Climate-Tourism-Information-Scheme (CTIS)

Andreas Matzarakis, Timm Schneevoigt, Olaf Matuschek, Christina Endler

Meteorological Institute, Albert-Ludwigs-University of Freiburg, Germany

Abstract

For the assessment of weather and climate in tourism regions the Climate-Tourism-Information-Scheme (CTIS) has been developed. CTIS represents frequencies, probabilities and thresholds of tourism climatic and bioclimatic factors. In addition, CTIS is a software that can operate this relevant data from text-based files and generate highly customizable diagrams. It can easily be used and implemented for diverse applications i.e. decision making or information about tourism industry.

1. Introduction

Weather and climate are important factors for tourism and recreation which are both promoting and limiting factors (Matzarakis 2006). For an integral assessment and implementation of the different facets of climate in tourism (Fig. 1) for both experts and tourism industry a clear and user friendly visualization is needed for information transfer. The results have, however, to be based on scientific knowledge.

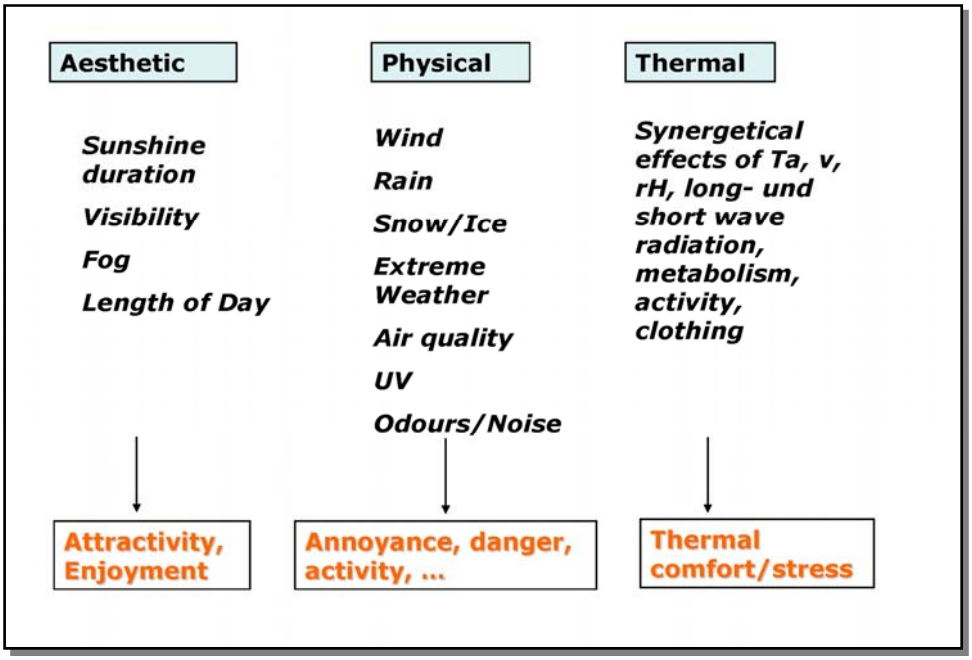

Fig. 1: Facets of climate in tourism (based on de Freitas, 2003)

Based on these demanded requirements the Climate-Tourism-Information-Scheme (CTIS) (Matzarakis 2007, Lin and Matzarakis 2008, Matzarakis et al. 2009) has been developed to create a simply representation and visualization of all these factors.

2. Climate-Tourism-Information-Scheme

CTIS (Matzarakis 2007, Lin and Matzarakis 2008) represents frequencies and probabilities of different bioclimatic and tourism climatic factors from all facets. It combines thermal components like physiological-equivalent-temperature ranges and thresholds, aesthetic components like cloudiness and fog, and physical components like wind speed, precipitation, and vapor pressure. The frequencies of these factors are presented in 10-day intervals visually grouped by months. An example is shown in Fig. 2 for Feldberg for the period 1971-2000. The definitions and thresholds of the different factors are shown in Table 1 (Matzarakis 2009).

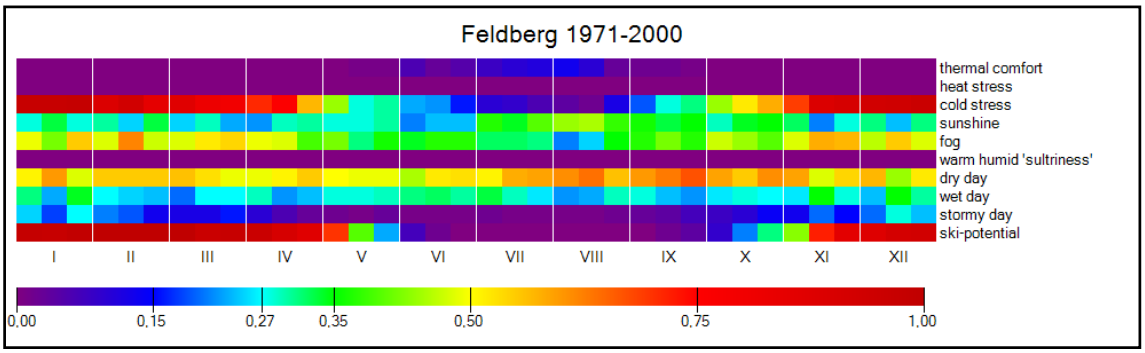

Fig. 2: CTIS for the Feldberg (Period: 1971-2000) in a temporal resolution of 10-days based on data from the German Weather Service (DWD)

Table 1: Factors, ranges, and sources for thresholds included in CTIS (after Matzarakis, 2007)

Factor	**Range**	**Literature**
thermal comfort	18 °C < PET < 29 °C	Matzarakis, 2007
heat stress	PET > 35 °C	Matzarakis und Mayer, 1996
cold stress	PET < 0 °C	Matzarakis, 2007
sunshine	sky cover < 5/8	Gómez Martín, 2004
fog	Relative humidity > 93 %	Matzarakis, 2007
warm humid („sultriness“)	vapor pressure > 18 hPa	Scharlau, 1935
dry day	precipitation ≤ 1 mm	Matzarakis, 2007
wet day	precipitation > 5 mm	Matzarakis, 2007
stormy day	wind speed > 8 m/s	Besancenot, 1990; Gómez Martín, 2004
ski-potential	snow cover> 30 cm	OECD, 2007

*PET = Physiologically Equivalent Temperature

3. CTIS software

CTIS has been developed in a user friendly way. It reads text based data files that contain frequencies of all climatic factors the user wants to present in his diagram. These factors have to be scaled on a uniform scale like 0 to 1 or 0 to 100. The CTIS program consists of two parts: the main window including data import and basic preparation (Fig. 3) and second, the report window for fine tuning the resulting image in size and font with real-time preview (Fig. 4).

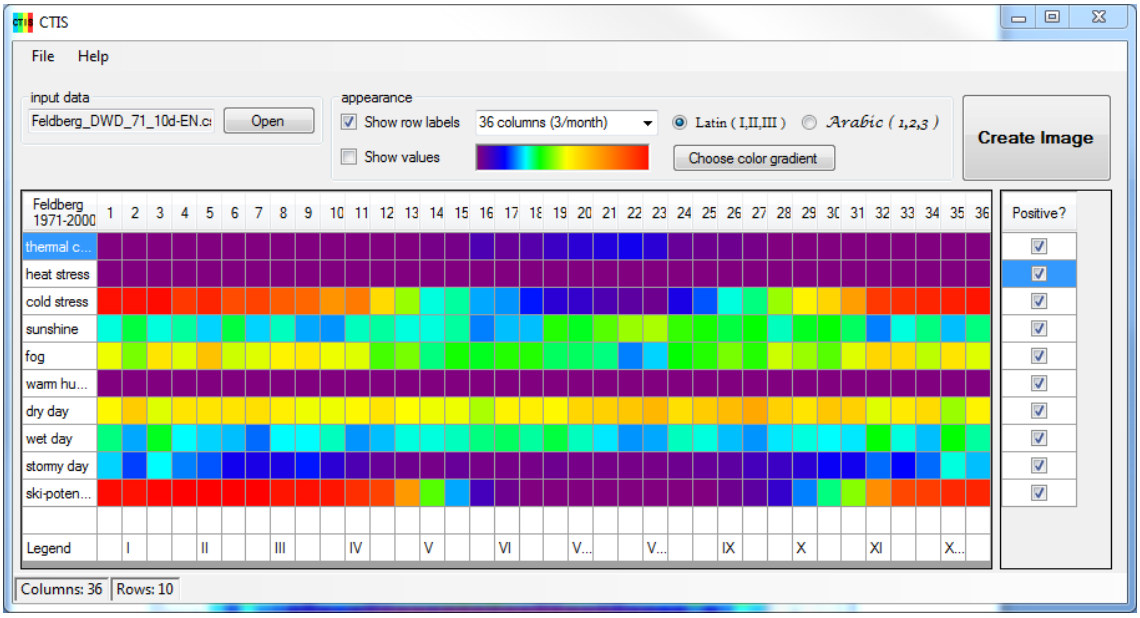

Fig. 3: CTIS main window for import of data, visual options and preparation of the factors (positive or negative)

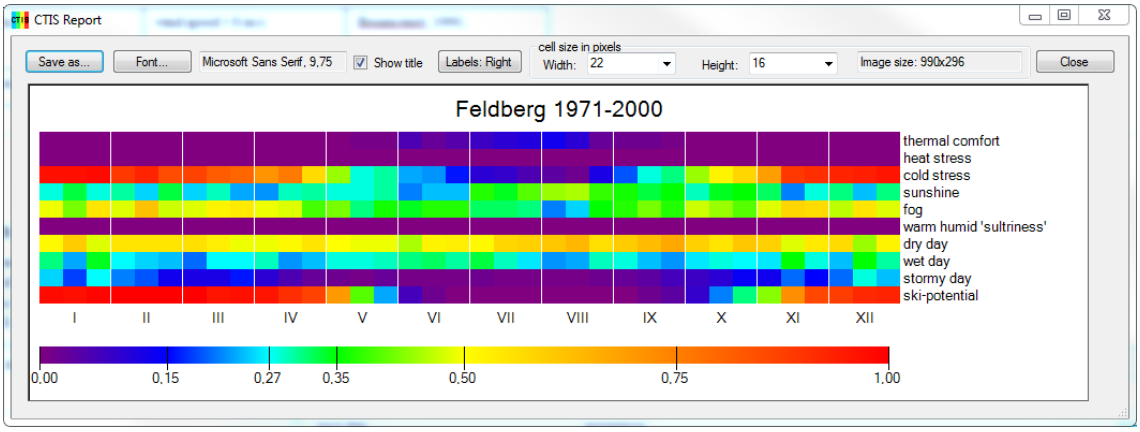

Fig. 4: CTIS report window for further visual options, font type and image size

As seen in Fig. 3 factors may be rated as positive or negative resulting in an inversion of the assessment scale for those rows. This rating is intended to use with classification coloring, not with colors interpolated according to frequencies.

After importing data the user is able to customize labeling options and time resolution options for visual grouping of intervals like 10-day periods grouped to months. Possible options are:

Time intervals:

- 1 value per month (12 columns)
- 3 values per month (36 columns)
- 1 value per hour (24 columns)
- 1 value per week (52 columns)

Legend numbering:

- Latin (I, II, III, …)
- Arabic (1, 2, 3, …)

Font type:

- Font type and size can be chosen from the standard windows font type dialog

Other visual options:

- Show or hide data values in diagram cells
- Show or hide factor (row) descriptions
- Place factor descriptions left or right of the diagram
- Show or hide diagram title

The dialogs for these choices are shown in Fig. 5 and Fig. 6.

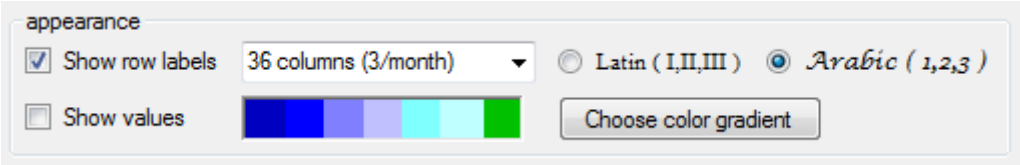

Fig. 5: Set of options in the CTIS main window

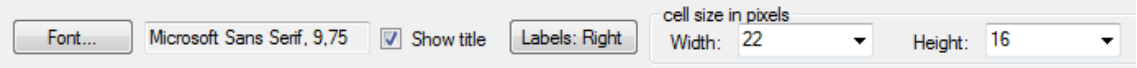

Fig. 6: Set of options in the CTIS report window

Moreover, the user can freely modify the color gradient used to classify frequencies or probabilities. Color values can be interpolated or classified as shown in Fig. 7.

Fig. 7: Color gradient comparison of an interpolated gradient (left) and classified gradient (right), both based on the same thresholds

For this purpose there is an additional dialog for creating value-color mappings and specifying assessment classes and descriptions. As shown in Fig. 8 values can be assigned to colors and a description. If *Interpolate Colors* is deactivated those descriptions appear in the diagram legend as class names. Advanced options are colors for error values and optical restriction of decimal places. The complete color gradient configuration can be saved and reused with other datasets without going through the setup process again.

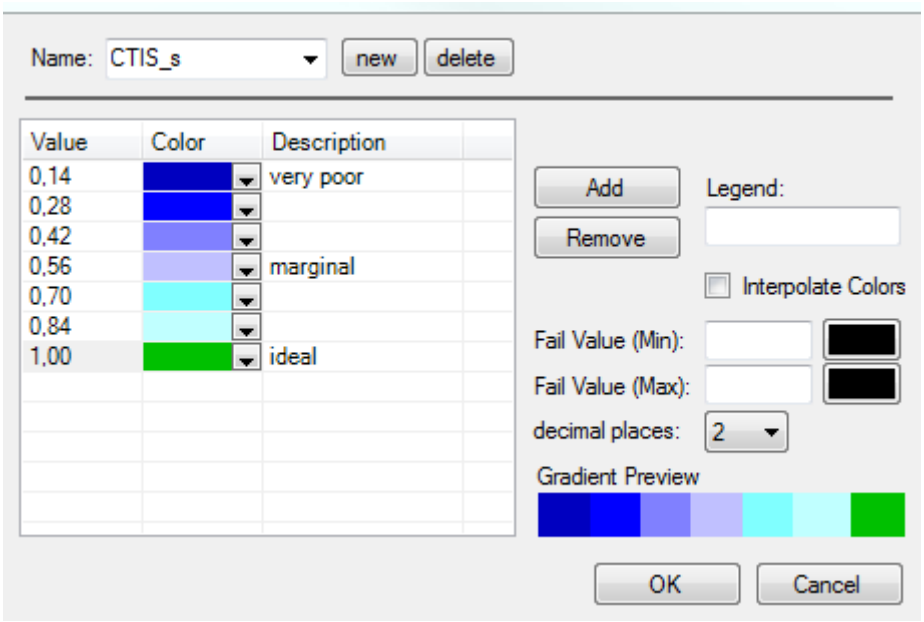

Fig. 8: Color gradient dialog

Finally, Fig. 9 shows a CTIS of the same data used for Fig. 2 but with the classification gradient of Fig. 8 and positive or negative ranked factors (Zaninovic and Matzarakis, 2009).

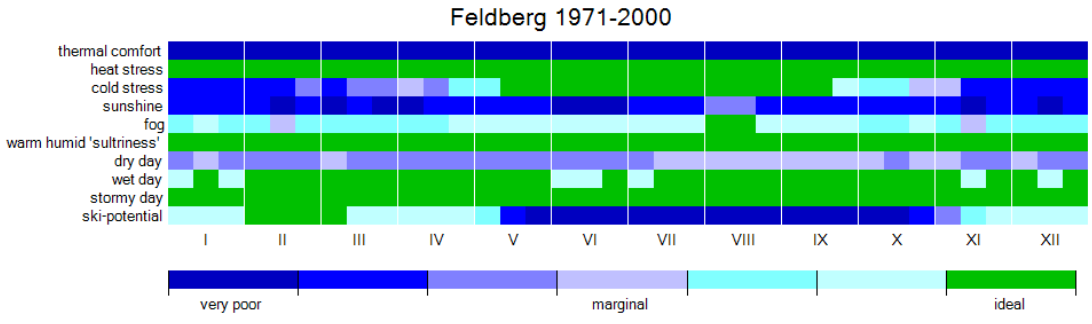

Fig. 9: CTIS with classes for the Feldberg (period: 1971-2000) in a temporal resolution of 10-days based on data from the German Weather Service (DWD)

The result image can be saved as .gif, .jpg or .png image file. sing Office 2007 the user can directly import the saved image to a new Word or PowerPoint document.

In order to improve the workflow when regularly creating multiple diagrams from different data sets or with different visual setups the complete program state can be saved in a settings file. The ability to load these previously saved setting files allows for a quick switch between different tasks working with numerous CTIS diagrams.

4. Conclusions

Required climate and climate relevant information has to be presented and visualized in an easily understandable way for non experts. Because of the plenty of kinds of tourism and the diverse requirements on climate information an integral assessment of weather and climate in one single factor or value is very difficult and too complex to understand. One single value let too many information and factors unconsidered. This lack can be filled by CTIS including the most relevant factors based on the climate facets in tourism and recreation.

Specific kinds of tourism possibilities based on CTIS can be assessed, quantified and periods with occurrence of specific extremes e.g. heat waves or periods of strong wind can detected.

The CTIS-Software is available under http://www.urbanclimate.net/climtour.

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Authors' addresses:

Prof. Dr. Andreas Matzarakis (andreas.matzarakis@meteo.uni-freiburg.de)
Timm Schneevoigt (timm.schneevoigt@saturn.uni-freiburg.de)
Olaf Matuschek (olaf.matuchek@uni-freiburg.de)
Christina Endler (christina.endler@meteo.uni-freiburg.de)
Meteorological Institute, Albert-Ludwigs-University of Freiburg
Werthmannstr. 10, D-79085 Freiburg, Germany