

Global Extreme Climate Indices

The Global Extreme Climate Indices have been calculated using the Global Meteorological Forcing Dataset for land surface modelling (PGFv221). The PGFv2 dataset provides nearsurface meteorological data for driving land surface models and other terrestrial modelling systems. It blends reanalysis data with observations and disaggregates in time and space.

More than 30 indices will be ported into Climate Insights on schedule, according to user feedback and market requirements (Table 2). Most indices are based on the standardised set recommended by the CCI/WCRP/JCOMM Expert Team on Climate Change Detection and Indices (ETCCDI22), possibly with some adjustments. The indices cover the following types of parameters:

- Shifts in the number of days where comparatively extreme conditions are observed v Growing season length
- 5th and 95th percentiles of temperature versus baseline conditions
- Lengths of warm, cold, wet, and dry spells
- Counts of days where precipitation exceeds a threshold
- Total precipitation where precipitation exceeds the 95th percentile of the baseline

Some indices are presented as annual climatology for both baseline and future periods such as growing degree day (GDD) and heating degree day (HDD), while others have been used to carry out further statistical summaries to derive more meaningful parameters, which means that the relevant layers presented in Climate Insights are reanalysis data, instead of the indices themselves. For example, Standardised Precipitation Index (SPI) and Standardized Precipitation Evapotranspiration Index (SPEI) are applied to calculate the probability of droughts for a specific period of interest, while SPI and SPEI themselves are not directly accessible. In addition, all indices are calculated for the future periods based on the ensemble of GCM or RCM projections. The corresponding data layers should be explained from a perspective of statistical probability.

The details of each index are presented in the table below. The index list will increase as more data is available and more indices are developed; it may also be shortened if any indices prove less useful.



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Table 1. The Climate indices available and new ones will be added – based on demand - in Climate Insights

ID	Long Name	Index Name	Definition	Units
1	Days for TN10p when TN < 10th percentile	<i>Cold nights</i>	Days when TN < 10th percentile	days
2	Days for TX10p when TX < 10th percentile	<i>Cold days</i>	Days when TX < 10th percentile	days
3	Days for TN90p when TN > 90th percentile	<i>Hot nights</i>	Days when TN > 90th percentile	days
4	Days for TX90p when TX > 90th percentile	<i>Hot days</i>	Days with TX > 90th percentile	days
5	Warm spell duration index	<i>WSDI</i>	Annual count of days with at least 6 consecutive days when TX > 90th percentile	days
6	Cold spell duration index	<i>CSDI</i>	Annual count of days with at least 6 consecutive days when TN < 10th percentile	days
7	Cooling degree days	<i>CoDD</i>	Cooling degree days t_{mean} (daily mean temperature) > 18°C	°C
8	Heating degree days	<i>HDD</i>	Annual heating degree days T_{mean} (daily mean temperature) < 17.0°C	°C
9	Growing degree days	<i>GDD4</i>	Annual growing degree days above 4.0 °C	days
10	Heat wave frequency	<i>HWF</i>	Number of heat waves events over a given period	times/year
11	Heat wave days	<i>HWD</i>	Number of days of heat wave over a given period	days
12	Heat Index Caution days	<i>Caution Days</i>	Number of days of heat index (HI) over 26°C	days
13	Heat Index Extreme Caution days	<i>Extreme Caution Days</i>	Number of days of heat index (HI) over 32°C	days
14	Heat Index Danger days	<i>Danger Days</i>	Number of days of heat index (HI) over 41°C	days
15	Heat Index Extreme danger days	<i>Extreme Danger Days</i>	Number of days of heat index (HI) over 54°C	days
16	SPI Drought probability	<i>Drought probability</i>	Probability of Standardised Precipitation Index (SPI)<-1.0	%
17	SPEI Drought probability	<i>Drought probability</i>	Probability of Standardized Precipitation Evapotranspiration Index (SPEI)<-1.0	%
18	Marine heatwave frequency	<i>MHWF</i>	Number of marine heat waves events over a given period	times/year
19	Marine heatwave days	<i>MHWD</i>	Number of days of heat wave over a given period	days
20	FFDI Category Frequency	<i>FFDI_Cat</i>	Frequencies of FFDI category over a given period	%
21	KBDI Category Frequency	<i>KBDI_Cat</i>	Frequencies of KBDI category over a given period	%