

Reconstruction shows increased global warming trends since 1850s

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Rebuilt Meteorological Pavilion at Hong Kong Ancient Observatory. Credit: Qingxiang Li

Earth is warming rapidly, but there is too little observational data in some regions like the Arctic and high-altitude areas like the Qinghai-Tibetan plateau. It is thus difficult to assess temperature variations accurately around the globe. To better understand how temperatures have increased, an international team led by researchers at Sun Yat-Sen University in China has released a newly merged global surface temperature dataset, including reconstructed land and marine measurements from the 1850s to 2018. The study provides evidence that there was a consistent increased warming trend compared with previous estimations, which closely matches the available observational data and updated simulations covering the past two decades.

The approach and results, including dataset description, were published on Jan 28 in *Advances in Atmospheric Sciences*.

"The global [surface](#) temperature is one of the most important and accurate essential climate variables in the Earth system, yet there are still a number of discrepancies among the evaluation of magnitude of global warming," said paper author Qingxiang Li, professor in the School of Atmospheric Sciences and Key Laboratory of Tropical Atmosphere-Ocean System, Sun Yat-Sen University, and in the Southern Laboratory of Ocean Science and Engineering in China.

"The importance of global complete coverage dataset is emphasized in recent studies of the 'hiatus' period, when global warming appeared to slow from 1998 to 2012, especially for observations of high-latitude regions such as the Arctic."

Li also noted that observed [surface temperatures](#) recorded over the decades appeared to increase slower compared to simulated models, but that could be explained by inaccurate tools or varied measuring practices.

To better understand how the globe has warmed, the team previously combined the global land surface temperature dataset with the extended reconstructed sea surface temperature dataset from the National Oceanic and Atmospheric Administration (NOAA) into the China Merged Surface Temperature (CMST) dataset. In this paper, they updated the CMST with a reconstructed global land surface temperature dataset, using ensembles from both datasets of land and sea surface temperatures.

"The resulting dataset is the CMST-Interim, a global monthly surface temperature dataset spanning 1854 to 2018," Li said, noting the new dataset includes improved coverage of the Earth's surface, with 90% of the globe include from the 1950s onwards. "The CMST-Interim shows a significantly increased warming rate of the [global surface temperature](#) compared to the original [dataset](#)."

The researchers previously found that the existing datasets overestimated surface temperature anomalies prior to the 19th century, yet underestimated surface [temperature](#) anomalies in the 21st century—explaining the appearance of the hiatus period.

Next, the team plans to continue improving and testing CMST-Interim, with a specific focus on improving the assessment of sea ice surface temperatures, and eventually upgrade CMST-Interim to a new version of CMST.

More information: Wenbin Sun et al. The Assessment of Global Surface Temperature Change from 1850s: The C-LSAT2.0 Ensemble and the CMST-Interim Datasets, *Advances in Atmospheric Sciences* (2021). [DOI: 10.1007/s00376-021-1012-3](https://doi.org/10.1007/s00376-021-1012-3)

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