

New Tectono-Stratigraphic Model with Revitalised Discovery Potential for Olympic Dam-type Haematitic Iron Oxide Copper Gold (HIOCG) Deposits

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A review of public data addressed questions raised by decades of minerals exploration on the Gawler Craton, including whether a spectrum of deposit styles for the Olympic Metallogenic Event (OME) was connected by a common stratigraphic marker and universal targeting vectors.

Discovery of the Paris Ag (Pb) epithermal, Helen Cu Au Ag skarn, and Nankivel Cu (Au) porphyry system and subsequent research indicated the system formed coevally with the HIOCG breccia pipes on the opposite side of the massif of Gawler Range Volcanics (GRV). Collaborative and public precise zircon dating established Olympic Dam (OD), Paris and Nankivel were deposited in the 5-million-year interval between the Lower and Upper GRV. Researchers had recognised remnants of an absent sedimentary basin within the OD pipe. This raised the question of how the basin was formed and vigorously eroded off in such a short period to the same upper level of multiple and widespread HIOCG pipes.

In this study, the stratigraphy hosting the Emmie Bluff “stratiform” HIOCG is correlated with the Lower Pandurra Formation. Unit PF2 Red Shale represents the regional marker of the OME “Big Bang”. Sedimentary inclusions in OD Deeps and Oak Dam West pipe are also correlated with the Lower Pandurra. The missing basin was hidden in plain sight.

The new model proposes that cessation of double subduction caused a rapid change to extension and sourcing of metals from two differently prepared mantles with precipitation at the palaeosurface. A waning phase of PF3 haematitic siltstone may be correlated with the Upper GRV that filled the southern part of a collapsed mega-caldera. Although the HIOCG potential is restricted to the Olympic Basin mapped by Lower Pandurra, the model provides new far-seeing geochemical and sedimentological vectors to prospective brownfields and greenfields targets.