

Geophysical processing, integration, and visualisation of multi-parameter survey data over parts of the Eastern Cape

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INTRODUCTION

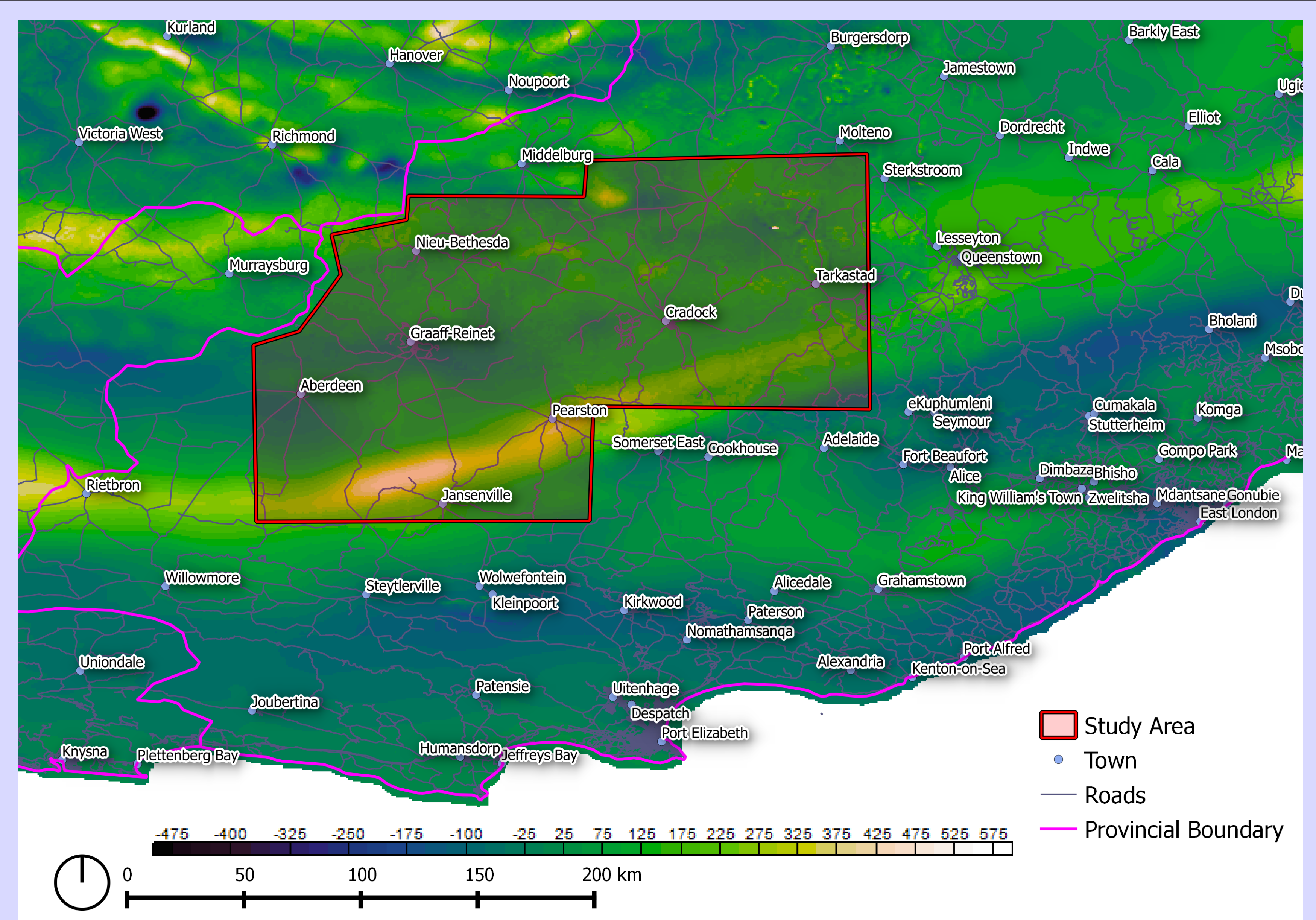
The existing geophysical data available for the Eastern Cape lacks detail on small-scale features. With ongoing debate about shale gas and increasing groundwater stress, more detailed information is vital for informed decision-making.

Geophysical data is widely used as a non-invasive means of investigating the sub-surface around the world. It has been used for determining structures (such as folds and faults) which may control groundwater, locating mineral resources, and identifying igneous bodies.

Traditionally, surveys were ground-based, but airborne surveys are now approaching similar levels of accuracy, (10s of metres depending on method). They are also able to cover a wider area more quickly.

GOALS

This project will gather new, high resolution geophysical data over parts of the Eastern Cape, particularly in the Karoo, which is the focus of intense interest for energy (shale gas) development and its groundwater resources, which may be impacted by this. At the same time, accurate elevation data for creation of a digital terrain model will be acquired.



A portion of the existing SANABOZI magnetic dataset over the western part of the Eastern Cape, highlighting the proposed study area. Small-scale features are not visible, since the dataset does not have high resolution data for this part of the country. A similar issue is evident in other geophysical datasets. Geographical data from OpenStreetMap.

Types of airborne geophysical data that will be collected include:

MAGNETIC

Detects the natural variation in the amount of magnetic minerals present in the near to subsurface geology. Igneous rocks are usually more magnetic than sedimentary rocks, so this will allow for better understanding of the distribution and architecture of rock formations in the Karoo (such as dolerite).

RADIOMETRIC

Detects the concentration of natural radioactive elements (U, Th, K) present in the very near surface (up to $\pm 0.4\text{m}$). Useful for determining soil erosion rates, sediment transport and underlying parent bedrock forming soils.

GRAVITY

Detects the variation in density of rock units. Useful to determine structure, particularly of igneous bodies in sedimentary basins, such the Karoo dolerites. High resolution airborne gravity studies are relatively recent and expensive, but provide good definition for lithological units.

DATA PROCESSING

The amount of data gathered on the survey flights precludes manual processing. Computers have become vital, but most commercial geophysical modelling and visualisation software is too expensive for academic institutions, or not suited for airborne data.

A license for Geosoft's *Oasis Montaj* is available, but new software, on an Open Source model, will be developed to process, analyse and visualise data. A number of projects exist which can be extended or used.

CONCLUSION

When this project concludes, a new, high resolution data set will be available for parts of the Karoo. Further analysis of geophysical properties within the study area will be possible with this new data, which may highlight previously unknown geological structures or areas of potential development.

The software developed as part of the project will also lower barriers to entry for processing, integrating and visualising of geophysical datasets in the future, making similar surveys more cost-effective than at present.



SURVEY METHODOLOGY

The airborne survey flights for this project will be undertaken using a gyrocopter as the payload carrier.

The gyrocopter can fly at low altitude, low speed, and is more cost-effective than traditional fixed-wing or helicopter platforms. This will allow for rapid collection of new, high-resolution data in areas surveyed. Low altitude is vital for high resolution data to be gathered.

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