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Use of SKUA-GOCAD 3D/4D models for exploration in the Athabasca Basin and surrounding area: some case studies (Moore Lakes, Fraser Lakes, McArthur River, Alces Lake)

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Summary

In this applied research investigation, a 3D/4D geological-geophysical model of the sub-Athabasca basement and its associated giant uranium deposits of northern Saskatchewan (i.e., in particular the uranium deposits within the eastern part of the Athabasca Basin, Canada, Figure 1) was constructed within the SKUA-GOCAD environment and its add-on the GOCAD® Mining Suite, and as well the Geosoft Oasis Montaj (Seequent) package. This (these) 3D/4D model(s) is (are) constrained by topographic, geophysical potential field, outcrop, drill hole, petrophysical, petrological, U-Pb geochronological, and downhole geophysical data, along with high-resolution regional and 2D/3D seismic profiles, in order to better understand the uranium mineral system(s) operating pre-, syn-, and post-Athabasca deposition on a regional to district to local to deposit scale (Figure 2). This knowledge is then employed to identify the key metallogenic parameters and exploration vectoring indices for pre-Athabasca magmatic and metamorphic/metasomatic uranium deposits, and most importantly for basement-hosted unconformity-type (U/C-type) uranium deposits. The ultimate goal of this advanced stage of geomodeling using a minerals system approach (i.e. from Greenfield to Brownfield scale) is to delineate new exploration targets, as well as augment existing characteristics/parameters of Brownfield deposits (e.g. McArthur River and Cigar Lake) within this world-class mineralized sedimentary basin. Here we present some case studies of 3D/4D models for Moore Lakes, Fraser Lakes, McArthur River, and Alces Lake.

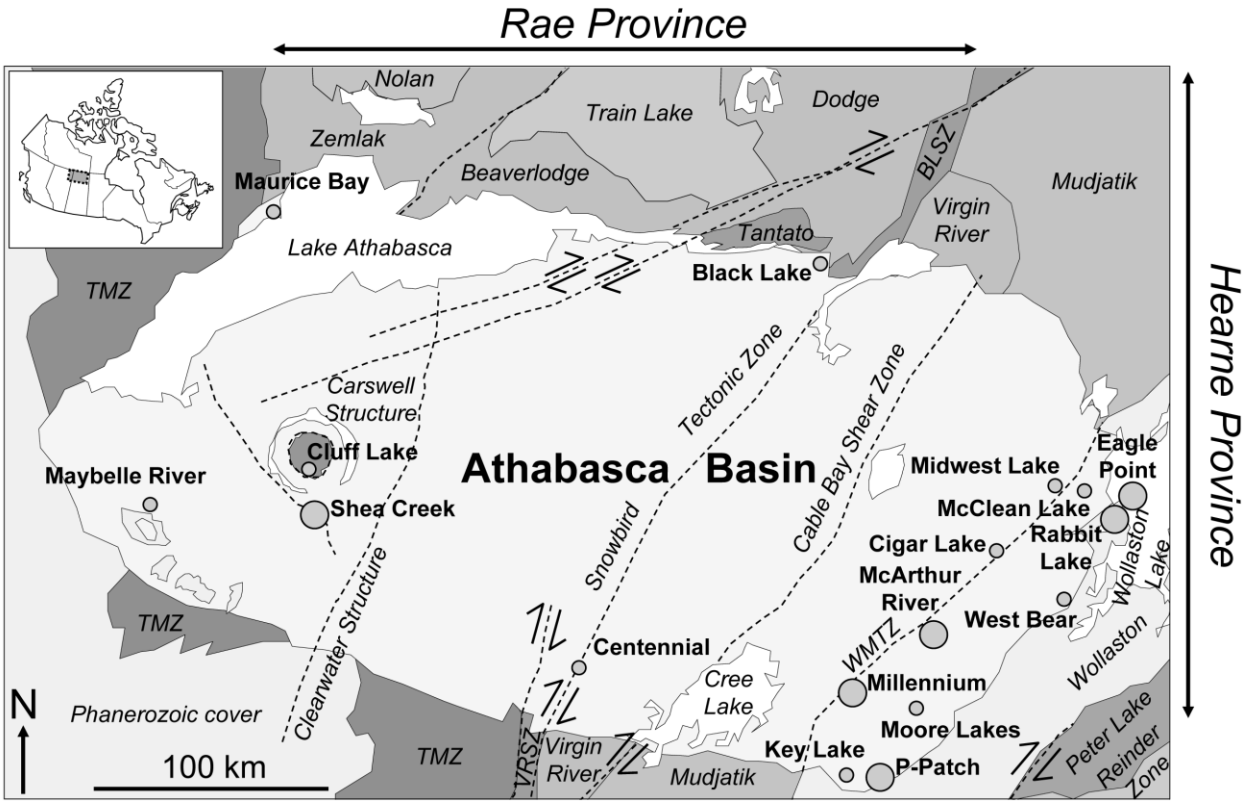

Figure 1 : Location of the Athabasca Basin, including major lithostructural trends and major U deposits, modified/simplified from Jefferson et al., 2007; Card et al., 2007; Annesley et al., 2005.

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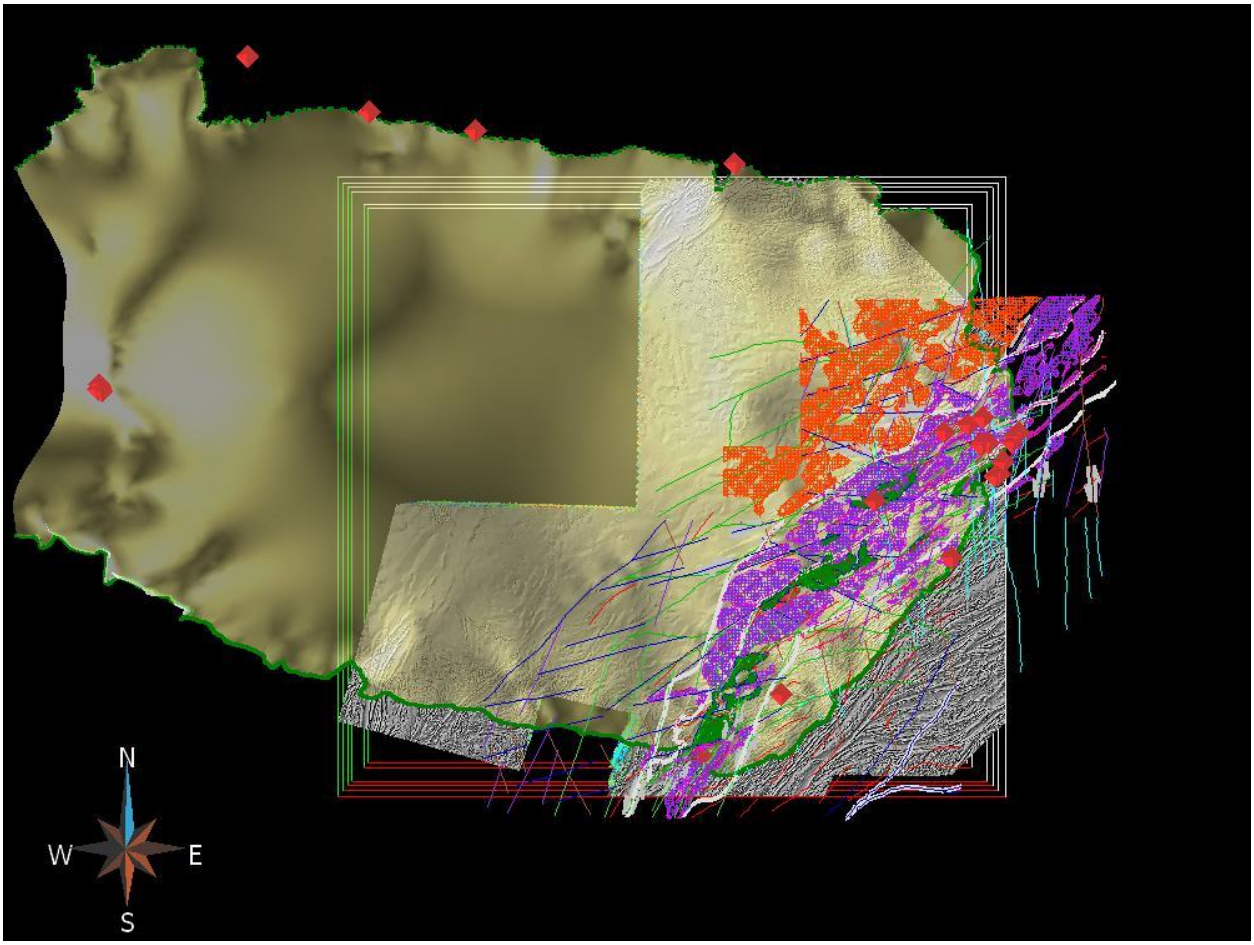

Figure 2. Overhead view in 3-D showing key lithotectonic features and location of U deposits on top of the semi-transparent Athabasca unconformity. Below the unconformity is the tilt derivative aeromagnetic data for the eastern Athabasca Basin.