THE DEVELOPMENT OF ANALOG EUROPEAN HEAT WAVES FOR U.S. CITIES TO ANALYZE IMPACTS ON HEAT-RELATED MORTALITY

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ABSTRACT

The unprecedented impact of the 2003 European excessive heat event (EHE) raises the question, “What if an EHE of this magnitude occurred in major U.S. cities?” As this was a real, rather than a modeled meteorological event, it is within the realm of possibility that a similarly extreme EHE could, in fact, occur in major U.S. urban areas.

The goal of this paper is to develop meteorological analogs of the recent Paris EHE for five heat-vulnerable U.S. cities: Detroit, New York, Philadelphia, St. Louis, and Washington, D.C. In addition, this work will estimate heat-related mortality for these five U.S. cities for a scenario in which an EHE of the magnitude of the 2003 European EHE occurs in each of them.

The analogs are synoptically based, and a daily air mass calendar is developed for each U.S. city based on the air mass types that were present in Paris during the 2003 EHE. Thus, we look at the air mass character for each day during the event in Paris, and transfer those values to the U.S. cities, based on variation from the mean character for each air mass. In this procedure, we develop the following meteorological variables daily: maximum and minimum temperature, and mean dew point temperature. We use this analog to develop our mortality estimates for the five target cities using tested procedures that have been applied to our numerous heat-health warning systems.

Assuming these conditions in the U.S. cities, all-time records for maximum and high minimum temperature are broken in all cities, and in some locales, there are consecutive days breaking all-time records. Excess deaths (which are assumed to be heat-attributed) approach totals that are more than five times the average calculated for summer.

The meteorological dataset representing the Paris analog EHE developed for the five U.S. cities can have broad application for evaluating environmental problems relating to extreme weather, such as impacts on electrical energy generation, water resources, and agricultural yields.

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