

New Exploration Techniques for Buried Ore Deposits in the Eastern Succession

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Introduction

The Eastern Succession of the Mount Isa Inlier, northeast Australia, is a richly endowed base metal province, with world class Fe-oxide-Cu-Au (IOCG) and Ag-Pb-Zn deposits (figure 1). With much of the exposed bedrock already explored focus must now turn to areas under different degrees of cover. The whole Inlier is comprised of about 50000 square kilometers of outcropping Precambrian rocks and a further 90000 square kilometers of similar rocks under sedimentary cover. This is a huge area of exploration potential and indeed many recent discoveries of large deposits (e.g. Ernest Henry, Osborne and Cannington) have been made in areas of extensive sedimentary cover using geophysical techniques. Analysis of potential field data is one of the most common and cost effective ways of

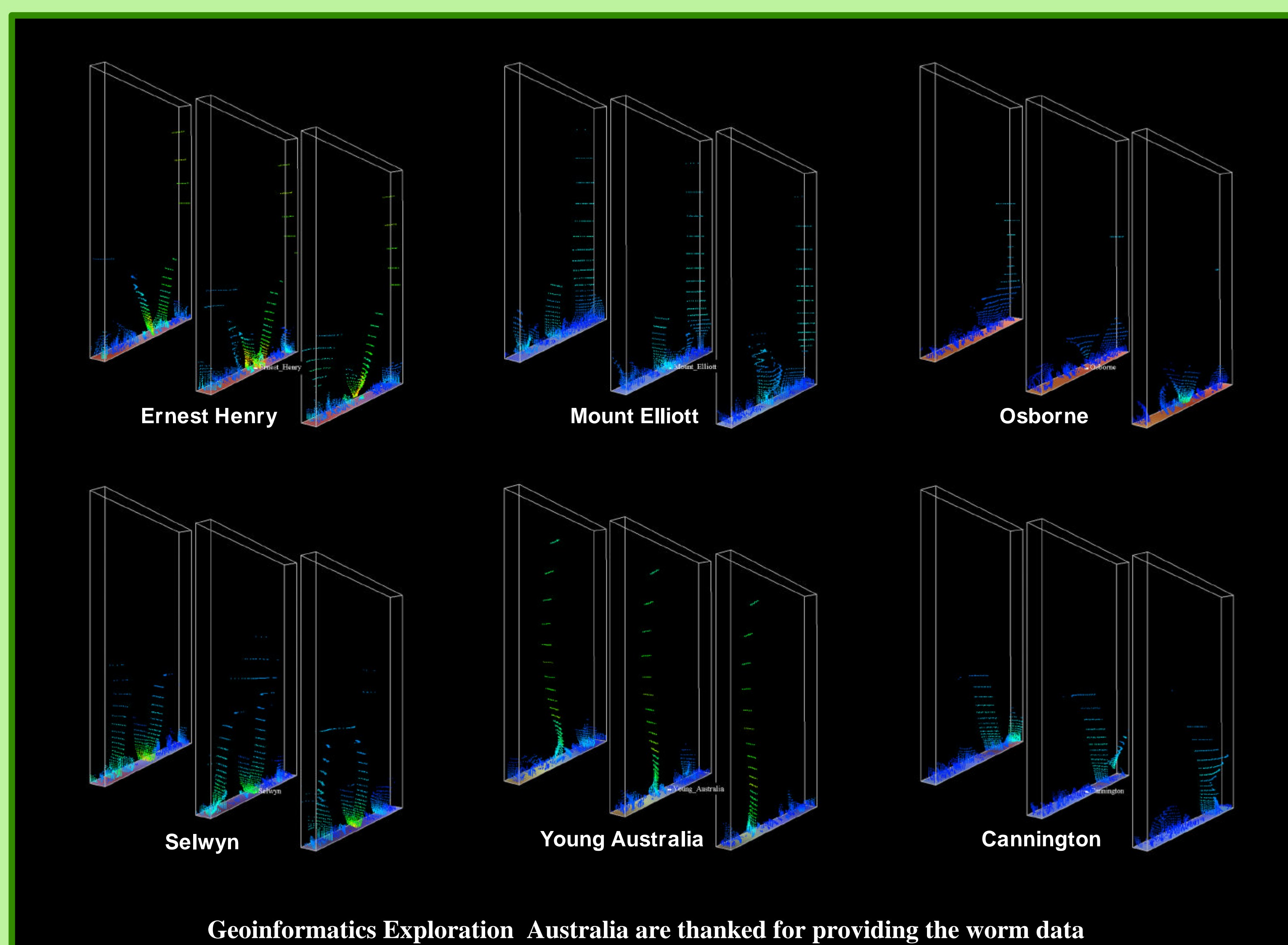


Figure 2 – Magnetic worms of major ore deposits in the Eastern Succession. Shown are perspective views of a sequence of 20x2x30 km prism with the middle prism centred around the deposits of Ernest Henry, Mount Elliott, Osborne, Selwyn, Young Australia and Cannington. Worm points are coloured by W_{MAX} values. Worms derived from MIM/Xstrata magnetic dataset.

inferring geology that cannot be seen and there is an extensive database of existing gravity and high quality magnetics data for the Mount Isa region that is available to the **pmd***CRC. With future developments of airborne gravity and gravity gradiometry, advanced analytical methods of these types of data becomes the key for prediction of mineral deposits beneath cover.

The aim of this project is to develop new ways to predict the location of ore deposits beneath cover. Methods to achieve this will include: **a)** The use of multiscale wavelet based edge analysis (worming) of potential field data. Worms have been successfully used in prospectivity analysis in the Mt Isa region, showing good correlation with mapped faults and intrusives and defining areas that are more permissive to mineralization. Work will involve classifying worm edges with respect to known geology and mineralized zones. **b)** 3D inverse modeling of potential field data will be used at a mine and local scale in order to determine the geological significance of classified worm edges. **c)** Integration of geochemical models of mineralized zones around ore deposits and gamma-ray spectrometry data. This will identify key aspects

of the geochemical models that can be identified in the spectrometry data and relate them to general and potential field data to extend exploration under cover.

What can the worms tell us?

The magnetic and gravity worms around major ore deposits in the Eastern succession (figures 2 and 3) have revealed several interesting features. Magnetic worms around Ernest Henry, Mount Elliott and Selwyn resemble a V-shape with semi or complete closure around the deposit and moderate to high W_{MAX} values. Osborne and Cannington are located in close proximity to a V-shaped features while Young Australia is in close proximity to a very large magnetic worm that upwardly continues to 29 km.

Ernest Henry, Mount Elliott, Osborne and Selwyn are all located not on but close to major N to NW trending gravity worms that upwardly continues to 70 km where as Cannington (Ag-Pb-Zn, not IOCG) is located directly on a large NNW trending worm. Young Australia is again unique amongst the IOCG deposits and is located between three potential field edges. Of particular interest is the similarity in appearance of Ernest Henry to Osborne and of Mount Elliott to Selwyn. Are these features significant and can we find similar features in other areas of the Eastern Succession?

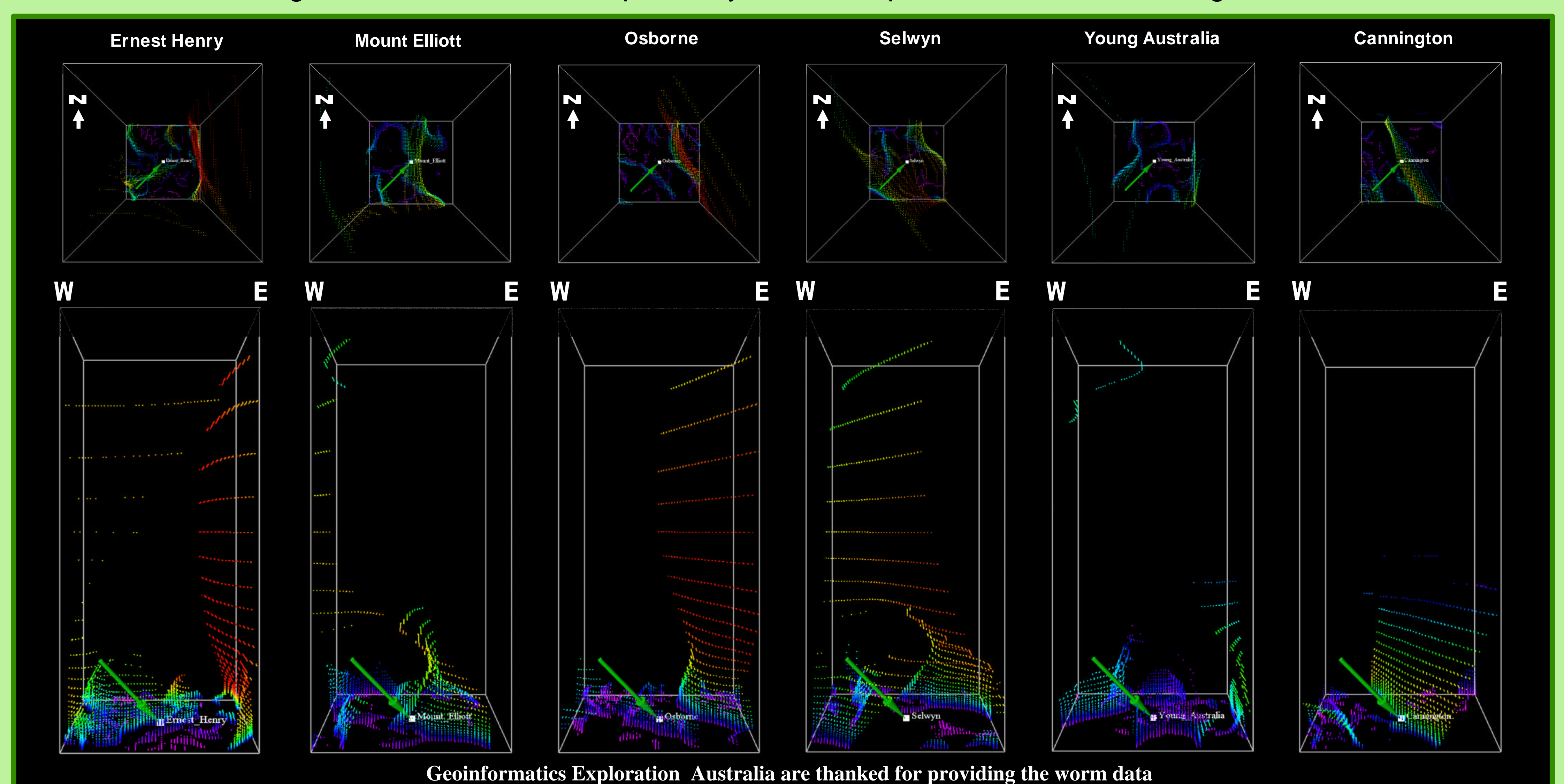


Figure 3 – Gravity worms of major ore deposits in the Eastern Succession. Shown are plan and north-facing perspective views of a 30x30x70 km prism centred around Ernest Henry, Mount Elliott, Osborne, Selwyn, Young Australia and Cannington. Worm points are coloured by WMAX values.