



## The Universal Thermal Climate Index UTCI

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The existing assessment procedures of the thermal environment in the fields of public weather services, public health systems, urban planning, tourism & recreation and climate impact research show more or less significant shortcomings. Thus the idea came up to develop a Universal Thermal Climate Index UTCI based on the progress in science within the last 3 to 4 decades both in thermo-physiology and in heat exchange theory. Following extensive validation of accessible models of human thermoregulation, the advanced multi-node 'Fiala' model was adopted for this study. This model was coupled with a state-of-the-art clothing model considering the behavioural adaptation of clothing insulation by the general urban population to actual environmental temperature.

UTCI was developed conceptually as an Equivalent Temperature (ET). Thus, for any combination of air temperature, wind, radiation, and humidity, UTCI is defined as the air temperature in the reference condition which would elicit the same dynamic response of the physiological model. A 10 points stress assessment scale from "extreme heat stress" to "extreme cold stress" was defined. Polynomial regression equations facilitate fast predictions of ET values over relevant climate combinations. Comparisons to existing thermal stress/strain assessment procedures showed good conformity. However, in difference to these procedures, UTCI is based on contemporary science. Local cooling of exposed skin, including frostbite risk (wind chill effects), should best be regarded as a transient, rather than a steady-state phenomenon. The consensus final procedure still remains to be determined.

Due to the difficulty to calculate precisely radiant fluxes based on different meteorological data levels (observations, numerical simulations), it is recommended to run the UTCI model for the fundamental application in Numerical Weather Predictions and climate assessments operationally in Regional Specialised