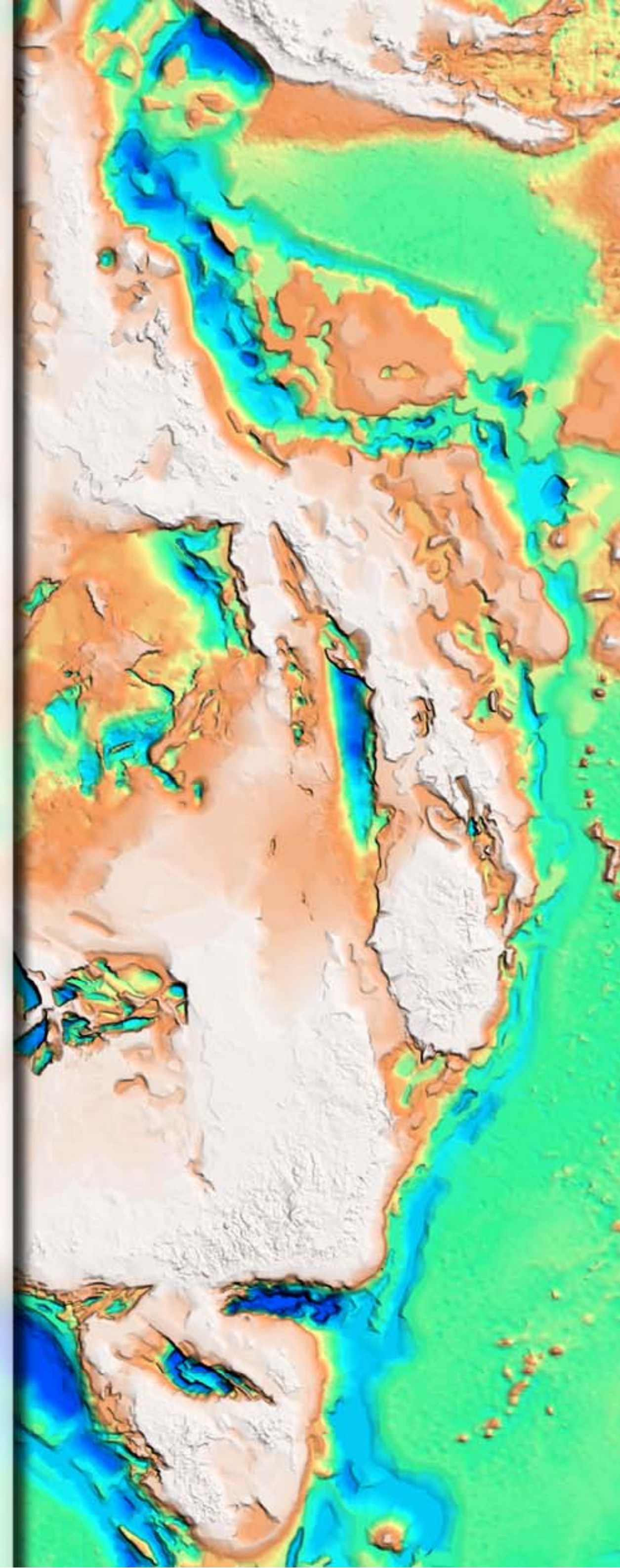
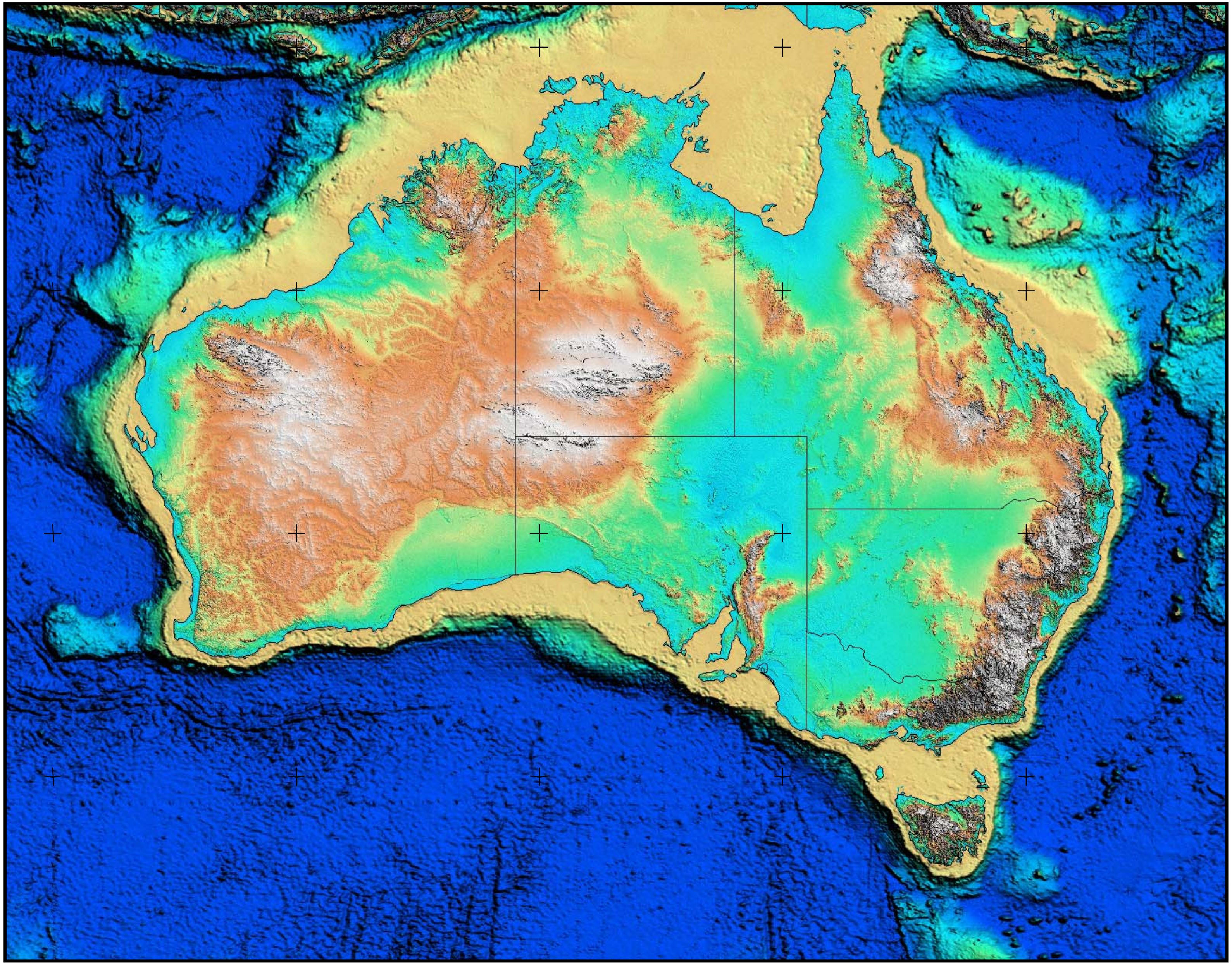
# OZ SEEBASE™
## STRUCTURAL GIS

**2005 - Version 1**

Project Code: GA703



# Digital Elevation Model



Digital Elevation Models (DEM's) often show the youngest structures, and any active geological structures. They are widely used for neotectonic analysis. The composition of eroding terrain controls its resistance to weathering, hence DEM's can be used to distinguish different compositional domains.

To provide the best possible digital elevation model, two available datasets, the Sandwell and Smith Global satellite bathymetry dataset and the SRTM30 (see below) were used.

**Global Topography**

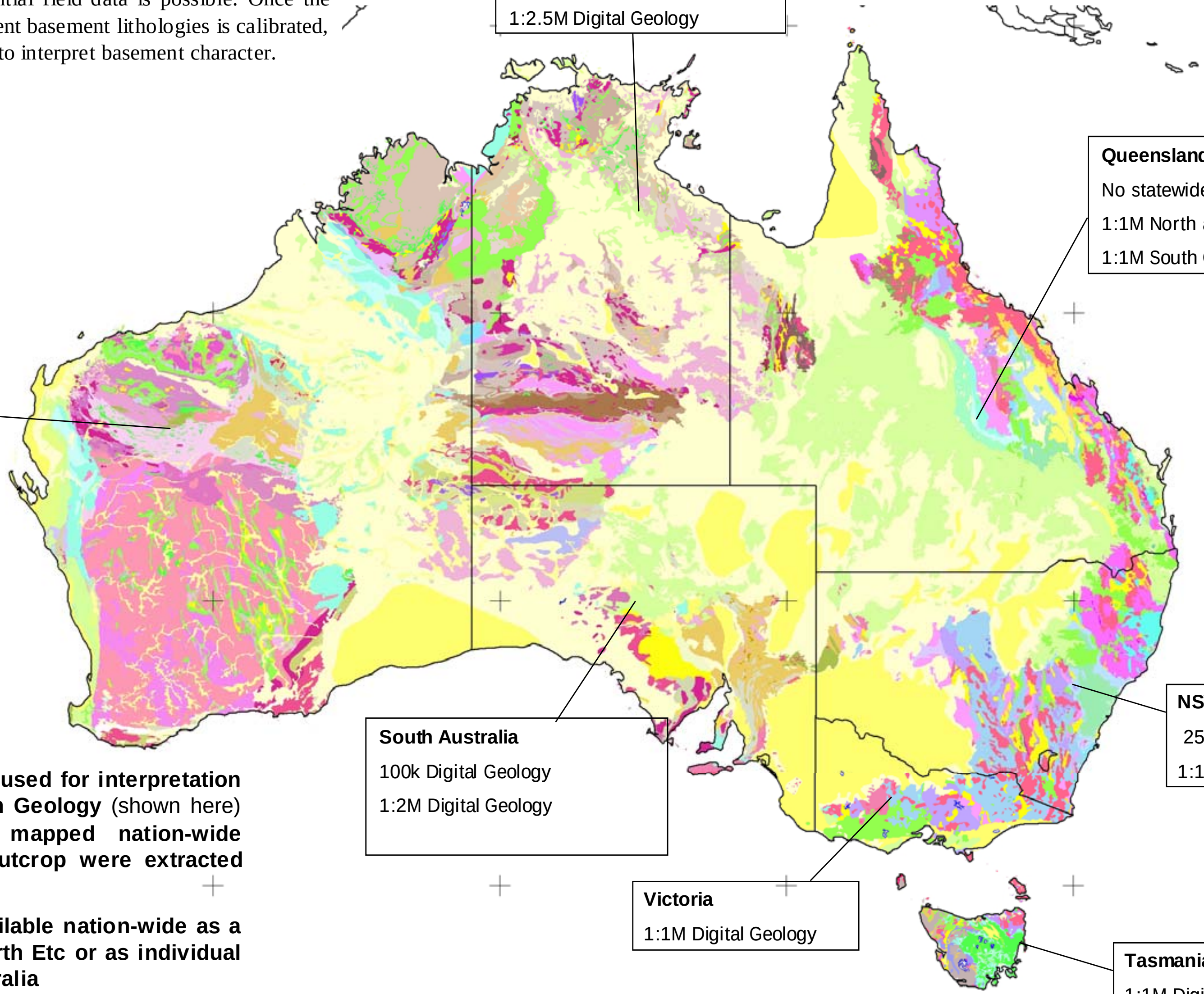
The Sandwell and Smith Global Topography dataset provides a combined topography / bathymetry model, using the SRTM30 dataset for the topography model and satellite altimetry data combined with ship depth sounding for the bathymetry model.
For more details about the bathymetry model see: Smith, W. H. F., and D. T. Sandwell, Global seafloor topography from satellite altimetry and ship depth soundings, Science, v. 277, p. 1957-1962, 26 Sept., 1997.

SRTM30 is a global digital elevation model (DEM) with a horizontal grid spacing of 30 arc-seconds (approximately 1 kilometer). SRTM30 is a near-global digital elevation model (DEM) comprising a combination of data from the Shuttle Radar Topography Mission, flown in February, 2000 and the U.S. Geological Survey's GTOPO30. More information is available online.

This image is a mosaic of the SRTM30 (onshore) and Sandwell & Smith Global Topography (offshore).

## Surface Geology

Surface geology is a key dataset for any geological interpretation. Surface geological maps provide calibration for interpretation of DEM, gravity and magnetic data. Where basement is outcropping, the direct correlation of geological units with patterns in geopotential field data is possible. Once the magnetic and/or gravity response of different basement lithologies is calibrated, it is possible to extrapolate beneath basins to interpret basement character.




**The main surface geology dataset used for interpretation was the Geoscience Australia 2.5m Geology** (shown here) **as it provides a consistently mapped nation-wide coverage. Limits of basement outcrop were extracted from this dataset.**

**250k Raster geology was also available nation-wide as a single ECW image provided by Earth Etc or as individual 250k sheets from Geoscience Australia**

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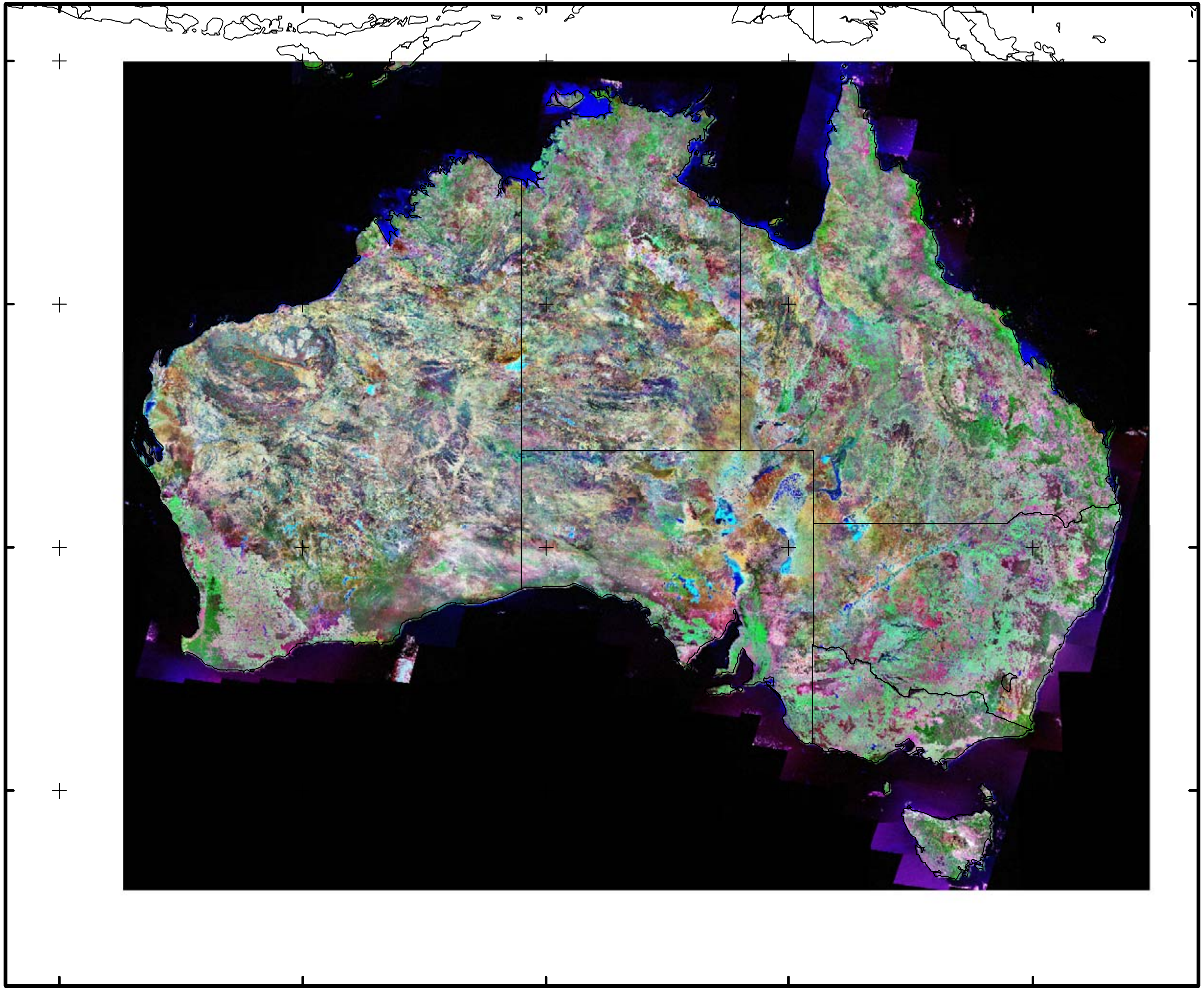
## Landsat

The Landsat mosaic shown here provides surface reflectance data in an RGB image with a 30 metre pixel size across 3 bands (band 7 in red, band 4 in green and band 2 in blue).
The data is useful for identifying surface geology and structure which may be reflected in outcrop, vegetation patterns or soil types.
The source of the Landsat data was EarthSat and NASA with the image being created and supplied by ERMapper.



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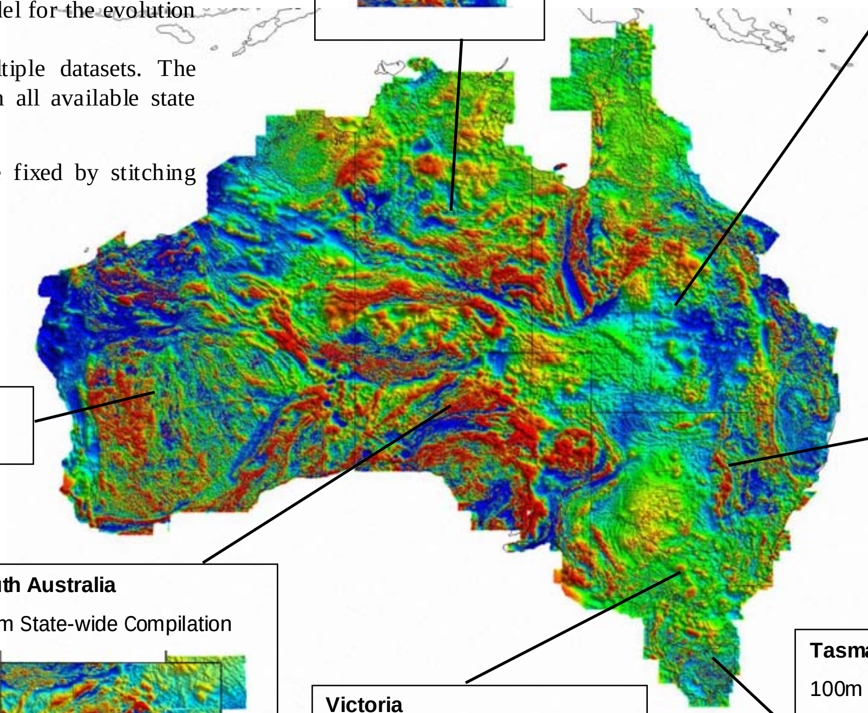
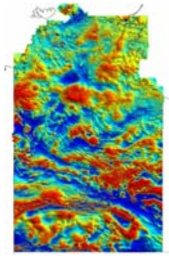
# Magnetics

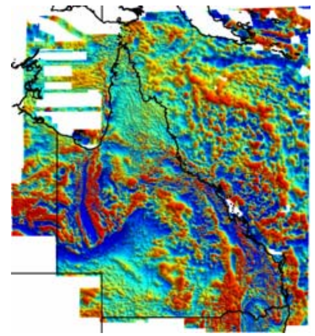
Aeromagnetic data measures variations in the Earth's magnetic field caused by variations in the magnetic susceptibility of the underlying rocks. It provides information on the structure and composition of magnetic basement and intrasedimentary magnetic units (if present). Most bodies within the basement have a distinctive magnetic signature which is characterized by the magnitude, heterogeneity and fabric of the magnetic signal. When calibrated with known geology, basement terranes can be mapped under a cover of sedimentary rock, regolith, water or ice.

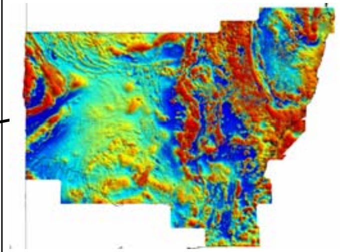
The most important and accurate information provided by magnetic data is the structural fabric of the basement. Major basement structures can be interpreted from consistent discontinuities and/or pattern breaks in the magnetic fabric. Once the structures have been evaluated and combined with those interpreted from gravity data, a model for the evolution of the basement and overlying basins can be developed.
The Magnetics coverage used for OZSEEBASE is a stitch of multiple datasets. The Geoscience Australia 2001 Magnetic Anomaly Grid was stitched with all available state compilation grids (Right).

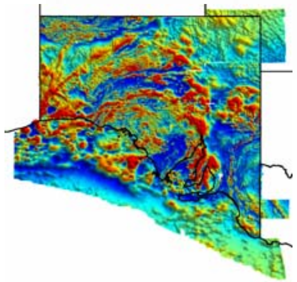
As much as possible, survey boundaries and levelling problems were fixed by stitching public domain surveys sourced from Geoscience Australia (overleaf)

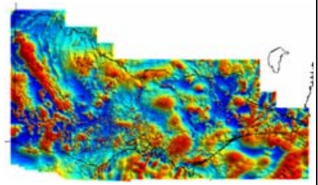


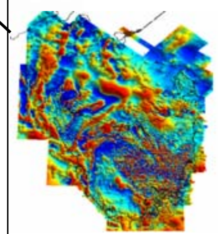

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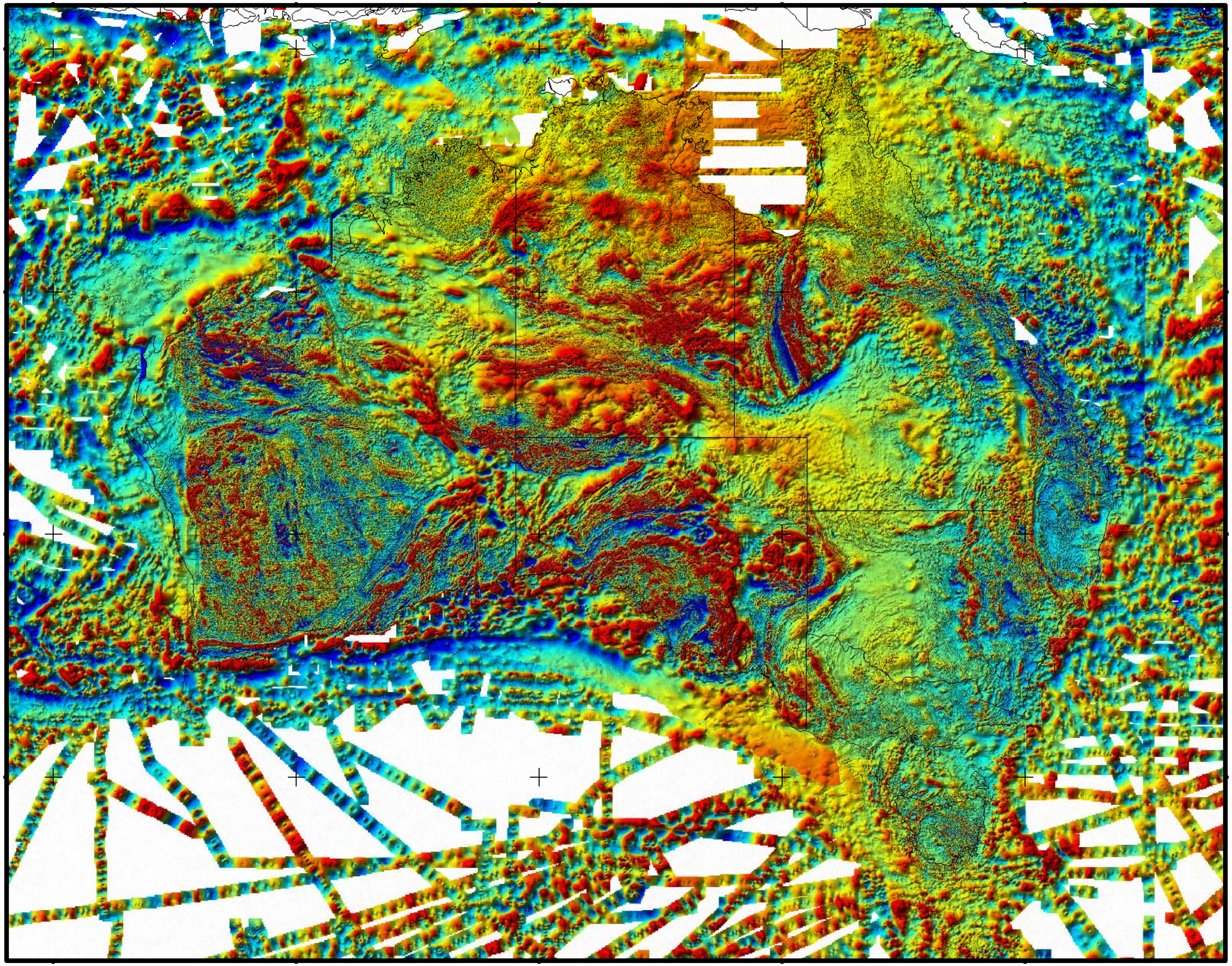
# Total Magnetic Intensity (TMI)



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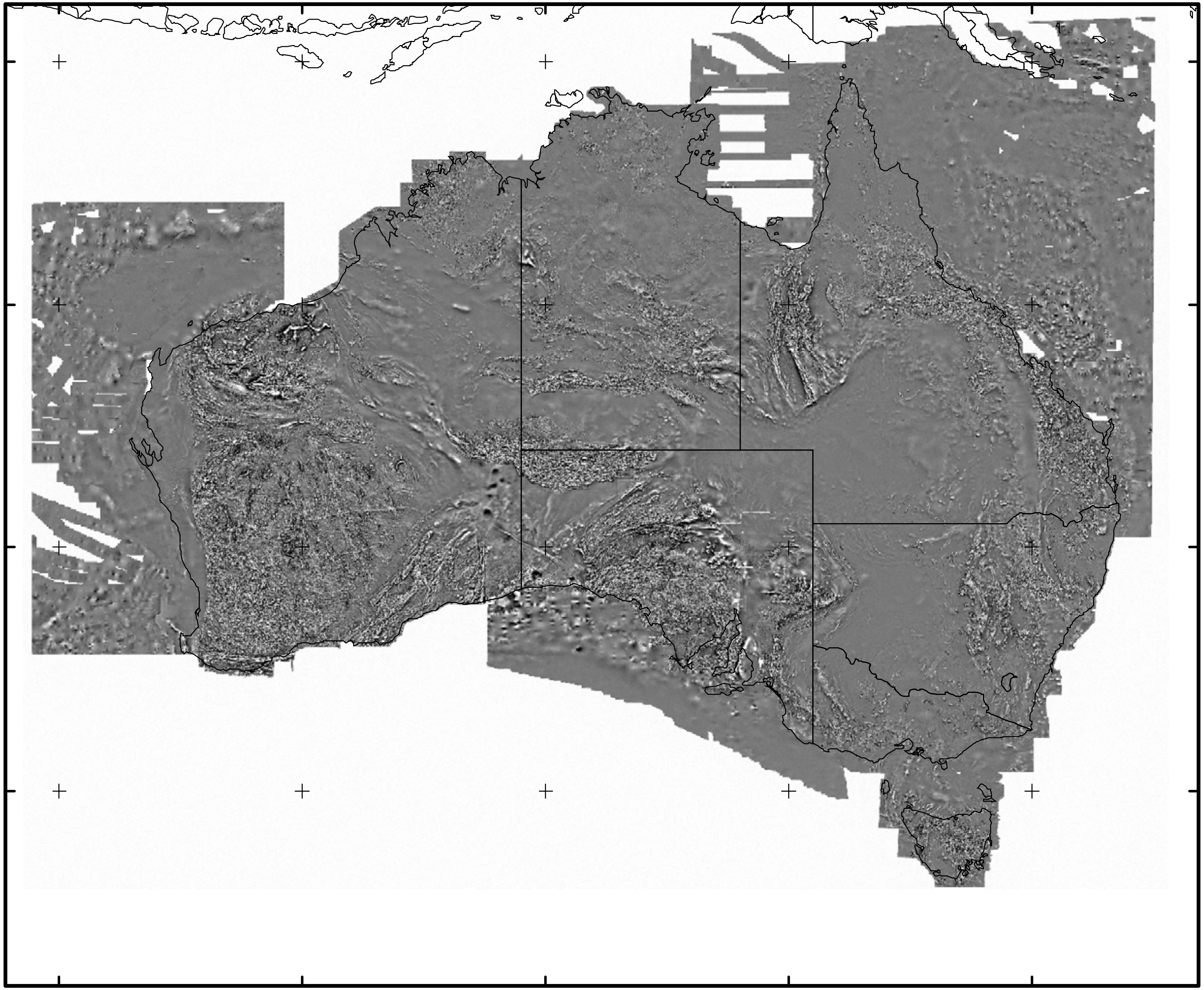
## First Vertical Derivative (1km Upward Continuance)

A first vertical derivative is applied to the data to remove the effects of very regional magnetic anomalies that would come from deep crustal or mantle sources. The FVD filter enhances magnetic anomalies caused by shallow sources and by the top parts of deep, or large depth extent, bodies. Anomaly peaks can be used to locate the centres of magnetic sources or the steeper sides of magnetic bodies. The zero contour lines can be used to locate boundaries of magnetic sources



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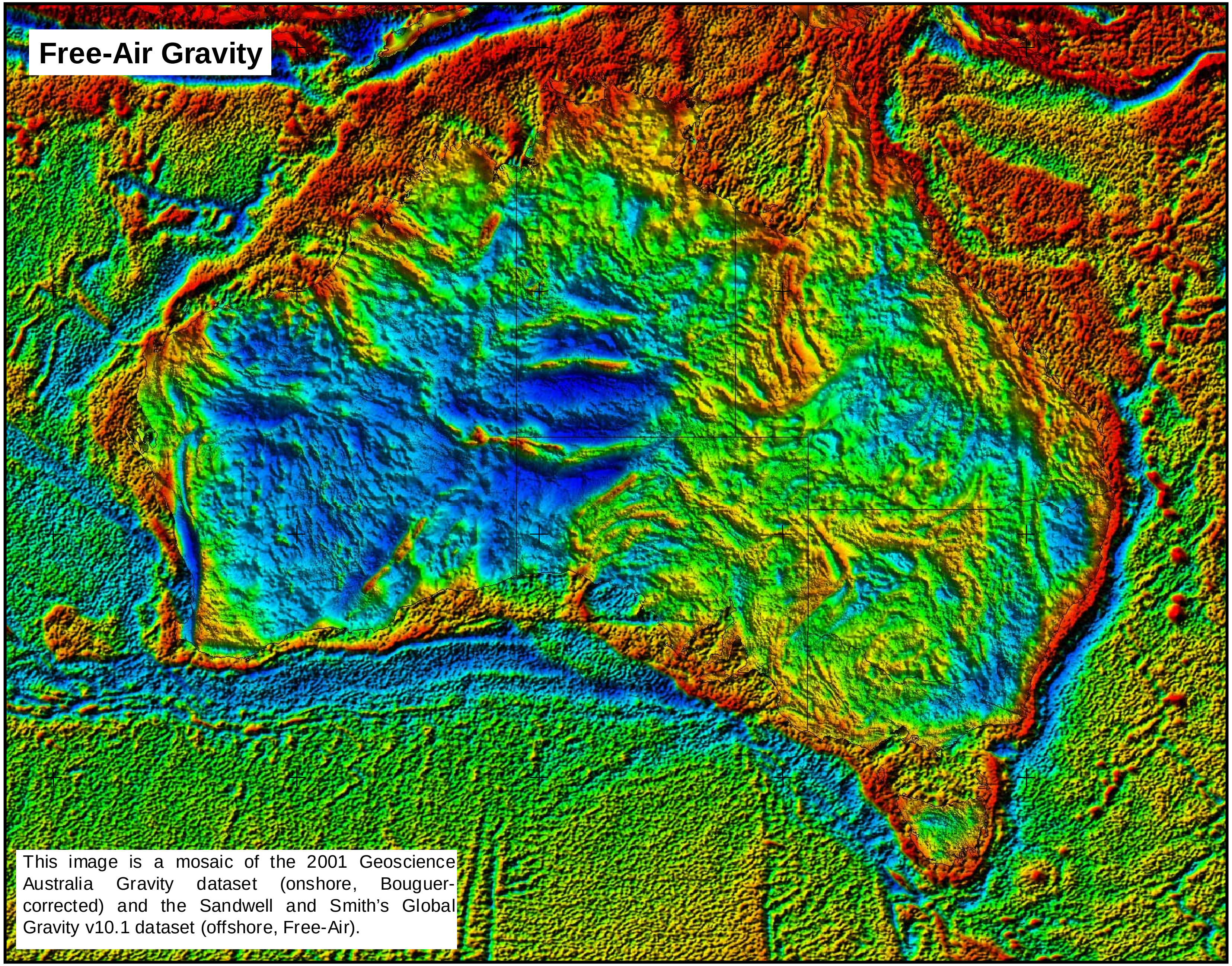
## Gravity

Gravity is a very important tool for interpreting basins. It maps subtle changes in the Earth's gravitational field caused by variations in the density of the underlying rocks. Although the resolution of this dataset is relatively low, it provides valuable information on basement topography and the nature of the deeper parts of the crust and mantle beneath the basins. Important intra-basin elements often have an associated gravity signature indicating that each element is related to a deep basement structure.

In order to interpret the geological source of a gravity anomaly, the data must be calibrated. Gravity images show density contrasts within the crust, but the source of the contrast is not unique. As a regional tool it gives information both on the density of bodies within the crust and on differences in mantle depth and composition. Satellite free-air gravity also has a major contribution from bathymetry. Thus, the nature of each anomaly as crust or mantle must be distinguished. By combining the onshore gravity data with mapped geology of the same region, the sources of many of the anomalies can be inferred and extrapolated offshore and/or under sedimentary cover. Others require geophysical modeling which must be constrained by a geological model. Calibrated interpretation of gravity data is a powerful tool for developing an understanding of basin shape.




This image is a mosaic of the 2001 Geoscience Australia Gravity dataset (onshore, Bouguer-corrected) and the Sandwell and Smith's Global Gravity v10.1 dataset (offshore, Free-Air).

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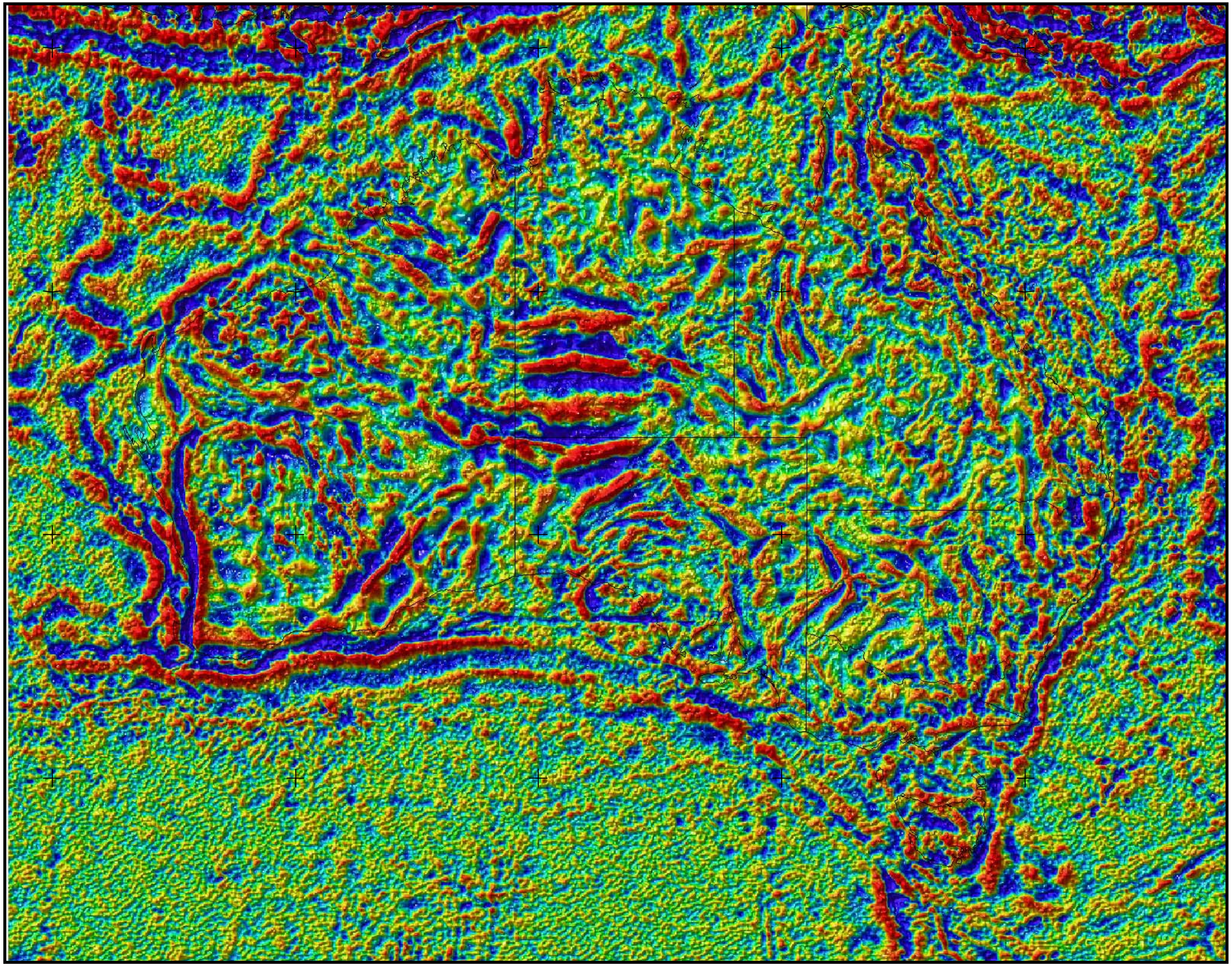
# Residual of Low Pass (200km) applied to Bouguer

A residual separation of the short-wavelength components of the Bouguer gravity grid was undertaken to reduce the effects of the shallow Moho (see previous page). This process does introduce artefacts into the dataset (eg. introduces "dipolar" anomalies where there are sudden field changes), therefore caution must be exercised during interpretation. The resulting image is useful for interpreting upper crustal structure and basement relief.



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