# Understanding sedimentary basin's gravity response variability using stratigraphic parameterisation

Vincent Crombez[1], Juerg Hauser[1], Luk Peeters[1], Richard Chopping[2]
[1] *Deep Earth Imaging Future Science Platform, Energy, CSIRO*
[2] *WA DMIRS*
Email: vincent.crombez@CSIRO.au

It is accepted that gravity inversions are non-unique and that multiple models will fit the data equally well. This non-uniqueness extends beyond the choice of parameter values to the choice of model parameterisation: a voxel-based model is likely to explain the data as well as a layer-based model with constant density and variable thickness. A practical first-order consequence of this non-uniqueness is the fact that the measured gravity response above a sedimentary basin can be related to (1) sediments with constant densities above a highly heterogeneous basement or to (2) a basement with a constant density combined with variations of densities within the sedimentary strata. Understanding the sedimentary cover's gravity response and its variability is therefore paramount to generate hypotheses on the causal mechanisms of observed gravity response anomalies.

We explore stratigraphic modelling as a new parameterisation for gravity models to assess the variability of sedimentary strata's gravity response. Using a process-based numerical simulation to generate the density models used in forward gravity modelling we seek to focus only on geologically plausible models. Results from a study of a 2D section in the Northern Carnarvon basin (northwest shelf of Australia) show that even with a wide range of input parameters for the stratigraphic models, the modelled gravity response still has a limited variability when compared to model results generated using subsurface density distribution parameterised with voxels or layers. Further to this, our results provide insight into the global sensitivity of the gravity response to geologic and stratigraphic controls.