

Austrian Climate and Health Tourism Initiative (ACTIVE)

Rudel, E. ¹, Koch, E. ¹, Matzarakis, A. ², Marktl, W. ³, Nefzger, H. ⁴, Schunder-Tatzber, S. ³, Zygmuntowski, M. ²

¹ ZAMG, Vienna, ² Meteorological Institute, Univ. of Freiburg, ³ Inst. of. phys. Medicine, Univ. of Vienna, ⁴ Inst. of Meteorology, Univ. of Natural Resources, Vienna

1 Introduction

According to its geographical situation Austria owns a multitude of regions with favourable bioclimatic conditions. Unfortunately in many cases this is not used in an adequate way as in the neighbouring countries. Therefore the Federal Ministry of Economics and Labour of the Republic of Austria initiated the project ACTIVE (**Austrian Climate and Health Tourism Initiative**) with the goal

To provide the scientific bases for the improved use of the natural resource "climate" in Austria (Koch et al., 2005).

By interdisciplinary co-operation between physicians, climatologists and tourism authorities the following topics should be analysed:

- State of art of climatic cure concepts?
- Current offer of climate cure concepts in Austria and in the neighbouring countries
- Human-bioclimatic conditions in Austria
- Specific climate treatment at Austrian climate and mountain resorts
- Potentials for development of climate cures
- Improvement of legal federal guidelines which define and protect the approved quality mark "climate and mountain resort" which is only awarded to places which can scientifically prove the therapeutic effectiveness of their climate and a permanent high air quality.

2 Actual climatic cure concepts

Balanced exposure in different climate zones can help to improve the success of a medical therapy. The most important bioclimatic factors in Central Europe are

- Chill and wind as therapy to increase the resistance to diseases
- (Balanced) increased UV radiation for the amendment of the vitamin D3 synthesis
- Unpolluted air, free from allergens.

The main objectives of climatic cure concepts are to prevent diseases by spending time in a climate with bio-climatologically positive elements, to amend discomfort and disorder as well as to cure chronic illness. Very often climatic therapies are combined with balneo-therapy and physical therapy.

The different forms of bioclimatic therapies are

- Heliotherapy: exposing parts of the skin or the whole body to the sun
- Terrain therapy combining favorable bioclimatic conditions with endurance training
- "Fresh air cure" letting patients rest outdoors on porches, balconies or just in front of open windows thus enduring a light cold stress to lower the metabolic rate.

3 The human- bioclimate in Austria

Human organism has to deal permanently with its environment and thus with the atmosphere as a part of it. Human biometeorology and human climatology are the sciences that describe that relationship.

3.1 Thermal environment

One of the main part of the environment affecting humans is the thermal complex including all meteorological elements that have an effect on the human thermo-physiology, i.e. air-temperature, humidity, wind-speed as well as short - and long-wave radiation from the entire surrounding area. (Jendritzky et al., 1990).

3.2 Thermo-physiological assessment of Austria

Originally simple climatic indices were used for the assessment of thermal comfort, e.g. heat stress index, Discomfort Index (Thom, 1959) or Wind-chill index (Steadman, 1971). But these indices

consider only a part of the relevant meteorological parameters and do not account at all for thermal physiology, e.g., they do not include the effects of short and long wave radiation fluxes as they are generally not available in climate records.

On the basis of this understanding since about 30 years heat balance models of the human body have gained acceptance in the field of assessment the thermal comfort. The heat balance equation of the human body takes into account the metabolic rate (internal energy production by oxidation of food), the physical work output, the net radiation of the body, the convective heat flow, the latent heat flow to evaporate water into water vapour diffusing through the skin, the sum of heat flows for heating and humidifying the inspired air, the heat flow due to evaporation of sweat and the storage heat flow for heating or cooling the body mass.

All the required components of the above equation can be calculated using synoptic/climatological and astronomical data (VDI, 1998, Matzarakis et al, 2000) plus physiological parameter. The full application of the energy balance equation of the human body gives detailed information on the effect of the thermal environment on humans (VDI, 1998, Höpfe, 1999). The necessary meteorological inputs are air temperature, air humidity, wind speed, short and long wave radiation fluxes as well as physiological parameters as sex, weight-height-skin surface, activity level, and clothing factor. From the meteorological input data the radiant fluxes are most difficult to deal with, because measuring data are more often than not available. In this work we used the physiologically equivalent Temperature (PET) (VDI, 1998). The advantage of PET compared to other thermal indices also obtained from the human energy balance is the widely known unit °C. In addition PET can be used all year round and in different climates. Here the internal heat production was set to 80 W and the heat transfer resistance of the clothing to 0.9 clo (Matzarakis and Mayer, 1996).

The assessment in terms of PET (monthly means or frequency of extremes) is transferred into the area using GIS-techniques to construct bioclimatic maps. The resolution of the maps is 1 km for Austria (Fig. 1, example for amount of days with PET > 35 °C).

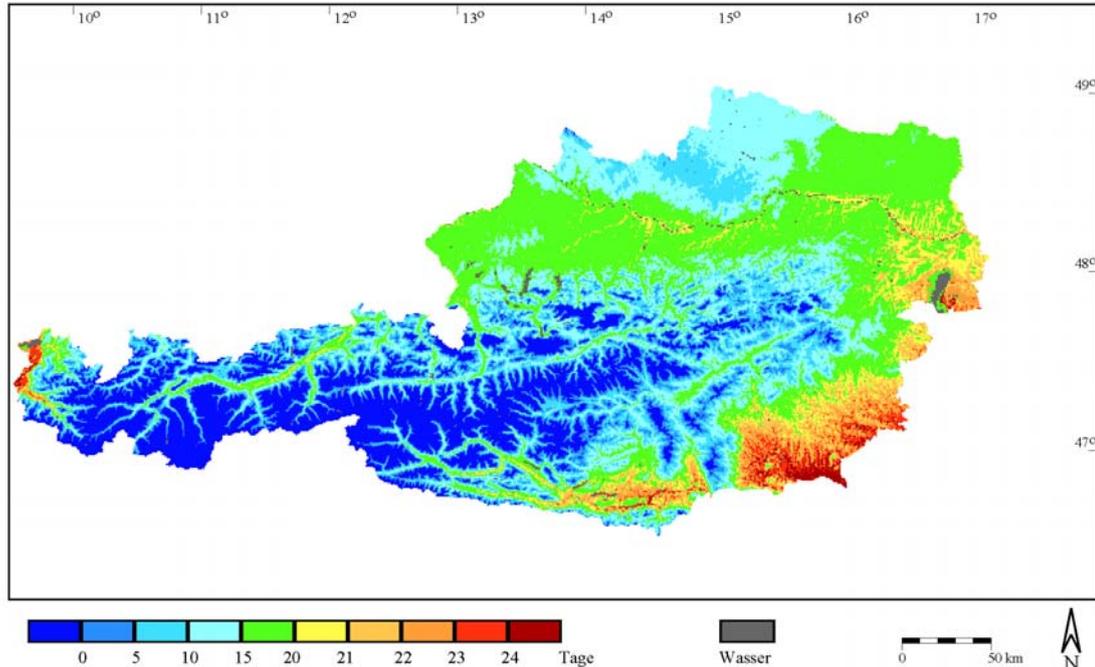


Figure 1: Days with PET > 35 °C at 14 CET, period: 1991-2000

4 Description of Austrian climatic health and mountain resorts

At present there are 40 climatic health and mountain resorts in Austria and many other sites are hoping to be awarded this state-approved quality mark. Within ACTIVE a brochure was produced that describes each of the health and mountain resorts with its specific bioclimate with special emphasis on

the thermal complex and gives an overview of the offered therapies and the recommended medical (see following example of the mountain resort Weissensee) (Koch et al., 2005).

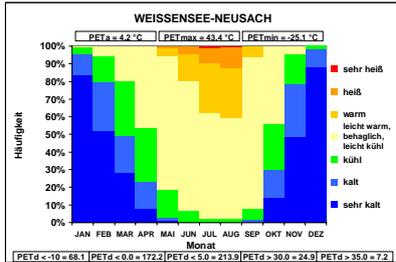


Weissensee

Location



Bioclimatic conditions



Climate station:

13°19'00" eastern longitude,

46°43'00" northern latitude

Legal indications

ACTIVE Proposal for indications

Additional therapies

Health care

Lodging

Further Information

Homepage

Height from 930 to 2221m, centre 945m a.s.l., imbedded in the Gailtaler Alps

Climatic health resort

Carinthia

Thermal component

Weak strong or extreme grade of hot thermal perception (PET>35°) mean value 7 d/a, in the months May, June, July, August and September more than 50 % of all days are comfortable (see figure). Cold stress on more than 50 % of all days in January, February and December can be alleviated by increasing the personal stages of activity or by wearing thicker clothes.

Thermal sensation:

Monthly frequencies of certain thermal perceptions in % (100% correspond all days of the month). Basis of classification: Physiologically Equivalent Temperature (PET), 1991-2000

Wind:

Main wind direction: Northwest and east, in the summer months thermal wind system with forced ventilation during daytime, during the night and the winter months mostly calm, low frequency (<7 days) of strong winds (>Bf 6) low frequency of Foehnwind (<5 days)

Precipitation:

Mean yearly sum 1260 mm on 106 days, 24 days with snowfall and 108 days with snow cover

Air pressure

Mean annual value between 912 hPa in 900 m und 767 hPa in 2300 m asl

Sunshine, cloudiness, fog:

Yearly sum 1780 hours, 110 days with no sun, 25 days with fog

Prämorbidie Erholungsbedürftigkeit aller Altersstufen: Vorbeugung von Krankheiten durch Abhärtungskuren, Herstellung des körperlichen und seelischen Gleichgewichtes, Beseitigung von Zivilisationsschäden; Genesungsaufenthalte nach Krankheiten und Operationen; chronische Atemwegserkrankungen, insbesondere Folgezustände nach Exposition in luftverschmutzten Regionen, funktionelle Herz-Kreislauf-Störungen (Hypotonie, labile Hypertonie, funktionelle Durchblutungsstörungen), neurovegetative Regulationsstörungen (nervöse Erschöpfungszustände, Streßfolgen), Auswirkungen von Übergewicht, Bewegungsmangel und Fehlbelastung auf den Stütz- und Bewegungsapparat, Wiederherstellung der körperlichen Leistungsfähigkeit
Rekonvaleszenz
Vegetative Regulationsstörungen
Chronisches Erschöpfungssyndrom einschließlich Schlafstörungen
Chronische Erkrankungen der Atemwege
Herz- und Gefäßerkrankungen

Massagen, Programme und Kurse (Autogenes Training, Yoga, Die fünf Tibeter, Gesunde Wirbelsäule, Figurgymnastik, Wagyment, Streching, ...) durchgeführt von staatlich geprüften Sportlehrern, Gesundheitstherapeuten und Wellnesstrainern. Bewegen im Heilklima – verschiedene Höhenlagen und verschiedene Klimareize. 140 km markierte Wanderwege, 80 km Mountainbike-Strecken, 12 markierte Laufparcours, 8 Nordic Walking Routen. Im Winter: Winterwandern, Eislaufen, Laufen und Nordic Walking

Health doctors with pharmacies

Hotels/accomodations: 4000 beds

Weissensee Information

A-9762 Weissensee

Techendorf 78

Tel.: +43 (0) 47 13 / 22 20

Fax: +43 (0) 47 13 / 22 20 44

e-mail: info@weissensee.com

<http://www.weissensee.com>

Figure 2: Climate health resort description of Weissensee (Koch et al., 2005)

5 Respects for new legal regulations

Since 1958 there exists in Austria a legal basis to define and protect the title climatic health- and mountain resort. Because Austria is a federal republic with nine provinces there are federal legal guidelines which define the principles and provincial enforcement laws which describe the details of acquiring and maintaining the title of a special climatic region. In these legal specifications there are three major points concerning meteorology:

- I. Existence of natural, scientifically approved climatic conditions to cure diseases or stimulate recuperation; e.g. the lack of severe weather conditions like long lasting fog, little sunshine, frequent sultriness, high cooling power.
- II. Running a climate station with registration of several meteorological parameters like air-temperature, air humidity, sunshine duration, air pressure, wind speed, precipitation.
- III. Every 10 years an expert opinion has to prove the climatic conditions have not changed.

That means the specifications which were issued in the early 1960's do not contain any quantitative threshold of meteorological or air quality parameter.

Because the air quality especially has become a determining factor of human well being and health, the lack of any threshold in the laws is a big disadvantage.

In the study a proposal of a new legal regulation to define and protect the title climatic health- and mountain resort is presented. Several quantitative thresholds which were found in the course of the study are proposed.

Acknowledgement: *This study is part of the Austrian Climate and Tourism Initiative (ACTIVE) funded by the Austrian Federal Ministry of Economy and Labour.*

References

Höppe, P., 1999: The physiological equivalent temperature - a universal index for the biometeorological assessment of the thermal environment. *Int. J. of Biometeorol.* 43, 71-75.

Jendritzky, G., Menz, G., Schirmer, H., Schmidt-Kessen, W., 1990: Methodik zur raumbezogenen Bewertung der thermischen Komponente im Bioklima des Menschen (Fortgeschriebenes Klima-Michel-Modell). *Beitr. Akad. Raumforsch. Landesplan.* Nr. 114.

Koch, E., Marktl, W., Matzarakis, A., Nefzger, H., Rudel, E., Schunder-Tatzber, S., Zygmuntowski, M., 2005: Klimatherapie in Österreich. Broschüre zu den Potentialen der Klimatherapie in Österreich. Bundesministerium für Wirtschaft und Arbeit.

Matzarakis, A., Mayer, H., 1996: Another kind of environmental stress: Thermal stress. *WHO Newsletter* No. 18, 7-10.

Matzarakis, A.; Rutz, F.; Mayer, H., 2000: Estimation and calculation of the mean radiant temperature within urban structures. In: *Biometeorology and Urban Climatology at the Turn of the Millenium* (ed. by R.J. de Dear, J.D. Kalma, T.R. Oke and A. Auliciems): Selected Papers from the Conference ICB-ICUC'99, Sydney. *WCASP-50, WMO/TD* No. 1026, 273-278.

Steadman, R. G., 1971: Indices of windchill of clothed persons, *J. Appl. Meteorology* 10, 674-683.

Thom, E. C., 1959: The Discomfort Index, *Weatherwise* 12, 57-60.

VDI, 1998: Methods for the human-biometeorological assessment of climate and air hygiene for urban and regional planning. Part I: Climate, VDI guideline 3787. Part 2. Beuth, Berlin.