Geophysical modelling of the Palmerville Fault and other major structural components of the Broken River-Hodgkinson Provinces

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The Palmerville Fault represents a major Precambrian - Palaeozoic boundary in the Northern Tasmanides. Central to the "understanding of the tectonic evolution of the crust in Northern Queensland" (Shaw et al., 1987), it constitutes a 'poorly-endowed' case-study for the A1 project in predicting mineral potential of major fault systems.

Almost as a consequence of lack of proven mineral potential, it is relatively poorly understood and surface and 3D datasets are sparse. From this perspective, the role of geophysics is instrumental in defining the structural form, depth extent, kinematic evolution and ultimately, factors leading to fluid pathways and mineral potential of the Palmerville Fault. Constraining this 1st-order structure also has major implications for our understanding of the tectonic evolution of the Northern Tasmanides during the Early Palaeozoic.

Armed with only regional databases: 200m line airborne magnetics, 10km spaced gravity and very limited petrophysics, potential field modelling has been driven by conceptual structural ideas, simplicity and minimisation of field annihilators. In contrast to the tectonic model of Shaw et al. (1987), with multiple phases of west over east thrusting, a more elegant and straightforward model is proposed. Specifically, forward modelling of magnetic and gravity data supports normal movement on an easterly dipping Palmerville Fault, with minor later-stage back-thrusting associated with the Mitchell Fault Zone.

From a mineral potential viewpoint, the significance of this simple model fit is still to be investigated. However one possible repercussion is that while the fault may still have provided a fluid conduit, there are no compounding features and subsequent dilation zones to provide effective sites for mineralisation.

Potential-field studies are also redefining the significance of other tectonic elements in these Provinces, most notably the Alice Palmer Structure. Previous interpretations have the Palmerville overprinted or terminating at this major feature, but multi-scale edge analysis ('worming') suggests that they are both of similar timing and are bifurcated by an undefined east-west lineament. Detailed modelling will be undertaken to further study the relationship, and to continue the structural analyses into the Broken River Province.

Reference
