Geophysical Research Abstracts
Vol. 16, EGU2014-5535-1, 2014
EGU General Assembly 2014

A decision support service for temperature-related mortality in Europe

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Users of climate information often require probabilistic information on which to base their decisions. However, communicating information contained within a probabilistic forecast presents a challenge. In this paper we demonstrate a novel visualisation technique to display ternary probabilistic forecast maps of climate-related mortality across Europe. In this method, ternary probabilistic forecasts, which assign probabilities to a set of three outcomes (e.g. low, medium, and high risk), are considered as a point in a triangle of barycentric coordinates. This allows a unique colour to be assigned to each forecast from a continuum of colours defined on the triangle. Colour saturation increases with information gain relative to the reference forecast (i.e. the long term average). This provides additional information to decision makers compared with conventional methods used in seasonal climate forecasting, where one colour is used to represent one forecast category on a forecast map (e.g. red = 'dry').

Temperature and humidity are related to human mortality via location-specific transfer functions, calculated using historical data. Daily mortality data at the NUTS2 level for 16 countries in Europe were obtained from 1998-2005. Transfer functions were calculated for 54 aggregations in Europe, defined using criteria related to population and climatological similarities. A statistical model is fit to cold and warm tails to estimate future mortality using forecast temperatures, in a Bayesian probabilistic framework. Using predefined categories of temperature-related mortality risk, probabilistic forecast maps of human mortality are presented at seasonal time scales. We demonstrate the information gained from using this technique compared to more traditional methods to display ternary probabilistic forecasts. This approach allows decision makers to identify areas where the model predicts with certainty area-specific heat waves or cold snaps, in order to effectively target resources to those areas most at risk, for a given season or year. Although this work is in a preliminary phase, it is hoped that the methodology will facilitate the interpretation of probabilistic forecasts not only for public health decision makers but also within a multi-sectoral climate service framework.