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Eight Tools for Confronting Models with Data

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This paper addresses common tools for confronting models with data in the broad geosciences. We are routinely faced with observational data, which is typically interpreted through the eyes of a particular model. However data and model types, quality, quantity and scales vary significantly. Often, scientists make broad conclusions based on comparisons of just one spatial or temporal attribute of these models and data, without considering seriously the model-data confrontation. Our object is to consider common 'tools' for model-data confrontation, that we believe are useful to a broad class of scientists to consider when confronting models with data. These include: (i) Model parsimony; (ii) Dimensional analysis; (iii) Uncertainty assessment; (iv) Sensitivity analysis; (v) Model/data 'benchmarks'; (vi) Data visualization; (vii) Consideration of alternative models/data/scenarios (viii) Does the question make sense within context of models/data structure it is placed in? We will briefly discuss each tool in the general context of model-data confrontation, along with specific examples from the geosciences.