## Probabilistic Assessment of Australia's Lithospheric Architecture and Its Relationship to Mineral Systems

**Mark Hoggard**[1], Rhys Hawkins[1], Thomas Duvernay[1], James Hazzard[2], Fred Richards[2], Sinan Özyadin[3], Zach Sudholz[1,4], Lynton Jaques[1], Greg Yaxley[1], Marcus Haynes[5], Karol Czarnota[5]
[1]Australian National University, Canberra, Australia, [2]Imperial College, London, United Kingdom, [3]University of Sydney, Australia, [4]University of Cambridge, United Kingdom, [5]Geoscience Australia, Canberra, Australia

It is increasingly recognised that the subcontinental lithosphere plays a first-order control on the distribution and dynamics of geological processes at Earth's surface, with prominent examples including active tectonics, magmatism, sedimentary basins, groundwater systems, and mineral deposits. Due to its importance, academic, governmental, and industry efforts to image lithospheric architecture have recently coalesced. Here, we present a new probabilistic approach to this problem that combines mantle xenolith geochemistry, seismic tomography, laboratory constraints on anelastic deformation at seismic frequencies, and magnetotelluric imaging to build self-consistent thermochemical models of the Australian lithosphere. The models allow us to query properties such as the seismogenic thickness, Curie depth, lithosphere-asthenosphere boundary, and presence of metasomatisation. These properties are correlated with several surface observables, including the distribution of sediment-hosted and IOCG mineralisation, and the associated maps and their uncertainties will underpin future exploration efforts including in regions undercover.