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Long-term global ground heat flux and continental heat storage from geothermal data

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1 Introduction

Additional Figures and Tables used in the manuscript "Long-term global ground heat flux and continental heat storage from geothermal data".

Table S1. Global mean estimates of ground surface temperature, ground heat flux at the surface and ground heat content within continental subsurface from borehole temperature profiles. Values display the mean and 95% confidence interval for each time period from estimates using the standard inversion approach (Standard), the new PPI approach (PPIT) and the new PPI approach applied to subsurface flux profiles (PPIF). All the inversions were performed using a model of 40 years per time step. Temperatures in K, fluxes in $\mathrm{mW\,m^{-2}}$ and heat content in ZJ.

	Temperatures		Heat Fluxes			Heat Storage		
Period (CE)	Standard	PPIT	Standard	PPIT	PPIF	Standard	PPIT	PPIF
1960-2000	1.1 ± 0.1	1.0 ± 0.3	80 ± 20	60 ± 40	70 ± 40	13 ± 3	11 ± 7	12 ± 6
1920-1960	0.6 ± 0.2	0.6 ± 0.4	30 ± 30	40 ± 40	30 ± 40	5 ± 5	6 ± 7	5 ± 7
1880-1920	0.4 ± 0.3	0.4 ± 0.4	20 ± 30	20 ± 30	20 ± 30	4 ± 4	4 ± 5	3 ± 5
1840-1880	0.2 ± 0.4	0.2 ± 0.3	20 ± 20	10 ± 20	10 ± 20	3 ± 3	2 ± 3	2 ± 3
1800-1840	0.1 ± 0.3	0.08 ± 0.3	10 ± 20	6 ± 10	8 ± 20	2 ± 4	1 ± 2	1 ± 3
1760-1800	0.05 ± 0.2	0.03 ± 0.3	7 ± 20	4 ± 8	6 ± 20	1 ± 3	0.6 ± 1	1 ± 3
1720-1760	0.002 ± 0.1	0.004 ± 0.2	4 ± 10	2 ± 5	5 ± 20	0.7 ± 2	0.4 ± 0.9	0.8 ± 3
1680-1720	-0.03 ± 0.09	-0.01 ± 0.2	3 ± 10	1 ± 4	4 ± 20	0.4 ± 2	0.2 ± 0.6	0.6 ± 4
1640-1680	-0.05 ± 0.2	-0.02 ± 0.2	1 ± 6	0.6 ± 2	3 ± 20	0.2 ± 1	0.1 ± 0.4	0.5 ± 4
1600-1640	-0.07 ± 0.2	-0.03 ± 0.2	0.3 ± 2	0.2 ± 0.8	3 ± 20	0.04 ± 0.4	0.03 ± 0.1	0.5 ± 3

Table S2. Global mean estimates of ground surface temperature, ground heat flux at the surface and ground heat content within continental subsurface from borehole temperature profiles. Values display the mean and 95% confidence interval for each time period from estimates using the standard inversion approach (Standard), the new PPI approach (PPIT) and the new PPI approach applied to subsurface flux profiles (PPIF). All the inversions were performed using a model of 50 years per time step. Temperatures in K, fluxes in $\mathrm{mW\,m^{-2}}$ and heat content in ZJ.

	Temperatures		Heat Fluxes			Heat Storage		
Period (CE)	Standard	PPIT	Standard	PPIT	PPIF	Standard	PPIT	PPIF
1950-2000	1.0 ± 0.1	1.0 ± 0.3	70 ± 20	60 ± 40	60 ± 30	16 ± 3	13 ± 8	14 ± 7
1900-1950	0.4 ± 0.2	0.5 ± 0.5	30 ± 30	30 ± 40	30 ± 40	5 ± 6	6 ± 8	5 ± 9
1850-1900	0.2 ± 0.4	0.2 ± 0.4	10 ± 30	20 ± 30	10 ± 30	3 ± 6	3 ± 6	2 ± 6
1800-1850	0.1 ± 0.4	0.09 ± 0.3	10 ± 30	7 ± 20	8 ± 20	2 ± 6	2 ± 3	2 ± 4
1750-1800	0.05 ± 0.3	0.02 ± 0.3	6 ± 30	4 ± 9	5 ± 20	1 ± 5	0.7 ± 2	1 ± 5
1700-1750	-0.005 ± 0.1	-0.009 ± 0.3	3 ± 20	2 ± 5	4 ± 20	0.7 ± 4	0.4 ± 1	0.9 ± 5
1650-1700	-0.03 ± 0.2	-0.03 ± 0.2	2 ± 10	0.8 ± 3	3 ± 20	0.3 ± 2	0.2 ± 0.6	0.7 ± 5
1600-1650	-0.05 ± 0.2	-0.04 ± 0.2	0.2 ± 3	0.2 ± 0.8	3 ± 20	0.05 ± 0.7	0.03 ± 0.2	0.5 ± 5

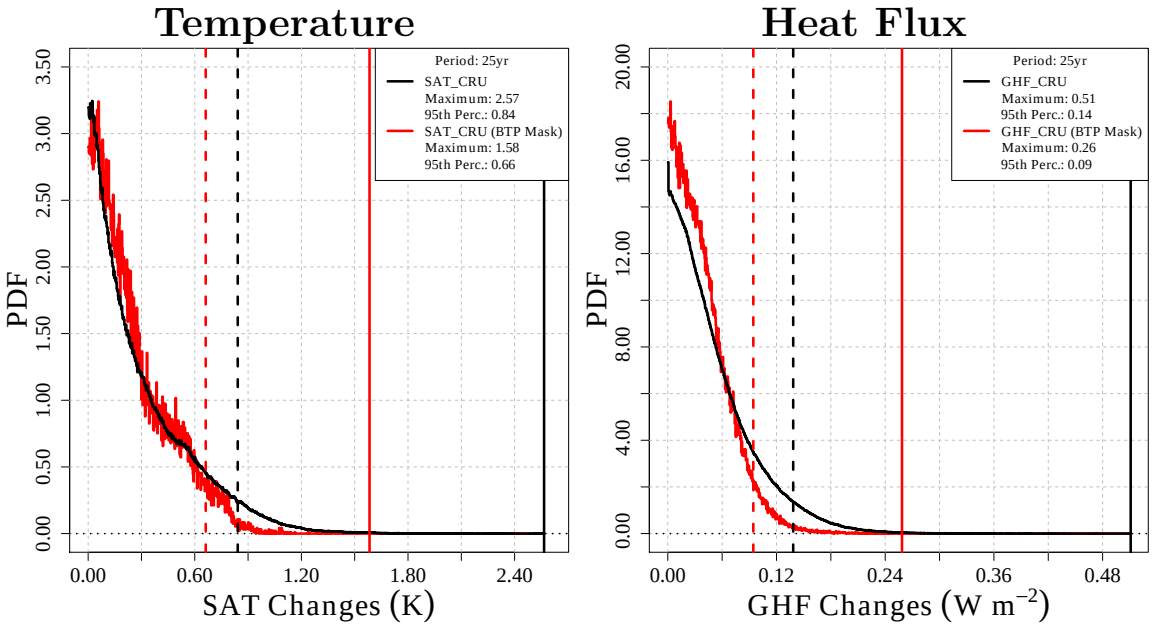

Figure S1. Histograms of temperature and heat flux variations between consecutive time steps from CRU temperature anomalies relative to 1961-1990 CE. The high-frequency temperature variations were filtered out by averaging the original temperature series in temporal windows of 25 years. The heat flux series were generated by applying Equation 19 to CRU temperatures, thus the high-frequency variability is not included in the flux histogram.

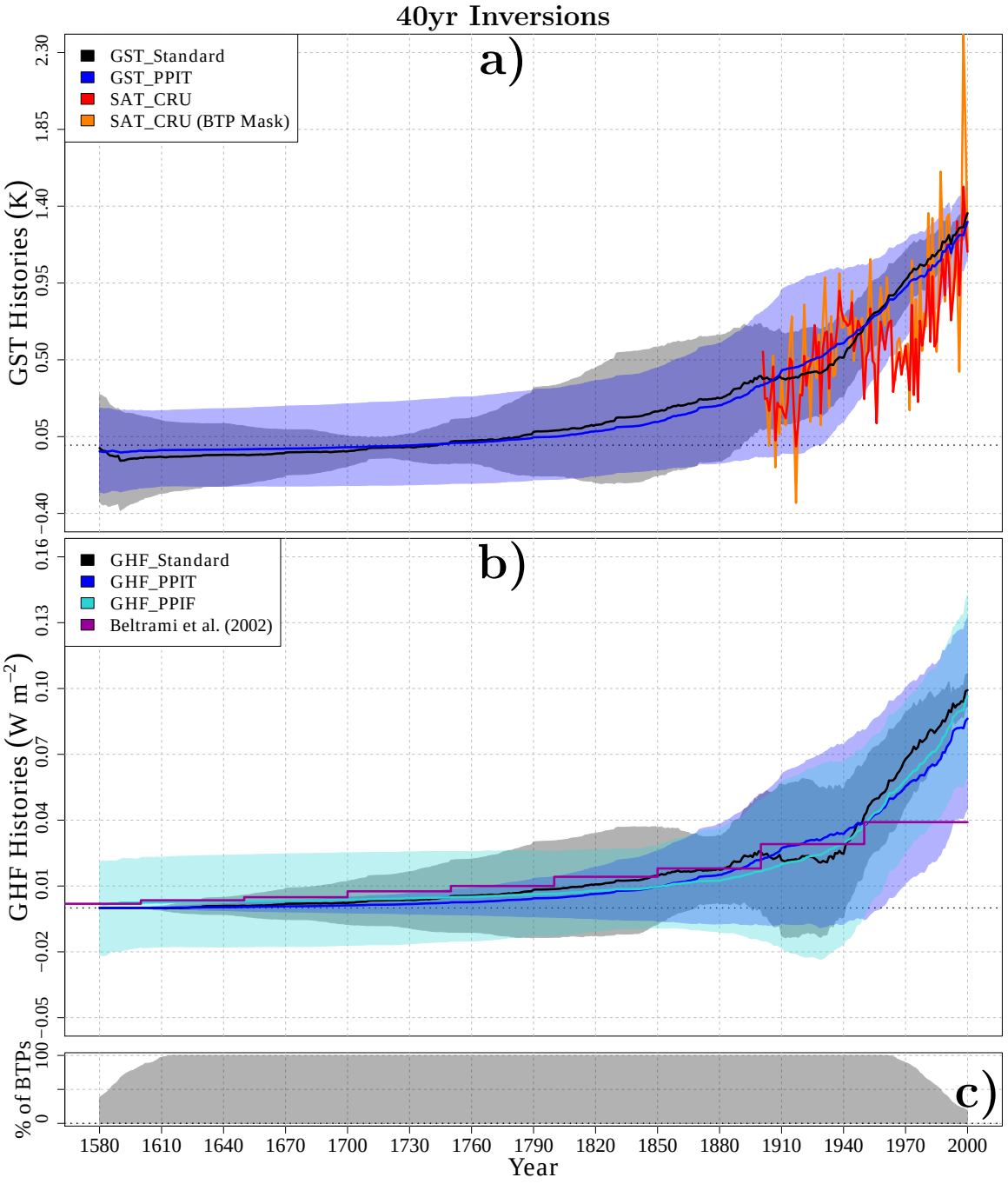

Figure S2. Global ground surface temperature histories (a) and global ground heat flux histories at the surface (b) from borehole temperature profiles using the Standard approach (black), the new PPI approach (PPIT, blue) and the new PPI approach applied to the corresponding heat flux profiles (PPIF, light blue). All inversions were performed using a 40 yr step change model. (c) Percentage of total borehole inversions with time. Surface air temperature anomalies relative to 1961-1990 CE from CRU data are also displayed, including results from the entire database (red) and results from locations and dates containing borehole inversions (orange). The CRU series have been adjusted to have the same mean than the results from the Standard approach for the period 1950-1970 CE.

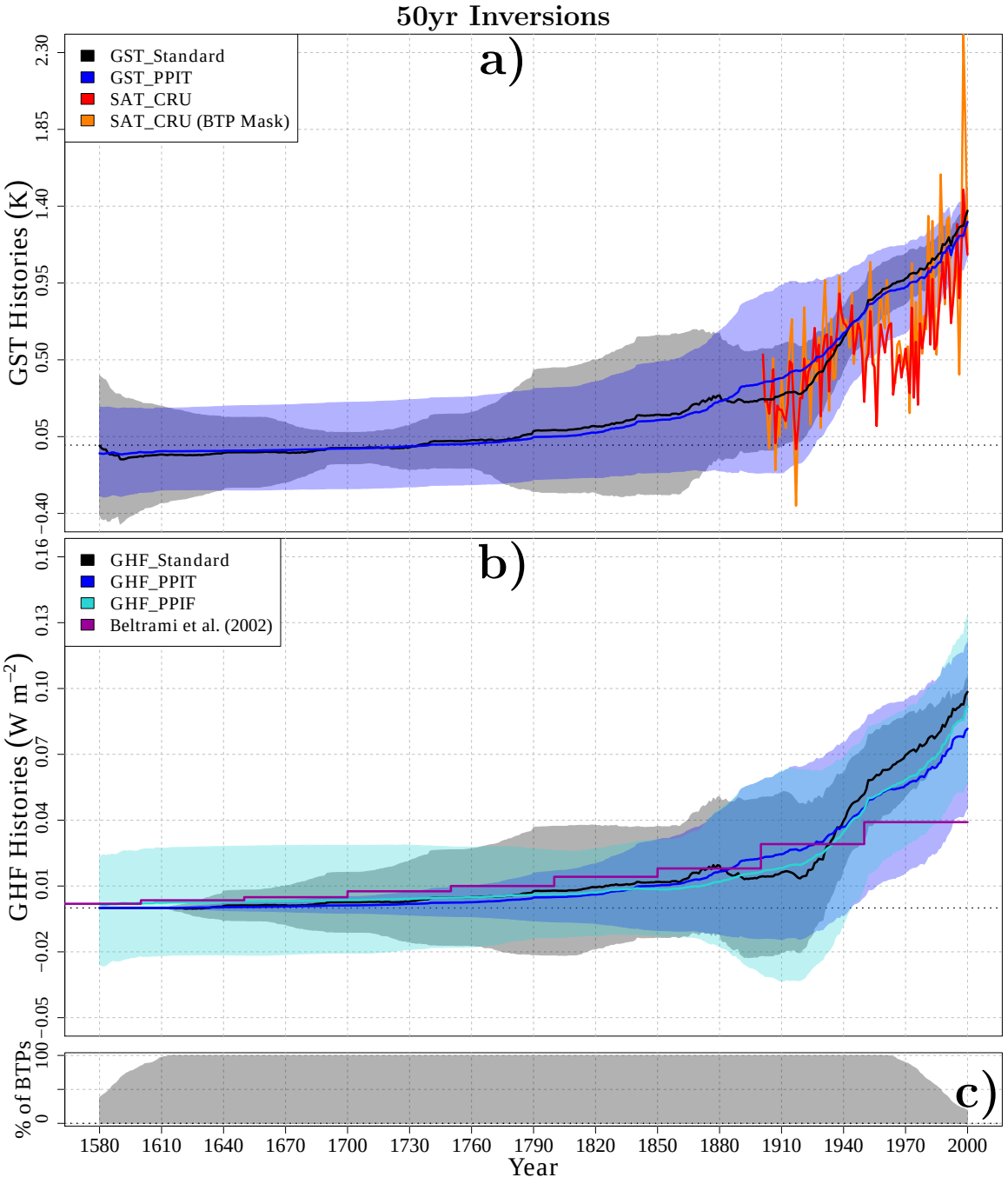

Figure S3. Global ground surface temperature histories (a) and global ground heat flux histories at the surface (b) from borehole temperature profiles using the Standard approach (black), the new PPI approach (PPIT, blue) and the new PPI approach applied to the corresponding heat flux profiles (PPIF, light blue). All inversions were performed using a 50 yr step change model. (c) Percentage of total borehole inversions with time. Surface air temperature anomalies relative to 1961-1990 CE from CRU data are also displayed, including results from the entire database (red) and results from locations and dates containing borehole inversions (orange). The CRU series have been adjusted to have the same mean than the results from the Standard approach for the period 1950-1970 CE.