



## **Choosing the Right Measurements for the Right Reasons**

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The scientific method is defined as a method of systematic observation and experiment guided by the testing of competing hypotheses. While we all embrace the scientific method, in practice we rarely use it to design our investigations. We present a conceptually simple approach to the selection of optimal measurements - the Data Discrimination Index (DDI). DDI is based on the development of an ensemble of models, each of which is seen as a competing hypothesis regarding the hydrologic system under investigation. Each model is comprised of its conceptual model, parameterization, parameter values, and initial and boundary conditions. The likelihood of each model is based on goodness of fit to all existing data. DDI then uses advanced sampling methods to identify sets of measurements that are most likely to differentiate among the likelihood-weighted and importance-weighted models. This constitutes a direct application of the scientific method. We show examples of the application of DDI and discuss how it is being extended to support risk-based decision making.