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Mapping Rock's Magnetisation on a Crustal Scale using the Automatic Curve Matching Method.

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This study presents mapping of rock magnetisation from the Total Magnetic Intensity field, and its distribution within the Upper and Lower Crust at different depths.

The Automatic Curve Matching method (ACM) was applied to profile magnetic data extracted from gridded TMI data along rows, columns and diagonally, over a 700 by 400km area. Using this automatic approach, millions of single magnetic anomalies of short, medium and long wave-lengths were analysed. Multi-phase filters were applied to the profile magnetic data to remove the high frequency component to detect anomalies arising from deeper parts of the crust. For each single anomaly, the depth to the causative body, its geometry and magnetic susceptibility were calculated. The magnetic sources (MS), represented by single points, were displayed at different depths, showing a genuine magnetic map of the crust rather than a map of the magnetic field. The detected magnetic sources represent the regional distribution of the magnetic rocks within the crust at different depths. The mapped rock's magnetisation shows major and minor structures that cannot be clearly delineated by any other method. It shows the regional geology of the Upper Crust and deep structures of the Lower Crust. The depth of basement was accurately determined and the intensity of magnetisation of the rocks was mapped.

This approach was used over a large area crosscutting different tectonic provinces in southern Australia: Gawler Craton, Stuart Shelf, Adelaide Geosyncline and Curnamona Craton. The ACM results were interpreted within horizontal crustal slices from the surface to a depth of 20km. The major known structures, such as faults and shear zones, were mapped and traced at depth. New, unknown crustal structures were uncovered and also traced at different depths.