

Global Warming Online Universal Baselines Converter

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Abstract

This publication includes details regarding the online converter of global warming baselines “*Global Warming Online Baselines Converter, °C*” available on the Internet site nowagreen.com/globalwarming.

This converter displays the conversion factor from any period to any period in the range 1850-2021 for land+ocean, 1880-2021 for ocean-only, or 1750-2021 for land-only.

Glossary

Ave	average
BL	baseline
CF	conversion factor between baselines or reference periods
DB	dataset, database
LBL	Berkeley Earth (Lawrence Berkeley Laboratory)

Units

The temperature change unit in this work is °C.

Global Warming Online Baselines Converter

The converter is on the Internet site “*Global Warming Online Baselines Converter, °C*” nowagreen.com/globalwarming [13]. The converter is free and is very easy to use.

It applies datasets converted to the 1850-1900 baseline.

Global Warming Databases

In this work “global warming” means annual changes in the global surface temperature above some specific baseline. The baseline is usually indicated in each database.

The converter [13] applies the following databases:

- NASA [1] [2]
- NOAA [3]
- Berkeley Earth (LBL) [4] [5] [6] [7]

Global Warming Baselines

As described in publications [10] [12] it takes a lot of effort to find conversion factors between various baselines applied by the main institutions involved in global warming, datasets and research works.

The EU determines the “global temperature increase” according to the IPCC baseline 1850-1900 [9].

IPCC Report 2011 [9] page 5 note 9: “*The period 1850–1900 represents the earliest period of sufficiently globally complete observations to estimate global surface temperature and, consistent with AR5 and SR1.5, is used as an approximation for pre-industrial conditions*”.

All main databases apply other baselines than IPCC, UN-FCCC and EU. NASA [1] [2] and Berkeley Earth [4] [5] [6] apply the 1951-1980 baseline, and NOAA [3] applies the 20th century baseline, 1901-2000.

Table 1 - Global warming databases, land+ocean [12]

	NASA	NOAA	LBL
Reference	[1] [2]	[3]	[4] [5]
Units	°C	°C	°C
From	1880	1880	1850
To	2021	2020	2021
Years	142	141	172
Baseline (BL)	1951-1980	1901-2000	1951-1980
BL years	30	100	30
Decimal places	2	2	3
Ave in BL	+0.0003	+0.0004	+0.0171

Table 2 - Global warming databases, land only [12]

	NASA	LBL
Reference	[1] [2]	[6]
Units	°C	°C
Records	annual	monthly
from	1880	1750
to	2021	2021
years	142	272
Baseline (BL)	1951-1980	1951-1980
BL years	30	30
Decimal places	2	3
Ave in BL	+0.0010	+0.0010

Table 3 - Global warming databases, ocean only [12]

	NASA
Reference	[1] [2]
Units	°C
Records	annual
from	1880
to	2021
years	142
Baseline (BL)	1951-1980
BL years	30
Decimal places	2
Ave in BL	+0.0007

As the ocean-only dataset is from 1880, it is not possible to convert the temperature changes baselines for periods before 1880. In such a case it is recommended to use the 1951-1980 baseline and the conversion factor from 1951-1980 to 1850-1900 baseline, as detailed below.

Conversion Factors between Main Datasets Baselines

The conversion factors between main datasets baselines were determined in the publication "Global Warming Baselines Conversion Factors" [10].

Table 4 - Conversion factors to 1850-1900 baseline [°C] [10]

from BL:	Land+Ocean	Land	Ocean
1850-1900	+0.00	+0.00	+0.00
1901-2000	+0.28	+0.49	+0.23
1951-1980	+0.31	+0.49	+0.29

CSV File

Table 5 - CSV file

Column	A	B	C	D
	Year	Land+Ocean	Land only	Ocean only
Baseline		1850-1900	1850-1900	1850-1900
Range	1750-2021	1850-2021	1750-2021	1880-2021
Units		°C	°C	°C
Decimal places		3	3	2
Data		Ave(NASA, NOAA, LBL)	Ave(NASA, LBL)	NASA
Source of data		[1] [2] [3] [4] [5]	[1] [2] [6] [7]	[1] [2]

Determination of Average Error

Three 31 years periods were selected for the determination of errors between 1880 and 2020, based on the absolute difference between the specific datasets (NASA, NOAA and LBL) and the averages of all of them.

Estimation of Error for Land+Ocean

Table 6 - Estimation of error for land+ocean [°C]

Period	NASA	NOAA	LBL	Ave	Δ
	[1] [2]	[3]	[4] [5]	°C	°C
1880-1910	0.055	0.027	-0.030	0.017	0.047
1935-1965	0.290	0.291	0.296	0.292	0.004
1990-2020	0.916	0.881	0.965	0.921	0.044
Δ_{max}					0.047
Δ_{ave}					0.032

Δ max absolute difference between the average and each dataset

Estimation of Error for Land Only

Table 7 - Estimation of error for land only [°C]

Period	NASA	LBL	Ave	Δ
	[1] [2]	[6] [7]	°C	°C
1880-1910	+0.086	+0.061	+0.074	0.013
1935-1965	+0.508	+0.477	+0.493	0.016
1990-2020	+1.397	+1.365	+1.381	0.016
Δ_{max}				0.016
Δ_{ave}				0.015

Δ max absolute difference between the average and each dataset

This work includes only one dataset for ocean-only: NASA [1] [2].

The maximum and average errors for ocean-only were calculated in the publication "*Global Warming Baselines Conversion Factors*" [10].

Table 8 - Estimation of error for ocean only [10] [°C]

	IPCC	LBL	Ave	Δ
Reference	[9]	[4] [5]	°C	°C
CF	+0.31	+0.27	+0.29	0.02

Average Errors

Table 9 - Average errors [°C]

Land+ocean	°C	0.032
Land only	°C	0.015
Ocean only	°C	0.020

References

1. GISTEMP Team, 2022: GISS Surface Temperature Analysis (GISTEMP), version 4. NASA Goddard Institute for Space Studies. Dataset accessed 2022-02-05 at <https://data.giss.nasa.gov/gistemp>
2. Lenssen, N., G. Schmidt, J. Hansen, M. Menne, A. Persin, R. Ruedy, and D. Zys, 2019: Improvements in the GISTEMP uncertainty model. *J. Geophys. Res. Atmos.*, 124, no. 12, 6307-6326, doi:10.1029/2018JD029522.
3. NOAA National Centers for Environmental information, Climate at a Glance: Global Time Series, published February 2022, retrieved on March 9, 2022 from <https://www.ncdc.noaa.gov/cag/>
4. Berkeley Earth - Global Temperature Report for 2021
<http://berkeleyearth.org/global-temperature-report-for-2021/>
5. Rohde, R. A. and Hausfather, Z.: The Berkeley Earth Land/Ocean Temperature Record, *Earth Syst. Sci. Data*, 12, 3469-3479, <https://doi.org/10.5194/essd-12-3469-2020>, 2020.
6. Berkeley Earth - Time Series Data, Land Only (1750 – Recent), Monthly Average Temperature (annual summary)
<http://berkeleyearth.org/data/>
7. Global Surface Temperature Changes over Land Dataset – Joseph Nowarski. DOI:10.5281/zenodo.6373255
8. European Commission, Climate Action, EU Action, Climate strategies & targets, 2050 long-term strategy, 4 March 2020
https://ec.europa.eu/clima/eu-action/climate-strategies-targets/2050-long-term-strategy_en

9. IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press. In Press.

10. Global Warming Baselines Conversion Factors - Joseph Nowarski.
DOI:10.5281/zenodo.6373058

11. Global Surface Temperature Changes Datasets Converted to 1850-1900 Baseline - Joseph Nowarski. DOI:10.5281/zenodo.6386191

12. Global Warming Datasets Converted to 1850-1900 Baseline - Joseph Nowarski. DOI:10.5281/zenodo.6386179

13. Global Warming Online Baselines Converter, °C – Joseph Nowarski
<https://nowagreen.com/globalwarming>

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