Geophysical Research Abstracts
Vol. 17, EGU2015-10747, 2015
EGU General Assembly 2015

Scenario Testing and Sensitivity Analysis for 3-D Kinematic Models and Geophysical Fields

Florian Wellmann (1), Mark Lindsay (2), and Mark Jessell (2)

(1) Aachen Institute of Advanced Study in Computational Engineering Science (AICES), RWTH Aachen, Germany, (2) Centre for Exploration Targeting, The University of Western Australia, Perth, Australia

Geological models are widely used to represent the structural setting of the subsurface. Commonly, a single model is generated for a region, representing the best interpretation of the structural setting in the light of all available information. It is, however, widely accepted that a such created model still contains uncertainties. We hypothesise here that it is possible to transform a single kinematic model into a powerful predictive tool for scenario analysis and uncertainty quantification.

We extend the functionality of a kinematic structural and geophysical modelling approach, implemented in the software Noddy, with a set newly developed Python modules to expose, generalise and automate essential parts of the modelling workflow. We show how these methods enable us to quickly generate and analyse different geological scenarios.

In addition to the geological model, Noddy also enables the direct calculation of geophysical fields of gravity and magnetics. We can use this functionality to compare the model to measured potential fields. With an example for a fold and thrust belt model, we show how to quickly estimate how changes in the model (due to parameter uncertainties, for example) affect the calculated gravity field in the model range.

Finally, we present the possibility to efficiently generate an ensemble of model realisations for predictive geomodel analysis with an application to a case study in the Gippsland Basin, Victoria. The results show that our approach can successfully extend the functionality of traditional modelling methods with an additional layer of predictive power towards an efficient evaluation of uncertainties in structural geological models.