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Communicating uncertainty in climate forecasts: Lessons from the EUPORIAS project

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In communicating seasonal climate forecasts to end users it is important that users are made aware of both the probabilistic nature of these predictions, and of how well the models used to make them perform (represented by measures of skill). If this is not done then it may lead to false perceptions of certainty, maladaptive decision making, and a loss of trust in forecast providers. However, forecast user groups are diverse; varying in both expertise and the types of decision made using forecast information. This means that forecast providers must find effective ways to communicate information about forecast probability and skill to different groups of users.

Here we report on a programme of work, undertaken as one part of the FP7 EUPORIAS project, to identify more effective strategies for communicating confidence in seasonal forecasts to end users. In a preliminary survey with 50 participants, we explored users' current perceptions of the provision of information about likelihood and forecast quality, and their preferences for visualising probabilistic information. Based on these findings, a series of communication formats were developed, and subsequently tested in two online decision labs with decision makers from relevant sectors (n=264 and n=56). Here four formats were shown to statistical experts (Bubble Map, Violin Plot, Bar Graph, Quantitative Table), and three to statistical novices (Confidence Index, Bar Graph, Qualitative Table). For each format, two seasonal forecasts were shown: higher-skill (for Ethiopia) and lower-skill (for Iberian Peninsula). We measured participants' objective understanding, preference, perceived familiarity, and subjective interpretation of the forecasts.

Our findings indicated that 1) even when forecasts perform worse than climatology (i.e. historical data) as a guide to future states, forecast probabilities have an undue influence on subjective expectations about future conditions; 2) using qualitative categories to represent skill can aid understanding of this information, especially amongst those who have less experience of using complex statistical information; 3) while preference for particular formats is related to their perceived familiarity it is not linked to better objective understanding; and 4) when presenting information about the likelihood of climate variables falling into a particular quantile, tabular representations tend to be better understood than visualisations, but they are less useful when users require full probability distributions.

Based upon these findings, we make the following recommendations: 1) forecasts should not be presented to end users by default if they perform worse than climatology; 2) users should be provided with frameworks – such as qualitative categories – to help them understand information about forecast skill; 3) communication formats should be tested with intended user groups in order to identify areas where preferred formats may be misinterpreted, and address these misunderstandings. At a broader level, our findings lend support to a growing body of work highlighting the importance of tailoring climate information to meet the needs of different user groups.