588: Should public health systems use simple thermohygrometric indices into urban environment?

Messeri A [1.2], Morabito M [1.2], Petralli M [1.2]*, Orlandini S [1.2]

CIBIC, Interdepartmental Centre of Bioclimatology, University of Florence, Florence, Italy[1]*
alessandro.messeri@unifi.it
DIPSA, Department of Plant, Soil and Environmental Sciences , University of Florence, Florence, Italy[2]

Abstract

Outdoor human heat perception is not only related to ambient temperature and humidity, as described in most direct biometeorological indices, but also to wind speed and solar radiation. Numerous biometeorological indices are used in Heat-Health Warning System and hot weather response plans to describe the discomfort conditions during the summer. This topic is of great interest because heat wave frequency and intensity is expected to increase due to climate change. The aim of this study was to compare the performance of the most frequently used direct indices in order to assess the thermal discomfort condition during the summer period (2007 - 2010) in several cities of Tuscany (Italy). In each city, one of the interlard and one of the costal plans, characterized by different climatic and geographical conditions, data from two different weather stations were collected (one in the city center and one in the suburb) in order to describe the intra-urban difference of thermal perception. Results showed a very similar trends between all direct thermohygrometric indices even if apparent temperature index seems to be more appropriate to describe the perceived thermal conditions in suburban areas where the wind speed might also be 6-7 times stronger than in the city center. According to these results, the choice and the consequent use of an appropriate thermal index appears a very important step to implement specific preventive measures for health and to set up a reliable heat warning system for the elderly and for the entire population.

Keywords: biometeorological indices, discomfort condition, heat warning system,

1. Introduction

In recent years, because of climate change, the number and the frequency of heat waves during summer in temperate regions has increased with a major impact on public health, especially for elderly people and children [1]. Moreover, in large urban centers, the heat island phenomenon makes thermal conditions even more critical during the hottest days of the year due to the high presence of buildings and impervious surfaces [2]. This is caused by the influences of urban characteristics on meteorological parameters, in particular wind, air temperature and humidity, which determines much difference of temperature perception between the city center and the suburbs. The habitual parameters used to calculate the biometeorological indices are air temperature and relative humidity, but some indices also consider other variables, such as wind speed, atmospheric pressure and solar radiation [3]. Nowadays, also in Italy some of these indices are used in heat warning system, particularly useful for elderly people but also for the entire population, especially if outdoor activities are performed. The main constraint, however, consists in the lack of uniformity of indices application, because each Region and each Institution use different indices. For this reason is crucial to understand the differences and the main limitations of each index [4,5]. Differences between two cities located in different geographical and climatic conditions (inland plains and coastal city) have been also assessed. This study focused on the possibility of using an index with a great potential use such as the Apparent Temperature Index (AT), which is able to evaluate the effect of the wind, coupled with temperature and humidity. Moreover, the choice and the consequent use of an appropriate index is a very important step to prevent the impact of heat on public health.

2. Materials and methods

2.1 Meteorological data

The meteorological data of the Tuscan city centres examined during the period 2007-2010 were obtained from GSM meteorological stations (Teckna model) installed by the Interdepartmental Centre of Bioclimatology of the University of Florence. These stations are located in the city centre of an inland plain city, Florence (Lat 43 ° 46 '44", Long 11 ° 15' 40", re altitude 50m) and in a coastal town, Leghorn (Lat 43 ° 33 '10", Long 10 ° 19' 18", Height 9m). These stations provide air temperature (°C), wind speed (ms-1), solar radiation (Wm-2), relative humidity (%), barometric pressure (hPa) and precipitation (mm) every thirty minutes. The meteorological data of