NGEA - Athabasca Basin, Canada

The Athabasca Basin region in northern Saskatchewan and Alberta hosts the world's largest high-grade, large tonnage uranium deposits. The uranium produced from three mines in the eastern Athabasca Basin fuels low-carbon nuclear power reactors worldwide and has potential for other critical metal by-products such as: Ni, Co, Cu, rare earth elements (REE), Sc and Y . To support exploration, the Geological Survey of Canada (GSC), Saskatchewan Geological Survey (SGS) and other contributors, have undertaken lithological, geochemical, mineralogical, geophysical and structural studies to improve understanding of rocks in the Athabasca Basin region and the resources contained therein.

For this challenge, the area of focus will be the eastern part of the basin as indicated by the red polygon in (Fig. 1).

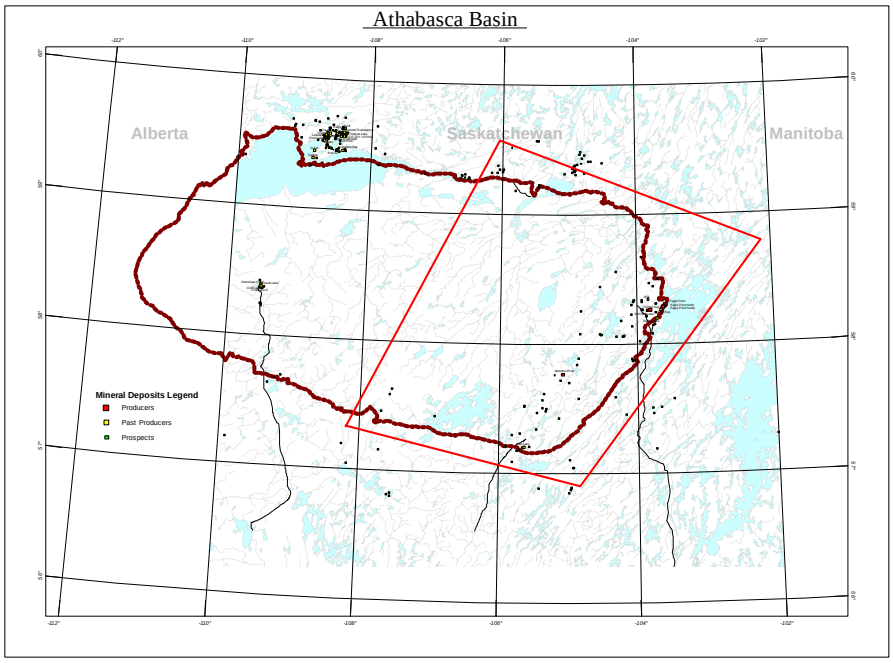

Figure 1: Location of Athabasca Basin study area [Source: Condor Geophysics]

Data Sources

Datasets and interpretations from the various geoscientific studies are summarized in Table 1 including links to access the data.

Data	Data sources
Publications Saskatchewan 3D models	3D Model 2.0 (2020)

GSC-SGS geophysics	Geophysical Data / Données géophysiques (canada.ca) Magnetotelluric Data
Industry assessment geophysics	SMAD_compilation of airborne geophysical surveys – go to the Seequent DAP Portal to sign in and access the data.
CMIC & MERC data	https://mirageoscience.com/open-data-mineral-exploration/
	https://metalearth.geohub.laurentian.ca/datasets/a039a5bcf82a4dcc97daf0f95ca24612
Athabasca Basin uranium geochemistry database	GEOSCAN Search Results: Fastlink (nrcan.gc.ca)
EXTECH IV	https://ftp.maps.canada.ca/pub/nrcan_rncan/publications/STPublications_PublicationsST/223/223742/bu_588.zip
	https://ftp.maps.canada.ca/pub/nrcan_rncan/publications/STPublications_PublicationsST/223/223551/of_5006.zip
	DF 38: Athabasca Supergroup Multiparameter Logging Data from Drillcores
	DF 39: Stratigraphy of the Jackfish, Cree and Mirror Basins from Multiparameter Drill Logs

Table 1: Summary of data sources

A detailed description of the data is given in the sub-section below.

Athabasca 3-D Model 2.0 (NTS 64E, L, M, 74E to 74P) - Publications Saskatchewan

Description

In 2020, a new version of the three-dimensional (3-D) model of the basin was initiated, to incorporate datasets and interpretations resulting from recent lithological, geochemical, mineralogical, geophysical and structural studies. The improvements to the 3-D model (Figure 2), carried out with the aid of MIRA Geoscience Inc., provide a clearer, more tangible visualization and deeper understanding of the subsurface in this region. Along with the new components added recently, this version of the model also includes several older, previously unpublished components; most information from older versions of the model is retained in this data package.

This release supersedes previous releases of the Athabasca 3-D model. The model will be updated and available to download as new components are added.

Data formats	Dataset size (MB)
General Description	0.26
Web DXF files Part 1-3	225
Web Geoscience Analyst Project	50
Web_SKUA_Gocad objects Part 1-3	75
GoCAD Project	51

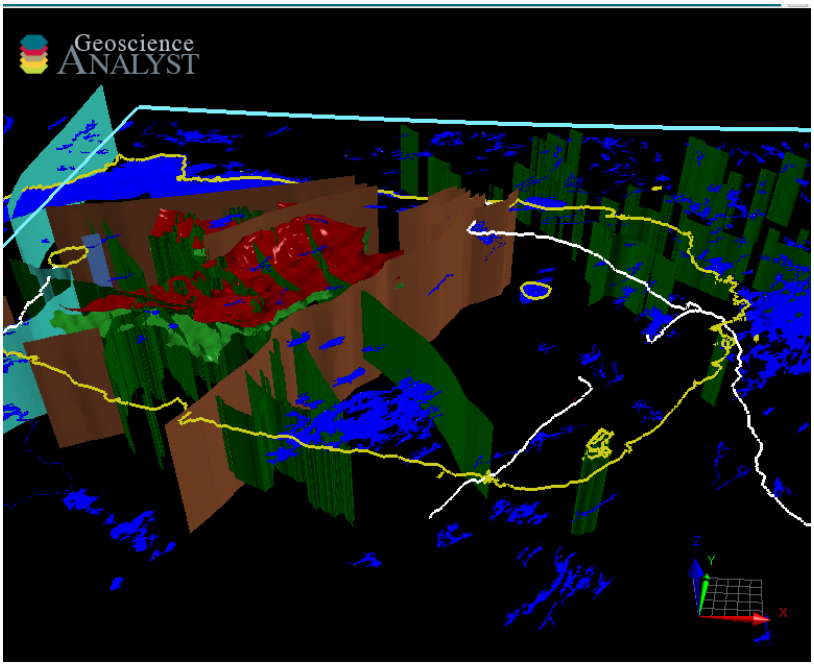

Figure 2: *Geoscience Analyst Project of Athabasca 3-D Model 2.0*

Government geophysics Geophysical Data / Données géophysiques (canada.ca)

Description

Two compilations of airborne magnetic and radiometric data are available for download from the GSC website (Figure 3).

1) The compilation contains data from Total Field Magnetic parameters (200m). The data were acquired between 1952-01-01 and 1962-12-31.
2) 2010 compilation contains data from Total Field Magnetic and Radiometric parameters (100m). The data were acquired between 2003-09-02 and 2008-10-24.

The link can also be used to add the server to SEEKER in Oasis montaj for easy access to the data.

The archived magnetotelluric data (Figure 4) are available for download from Open Data.

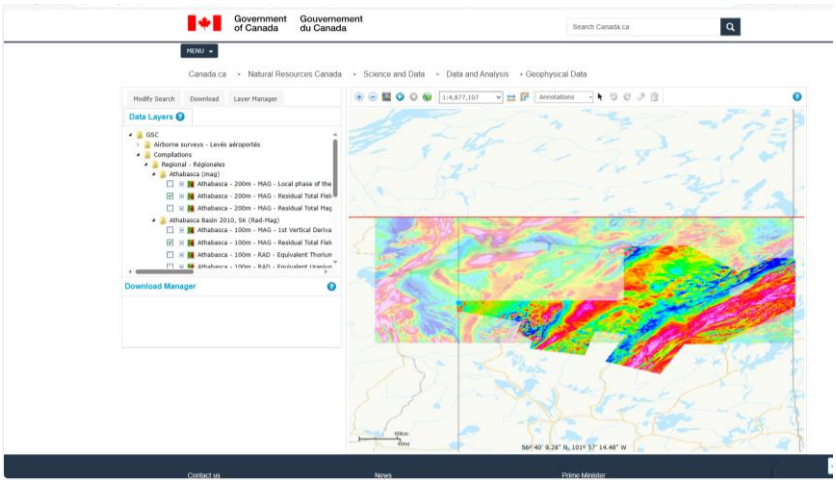

Figure 3: GSC portal for distribution of geophysical data showing selected Athabasca Basin data

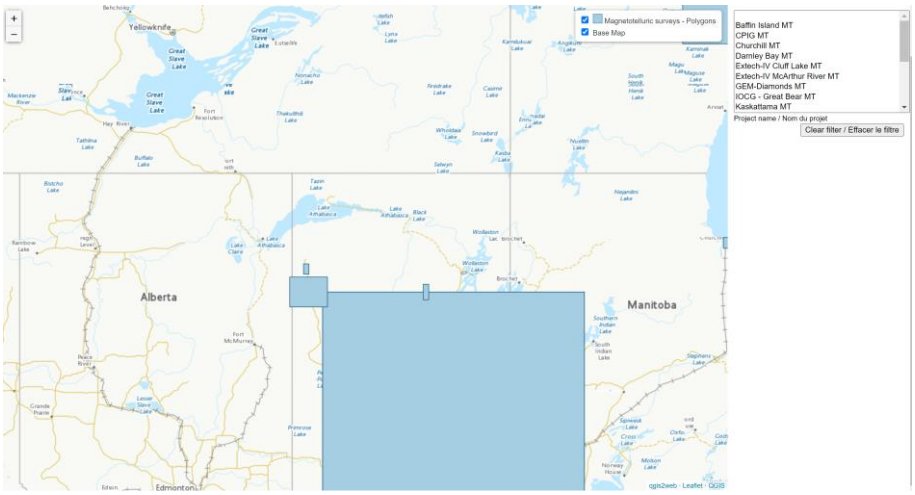

Figure 4: GSC portal for distribution of magnetotelluric data

Industry assessment geophysics (Go to the Seequent DAP Portal to sign in and access the data)**.**

Description

The data package contains a Geosoft map (Figure 5) and ArcGIS project which outlines the surveys as well as all the geophysics data. The original documents with the surveys are also included. The 'end' period for surveys is 2011, as data was compiled in 2014 (after 3 year hold-back).

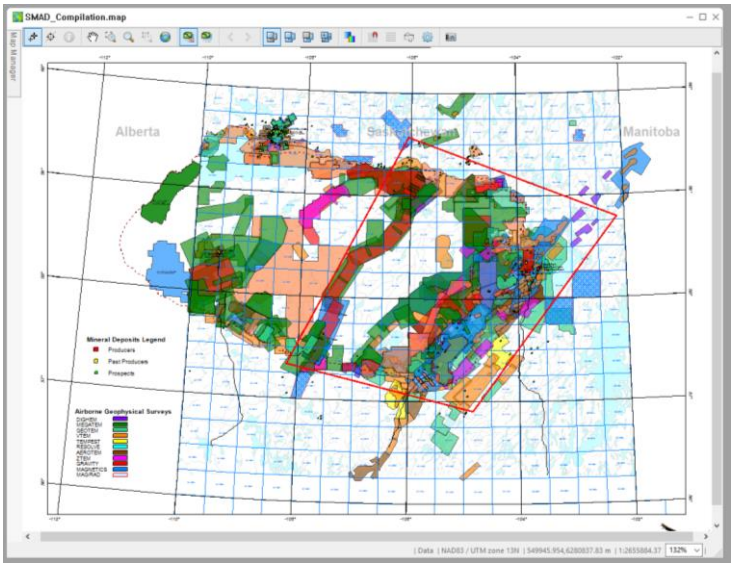

Figure 5: Footprint map of industry geophysical data color-coded by geophysics method

NSERC/CMIC & Metal Earth data Open data mineral exploration & Metalearth

Description

An objective of the NSERC-CMIC project was the integration of multi-disciplinary data through machine learning alongside standard statistical techniques.The repository contains numerous files such as data files, core photos, and lab certificates linked to data. It also contains nearly 200 project documents including abstracts, papers, and theses, hosted by Mira Geoscience.

The Mineral Exploration Research Centre (MERC) at Laurentian University is currently leading Canada's Largest Exploration Research Project, Metal Earth. There are ArcGIS feature layers, web map services and feature services of the data available as per Figure 5.

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Athabasca Basin uranium geochemistry database GEOSCAN Search Results: Fastlink (nrcan.gc.ca)

Description

The Athabasca Basin Uranium Geochemistry Database (AUG) represents the compilation of several Saskatchewan Geological Survey Data Files and drill core geochemistry extracted from Mineral Assessment reports submitted to the Saskatchewan Mineral Assessment Database for the period 2000 to 2011 for the Athabasca Basin of northern Saskatchewan and Alberta (Figure 6). This revised version (2) of the database supersedes Open File 7495 (Wright et al., 2013), incorporating an additional year of publicly available data. The primary purpose of this compilation is to produce a

dataset from which further academic, government, and industrial research related to unconformity-associated uranium deposits may proceed.

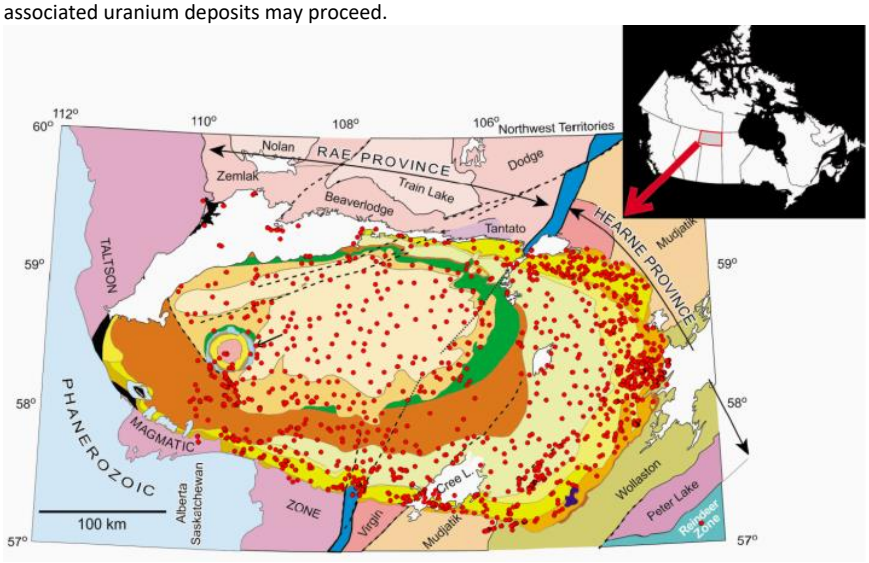

Figure 6: Location of geochemistry samples

Data formats	Dataset size (MB)
mxd, shp & asci point data	19

EXTECH IV EXTECH data package

Description

The data package is an archive of the primary and processed data collected by the EXTECH IV project from 2000 to 2004. Support was provided by a broad partnership including the SGS (Northern), Alberta Geological Survey, Cameco Corporation, AREVA Resources Canada Inc. (now Orano Group), the universities of Alberta, Regina, Saskatchewan and Laurentian, the National Science and Engineering Research Council of Canada, and the GSC under the Earth Sciences Sector Project Approval System (PAS) enhanced by the first Targeted Geoscience Initiative (TGI).

Seismic-reflection data and a vertical seismic profile were acquired in the vicinity of the McArthur River mining camp. These data are interpreted with the aid of in situ geophysical and geological logs and rock-property measurements. Figure 7 shows the regional geology of the Athabasca Basin and the approximate location of the seismic study area and transects at the McArthur River mining camp.

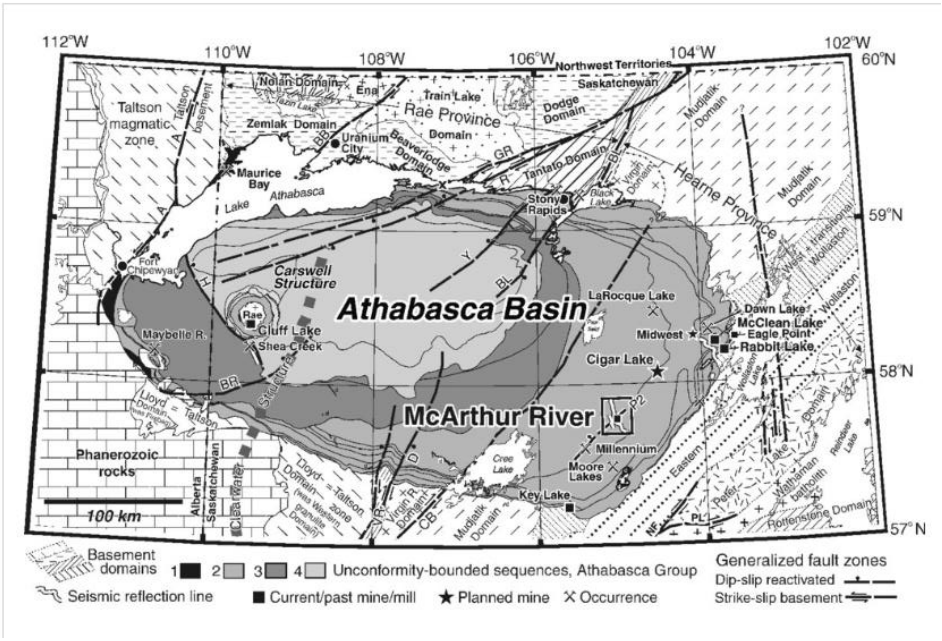

Figure 7: Location of seismic study area at McArthur River

Data formats	Dataset size (MB)
pdf	275
raw data & pdfs	3,016
.zip files of logging data from drill core	9

Data Source Acknowledgments

The data for this project was provided by:

- 3D models – Sean Bosman sean.bosman@gov.sk.ca
- Government Geophysics - Vicki Tschirhart victoria.tschirhart@nrcan-rncan.gc.ca
- Industry assessment geophysics – Ken Witherly ken@condorconsult.com
- NSERC/ CMIC & Metal Earth data – Kevin Ansdell kevin.ansdell@usask.ca & Stephane Perrouty sperrouty@laurentian.ca
- Athabasca Basin uranium geochemistry database – Eric Potter eric.potter@nrcan-rncan.gc.ca
- EXTECH IV – Charlie Jefferson charlie.jefferson49@gmail.com & Sean Bosman sean.bosman@gov.sk.ca