



Investigation of the different heat waves indices applicability for the territory of Ukraine

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Climate extremes are of the major concern in the global context, since they can result in significant financial and human losses. The scale of heat wave (HW) impacts highlights the necessity to be able to measure extreme events in an informative manner, which is suitable for the geographical region and the climatic fields. Recent climatic projections show increasing in the frequency, magnitude, and duration of temperature extremes. It makes very important to determine appropriate metrics of heat / cold waves, and in particular, under climate change conditions. But to date there is no one universally acceptable heat wave definition. Because of the range of social groups and economy sectors affected by heat waves it is, of course, impossible to obtain a single index that is appropriate across each group and can be calculated from readily available climatological data.

This research therefore has the aim to calculate some absolute and relative heat wave indices for the reference period 1981-2010 to provide a comparison spatial-temporal distribution of the HW indices over territory of Ukraine according to the recommendation of WMO 2015 Technical Regulations.

The selected methodology for the heat waves investigation at this stage is based on the absolute indices proposed by Fischer and Schar (2010), Perkins and Alexander (2012): HWM (average magnitude of all summertime heat waves), HWA (hottest day of hottest summertime event), HWN (yearly number of heat waves during summertime), HWD (length of the longest summertime event) HWF (sum of participating heat wave days in the summertime season, which meet the HW definition criteria over a 30-day interval). Also, relative indices (Heat Wave Magnitude Index (HMMI), Russo et al. 2014 and Heat Wave Magnitude Index daily (HMMId), Russo et al. 2015) were used for the research.

Thereby, in this research 5 absolute indices and 2 relative indices for 50 weather stations of the meteorological network of the Ukrainian Hydrometeorological Centre for the summer months of the reference period 1981-2010 were calculated.

It was found that for the almost all the territory of Ukraine, the anomalies of all absolute heat wave indices in 2010 (compared to the reference period 1980-2010) were clearly noticeable.

However, the analysis of the heat wave 2010 showed that a certain multicollinearity is inherent to the absolute indices calculated. The results of the statistical estimation showed that using all five heat wave indices is not necessary. In our opinion, only HWN, HWF and HWM are sufficient for the HW characteristic.

The calculated relative heat waves indexes are sufficiently sensitive to the minor changes of the daily maximum air temperature. It was found HWMI_d is the most sensitive between the studied indices. Therefore, on our opinion HWN, HWF, HWM and HWMI_d indices are the most applicable for the investigation of heat waves over the territory of Ukraine.