Geophysical Research Abstracts
Vol. 17, EGU2015-13900, 2015
EGU General Assembly 2015

When should a model be rejected as not fit-for-purpose?

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There are many models used in the geosciences that are actually not very good at predicting available observations, even after calibration or inversion that allows for some stochastic error model. This may be for very good reasons: because there is some difficulty in implementing perceptual understanding into quantitative model representations, because the initial and boundary conditions are subject to both aleatory and epistemic uncertainties (particularly in respect of the future); because there are computational constraints on model resolution or identification strategies; or because there are commensurability issues in relating measured and model parameter values. But models are very rarely rejected, even when it is clear that they are not really fit-for-purpose. Increasingly, any model limitations are compensated by some form of uncertainty estimation (perhaps including bias and other corrections). But if a model is not fit-for-purpose it might be dangerous to base decisions on the basis of its prediction, even with some form of uncertainty assessment. This presentation will consider how a framework for model rejection might work, taking account of the various sources of uncertainty in the model process. It turns out that this puts emphasis back on the quality of the data sets for model testing in not rejecting potentially useful models just because the input data are poor.