.



2 How do we estimate climate effects of future eruptions?

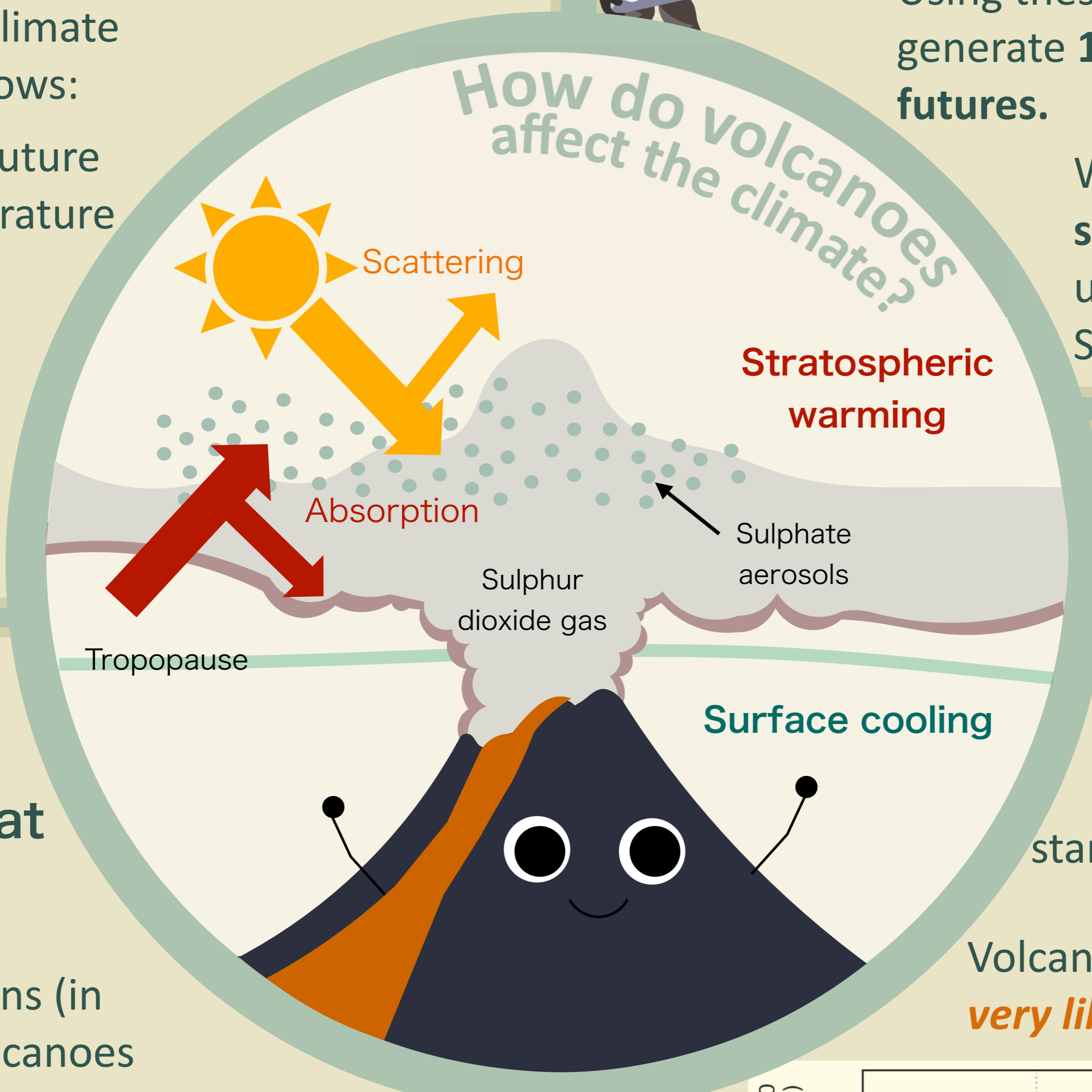
The past is the key to the future!

Ice cores and **satellites** can inform us about historical eruptions in the past 11,500 years.



Using these historical records, we generate **1000 plausible volcanic futures**.

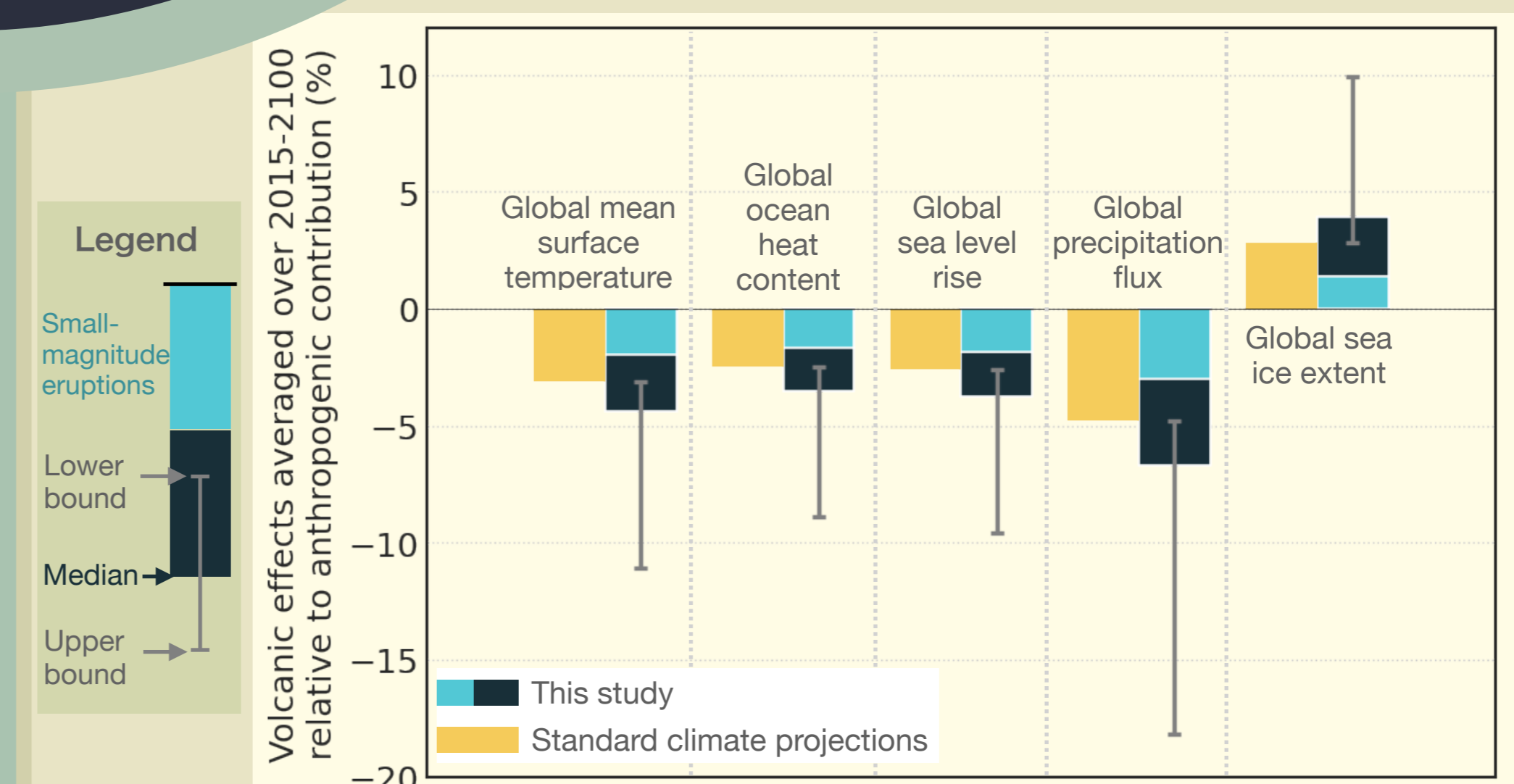
We simulate **selected futures** using the UK Earth System Model.



4 Implications for future climate

Our volcanic futures can offset **0.16°C to 0.56°C of global warming**, as compared to 0.12°C in standard climate simulations.

Volcanic effects on climate are **very likely underestimated**.



Conclusions

Correctly accounting for future eruptions in models is crucial for **more accurate climate projections**, facilitating **informed decision-making, hazard preparedness, and mitigation strategies**.

Climate models play a pivotal role in **advancing interdisciplinary research** on volcanic eruptions and climate modelling.

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