Xcalibur
SMART MAPPING

FALCON® AGG

Location: Greymouth, New Zealand | **CASE STUDY**

Solutions for Coal Exploration

As part of an exploration program to identify coal measures, Fortescue Metal Group Limited (FMGL) undertook a FALCON® Airborne Gravity Gradiometry (AGG) survey over the Greymouth coalfields in the South Island of New Zealand.

Integrated interpretation of the FALCON® AGG dataset was undertaken to assist in the understanding the partitioning within the basin due to faulting, and to enable FMGL to better plan the coal exploration by identifying synclines forming basement lows. These indicate areas of low deformation and thicker coal deposition.

The survey consisted of 1,181-line km of data (AGG, magnetic and DTM) acquired on a NNE-SSW traverse line spacing of 200m and WNWESE tie line spacing of 2,000m (Figure 1). The average terrain clearance was 100m.

The Greymouth area contains three quarters of New Zealand's economically important reserves of high-quality bituminous coals. The two main coal measures are the Cretaceous-Paleocene Paparoa coal measures and Eocene Brunner coal measures. These occur at high altitude within the inverted Paparoa Ranges that have a complex tectonic history which began during the Late Paleozoic and continued through to the Quaternary.

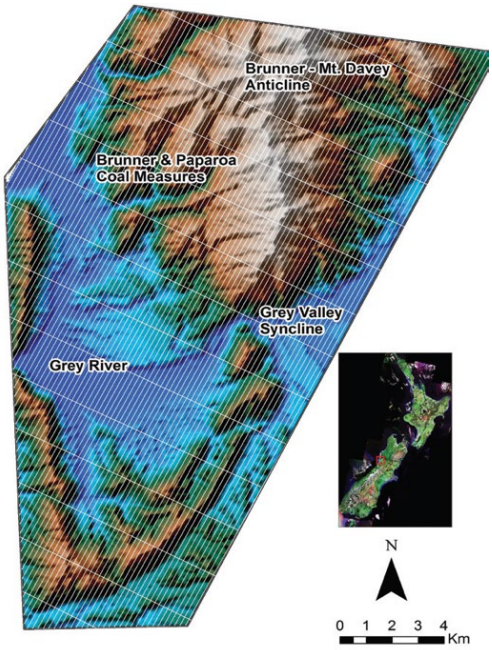

Figure 1. Location of the Greymouth area including the Paparoa and Bruner Coal Measures. The flight plan (white lines) is overlain on the sun shaded DEM.

1. FALCON® AGG DATA

FALCON® AGG data (Figures 2 & 3) shows high amplitude medium long wavelength features in the NE, due to the relatively higher density basement and a series of high-amplitude short-wavelength features through the central part of the survey area interpreted as relatively higher density intra-sedimentary volcanic units (Figure 4). Relatively low amplitude regions represent synclines within the basement and/or lower density coal measures.

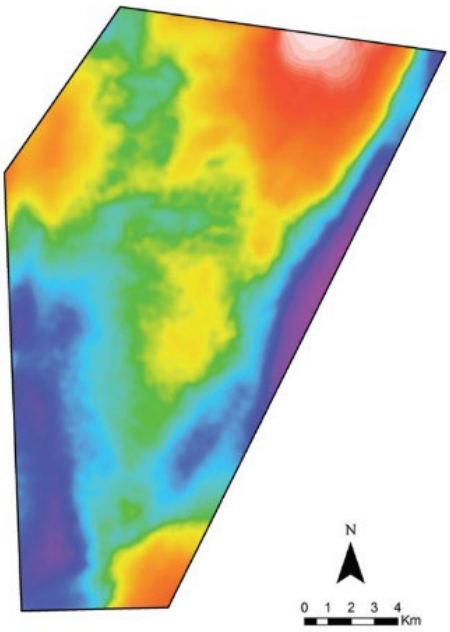

Figure 2. AGG dataset showing gD data.

2. INTERPRETATION

A series of E-W fault-controlled basins contains the Pororia Coal Measures and are associated with intra-plate extension during the Cretaceous-Paleocene. Discrete NNE-SSW oriented depocenters, including the Paparoa Trough, accommodate the Brunner Coal Measures that developed during a second phase of extensional tectonism in the Eocene. A series of NNW-SSE reverse structures represent newly developed splay faults if the main NNE-SSW inverted structures (Figure 4) associated with oblique shortening and inversion of the Eocene basins due to plate reorganization during the Late Oligocene-Early Miocene. The inversion structure (Brunner-Mt. Davy anticline) is dominant in the north and is associated with the uplift of the Paporoa Ranges but terminates in the south with decreasing strain being accommodated by the reactivated NW-SE trending structures. WSW-ENE dextral transgressive deformation (Figure 4) along the Alpine Fault system marks rapid uplift in the Quaternary.

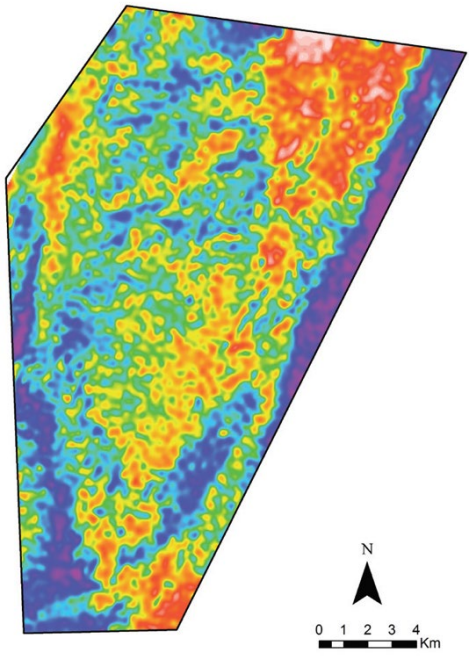

Figure 3. AGG dataset showing GDD data.

3. SUMMARY

FALCON® AGG data has been used to provide a greater understanding of the basement topography, the kinematic relationship of structures in the Greymouth area and the different phases of extension and deformation in the coalfields. Interpretation of the basin architecture for the area with attributed structures highlight the evolution of the basin. The enhanced imagery, including pseudo depth slices show intra-sedimentary features. Target areas for exploration have been identified by interpreting synclines, lows in the FALCON® AGG data, which formed areas of low deformation in coal and thicker accumulations of coal.

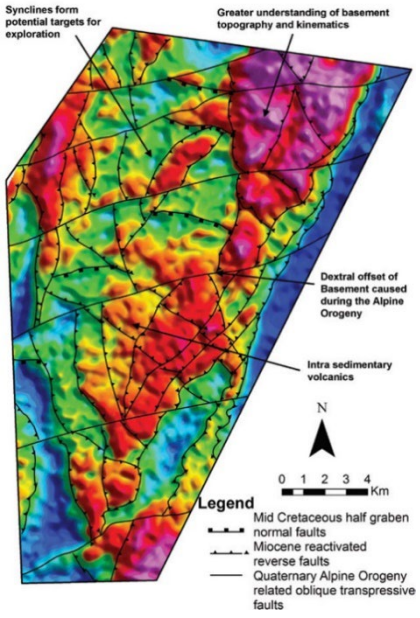

Figure 4. Structural interpretation and features of interest highlighted from the sun shaded 1670m + 370m pseudo-depth slices of GDD.