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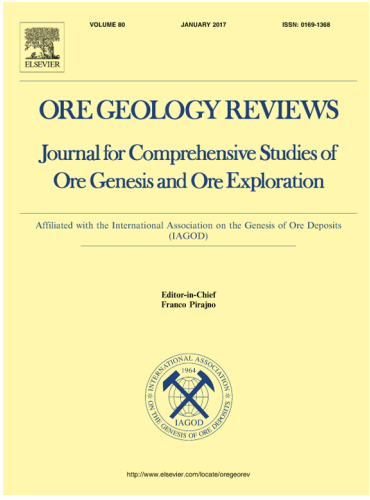

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Structural controls on Proterozoic nickel and gold mineral systems identified from geodynamic modelling and geophysical interpretation, east Kimberley, Western Australia

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Abstract

Major structures considered important for controlling mineralisation in the Halls Creek Orogen, east Kimberley are identified via integrated interpretation of geophysical and geological data combined with geodynamic numerical modelling. In the numerical geodynamic models, the second invariant of strain rate ($\dot{\varepsilon}_{II}$) is used to investigate the shearing processes that led to the development of major faults or shear zones and assessing their role as lithospheric-scale conduits and pathways for the movement of magmatic and hydrothermal fluids into the upper crust. The influence of these deep structures interpreted from the geodynamic models is evaluated through structural interpretation of geophysical, remotely-sensed and geological data. When compared to the location of Ni and Au mineral deposits the deep-crustal scale structures delineated in the models and compared to those mapped in the region contain a close spatial relationship with mineral deposits. It is apparent that 1st order crustal-scale structures acted as fluid conduits in the deep crust resulting in the formation of Ni-Cu-PGE deposits and are associated with Au mineralization. However, 2nd and 3rd order structures manifesting in the upper crust as deformation focused mineralising fluids and magma resulting in the formation of gold deposits. Large-scale