The Climate and Bioclimate of Nevşehir from the Perspective of Tourism

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Abstract Climate is an important resource for tourism and an equally important element that needs to be included in tourism purposes. This study reveals Nevşehir's human-bioclimatological and tourism climatological conditions. These conditions were identified by using physiologically equivalent temperature and Climate-Tourism-Information-Scheme over 10-day periods and analyzing the mean thermal perception values that emerged. Evaluating bioclimatic conditions and meteorological parameters such as thermal bioclimate issues, duration of sunshine, number of wet days, amount of precipitation and wind, from the perspective of tourism will help people choose the best holiday times depending on their individual needs and circumstances.

1 Introduction

Tourism is one of the world's largest and fastest growing economic sectors. Usually, the weather conditions and climate of a specific region are perceived, among other natural resources, as determining factors for tourism and recreation potential (de Freitas 2003; Matzarakis 2006). In recent years, tourism has become a fast growing economic sector attracting big investments in Turkey. The contribution of tourism to Turkish Gross National Product (GNP) leapt from approximately $7.8 billion in 1998 (net revenues) to approximately $22 billion in 2008 (Turkish Statistical Institute, TSI 2009). Although there is a big potential for tourism in many different parts of the country, the tourism industry has mostly been appeared in Southern and Western Anatolia. While promoting the potential of these regions,

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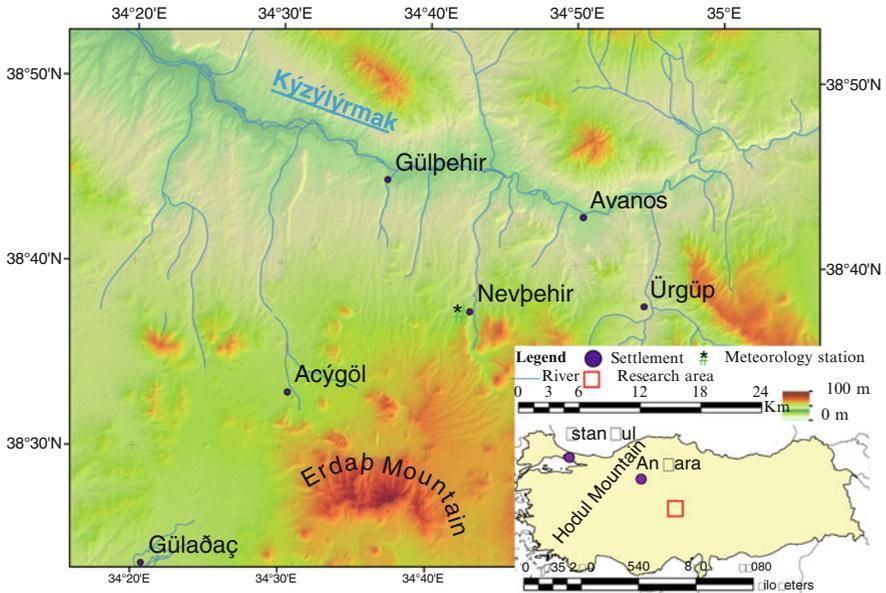
Fig. 1 Location map of Nevşehir

the sole focus remains on the triple S (sea, sand and sun trio). However, Nevşehir and its environs in Central Turkey comprise a natural recreational region with their diverse tourism opportunities, including culture, nature, sports and health tourism (Fig. 1). In 2008 a total 253,532 tourists (80,136 domestic and 173,396 foreign) visited and stayed on an average 1.4 days in Nevşehir (TSI 2009).

2   Data

The climatic and bioclimatological conditions of Nevşehir have been analyzed by using data (air temperature, humidity, wind speed and frequencies, global radiation, cloudiness, sunshine duration) belonging to the time period between 1975 and 2008 obtained from the General Directorate of State Meteorology Affairs for Nevşehir Meteorology Station.

3   Methodology

In order to present the potential of Nevşehir for tourism climate and bioclimate of the city has been analysed. In order to explain the bioclimatic conditions of the research area, thermal perception over a year were given in 10-day intervals at 7, 14 and 21

LST, and the formation frequency of different thermal perceptions was revealed for more detailed bioclimatological analyses. In addition, the meteorological variables important for tourism were given in 10-day periods over a year in the Nevşehir bioclimatology brochure. The meteorological parameters taken in 10-day time resolution were evaluated under three main heading parameters that affect tourism on thermal (thermal perception), physical (precipitation, snow, wind) and aesthetic dimensions (daylight and clouds) were treated together (de Freitas 1990; de Freitas and Matzarakis 2005). Climate variables were presented by using mean, minimum and maximum air temperature and the number of days with different threshold values. Days with a maximum temperature over 25°C (Tmax > 25°C) were classified as hot days, those with a maximum temperature over 30°C (Tmax > 30°C) were classified as tropical days. Days with a minimum temperature below 0°C (Tmin < 0°C) were classified as frost days, those with a minimum temperature over 20°C (Tmin > 20°C) were classified as tropical nights, and their annual distribution was given with 10-day intervals (Zaninović and Matzarakis 2009). Thermal conditions were also analyzed by using the PET values.

The aesthetic weather conditions in the brochure included parameters such as cloudiness, daylight periods, and the number of clear and overcast days. Similarly, the number of foggy days was also included among aesthetic weather conditions. Physical factors in the brochure were the number of days with precipitation and rain. Wind conditions were shown by using a wind vane. In addition to climatological and bioclimatological parameters, the Climate-Tourism-Information-Scheme (CTIS) (Matzarakis 2007; Lin and Matzarakis 2008; Zaninović and Matzarakis 2009) was used in the brochure in order to be able to offer a more holistic picture of tourism and recreation conditions. CTIS includes detailed climate information for tourists to use as they plan their holidays, such as thermal comfort conditions over a year, or aesthetic and physical weather conditions. The components of CTIS are:

Thermal components

1. Hot stress (PET > 35°C)
2. Cold stress (PET < 0°C)
3. Thermally comfortable conditions (18°C < PET < 29°C)

Aesthetic components

4. Cloudiness (cloud age < 4 okta)
5. Fog (relative humidity > 93%)

Physical components

6. Wind (wind speed > 8 m/s)
7. Consistent rain (precipitation > 5 mm)
8. Dry days (precipitation < 1 mm)
9. Sultriness (vapor pressure > 15 hPa)

4   Results

Nevşehir is an area with a high potential for tourism and recreational activities. In addition to areas conducive to outdoor activities such as trekking and mountaineering, it also has camp sites. For the correct timing of activities, knowing about the bioclimatological conditions would be useful. An analysis of Nevşehir 10-day mean thermal perception (PET) values between 1975 and 2008 shows that extreme cold stress may be experienced in morning and evening hours during the cold season (from the middle of November through the end of March; approximately 130 days), which is relatively less in the afternoon. Spring (18 days) and fall (17 days) have better thermal comfort conditions. In May, June, September and October, PET values seem to be comfortable mostly throughout the day. In July and August, mornings have more comfortable hours than evenings. During noon in these months, a hot stress can be seen. Therefore, it would not be wrong to say that morning hours have more appropriate bioclimatological conditions for walking and sports activities. One advantage of the bioclimatology of Nevşehir is that heat and excessive heat periods are rare and almost exclusively limited to the afternoon. In the summer, it is possible to stay outdoors at morning and evening hours (nearly all day except noon hours) thanks to comfortable weather conditions. During the hottest times of the day, it is necessary to stay in cool places as much as possible (Fig. 2).

Nevşehir's CTIS shows that there is a probability for thermo-physiologically severe cold from November through April. The probability is much higher between December and January. While early April to late October seems to be a favorable period as regards cold stress, there is an increased risk of cold after this. In contrast, heat stress occurs between the end of June and mid-August, and causes uncomfortable conditions during this period. Thermally favorable conditions last from mid-April to the end of October, and unfavorable (uncomfortable) conditions emerge once again in July and August. Except a very short time period in the summer, clouds of different degrees are seen at all times throughout the year. With respect to fog Nevşehir has very favorable conditions but strong winds can cause uncomfortable conditions especially during the cold season. Apart from the winter precipitation, there is a slight possibility of precipitation more than 5 mm almost anytime throughout the year (Fig. 2).

The climatological characteristics of Nevşehir with respect to tourism show that the season with cold stress (PET $< 0°$C) lasts from late October to early May, and the highest frequencies (75–100%) are seen in January and February. Excessive cold is not seen between May and September. The possibility of thermally comfortable conditions ($18°$C $<$ PET $< 29°$C) is highest (75–100%) between May and September, which is a transition between the warm and cold seasons. Hot stress (PET $> 35°$C) is observed between late May and late September, with a 75–100% of extreme heat stress possibility in July and August. Such thermal conditions (PET values) are not possible in the period between December and late March. There is a 50% and 27% possibility of sky conditions with less cloudiness than
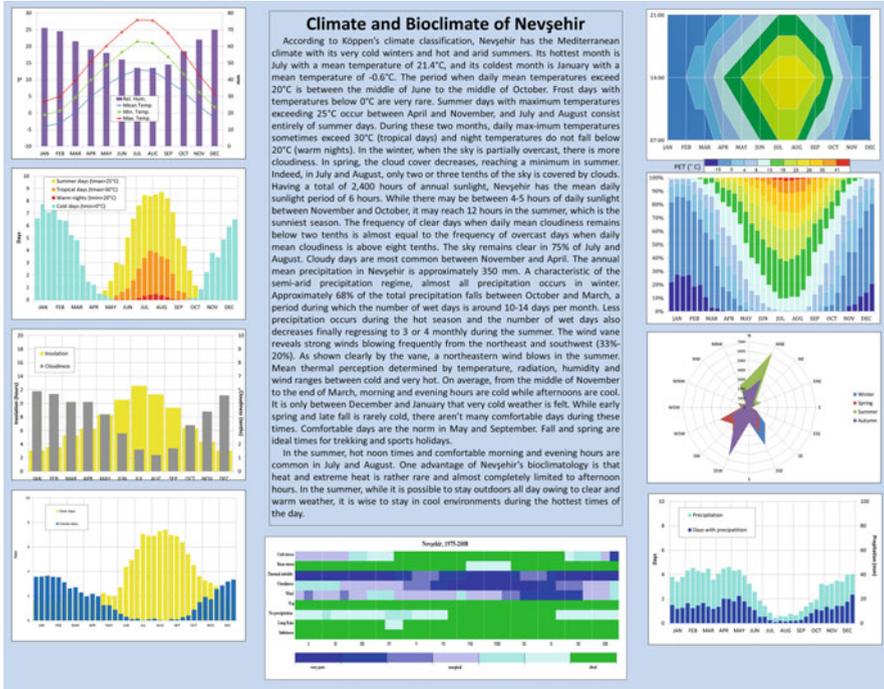
Fig. 2 Climate information scheme of Nevşehir

4 octa in the cold season, while in the warm season the possibility increases to 75–100%. The wind speed surpasses 8 m/s in Nevşehir during cold season, and relative humidity very rarely exceeds 93%. Throughout the year, there is a possibility of precipitation less than 1 mm (except summer). The possibility of consistent rain (precipitation > 5 mm) is approximately 15%. There is no such possibility in June, July and August. Conditions of water vapor pressure higher than 18 hPa only appear in the summer. It is estimated that in June, July and August, there is a 15–50% possibility of water vapor pressure (sultriness) higher than 18 hPa (Fig. 2).

When the tourism potential appropriateness of climatological and bioclimatic conditions is analyzed, it is calculated that cold stress is felt from early November to late March. Ideal tourism conditions are seen in the period between early April and late October as the cold stress disappears. Heat stress is experienced most in July and August, and is almost nonexistent outside of summer months. Nevşehir does not have a time period when most appropriate thermal conditions for people increase to ideal levels of tourism. Still, thermally comfortable conditions are taking place from mid-April to late October. Regarding cloudiness, the ideal conditions appear in the summer. The most ideal sky conditions are seen in July and late August. Another advantage for tourism is that ideal wind speed and fog parameters exist in Nevşehir throughout the year. Even though the high possibility

of precipitation in Nevşehir in the cold season may imply unfavorable conditions, the conditions in the warm season are conducive to tourism activities. Excessive heat is only experienced between mid-June and early September and the rest of the year does not have excessive weather conditions (Fig. 2).

5   Conclusions

With this study, Nevşehir's climatic and bioclimatological conditions, and their change and distribution over the year were analyzed in order to be used in the tourism as well as tourism industry. The findings obtained were used to prepare a simple and clear bioclimate and tourism climate brochure that can be understood by everyone. Being well-suited to be used as part of tourism promotions, this brochure is important for the evaluation of not only the sea, sand, sun trio but also various natural resources and alternatives. Offering thermo physiologically comfortable conditions in May and September, Nevşehir is suitable for different health, culture, recreation and nature tourism activities from May to September. In July and August, there are hot noon hours and comfortable morning and evening hours. One advantage of Nevşehir's bioclimatic conditions is that rare heat and excessive heat periods are almost exclusively limited to the afternoon. In the summer, it is possible to stay outdoors all day owing to comfortable weather conditions. The proximity of Nevşehir to the sea and its low altitude prevent extreme thermal conditions.

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