Geological and Exploration Models of Paleovalley-related Uranium Deposits, Integrated from Case-Studies of Australia and China

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Geological, geophysical and geochemical features of the paleovalleys and related uranium deposits have been used to construct models to understand controls on ore genesis and to assist exploration for paleovalley-hosted uranium deposits. 'Paleovalley-related' uranium deposits, encompassing variants of 'sandstone-hosted', 'calcrete'-type and lignite-type deposits, implies more than just uranium hosted within a paleovalley. The uranium mineralisation can be defined as any diagenetic/epigenetic concentration of uranium minerals occurring in fluvial, alluvial, lacustrine, and estuarine sediments. Uranium deposits of this type are often associated with reduced lithologies and typically form within unlithified sand, lignitic clays or calcreted channel-fill, deposited in continental or marginal marine environments. Cenozoic paleovalleys of Australia, and Mesozoic paleovalleys of China host the greatest number of uranium deposits and include the largest and highest grade deposits of this type within each country, respectively. Uranium exploration and mining in Australia and China are significant and increasingly important sectors of each country's respective mineral industry. In regard to Sino-Australian examples, the similarities in the geology of paleovalley-related uranium mineralising systems can be used to refine common approaches to exploration.

Australia and China remain highly prospective for the discovery of new paleovalley-related uranium deposits. The precise geometric definitions of the basin margin and paleovalley architecture are important in identifying exploration targets and improving the effectiveness of drilling. This requires the integration of various geoscientific data sets. Refinements in remote sensing, geophysical techniques and data processing, in combination with sedimentological and depositional interpretations, provide an efficient approach for outlining the principal drainage patterns and channel dimensions. To help reduce risk, an exploration strategy should combine these technologies with a detailed understanding of the physicochemical parameters of uranium reduction, mobilisation and preservation.