



**A method to generate small-scale, high-resolution sedimentary bedform
architecture models representing realistic geologic facies**

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Abstract

Small-scale (mm to m) sedimentary structures (e.g. ripple lamination, cross-bedding) have received a great deal of attention in sedimentary geology. The influence of depositional heterogeneity on subsurface fluid flow is now widely recognized, but incorporating these features in physically-rational bedform models at various scales remains problematic. The current investigation expands the capability of an existing set of open-source codes, allowing generation of high-resolution 3D bedform architecture models. The implemented modifications enable the generation of 3D digital models consisting of laminae and matrix (binary field) with characteristic depositional architecture. The binary model is then populated with petrophysical properties using a textural approach for additional analysis such as statistical characterization, property upscaling, and single and multiphase fluid flow simulation. One example binary model with corresponding threshold capillary pressure field and the scripts used to generate them are provided, but the approach can be used to generate dozens of previously documented common facies models and a variety of property assignments. An application using the example model is presented simulating buoyant fluid (CO₂) migration and resulting saturation distribution.