Map deconstruction helps model construction

Mark Jessell[1], Vitaliy Ogarko[2], Mark Lindsay[1], Ranee Joshi[1], Lachlan Grose[3], Laurent Ailleres[3], Miguel de la Varga[4], Guillaume Pirot[1]

[1] *Mineral Exploration Cooperative Research Centre, School of Earth Sciences, UWA, Perth, Australia*
[2] *International Centre for Radio Astronomy Research, UWA, Perth, Australia*
[3] *School of Earth, Atmosphere and Environment, Monash University*
[4]Computational Geoscience and Reservoir Engineering, RWTH Aachen, Germany
mark.jessell@uwa.edu.au
orcid.org/0000-0002-0375-7311

Where available, the best predictor for the 3D geology of the subsurface is often the information contained in a geological map. This information falls into three categories of geometric data: positional data such as the position of faults, intrusive and stratigraphic contacts; topological data, such as the age relationships of faults and stratigraphic units, and gradient data, such as the dips of contacts or faults. In a 3D workflow, we combine all of these direct observations with conceptual information, including assumptions regarding the subsurface extent of faults and plutons to provide sufficient constraints to build a 3D geological model. Typically these conceptual assumptions are communicated via geological cross-sections supplied with the map, however these are often based on limited or no data. In the Loop Consortium we are developing algorithms that allow us to automatically deconstruct a geological map to recover the necessary positional, topological and gradient data as inputs to different 3D geological modelling codes. This automation provides significant advantages: it significantly reduces the time to first prototype models; it clearly separates the primary data from the data reduction steps and conceptual constraints; and provides a homogenous pathway to sensitivity analysis, uncertainty quantification and Value of Information studies.

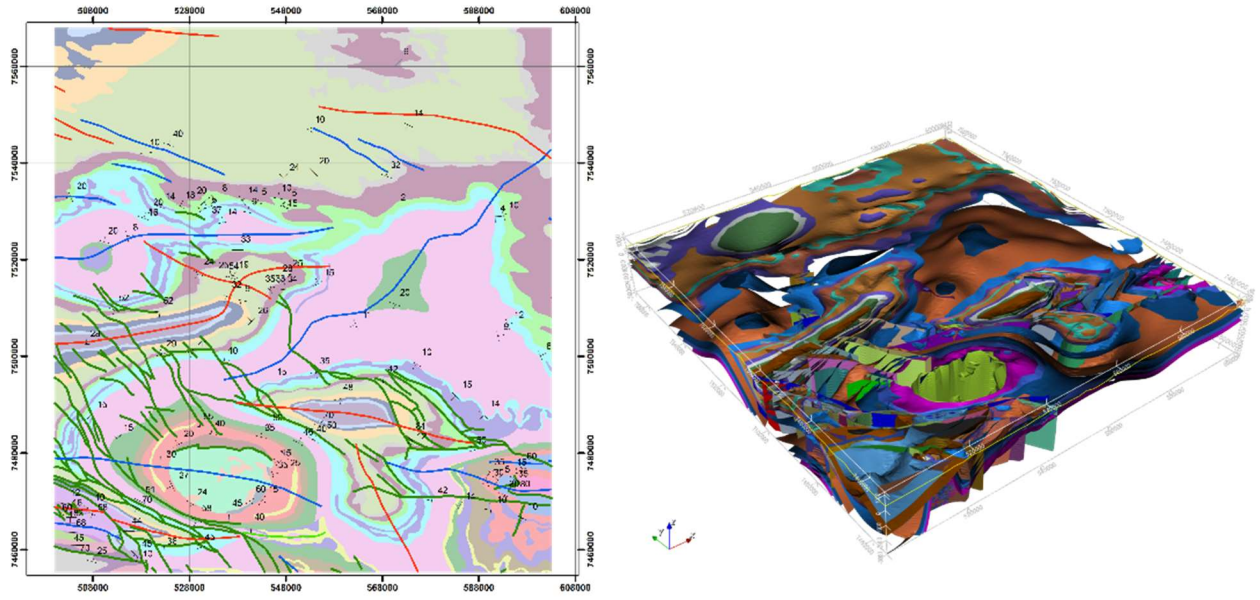

Figure 1. Left: Extract of the GSWA 500K Interpreted Bedrock Geology of the Mount Bruce area, Western Australia. Right: 3D Model built using only the information automatically extracted from the map.

Acknowledgement
We acknowledge the support from the ARC-funded Loop: Enabling Stochastic 3D Geological Modelling consortia (LP170100985) and DECRA (DE190100431). The work has also been supported by the Mineral Exploration Cooperative Research Centre whose activities are funded by the Australian Government's Cooperative Research Centre Programme. This is MinEx CRC Document 2019/016.