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Evaluation of hydrological cycle intensification in response to temperature variability

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Outline

- Background
- Methodology
- Results
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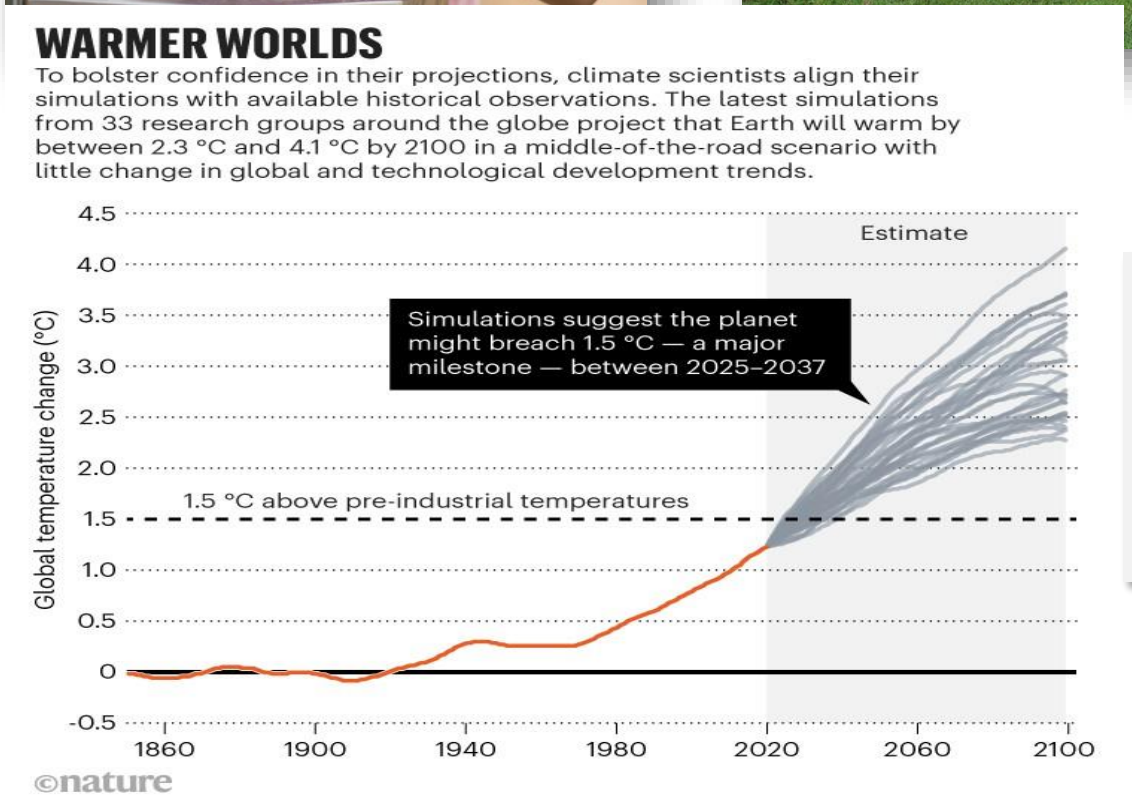
Background



Source: Zeke Hausfather/Coupled Model Intercomparison Project Phase 6

- A Warming Earth is also a Wetter Earth[1,2,3,4].
- Expected to intensify the global hydrologic cycle[5,6].

Methodology

- Investigated the precipitation response during different geological periods with significant temperature shifts.

- The review of 417 paleoclimatic articles

- The periods we investigated are-

  - Mid-Miocene Climate Optimum (17 - 14.5 my BP)
  - Eemian Interglacial Stage (130 - 116 ka BP)

  Distant past

  - Last Glacial Maximum (30 - 15 ka BP)
  - Dansgaard–Oeschger and Heinrich Events (80 - 14 ka BP)
  - Bølling-Allerød (14.8 - 12.85 ka BP)
  - Younger Dryas (13 - 11.7 ka BP)

  Last Glacial

  - 8.2 ka event (8.2 ka BP)
  - Medieval Climate Anomaly (800 - 1350 CE)
  - Little Ice Age (1350 - 1900 CE)

  Holocene

Million years = my
Thousand years = ka
Before present = BP
Common Era = CE

Results

WARM PERIODS

Warm & Wet

- Mid-Miocene Climate Optimum
  Temperature = 3 to 8ºC
- Eemian Interglacial Stage
  Temperature = 1.3 to 5ºC
- Dansgaard–Oeschger
  Temperature = 10 to 15 °C (regional)
- Bølling-Allerød
  Temperature = 2.5 to 3.2°C

Warm & Dry

- Medieval Climate Anomaly
  Temperature = 0.3 to 1°C

COLD PERIODS

Cold & Dry

- Last Glacial Maximum
  Temperature = -3 to -6ºC
- Heinrich Events
  Temperature = -5 to -8ºC
  (regional)

Cold

- Younger Dryas
  Temperature = -4 to -7ºC
- 8.2 ka event
  Temperature = -0.9 to -1.8 º C

Cold & Wet

- Little Ice Age
  Temperature = -0.5 to -1.5°C

Pre-industrial – 1850 to 1900

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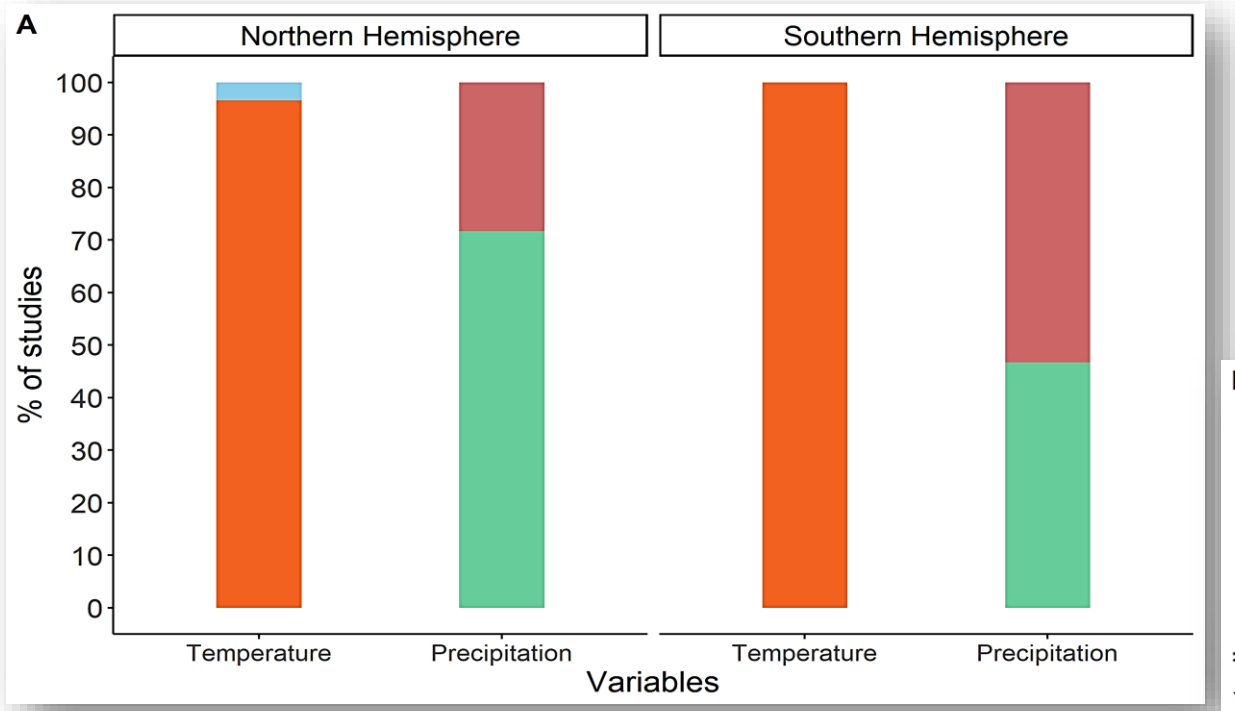
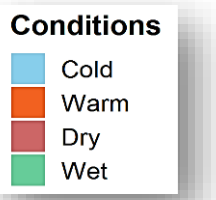
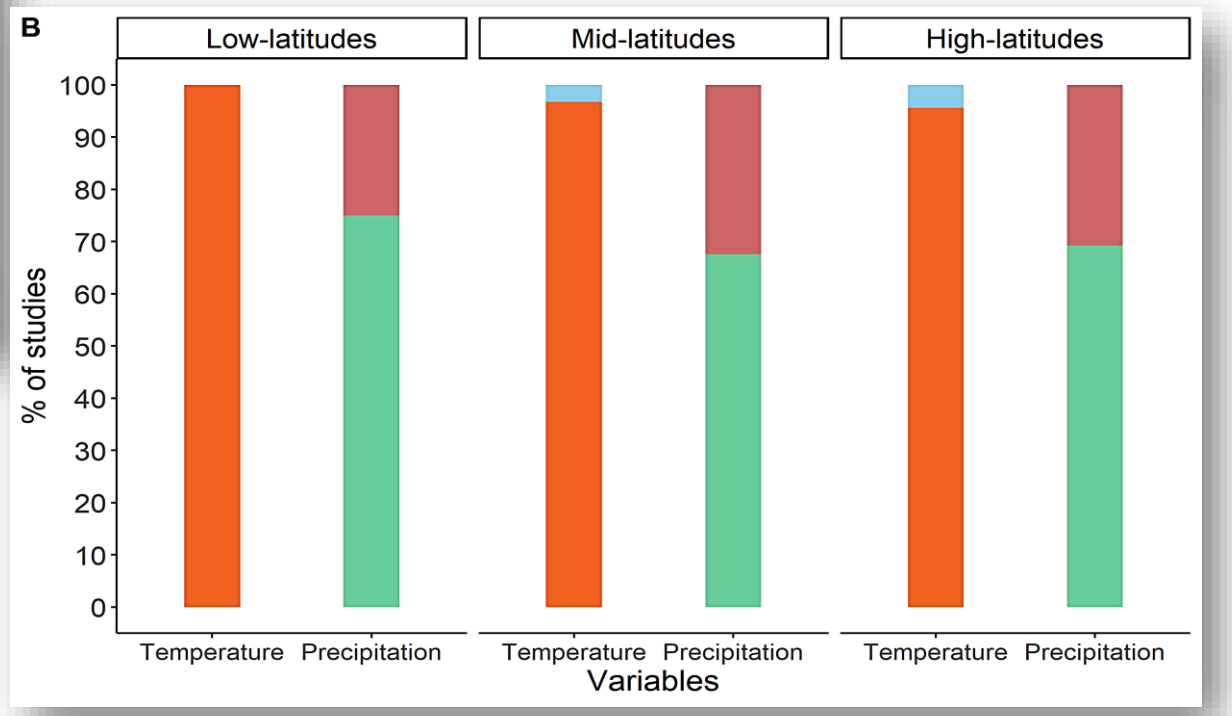
Results: warm periods







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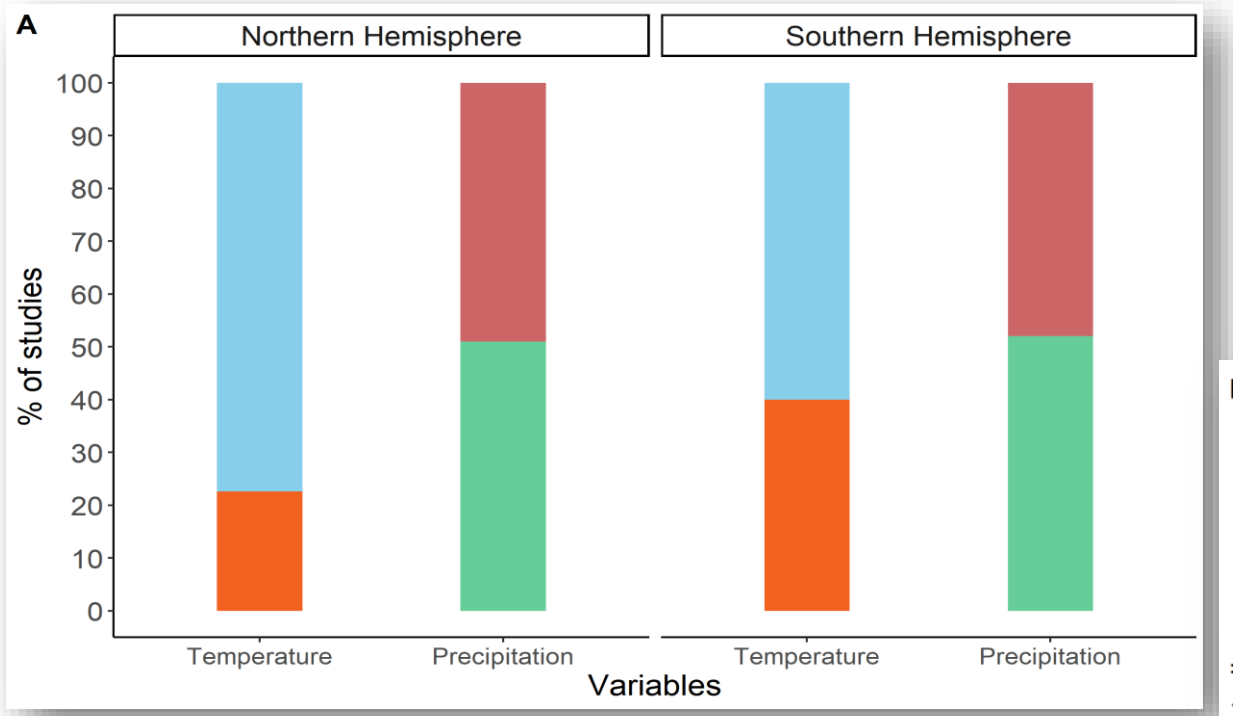
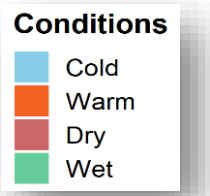
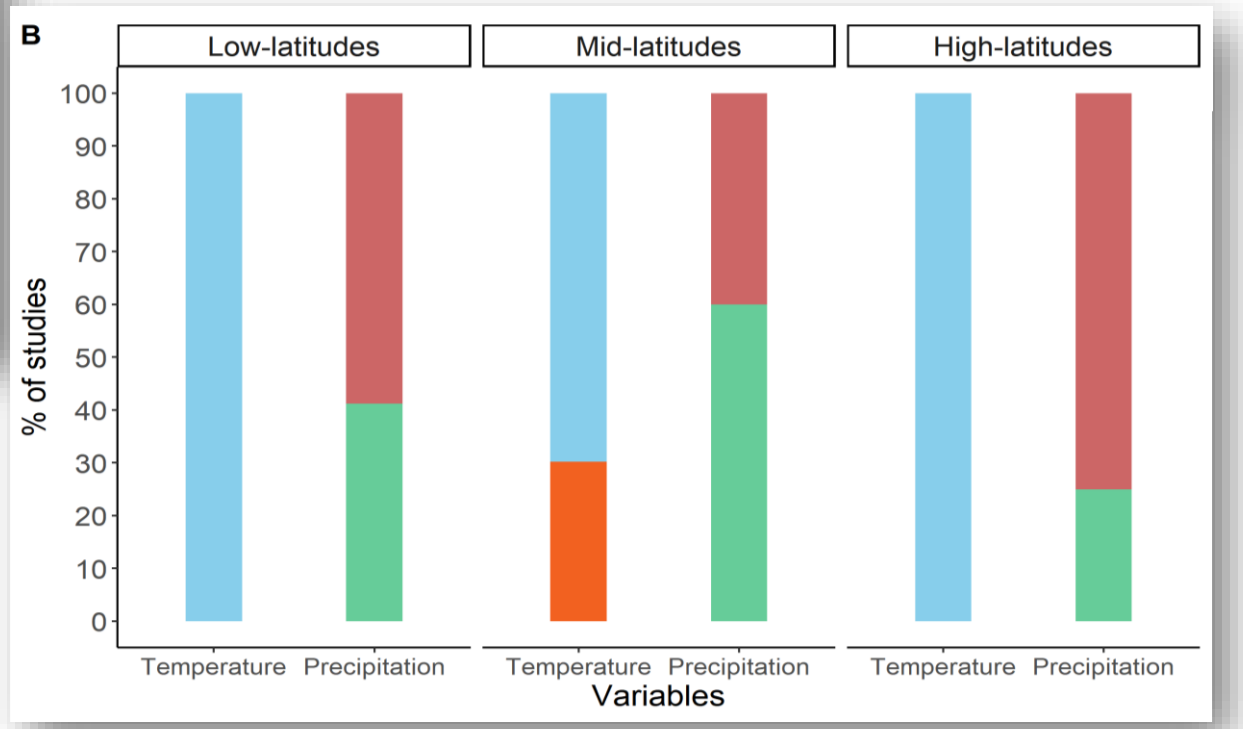
Results: cold periods







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Conclusions

- Higher temperatures appear more strongly related to wet conditions than lower temperatures to dry

- The spatial signals are not uniform worldwide.

- Global/hemispheric studies: thermodynamic response

  Spatial scale: changes in atmospheric and oceanic circulation[7,8]

- Understanding the past hydrological cycle during warmer periods might shed more light on its response to temperature variability

Thank You

Our climate is our future, Our future is in our hands

We are thankful to the EGU committee for
allowing us to participate and present our work.

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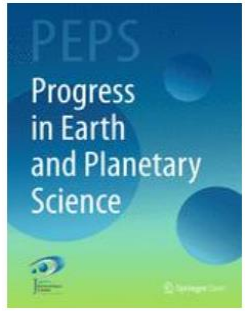
The response of the hydrological cycle to temperature changes in recent and distant climatic history

Shailendra Pratap* and Yannis Markonis



Abstract

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