

# Global climate changes during the most recent two millennia

*Sarah Eggleston<sup>1</sup>, Oliver Bothe<sup>2</sup>, Nerilie J. Abram<sup>3</sup>, Bronwen L. Konecky<sup>4</sup>, Hans W. Linderholm<sup>5</sup>,  
Belen Martrat<sup>6</sup>, Helen McGregor<sup>7</sup>, Steven J. Phipps<sup>8</sup>, Scott St George<sup>9</sup>*

*(1) PAGES International Project Office, Bern, Switzerland*

*(2) Helmholtz-Zentrum Geesthacht Centre for Materials and Coastal Research, Geesthacht, Germany*

*(3) The Australian National University, Canberra, Australia*

*(4) Washington University, St. Louis, USA*

*(5) University of Gothenburg, Gothenburg, Sweden*

*(6) Institute of Environmental Assessment and Water Research (IDÆA-CSIC), Barcelona, Spain*

*(7) University of Wollongong, Australia*

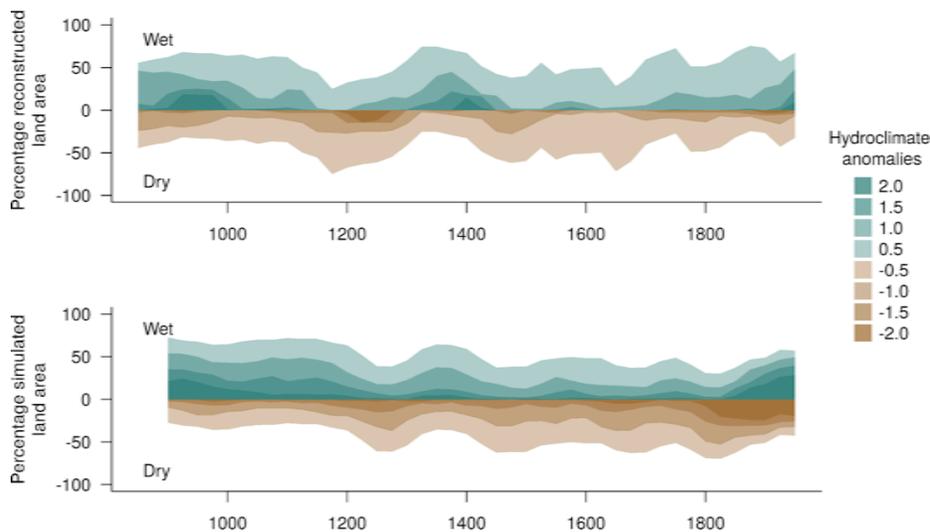
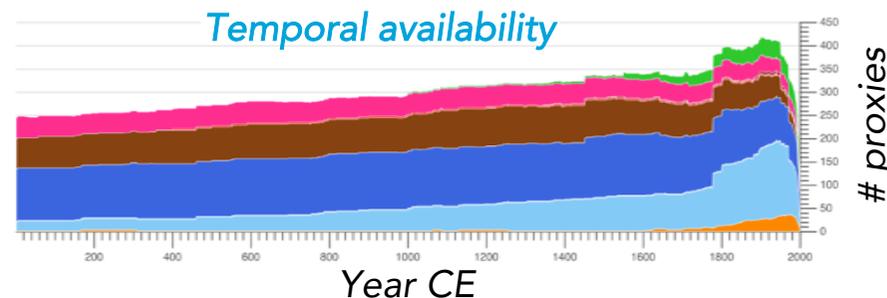
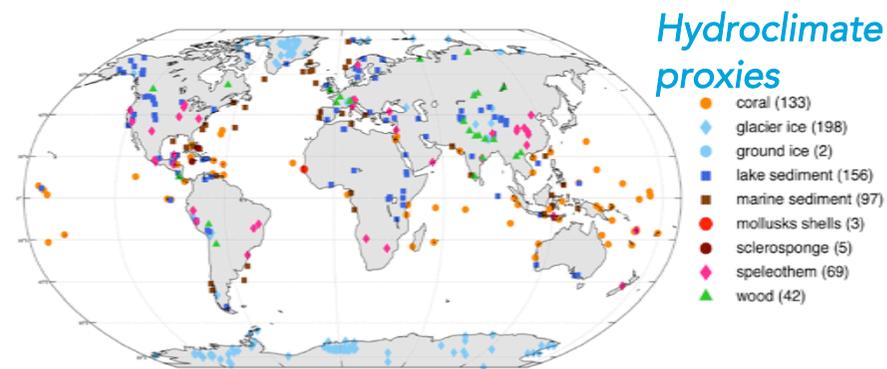
*(8) University of Tasmania, Hobart, Australia*

*(9) University of Minnesota, Minneapolis, USA*

# Hydroclimate of the Common Era

Archive types, distribution as well as temporal availability of the Iso2k database, a global compilation of  $\delta^{18}\text{O}$  and  $\delta\text{D}$  records, to investigate spatiotemporal variability and secular trends in global hydroclimate.

Konecky et al. (2018) doi: 10.1029/2018EO095283  
 More information about Iso2k: [pastglobalchanges.org/iso2k](http://pastglobalchanges.org/iso2k)



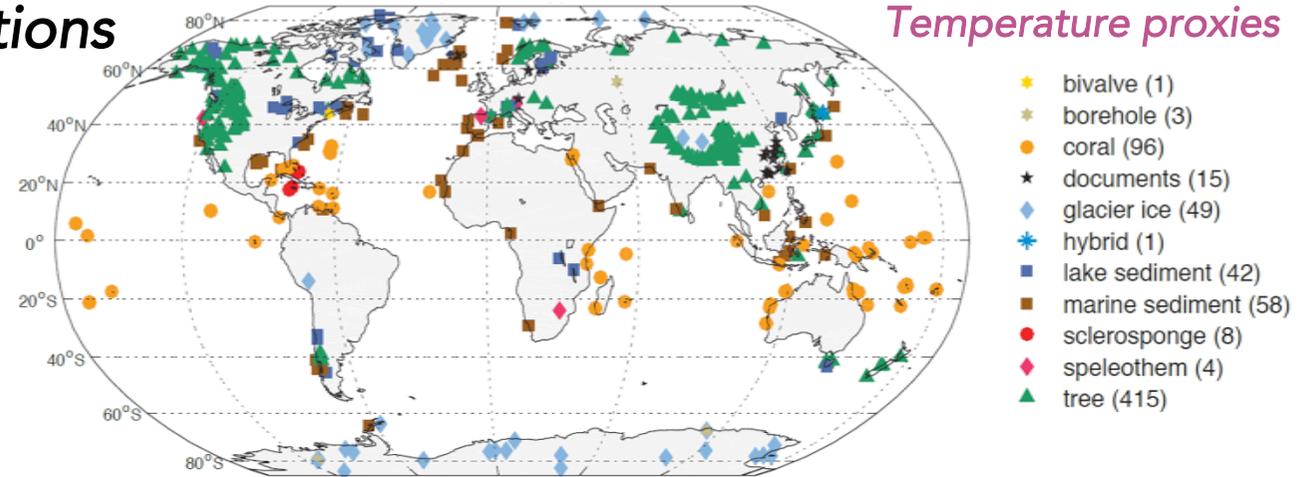
< Spatially resolved reconstructions and simulations of precipitation across the Northern Hemisphere for the past 1200 years are not in agreement, suggesting further investigation of the potential for systematic errors in each.

PAGES2k-PMIP3 group (2015) doi: 10.5194/cp-11-1673-2015  
 Ljungqvist et al. (2016) doi: 10.1038/nature17418 (figure modified)

# Temperature reconstructions

Archive types and distribution of the database temperature-sensitive proxy observations and metadata covering the 2k interval.

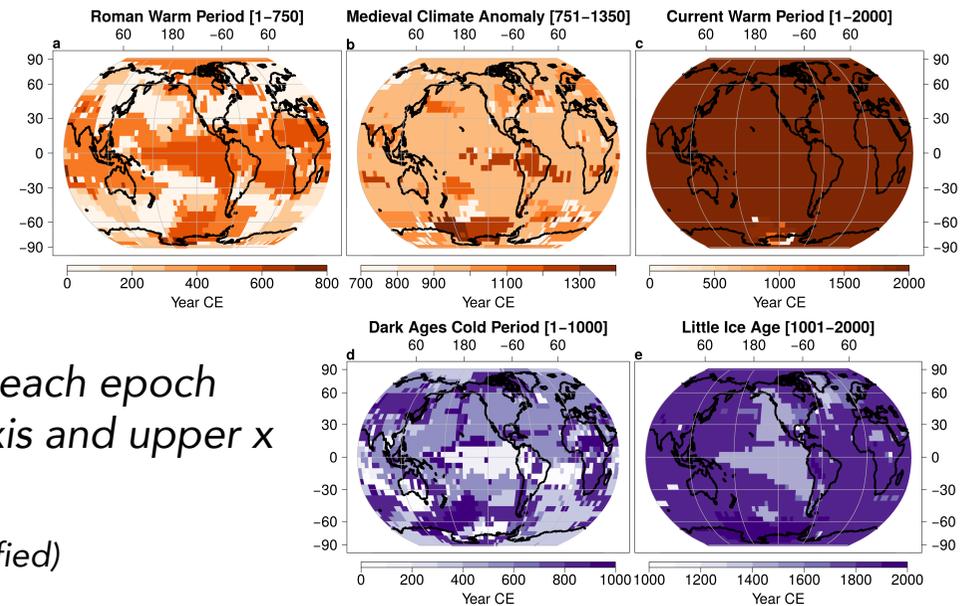
PAGES 2k Consortium (2017)  
doi: 10.1038/sdata.2017.88



No globally consistent warm or cold periods during the preindustrial Common Era

Timing of peak warm and cold periods. Centuries with the highest probability of containing the (a-c) warmest and (d, e) coldest 51-year period climatic epoch from an ensemble of reconstructions. The full time ranges over which the search was performed for each epoch are indicated in parentheses. The numbers on the y axis and upper x axis are degrees latitude and longitude.

Neukom et al. (2019) doi: 10.1038/s41586-019-1401-2 (figure modified)



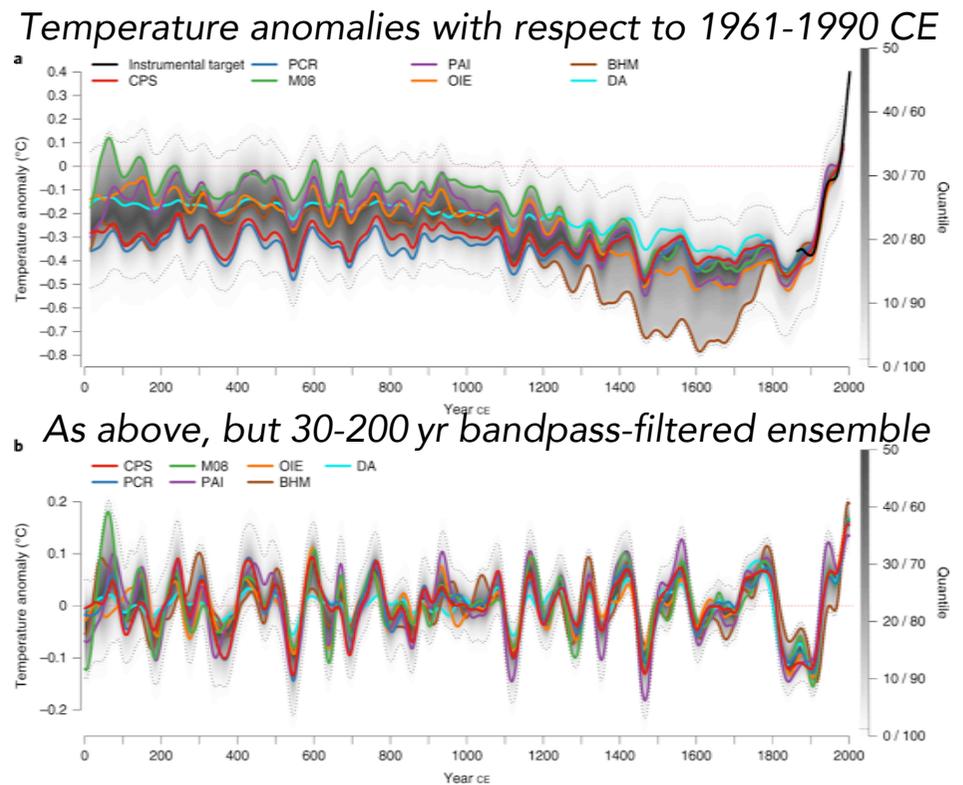
# Global temperature reconstructions and simulations: Multidecadal variability

Global mean surface temperature history over the Common Era from an ensemble of reconstructions.

1. Temperature anomalies with respect to 1961-1990 CE. The colored lines represent 30 yr low-pass-filtered ensemble medians for the individual reconstruction methods. The grey shading shows the quantiles of all reconstruction ensemble members from all methods (right-hand y axis); the 2.5 and 97.5 percentiles are indicated with black dotted lines. The black curve shows instrumental data for 1850-2017 CE.

2. Same as (a) but for the 30-200 yr bandpass-filtered ensemble. Instrumental data are not shown.

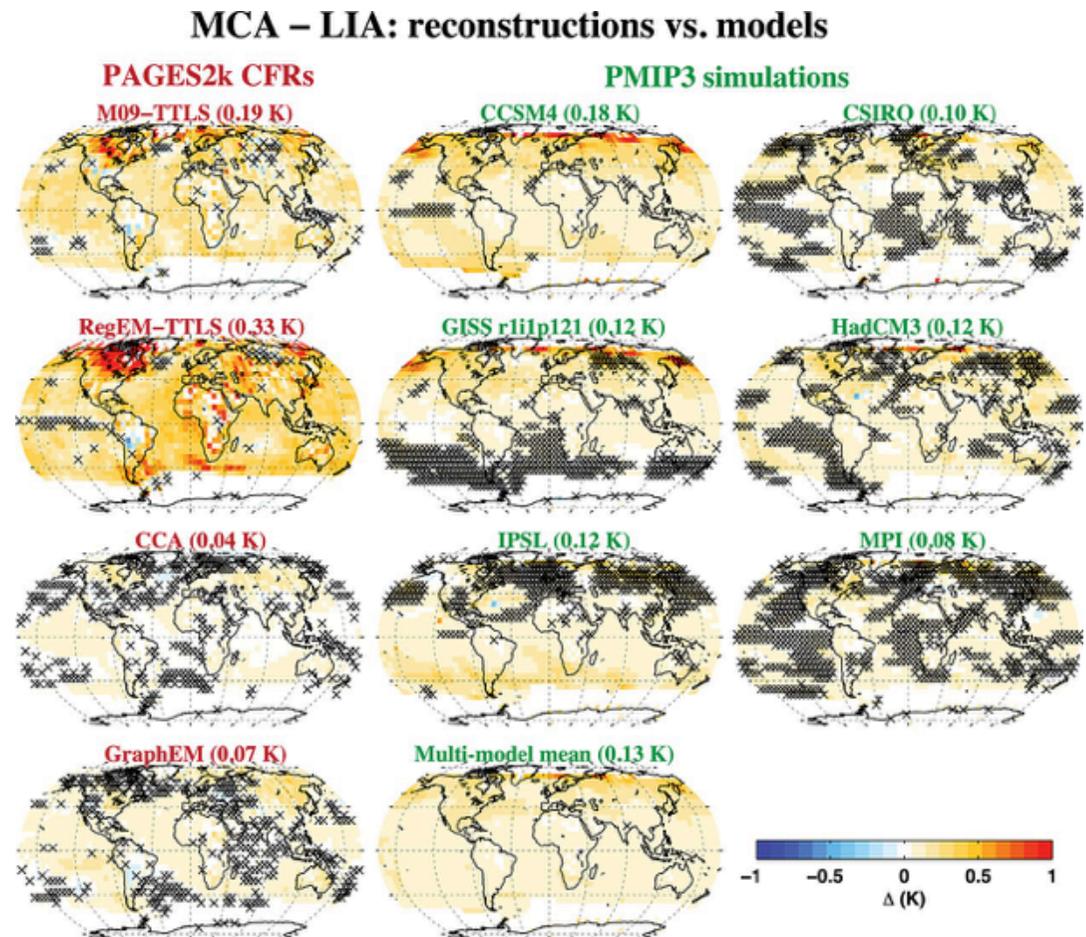
PAGES 2k Consortium (2019) doi: 10.1038/s41561-019-0400-0



## Differences and commonalities between reconstructions and simulations

Reconstructed and simulated temperature difference between the Medieval Climate Anomaly (MCA; 950-1250 CE) and the Little Ice Age (LIA; 1400-1700 CE). Note that all models are regridded to have  $5^\circ \times 5^\circ$  resolution. Grid cells marked with cross symbols represent insignificant ( $p \geq 0.05$ ) temperature difference between the MCA and LIA. Numbers above each map denote the (latitudinally) weighted global average values of the MCA-LIA temperature difference.

Wang et al. (2015) doi: 10.1002/2015GL065265



# Onset of industrial warming over continents and oceans

Onset of industrial-era warming in regional temperature reconstructions, consistent with simulations, was found to be earlier than previously suggested from historical observations.

*Abram et al. (2016) doi: 10.1038/nature19082*

