

The Universal Thermal Climate Index (UTCI) is now available in Alpha-Log

The LSI LASTEM technical pills

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Introduction

The UTCI index was recently included in the Alpha-Log data logger calculation library. It was chosen because of its widespread use in the evaluation of the thermo-physiological effects of the atmospheric environment on the human body in outdoor environments, whatever the climatic conditions. In fact, the UTCI index is one of the few indices that can specifically be used in climatology, because it is:

- thermo-physiologically representative in the entire field of heat exchange between the environment and the human body;
- valid in all climates and seasons;
- independent of the person's characteristics (age, sex, specific activities and clothing, etc.).

UTCI index development

The UTCI index has been developed since the early 2000s by a specific commission within the International Society of Biometeorology ISB (uwm.edu/biometeorology/), the work was carried out under the supervision of the World Meteorological Organisation (WMO) through the Climatology CCI commission and was presented in a joint WMO/European Union scientific and technological cooperation (COST Action 730) at the Symposium on UTCI in Geneva in 2009. Currently, information on the UTCI can be obtained from the UTCI organisation (www.utci.org).

Growing needs and dissemination

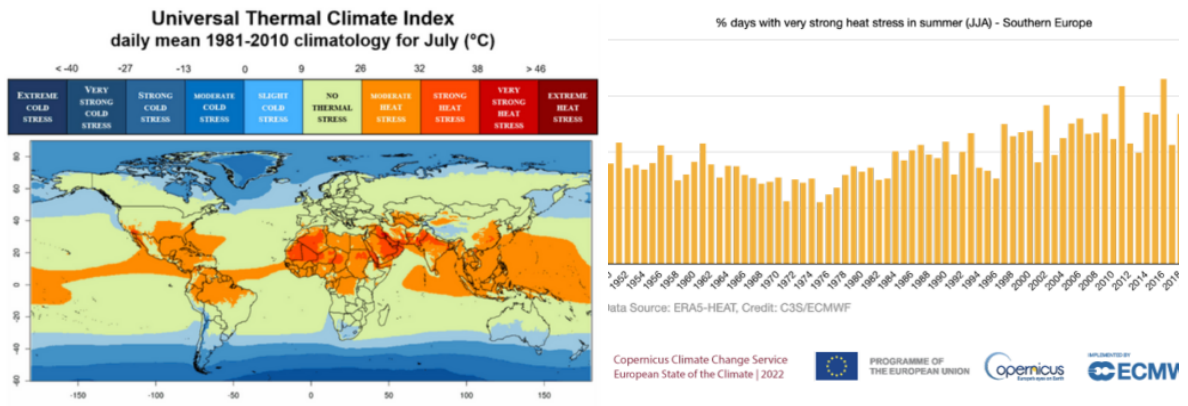
Based on the increasing Global Warming activity and its effects on the human activities, there is an increasing need to find a global harmonisation of the way in which information about people's perceived temperature is disseminated, using meteorological and climatic indices rather than simply measuring air temperature. The UTCI index seems to be the most representative for this purpose, as it analyses the effects of radiation and wind speed on the body's heat balance in addition to temperature and relative humidity.

The term 'Universal' defines the adaptability of the UTCI index to assessments of external thermal conditions in various human bio-meteorological fields, such as in public health, for the purpose of precautionary planning and climate impact research in the health sector.

To support this, the European Centre for Medium-Range Weather Forecasts (ECMWF) recently completed a feasibility study demonstrating the usefulness of forecasting UTCI up to 10 days on a global scale. These forecasts could be used by the National Meteorological and Hydrological Services (NMHS) as a basis for their regional or local health warning systems.

The UTCI index is reported as an indicator by the European Agency 'Copernicus' which makes it available in the ERA5-HEAT (Human thErMal comforT) dataset

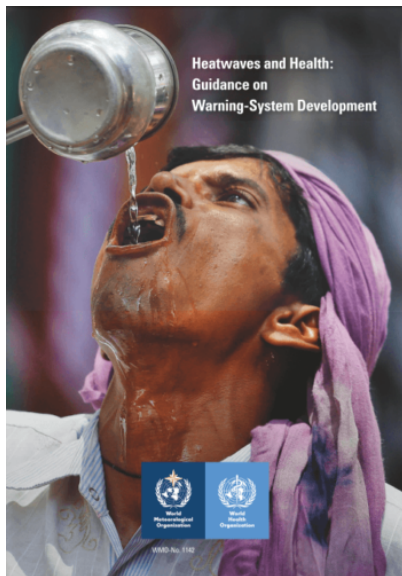
which represents the current state of the art for producing bio-climate data records.



Percentage of days during summer with 'very high heat stress' (UTCI between 38 and 46°C) in Southern Europe, 1950 to 2022. Data source: ERA5-HEAT. Credit C3S/ECMWF.



The UTCI index is also mentioned by the European Commission in its publication "Evaluating the Impact of Nature-based Solutions: Appendix of Methods" as one of the indicators of "Climate resilience" and "Heat-related discomfort".



Currently, the UTCI index is mentioned in the WMO “Guidance on Warning-System Development.”

What is the UTCI index

The UTCI index provides an estimate of the ‘apparent’ temperature (°C) that the human body would perceive when exposed to a given real environmental condition specified by a given air temperature, wind speed, relative humidity and radiation. This perceived temperature is the temperature that a reference environment, defined by fixed values of humidity, wind and radiation, should have, producing the same physiological reaction in the human body as that produced in the real environment. The input parameters for calculating the UTCI index are air temperature, dew point temperature (or relative humidity), wind speed and mean radiant temperature (MRT).

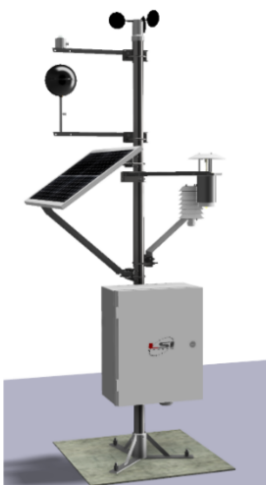
The result obtained is classified into 10 UTCI thermal stress categories that correspond to specific human physiological responses to the thermal environment:

UTCI	Human physiological response
>46 °C	Extreme heat load
38...46 °C	Very strong heat load

32...38 °C	Strong heat load
26...32 °C	Moderate heat load
9...26 °C	No thermal stress
9...0 °C	Slight cold stress
0...-13 °C	Moderate cold stress
-13...-27 °C	Strong cold stress
-27...-40 °C	Very strong cold stress
<-40°C	Extreme cold stress

UTCI index in Alpha-Log

Starting from version 2.08.00 released in February 2024, Alpha-Log is able to calculate UTCI index values. The input environmental measurements are the following: air temperature and relative humidity, black globe temperature, wind speed. Alpha-Log calculates the UTCI index and stores the results by adding them to the available data set. For users wishing to add the UTCI index to their data set, it is possible to update the data logger, (including any missing probes) if version 2.00.00 or higher is used.



LSI LASTEM weather station for the calculation of the

UTCI index.

This configuration is also capable of calculating the WBGT heat stress index (ISO7243-2017-08), which is also included in the Alpha-Log data logger calculation library (version \geq 2.08.00). The input measurements of the WBGT index are the following: air temperature, black globe temperature and naturally ventilated wet temperature.

Conclusions

The decision to include the UTCI index as new calculations inside the Alpha-log data logger library was dictated by the growing need to combine classical meteorological measurements with an assessment of the temperature perceived by the human body. The UTCI index appears to be the most suitable and recognised for such evaluations. In a context of increasing frequency of extreme events and sensitivity to such situations, the objective assessment of perceived temperature is useful for characterising the climate of a given area. This analysis is useful both for statistical purposes and to plan human activities according to current and expected values and, more generally, to make it possible to plan actions to mitigate the effects on public health, as well as workers performing outdoor activities and possible economic impact.