EMS Annual Meeting Abstracts
Vol. 8, EMS2011-65, 2011
11th EMS / 10th ECAM
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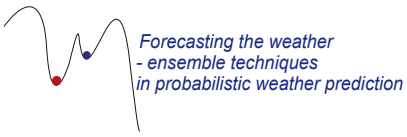

Probabilistic projections of the impact of climate change on heat-related mortality in three European cities

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The majority of climate change impacts assessments account for climate change uncertainty by adopting the scenario-based approach. This typically involves assessing the impacts for a small number of emissions scenarios but neglecting the role of climate model physics uncertainty. Perturbed physics ensemble (PPE) climate simulations offer a unique opportunity to explore this uncertainty and to present impact estimates in a probabilistic framework for communication and education to decision-makers. Moreover, PPEs mean it is now possible to make risk-based impacts estimates because they allow for a range of estimates to be presented to decision-makers, which spans the range of climate model physics uncertainty inherent from a given climate model and emissions scenario, due to uncertainty associated with the understanding of physical processes in the climate model. This is generally not possible with the scenario-based approach. Here, we present the first application of a PPE to estimate the impact of climate change on heat-related mortality. By using the estimated impacts of climate change on heat-related mortality in three European cities; Budapest, Lisbon and London, we demonstrate the benefits of quantifying climate model physics uncertainty in climate change impacts assessment over the more common scenario-based approach. We also show that the impacts are more sensitive to climate model physics uncertainty than they are to emissions scenario uncertainty. For the impact we consider here, whether the climate projections are taken from a global climate model or a regional climate model is shown to have only minor effect. The results demonstrate the importance of presenting model uncertainties in climate change impacts assessments if the impacts are to be placed within a climate risk management framework.