3D gravity and magnetic modeling - its past and future contribution to understanding the geology of Australia

Minerals keynote paper

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SUMMARY

Geoscience Australia (a.k.a. BMR and AGSO) pioneered the acquisition of regional gravity and magnetic data to aid geological mapping. These data revealed for the first time the extent and nature of the major tectonic elements of the Australian continent. In the 1980’s, airborne survey and major exploration companies extended this concept to higher resolution at the province scale, further bringing the geology into focus. Qualitative interpretation of this type of information in 2D plan view has proved invaluable. Thoughts turned to 3D modeling and interpretation. Despite an array of software tools to perform the modeling, we are yet to feel that it has really met expectations. As we move into the future, the grand challenge for us all will be to inject more geological knowledge ("prior information") into the modeling. Technology in the form of better geophysical data acquisition capabilities, improved software tools, High Performance Computing facilities, and novel ways to integrate interpretations and visualize 3D spaces will all contribute to the solution. However, user input will remain the key ingredient for success. Injecting geological knowledge into the modeling process and understanding the results that modeling provides will enable us to reveal more detail of the 3D subsurface structure and to identify and manage the resources that are hidden therein.