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Spatial and temporal distribution of heat wave hazard and risk in Athens, Greece, using artificial intelligence fuzzy logic

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As the average summer temperatures as well as the frequency and intensity of hot days and heat waves are expected to increase due to climate change, this presentation proposes a methodology to evaluate the monthly heat wave hazard and risk and how they are spatially distributed within large cities. Heat wave hazard was estimated from the analysis of hourly modeled air temperatures distributed at 1-km grid over Athens, Greece, by identifying the areas (municipalities) that are more likely to suffer higher temperatures in the case of a heat wave event. Firstly the hot days were defined, then the heat waves were identified and extracted and several features were calculated such as duration, intensity and timing. Then artificial intelligence fuzzy logic was used to classify the heat waves from mild to extreme. The monthly hazard was subsequently calculated as the sum of the heat wave hazards that occurred in a month at each grid point. The monthly heat wave risk map provides the spatial distribution of the risk of the population subject to heat waves within a specific month. It was estimated from the monthly heat wave hazard and the vulnerability of the population to heat waves calculated from socio-economic variables.
The produced maps constitute an important input to Civil Protection authorities for the appreciation of areas of high risk especially during the preparedness phase where the emergency managers develop plans of action to manage and counter relevant risks.
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