Title:

Rapid Reservoir Modelling: Geological Rules for Surface-based Modelling

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Abstract:

Two-dimensional (2D) maps and cross-sections, and 3D conceptual models, are fundamental tools for understanding, communicating and modelling geology. Yet geologists lack dedicated and intuitive tools that allow rapid creation of such figures and models. Standard drawing packages produce only 2D figures that are not suitable for quantitative analysis. Geological modelling packages can produce 3D models and are widely used in the groundwater and petroleum communities, but are often slow and non-intuitive to use, requiring the creation of a grid early in the modelling workflow and the use of geostatistical methods to populate the grid blocks with geological information.

We present an alternative approach to rapidly create figures and models using sketch-based interface and modelling termed Rapid Reservoir Modelling (RRM). We leverage methods widely adopted in other industries to prototype complex geometries and designs. The RRM tool contains built-in geological rules that constrain how sketched lines and surfaces interact. These rules are based on the logic of superposition and cross-cutting relationships that follow from rock-forming processes, including deposition, deformation, intrusion and modification by diagenesis or metamorphism.

The approach allows rapid creation of multiple, geologically realistic, figures and models in 2D and 3D using a simple, intuitive interface. The user can sketch in plan- or cross-section view. Geological rules are used to extrapolate sketched lines in real time to create 3D surfaces. Quantitative analysis can be carried out directly on the models. Alternatively, they can be output as simple figures or imported directly into other modelling tools. The software runs on a tablet PC and can be used in a variety of settings including the office, classroom and field.

The speed and ease of use of RRM enables multiple interpretations to be developed from limited data, uncertainty to be readily appraised, and figures and models to be rapidly updated to incorporate new data or concepts.

Biography:

I completed a BA in Earth Science from Boston University, USA in 2002. In 2007, I completed a MS in Geological Sciences from University of California, Santa Barbara, USA. I spent five years working in industry as a reservoir characterization geologist at Chevron Energy Technology Company and at geothermal consulting firm GeothermEx, a Schlumberger company. From 2012-2014 I worked as a University Teacher in the School of Geographical and Earth Sciences at the University of Glasgow. I joined Imperial College London in January 2015 where I am employed as a research assistant and PhD student working with Prof Matt Jackson and Dr. Gary Hampson on Rapid Reservoir Modelling.