Modeling Uncertainty and Code Verification: Quantifying the Accuracy of Modeling Codes.

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ABSTRACT: Recent advances in computer technology and numerical methods have triggered a surge in the development and application of water resources and environmental modeling codes. Practitioners faced with complex environmental systems have rushed into utilizing modeling codes with increasing complexities. The modeling codes usually receive minimal testing, if any, by code developers. However, not enough resources have been allocated to quantifying uncertainty associated with the modeling codes. A greater need exists for higher standards on the control of numerical accuracy. The presented paper discusses uncertainty stemming from the numerical implementation used in modeling codes routinely applied in environmental restoration. A number of cases are discussed where error in modeling codes has resulted in error in the simulation results. Commonly utilized in the computational fluid dynamics field, a systematic approach known as grid convergence study is discussed and applied to examine the order of convergence and the accuracy of a modeling code. The approach allows for estimating the order of convergence of the numerical approach without the need examining the source code. The paper also discusses some of the terminology and recommended methodology used in the field of computational fluid dynamics and how they apply to models used in water resources and environmental restoration**.**