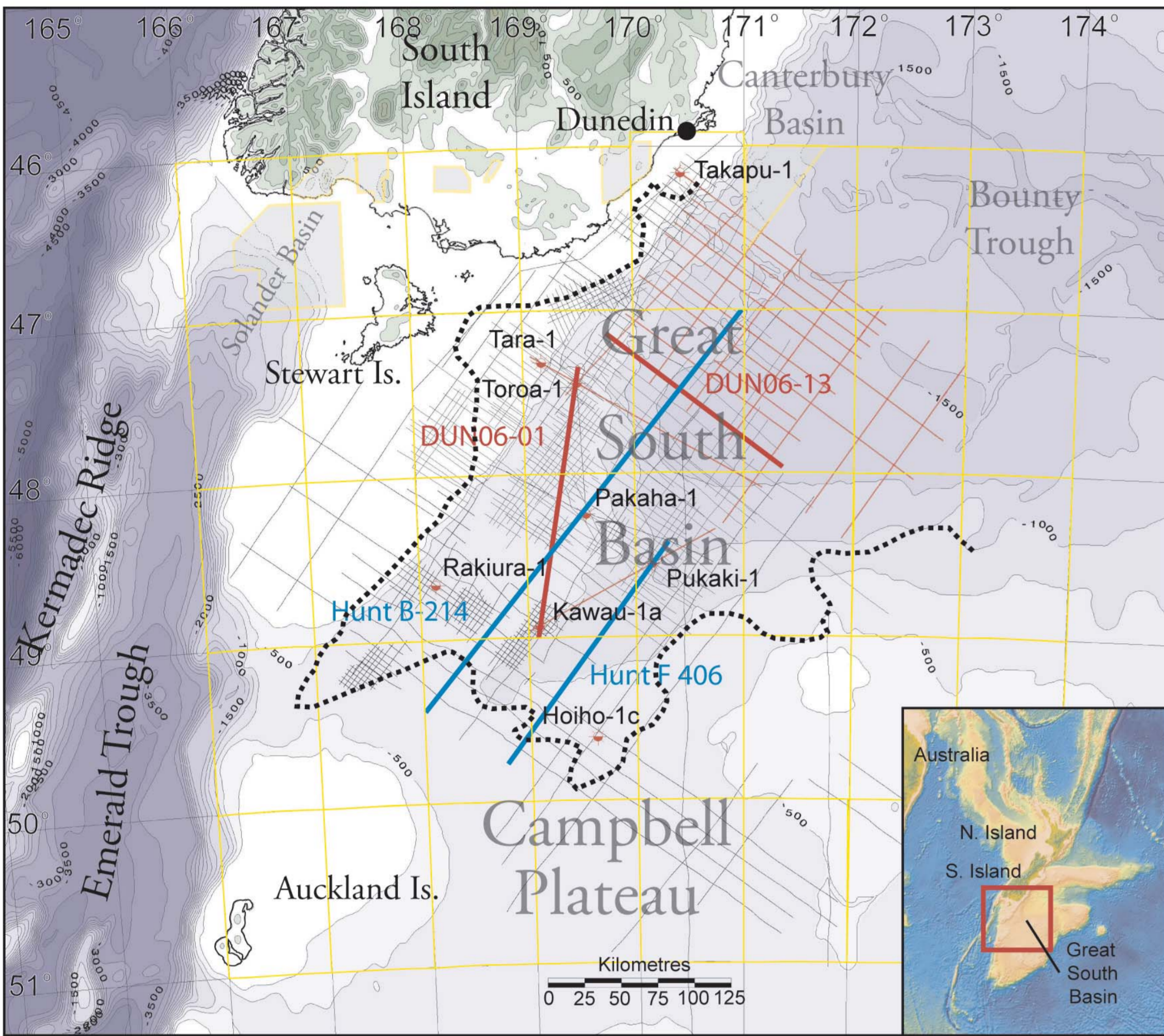


## Introduction

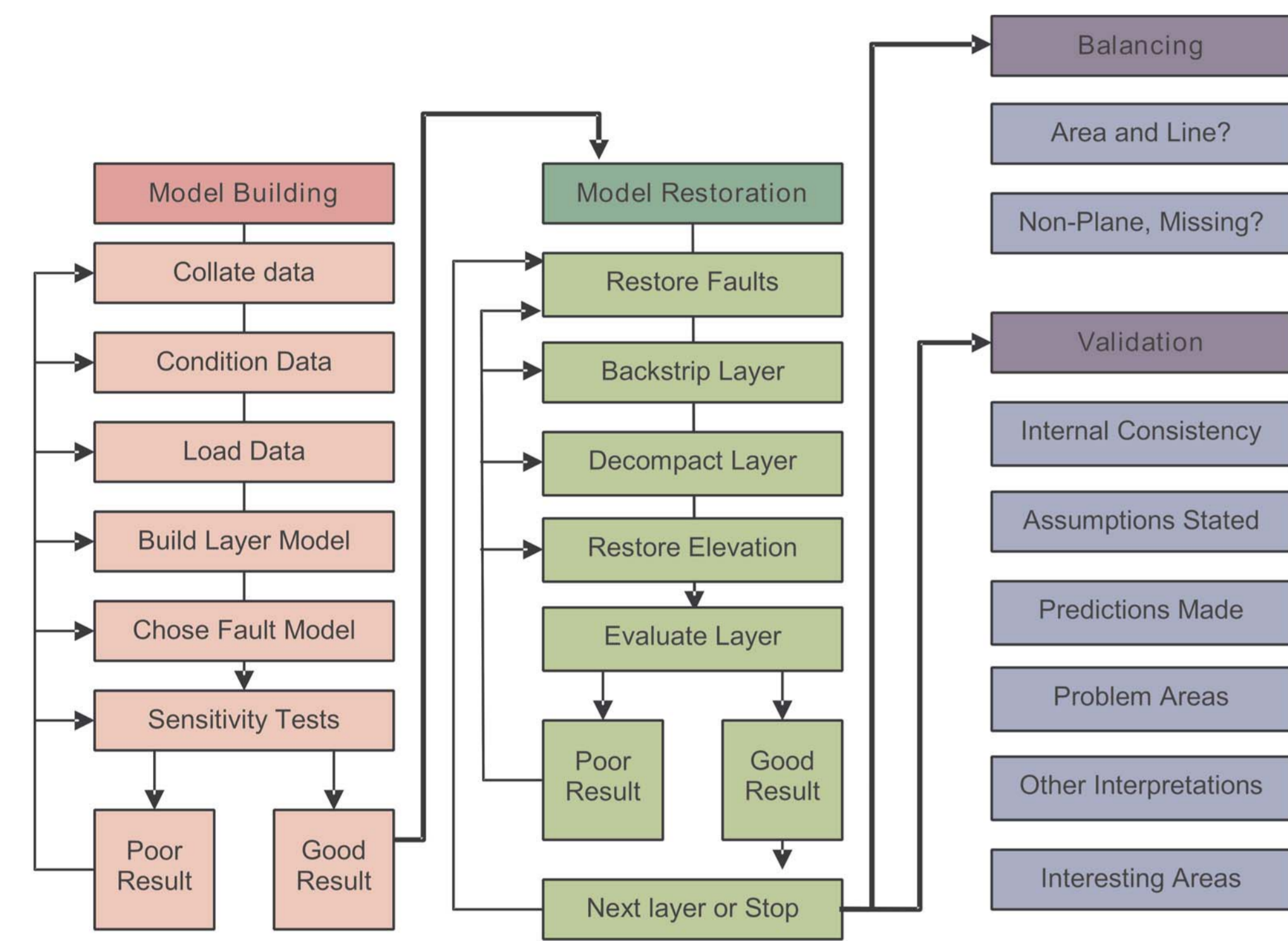
The recent Crown Minerals DUN06 seismic reflection survey greatly improved imaging of sedimentary successions and basement configurations in the Great South Basin. Geometries newly imaged by the survey are predicted to have strongly influenced many aspects of resident petroleum systems. Understanding these geometries will be critical to exploration.

We show our seismic interpretation of seismic line DUN06-13 (right) and a series of 2DMove structural modelling panels (below right) that we developed to test the seismic interpretation. The panels depict restoration of part of the basin back to the Cretaceous or possibly earlier. While we acknowledge that the seismic interpretation of SEGY data are typically non-unique, our modelling suggests that this particular interpretation is structurally valid for this seismic line.



Map of study area. The red lines are the DUN06 survey with thick red line indicating the location of line DUN06-01 and DUN06-13. The dashed black line represents the approximate boundary of Great South Basin.

## Structural Modelling Workflow



Structural modelling workflow showing key steps. Though not highlighted, depth conversion was performed in 2DMove using a velocity model provided by G. Maslen (personal communication). Faults were restored with the fault parallel flow algorithm with satisfactory results. Relatively large asymmetric scarps were left following backstripping and restoring of the deepest sediments. These were restored in the final restoration panel at right. The result, at bottom right is speculative.

## Study Predictions

### Facies distribution a function of imaged geometries

Basin history and structural evolution have implications for distribution of deeply-buried sediments, including source and reservoir facies, which were previously unrecognised on older seismic data (e.g. Carr et al 2003).

### Rift asymmetry affects basin evolution

Asymmetric crustal structure will have likely affected heat flow distribution, and ultimately the generation and expulsion of petroleum from source sequences.

### Deep rift geometry affects petroleum migration

The large, asymmetric, dipping growth strata wedges and relatively well constrained listric faults have strongly influenced regional hydrocarbon migration, focussing and trapping.

### Charging depends on new geometric model

The two primary previous play types, drape-folds and inverted fault anticlines, are critically dependent on newly imaged asymmetric geometries.

### DUN06 Survey-a good investment

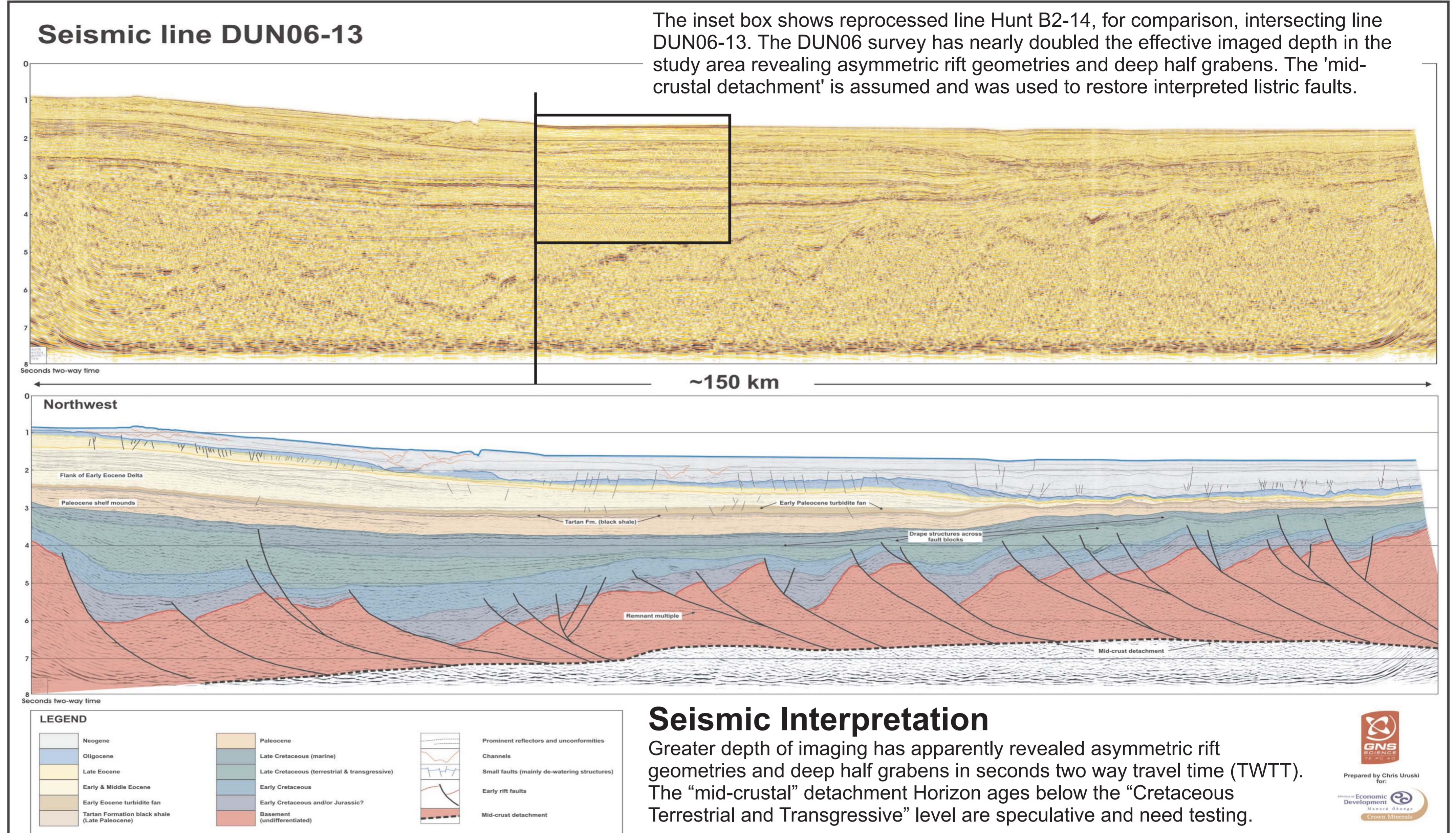
The DUN06 seismic survey has significantly enhanced the potential for the discovery of billion barrel oil fields and multi-TCF gas fields in Great South Basin by imaging, for the first time, the deep rift structure and rift fill in the study area.

## References

- Carr, I.D., Gawthorpe, R.L., Jackson, C.A.-L., Sharp, I.R. & Sadek, A. (2003) Sedimentology and sequence stratigraphy of early syn-rift tidal sediments: the Nukhul Formation, Suez rift, Egypt. *J. Sed. Res.*, 73, 407–420.
- Lezzar et al., 2002 K.E. Lezzar, J.J. Tiercelin, C. Le Turdu, A.S. Cohen, D.J. Reynolds, B. Le Gall and C.A. Scholz, Control of normal fault interaction on the distribution of major Neogene sedimentary depocenters, Lake Tanganyika, East African rift, *Bull. Am. Assoc. Pet. Geol.* 86 (2002), pp. 1027–1059.

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## Seismic Reflection Data



## Structural Modelling Results

This restoration sequence is developed from a 150 km-long model simplified from the interpretation above. Horizon ages below the "Cretaceous Terrestrial and Transgressive" level are speculative and need testing. The modelling suggests that the majority of finite extension accumulated very early in the basin history. The finite extension factor on DUN06-13 is about 1.3, although that number needs tested on adjacent parallel lines. Line DUN06-01 (see map), at a high angle to DUN06-13, records less extension, with an e factor just under 1.2. Given the apparent sediment thickness, half graben asymmetry, and heterogeneously distributed strain, mapping the 3D rift geometry would provide valuable insight to the predicted distribution of sediment facies and likely source rock accumulations (e.g. Lezzar et al 2002).

