Minimizing Model 'Misuse': Communicating both Imprecision and Inadequacy in Uncertainty Management

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Model over-dependency often leads to self-inflicted wounds when the diversity of our models is misinterpreted as the uncertainty in our future. Structural model error is arguably the most devastating source of failure in science-based decision support, as it is sometimes impossible to see it coming. How might we better manage uncertainty given that models are both essential and imperfect? In short: given that all models are wrong, when is mine dangerous? Including background knowledge of the system we are modelling can provide insight into the likely deficiencies of model-based probability forecasts. These insights may prove of great value when some aspects of the system lie outside the dynamics accessible to any member of the available model class; here the 'best available' probability forecasts may not be fit for use as such. These challenges are ubiquitous in practice; corrective measures to improve uncertainty management are considered (and illustrated), including the provision of explicit information on second order uncertainty (perhaps a subjective probability of 'big surprise', and the abandonment of the concept of 'fair odds', perhaps in favour of "sustainable odds").