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Neotectonics and landscape characterization in the Gawler Craton, South Australia - Insights through high-resolution remote sensing

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The Gawler Craton hosts significant economic mineralization within South Australia. Due to limited outcrops, deeply weathered profiles, and the absence of a clear variety of landscape surface features, mineral exploration is particularly challenging in this part of Australia. Here we present a workflow of data processing and interpretation to understand the neotectonics and landscape characterization of this region. We explore the potential to delineate surface lineaments and features from newly acquired high-resolution datasets. We aim to automatically identify landform domains based on the analysed data and investigate whether deep seated tectonic lineaments manifest in recognizable surface expressions.

The data we analyse in this study comprises digital elevation, radiometric, magnetic, and gravity data. We assume that elevation and radiometric data relate to surficial landscape features, whereas gravity and magnetic data represent subsurface basement features. Linking the analysis of both surface and subsurface datasets can potentially yield information on the neotectonic activity, and the association between landforms and basement structures as potential zones of fluid migration. We will show how processed digital elevation data can be used for automatic classification of different landform domains.

In order to assess mineral potential zones in the area, we compare the generated lineament data in terms of their geometric and topological properties to examine whether there is consistency in the subsurface and surface layers. We postulate that through a line density map, we may be able to quantify a potential relationship between lineaments that are representative in both the surface and subsurface, indicating potential faults or large-scale lineament trends that may link mineral systems in the basement with the landscape surface features. Areas that exhibit large numbers of surface and subsurface lineaments might be areas of enhanced mineral potential. This study contributes to enhance the efficiency of mineral exploration protocols in areas under cover.