Advances in Meteorology

Special Issue on
Climate Change and Biometeorology

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Climate and climate change are usually explored based on standard climate parameters such as air temperature or precipitation in time and space. Likewise, most of the studies of potential climate effects on human beings relate just air temperature to data of health outcome. During recent decades, extreme weather and climate events have been major concern with the potential for highly destructive impacts on society and ecosystems. The focus of this special issue will be put on human environment and health as the human health is sensitive to changes in weather patterns and other aspects of climate change. Since the relationship of human beings to the thermal environment is very complex this requires a more comprehensive consideration especially during extreme weather events.

According to the simulations from the IPCC report (2013), air temperature will continue to rise through the 21st century. It is recognized that the best way to interpret extreme weather events (heat and cold waves, droughts) is by using biometeorological indices which take into account not only air temperature but also other meteorological parameters such as atmospheric moisture, wind, cloud cover, and solar irradiance as well as energy balance of the human being. For example, wind conditions have an impact on human thermal comfort outdoors and on the dispersion of airborne pollutants. Airborne pollutants have adverse effects on respiratory as well as on cardiovascular diseases. Combination of extreme biometeorological conditions and high pollution levels lead to elevated number of cardiovascular and pulmonary hospital admissions and deaths. For example, in 2010 in Russia, over 20 000 extra deaths were caused by a heat wave and pollution due to forest fires.

Thus, the assessment of human thermal comfort at different scales (micro-, meso-, and macroscales) using either empirical or numerical modeling approaches is very important. Using different indices based on human thermal comfort models or empirical ones (based on combination of air temperature and atmospheric moisture) could be used to explore the effects of warm and cold days on excess mortality and morbidity or ambulance response calls for heat and cold related illness. Heat waves, especially when pollution is also present (ozone, smoke from forest fires, etc.), also cause deaths, particularly among vulnerable people and especially when there is a lack of preparation.

Also, the changes in human thermal comfort will affect human social and economic environments such as tourism and migrations. This topic needs to be explored in more detail; for example, how would extreme weather events and changes in biometeorological indices in tourist destination affect tourism industry or will the tourism flows change in future?

The human biometeorology of extreme climate events needs to be explored in more detailed way using appropriate bioclimatological indices. Since different countries use different definitions of extreme weather events (cold and heat waves) as well as specific thresholds and lead times (from one to five days) these thresholds need to be established taking into account both daytime and nighttime atmospheric conditions to better understand and compare the human thermal conditions among different regions in the world.

Quantifying and assessing extreme weather events from a human biometeorological point of view is of great importance since it is needed to find a way to deal with the oppressive heat or cold in the future.

Potential topics include but are not limited to the following:

- Changes in human biometeorological indices in the 20th and 21st century (long term trends)
- Changes in biometeorological extreme events during 20th and 21st century (heat and cold waves, days with extreme events)
- The impact of extreme biometeorological events on urban heat island (occurrence of urban heat island events)
- The impact of extreme biometeorological events on human health (heat and cold related mortality and morbidity)
- Adaptation strategies and possibilities in the urban structures and microclimate

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