



Continental geodynamics and mineral exploration – the Western Australian perspective

Klaus Gessner (1), Ruth Murdie (1), Huaiyu Yuan (2,1,3), Lucy Brisbout (1), Christian Sippl (4), Ian Tyler (1), Chris Kirkland (5), Michael Wingate (1), Simon Johnson (1), Catherine Spaggiari (1), Hugh Smithies (1), Yongjun Lu (1), Chris Gonzalez (3), Mark Jessell (3), Eun-Jung Holden (3), Weronika Gorczyk (3), and Sandra Occhipinti (3)

(1) Geological Survey of Western Australia, East Perth, Australia, (2) ARC Centre of Excellence for Core to Crust Fluid Systems, Macquarie University, Sydney, Australia, (3) Centre for Exploration Targeting, The University of Western Australia, Crawley, Australia, (4) Deutsches GeoForschungsZentrum, Potsdam, Germany, (5) Centre for Exploration Targeting-Curtin Node, Curtin University, Perth, Australia

The exploration for mineral resources and their extraction has been a fundamental human activity since the dawn of civilisation: Geology is everywhere – ore deposits are rare. Most deposits were found at or near Earth's surface, often by chance or serendipity. To meet the challenge of future demand, successful exploration requires the use of advanced technology and scientific methods to identify targets at depth. Whereas the use and development of high-tech exploration, extraction and processing methods is of great significance, understanding how, when and where dynamic Earth systems become ore-forming systems is a difficult scientific challenge. Ore deposits often form by a complex interplay of coupled physical processes with evolving geological structure. The mineral systems approach states that understanding the geodynamic and tectonic context of crustal scale hydrothermal fluid flow and magmatism can help constrain the spatial extent of heat and mass transport and therefore improve targeting success in mineral exploration. Tasked with promoting the geological assets of one of the World's largest and most resource-rich jurisdictions, the Geological Survey of Western Australia is breaking new ground by systematically collecting and integrating geophysical, geological and geochemical data with the objective to reveal critical ties between lithospheric evolution and mineral deposits. We present examples where this approach has led to fundamental reinterpretations of Archean and Proterozoic geodynamics and the nature of tectonic domains and their boundaries, including cases where geodynamic modelling has played an important role in testing hypotheses of crustal evolution.