

Investigation and forecast of heat waves with fuzzy methods

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The research concerns fuzzy statistical analysis of the influences of global warming on health of the population. We consider an important parameter - a heat index - that is a characteristics of a human thermal comfort and represents a combination of the air temperature and relative humidity. On the base of the heat indexes we propose a new approach to define and investigate heat waves which, if defined properly, can be used in, e.g., heat health warning systems.

A heat wave notion is closely related to heat index. In a general sense a heat wave (HW) can be defined as a prolonged period of excessive heat. Similarly to the descriptions of HI there is no universal and rigorous descriptions of HW: subjectiveness and uncertainty is a part of existing definitions, thus calling for application of fuzzy methods. We find the typical characteristics of the set of heat indexes representing some period, using most typical fuzzy expected values and rough set. We use these typical characteristics to define heat waves, and also for forecasting them in future. Our results are applied to evaluate heat wave occurrences in past and in future in several cities in Georgia, based on climate data collected from the Ministry of Preservation of the Environment of Georgia.

Keywords: heat index, heat wave, fuzzy expected value, rough set