Evaluation of the ERA5-based UTCI on mortality data in Europe

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The study was conducted on behalf of the MCC Collaborative Research Network (http://mccstudy.lshtm.ac.uk/).

Background: The Multi-City Multi-Country (MCC) network is an international collaboration of research teams working on a program aiming to produce epidemiological evidence on associations between weather and health. Sharing epidemiological and meteorological data allows the MCC members to investigate environment-health relationships across national boundaries. ERA5 is a novel climate reanalysis product from the ECMWF (European Centre for Medium-Range Weather Forecasts). It provides estimates of surface and atmospheric parameters at much higher resolution (31 x 31 km) than any previous climate reanalyses. From ERA5 parameters the Universal Thermal Climate Index (UTCI) can be computed as a gridded parameter at the ERA5 resolution for the whole European continent.

Methods: Using daily mortality data from European members of the MCC Collaborative Research Network, we explored the potential of the ERA5-based UTCI as a health-related tool by evaluating UTCI-mortality relationships in 20 cities across 10 European countries. Distributed Lag Nonlinear Models (DLNM) were used to analyse exposure-response relationships between mortality and UTCI in selected cities calculated from (i) the ERA5 reanalysis and (ii) station-based data. Meta-analysis was used to pool the results for each city to bigger groups according to climate zones.

Results and Conclusions: The first results suggest that ERA5-based UTCI is a useful tool for heat- and cold-related mortality assessment. The comparison of the exposure-response relationships between the ERA5- and station-based UTCI is an important step towards the development of a pan-European health-hazard warning system that would be able to assess thermal conditions in locations where high-quality station data are not available.