Geophysical Research Abstracts
Vol. 12, EGU2010-15435-1, 2010
EGU General Assembly 2010

Uranium mineralization and unconformities: how do they correlate? - A look beyond the classic unconformity-type deposit model?

Vanessa Markwitz (1), Alok Porwal (2), T. Campbell McCuaig (1), and Oliver P. Kreuzer (3)

(1) Centre for Exploration Targeting, School of Earth and Environment, The Unversity of Western Australia, Crawley 6008, Australia , (2) Centre for Exploration Targeting, Western Australian School of Mines, Curtin Unversity of Technology, GPO Box U1987, Perth WA 6845, Australia, (3) Silver Swan Group Ltd., 15 Ogilvie Road, Mount Pleasant, WA 6153, Australia

Uranium deposits are usually classified based on the characteristics of their host rocks and geological environments (Dahlkamp, 1993; OECD/NEA Red Book and IAEA, 2000; Cuney, 2009). The traditional unconformity-related deposit types are the most economical deposits in the world, with the highest grades amongst all uranium deposit types. In order to predict undiscovered uranium deposits, there is a need to understand the spatial association of uranium mineralization with structures and unconformities. Hydrothermal uranium deposits develop by uranium enriched fluids from source rocks, transported along permeable pathways to their depositional environment. Unconformities are not only separating competent from incompetent sequences, but provide the physico-chemical gradient in the depositional environment. They acted as important fluid flow pathways for uranium to migrate not only for surface-derived oxygenated fluids, but also for high oxidized metamorphic and magmatic fluids, dominated by their geological environment in which the unconformities occur.

We have carried out comprehensive empirical spatial analyses of various types of uranium deposits in Australia, and first results indicate that there is a strong spatial correlation between unconformities and uranium deposits, not only for traditional unconformity-related deposits but also for other styles. As a start we analysed uranium deposits in Queensland and in particular Proterozoic metasomatic-related deposits in the Mount Isa Inlier and Late Carboniferous to Early Permian volcanic-hosted uranium occurrences in Georgetown and Charters Towers Regions show strong spatial associations with contemporary and older unconformities. The Georgetown Inlier in northern Queensland consists of a diverse range of rocks, including Proterozoic and early Palaeozoic metamorphic rocks and granites and late Palaeozoic volcanic rocks and related granites. Uranium-molybdenum (+/- fluorine) mineralization in the Georgetown inlier varies from strata- to structure-bound and occurs above regional unconformities.

The Proterozoic basins in the Mount Isa Inlier rest unconformably on Palaeoproterozoic basement accompanied by volcanic and igneous rocks, which were deformed and metamorphosed in the Mesoproterozoic. Uranium occurrences in the Western Succession of Mount Isa are either hosted in clastic metasediments or mafic volcanics that belong to the Palaeoproterozoic Eastern Creek Volcanics. Uranium and vanadium mineralization occur in metasomatised and hematite-magnetite-carbonate alteration zones, bounded by major faults and regional unconformities.

The results of this study highlight the importance of unconformities in uranium minerals systems as possible fluid pathways and/or surfaces of physico-chemical contrast that could have facilitated the precipitation of uranium, not only in classical unconformity style uranium deposits but in several other styles of uranium mineralization as well.

References

Cuney, M., 2009. The extreme diversity of uranium deposits. Mineralium Deposita, 44, 3-9.

Dahlkamp, F. J., 1993. Uranium ore deposits. Springer, Berlin, p 460.

OECD / NEA Red Book & IAEA, 2000. Uranium 1999: Resources, Production and Demand. OECD Nuclear Energy Agency and International Atomic Energy Agency, Paris.