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POSTER PRESENTATION

Application of Gravitational Curvature Analysis to Structural Domaining of Onshore Basins

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During 2018, a paper entitled "Derivatives, Tensors and Invariant Imaging for Qualitative Interpretation" was presented at the EAGE Annual Conference in Copenhagen and the 1st AEGC Conference in Sydney. This paper describes the application of tensor gradient transforms derived from airborne gravity gradiometry surveys in visual interpretation. Potential Field Gradient Tensors are a multichannel dataset combining 5 independent components in a matrix array (Zengerer, 2018). As such, the data can be used and combined in many ways. A very common problem right across the world of geoscience is that even standard potential field transforms are not actually well understood by users. It is important that all images used in potential field analysis carry some sort of physical meaning which is understood by the interpreter. True understanding arises from geophysically modelling a known 3D geological model, creating the grid transforms from the forward response of the model, and comparing these to the geology.

3D forward gravitational responses of a 3D model of a simple two-body basin-basement system, with conjugate faulting and a dome-basin shape, were used to generate the examples. Depths to the basin-basement interface were computed from the model and are presented as grids and contours, draped on the gravity gradient imaging products to illustrate their responsiveness to the basement architecture. Various combinations of traditional gravity and its gradient transforms, as well as tensor invariants and phase products, have been assessed against the model. It is shown that certain imaging products show more responsiveness to physical property variations, whilst others are more sensitive to geometry, but combining these in novel ways can result in understanding of subsurface mapping possibly not explored previously using potential fields. The applications of these transforms may also apply to both gravity and magnetics data under specific circumstances.

Selected examples of gravity, FTG and AGG with magnetics, from public domain surveys over the Bonaparte, Amadeus and Otway Basins are taken to show physical examples of gravity gradient transforms over known geological features. These include salt domes, igneous intrusions, volcanic flows, carbonate build-ups and complex folded terranes. The poster format will allow visual interrogation of examples not possible in the oral presentation of 2018.

REFERENCE

Zengerer, M. 2018. An Overview of Tensors, Gradient and Invariant Products in Imaging and Qualitative Interpretation. ASEG Extended Abstracts.