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GIS-based epithermal copper prospectivity mapping of the Mt Isa Inlier, Australia: Implications for exploration targeting

A. Porwal (1,2), K. Gessner (1,3), and T.C. McCuaig (1)

(1) Centre for Exploration Targeting, The University of Western Australia, Crawley WA 6009, Australia, (2) Western Australian School of Mines, The Curtin University of Technology GPO Box U1987, Perth WA 6845, Australia, (3) pmd*CRC, Computational Geoscience, CSIRO Exploration and Mining, 26 Dick Perry Avenue, Kensington WA 6102, Australia

The Proterozoic Mt Isa Inlier in Queensland, Australia, contains significant hydrothermal base-metal deposits including shale hosted lead-zinc sulphides, Broken Hill-type lead-zinc-silver, as well as iron-oxide copper-gold and Mount Isa-type iron-sulphide copper deposits. Mount Isa-type epithermal copper deposits generally occur in the Western Succession of the Inlier and are hosted by ca 1650 Ma brecciated sedimentary rocks of the Cover Sequences 2 and 3. Although generically similar, these deposits exhibit clear spatial clustering around Mt Isa and Mammoth-Esperanza, which are separated by a distance of about 100 km. GIS-based empirical analyses of spatial associations of the deposits of the two clusters with various regional-scale geological, structural, geophysical, geochemical and alteration datasets revealed significant differences amongst the two clusters. Subsequently, two neural-network-based predictive spatial mathematical models for hydrothermal copper prospectivity mapping of the Mt Isa Inlier were developed using deposits exclusively from each cluster. The results show that the model trained on the deposits of the Mt Isa cluster performs unsatisfactorily in predicting the deposits of the Mammoth-Esperanza cluster. Similarly, the model trained on the deposits of the Mammoth-Esperanza cluster does not perform well in predicting deposits of the Mount Isa cluster. The implications of the above results for exploration targeting of epithermal copper deposits in the Mt Isa Inlier are discussed.