

Broken Hill model - bringing portability to 3D geoscience

S. Nichols

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Abstract: Pasmaenco geologists and Fractal Graphics have collaborated on a project to build a 3D geometrical model of the Broken Hill block. This model is based on all available data including Geological Survey of NSW (GSNSW) mapping, reflection seismic surveys, magnetics, gravity and proprietary drilling data. A number of important geological assumptions have been made in order to carry out this project. Most critical is the assumption that a litho-stratigraphy, as represented on the GSNSW maps, is continuous throughout the region. Although debate exists as to the validity of this assumption, once made it further implies that mapped outcrop patterns are largely the result of superposed fold systems.

Analysis of seismic reflection profiles and "worming" (see FracChat no. 3 DSept., 1999) the gravity and magnetics data has aided the interpretation and discrimination of major structures, particularly retrograde shear zones. Unraveling the intervening structural geometry has required a rigorous topological analysis prior to model construction. Map patterns rationalised in terms of various generations of fold axial traces and areas of postulated upwards and downwards facing provided a basis for 16 regional cross-sections constructed across the block. The cross-sections depict the four main stratigraphic units defined by the GSNSW and their contacts have been modelled as continuous surfaces throughout the block (both above and below the current erosion surface). The ability to build 3D models of the structure strongly constrains the fold geometries present and provides a possible solution for the assumptions employed.

Detailed models of the "line of lode" structure have been constructed based on cross-section interpretation and various level maps compiled from underground workings and drilling. These models provide considerable insight to the geometry of mineralisation in the mined areas. Correlations of distinctive gneiss units throughout the line of lode has resulted in the interpretation of important structures in this area. Moreover a very specific structural position for mineralisation is indicated. Similar structural situations may exist elsewhere in the block and regional models help to identify these. Field testing of the geometric models and testing of hypotheses about the location (in 3D space) and structural setting of mineralised zones throughout the block can now proceed.

Modelling was completed using Vulcan software and wireframes exported to MAYA for animation and rendering. Compilation to QuickTime and MPEG format was completed using Adobe Premiere.

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Animation of 3D model

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