Steady global surface warming through 2022, after a recent step-up in warming rate

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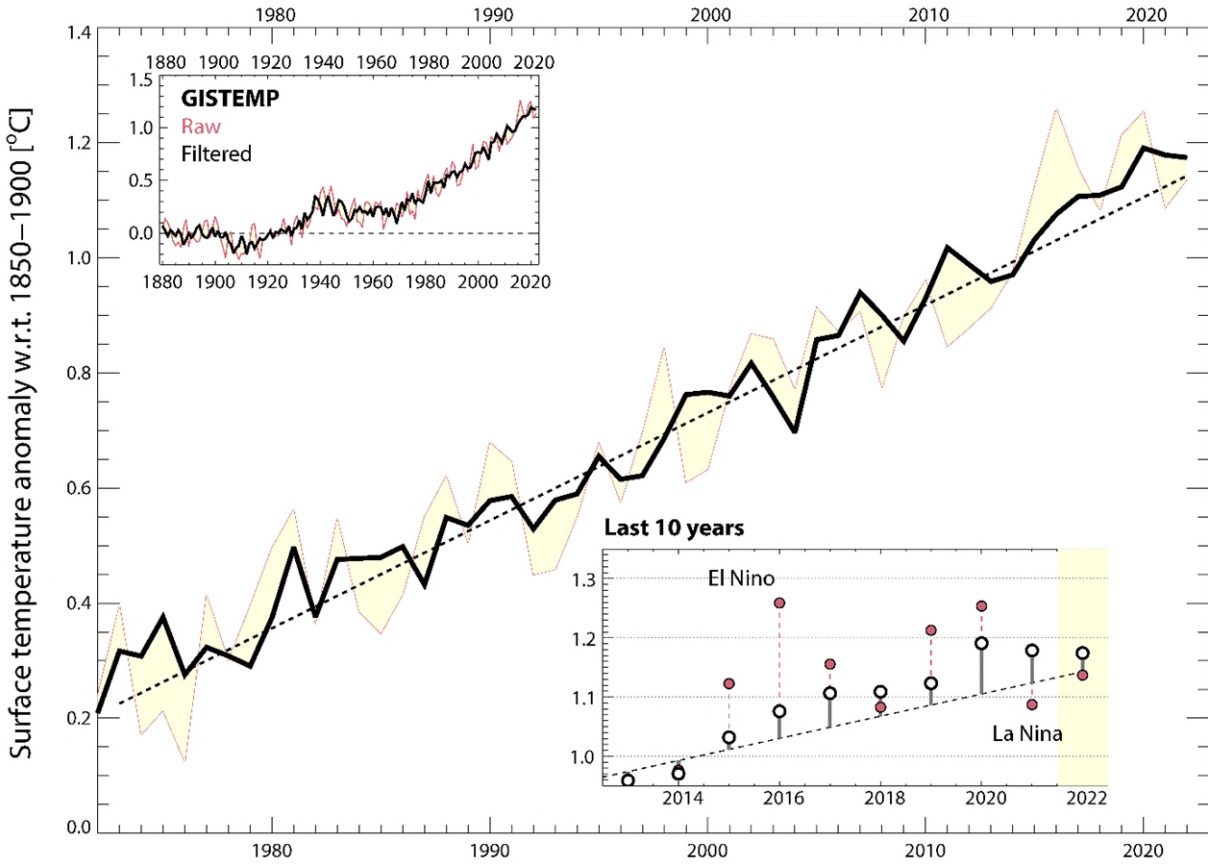
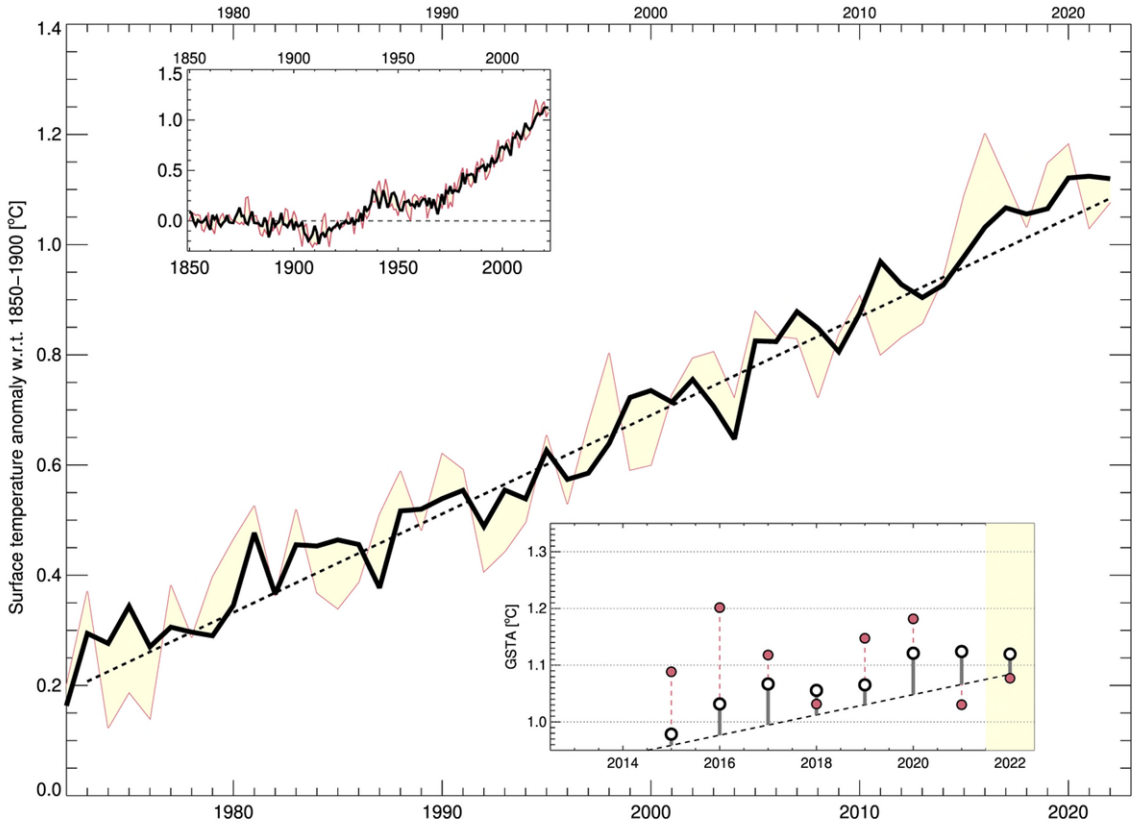
Supplementary materials

Supplementary Methods 1: Consistency check with other data series

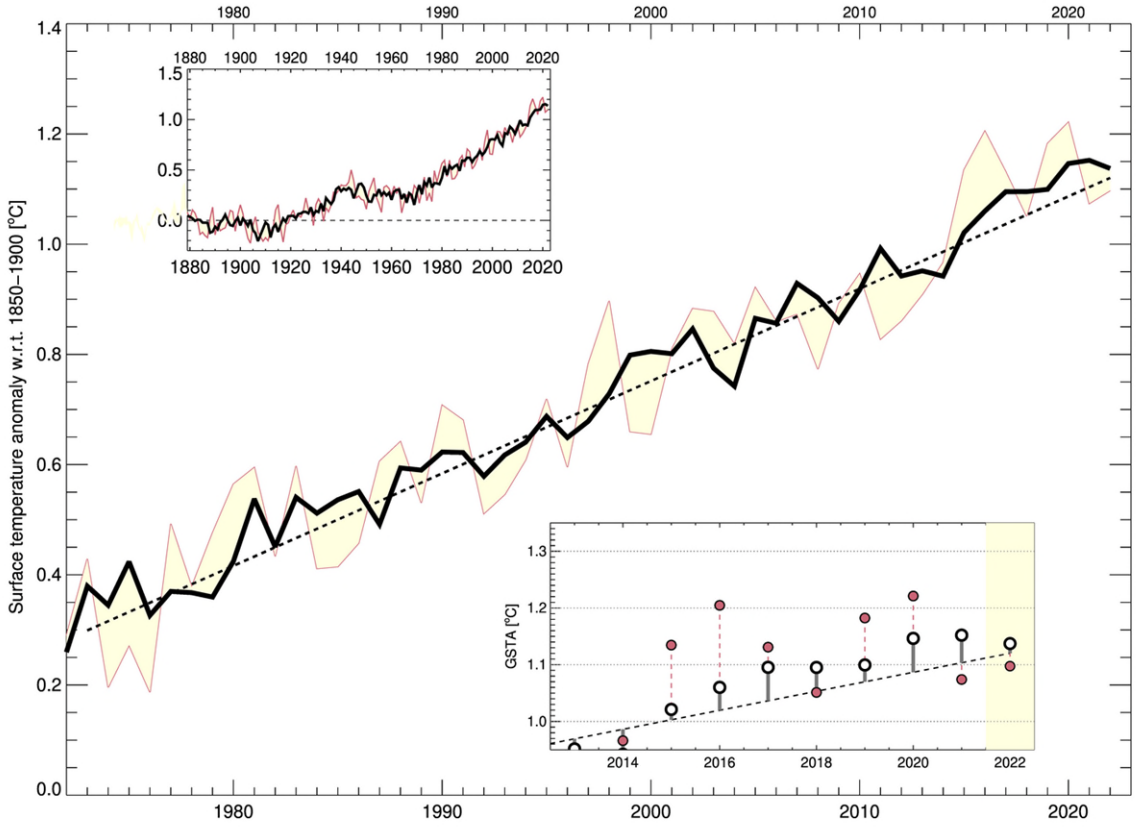
We performed an identical analysis to the one presented in the main manuscript, with GISTEMP, NOAA and BEST. Supplementary Figures 1-3 shows the resulting evolution of the global surface temperature anomaly, for all years (1880-2022), and the last 50 and 10 years. The overall conclusions are consistent with what was found for HadCRUT5.



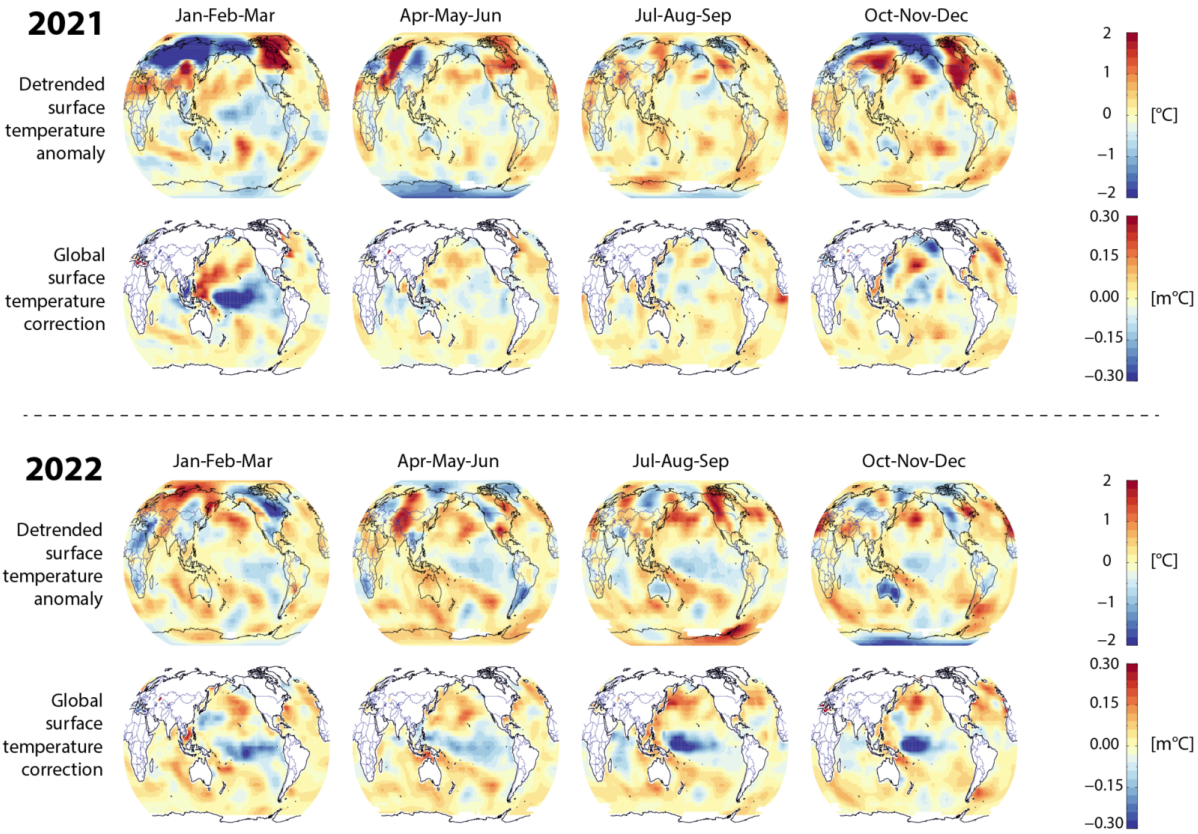
Supplementary Figure 1: Global, annual mean surface temperature anomalies from the GISTEMP data series, raw (red) and SST influence filtered via a model derived transfer function (black). The upper and lower insets show, respectively, the full data series since 1858, and the latest 10 years. Anomalies are taken relative to 1880-1899.



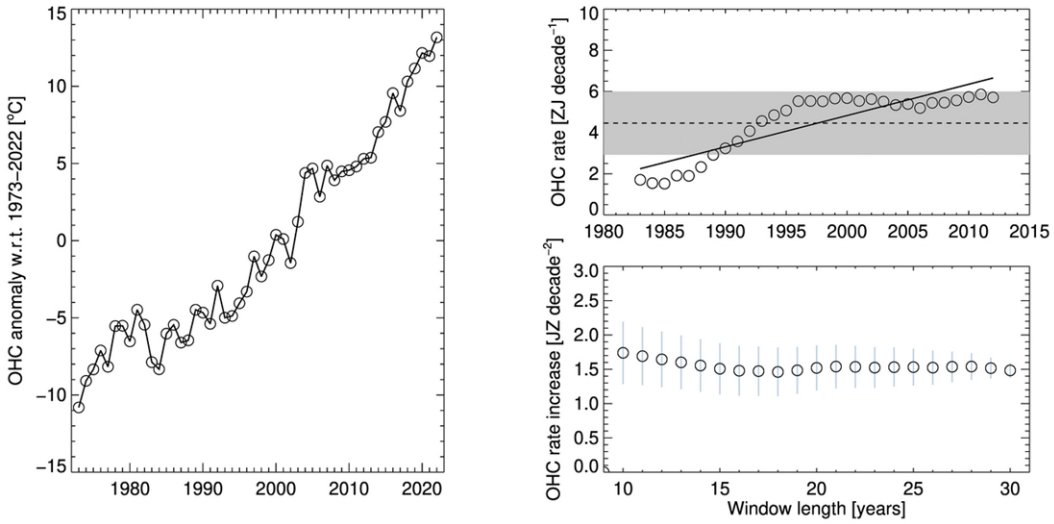
Supplementary Figure 2: As Supplementary Figure 2, for NOAA v5.1.



Supplementary Figure 3: As Supplementary Figure 2, for Berkeley Earth.



Supplementary Figure 4: The influence of SST fluctuations and regional feedbacks on global mean surface temperature anomaly, for the four seasons of 2021 and 2022. Top rows show the geographical pattern of surface temperature anomalies with long-term trends removed, bottom rows show the transfer function contribution to global temperature from each sea surface dominated grid point.

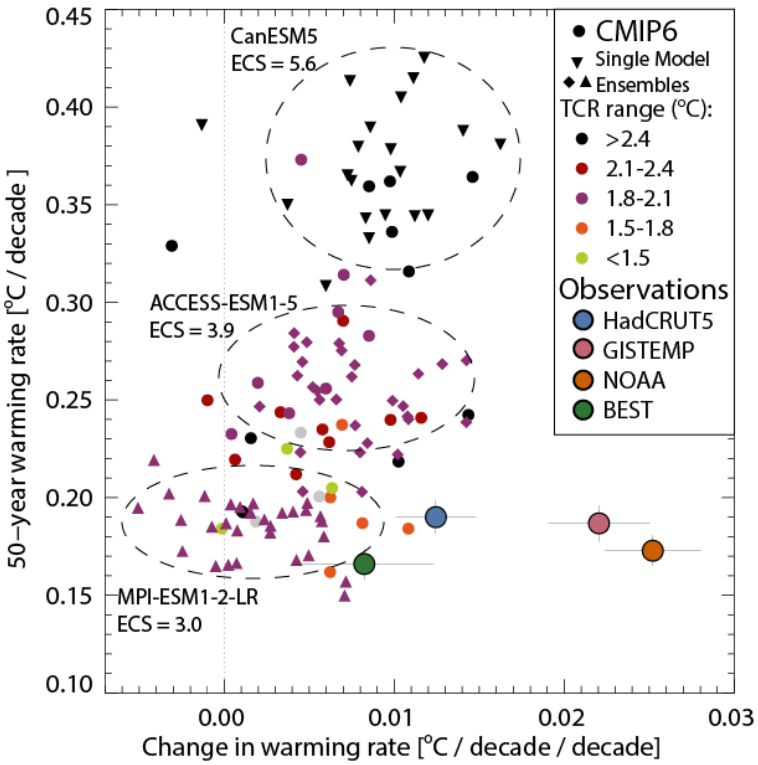


Supplementary Figure 5: Analysis similar to Figure 2, for NOAA Ocean Heat Content (OHC). (a) OHC anomalies relative to 1973-2022. (b) Time evolution of rate-of-change of 20-year regressions of OHC anomalies. The dashed line shows the 50-year rate of change, the yellow grey shows the 5-95% confidence interval of the 50-year regression. (c) Increase in rate-of-change (the regression coefficient from the fit in panel b), as function of the length of the fit window. Error bars are 5-95% confidence intervals from the regression.

Supplementary Methods 3: TCR analysis

In the main manuscript, Figure 2d shows the correlation between the recent step up in 20-year warming rates, and the 50-year warming rate over 1973-2020, for observations and CMIP6 climate model simulations. It also includes information on the Equilibrium Climate Sensitivity (ECS) of the models.

Here, we show the same figure (CMIP6 panel only), using Transient Climate Response (TCR) instead. The TCR values are from Zelinka et al. 2019 [1].



Supplementary Figure 6: As Figure 2d, but with Transient Climate Response (TCR) values instead of Equilibrium Climate Sensitivity.

Supplementary Methods 1: Climate models used

The following climate models were used for Figure 2. Number in parentheses indicate that multiple ensemble members were used.

ACCESS-CM2, ACCESS-ESM1-5 (30), AWI-CM-1-1-MR, BCC-CSM2-MR, CAMS-CSM1-0, CESM2-WACCM, CESM2, CNRM-CM6-1-HR, CNRM-CM6-1, CNRM-ESM2-1, CanESM5 (20), EC-Earth3-Veg (3), EC-Earth3 (7), FGOALS-f3-L, FGOALS-g3, FIO-ESM-2-0, GFDL-ESM4, HadGEM3-GC31-LL, HadGEM3-GC31-MM, INM-CM4-8, INM-CM5-0, IPSL-CM6A-LR (6), KACE-1-0-G (2), MCM-UA-1-0, MIROC-ES2L, MIROC6, MPI-ESM1-2-HR, MPI-ESM1-2-LR (30), MRI-ESM2-0, NESM3, NorESM2-LM, NorESM2-MM, UKESM1-0-LL

Supplementary References

1 Zelinka, M. D. *et al.* Causes of Higher Climate Sensitivity in CMIP6 Models. *Geophysical Research Letters* **47**, doi:10.1029/2019gl085782 (2020).