

Athabasca Basin (Canada) Unconformity - Type Uranium Deposits: Exploration Model, Current Mine Developments and Exploration Directions

THOMAS, DAVID J., MATTHEWS, RONALD B., SOPUCK, VLADIMIR, MACDONALD, COLIN C., Cameco Corporation, Saskatoon, Canada.

Unconformity-type deposits represent the most significant high grade, low cost uranium resource currently being exploited on a world-wide basis. The Athabasca Basin of northern Saskatchewan, Canada, is the premier host for unconformity-type deposits and has an estimated resource in excess of 373,000 t U. Recent production from the Athabasca Basin has come from mines at Key Lake, Rabbit Lake and Cluff Lake, which had a combined output of 10,924t U (28.4 M lbs U_3O_8) in 1998, representing approximately 32% of total world uranium production. These shallow deposits (<200 m depth) came into production in the mid-1970's to early 1980's and represent the first generation of unconformity-type uranium deposits. They were discovered by shallow penetrating geophysical methods, surficial geochemical surveys (e.g. radioactive boulder prospecting), and combined diamond and RC drilling programs.

The McArthur River mine, which began production in 1999, and the Cigar Lake mine, scheduled for production in the next few years, represent the next generation of high grade deposits. These deposits are located in deeper parts of the basin, typically exceeding 400 m depth.

While exploration for new unconformity-type deposits continues in the Athabasca Basin similar mid-Proterozoic basins are also being explored; notably the Thelon Basin in the Northwest Territories of Canada and the McArthur Basin in northern Australia. The trend towards deeper exploration in the Athabasca Basin, will require improved geochemical and geophysical methods, as well as the refinement of the empirical/genetic model through detailed studies of existing deposits.