16th SGA BIENNIAL MEETING
KEYNOTE SPEAKER

In concurrent session:
Geochemical anomaly classification and modelling in mineral exploration

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Deep time exploration

Understanding the association between tectonic and geodynamic processes and the timing – and therefore the location – of the formation of major mineral deposits requires the linking of geological and geophysical observations to plate tectonic and geodynamic models. To associate the likelihood of resource formation with a particular subduction/rift setting or geological terrain, we need to trace relevant data through geological time. The recent development of global topological plate models now allows us to start implementing spatio-temporal “deep time” mineral exploration, leading to the generation of new ideas and more accurate predictive exploration models. The Deep Time Exploration concept is built on 15 years of development of the open-source GPlates software, and its companion, the pyGPlates python library, a powerful tool for on-the-fly reconstruction and analysis of multidimensional data through time. The Deep Time Exploration infrastructure enables the analysis and visualisation of vast amounts of multidimensional data through geological time. Regional and global geological and geophysical data sets can be aggregated, building large scale custom-tailored data collections for use in mineral exploration. Geodynamic simulations of the Earth’s mantle can be connected to map the passage of ore deposit provinces over different mantle domains through time, providing information about the temperature, or upwelling/downwelling speed and potential fertility of different mantle domains in a minerals context. Hyper-dimensional data in a plate tectonic framework can be analysed using machine learning techniques, to discover hidden associations between the formation and preservation of particular deposits and the tectonic/geodynamic history of particular types of deposits from continent-wide to regional/local exploration scales. A prototype of a cloud-based data and software infrastructure is being integrated into the GPlates Portal (http://portal.gplates.org/), with the vision of enabling end-users to produce mineral deposit probability maps through time, based on alternative plate models and combinations of open-access and their own in-house data.

Dietmar Müller

Dietmar is Professor of Geophysics at the University of Sydney School of Geosciences. He leads the EarthByte Research Group and the development of the GPlates software, assimilating the wealth of disparate geological and geophysical data into a four-dimensional Earth model used for resource exploration and many other applications. He is a Fellow of the Australian Academy of Science and the American Geophysical Union.