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Miscellaneous Release—Data 298

Ontario Rhyolite Database—Northwestern Ontario and the Grenville Province

by B.R. Berger and J.E. Chartrand

This publication can be downloaded from

http://www.geologyontario.mndm.gov.on.ca/mndmaccess/mndm_dir.asp?type=pub&id=MRD298

This digital release is a compilation and interpretation of rhyolite occurrences in northwestern Ontario and the Grenville Province. This digital data set provides information on areas where rhyolite is identified by geology or geochemistry in northwestern Ontario and the Grenville Province. This publication complements the data set on the compilation and interpretation of rhyolite occurrences in northeastern Ontario, Miscellaneous Release—Data 281, *Northeastern Ontario Rhyolite Database*. The data are presented in geodatabase (.mdb) and shapefile (.shp) formats (created using ESRI® ArcGIS® 9.3) on a colour geology base derived from Miscellaneous Release—Data 126—Revised, *1:250 000 scale Bedrock Geology of Ontario*. The data comprise a polygon layer containing outlines of rhyolite and “felsic metavolcanic rocks”; geochemistry, geochronology and mineral occurrence layers; and Microsoft® Excel® 2003 (.xls) files containing geochronological data and geochemical analyses. Locations of point source rhyolite occurrences are inferred from the locations of the geochemical samples. Location data are provided in the latitude and longitude as well as Universal Transverse Mercator (UTM) projection and grid system, zones 15, 16, 17 and 18, North American Datum 1983 (NAD83). The data are available on 1 CD.

CONTENT

- File structure
- Introduction
- Description of contents
- Description of layers
- Map projections, scale and base map information
- References

FILE STRUCTURE

```
MRD 298 CONTENT
//Grenville_final
  /BASE
  /GEOCHEMISTRY
    /EXCEL
    /SHAPEFILES
      /ZONE17
      /ZONE18
  /GEOLOGY
  /MINERALIZATION
  GRENVILLE_RHYOLITE.mxd

//NW_Final
  /BASE
  /GEOCHEMISTRY
    /EXCEL
    /SHAPEFILES
      /Z15
      /Z16
  /GEOCHRONOLOGY
    /EXCEL
    /SHAPEFILES
      /z15
      /z16
  /GEOLOGY
  /MDI2
  /MINERALIZATION
  NW-RHYOLITES_FINAL.mxd

Readme.pdf
Metadata.pdf
```

INTRODUCTION

The various definitions listed below provided a starting framework for the compilation of “rhyolite” units of the bedrock geology of Ontario.

Rhyolite - extrusive igneous rock that is the volcanic equivalent of granite. (*Encyclopaedia Britannica Online*, <http://www.britannica.com/search?query=rhyolite>)

Rhyolite – A group of extrusive igneous rocks, typically porphyritic and commonly exhibiting flow texture, with phenocrysts of quartz and alkali feldspar in a glassy to cryptocrystalline groundmass; also, any rock in that group; the extrusive equivalent of granite. (*Glossary of Geology*, Neuendorf, Mehl Jr., and Jackson 2005)

Rhyolite is an igneous rock in the class designated as "felsic" rock. This class of rock crystallizes from silicate minerals at relatively low temperatures and with relatively a high percentage of silica. It is at the low temperature extreme of the Bowen reaction series. (<http://hyperphysics.phy-astr.gsu.edu/hbase/Geophys/rhyolite.html>)

Rhyolite can be considered as the extrusive equivalent to the plutonic granite rock, and consequently, outcrops of rhyolite may bear a resemblance to granite. Due to their high content of silica and low iron and magnesium contents, rhyolite melts are highly polymerized and form highly viscous lavas. They can also occur as breccias or in volcanic plugs and dikes. Rhyolites that cool too quickly to grow crystals form a natural glass or vitrophyre, also called obsidian. Slower cooling forms microscopic crystals in the lava and results in textures such as flow foliations, spherulitic, nodular, and lithophysal structures. Some rhyolite is highly vesicular pumice. Many eruptions of rhyolite are highly explosive and the deposits may consist of fallout tephra/tuff or of ignimbrites. (Wikipedia at <http://en.wikipedia.org/wiki/Rhyolites>)

The intent of this digital database is to provide the user with an approximate location, physical character, age and chemical nature of the various "rhyolite" units in Ontario. The first release of the database in 2011 was restricted to northeastern Ontario. This release provides data for northwestern Ontario and the Grenville geological province. Over the last century various descriptive field terms such as "rhyolite", "acid volcanics", "silicic volcanics", "felsite", "quartz and/or feldspar porphyry", and "felsic volcanics" have been used by many geologists in Ontario to identify rocks and rock units interpreted as rhyolite. These rocks are not necessarily true rhyolite; indeed subsequent mapping supplemented with whole rock geochemistry and/or detailed petrographic analysis has often refuted earlier mapping. Nevertheless, for many parts of the province descriptive field terms still exist for labelling rhyolite units. Therefore, compilation of this database is very liberal and many of the polygons included as "rhyolite" may contain metavolcanic rocks or possibly even intrusive rocks that may not be true rhyolite. Users are cautioned to further investigate any area in which they are interested.

Whole rock litho-geochemistry is now widely used to support field interpretations. Various discrimination diagrams are used to define rhyolite geochemically; however, the lower silica limit varies between 65% and 73% SiO₂ (Cox, Bell and Pankhurst 1979; LeBas et al. 1986; Peccerillo and Taylor 1976; and Winchester and Floyd 1977). In addition, virtually all the Precambrian supracrustal rocks are metamorphosed and portions have undergone hydrothermal alteration such that original chemistry is suspect at best. For these reasons geochemical analyses with a lower silica limit of 65% were selected for inclusion in this digital release. The geochemical analyses included in this database are derived from many sources (including Lemkow et al. 2006; Haus and Pauk 1993, 2010) and were collected over many years. Precision of major oxide and trace element data is widely variable and there was little attempt by the authors to standardize the reporting of the data. Users are cautioned that rock names attached to the analyses may not be accurate; for example instances where silica analyses exceed 65% SiO₂ and the rock is called "basalt" may occur. Several analyses of felsic intrusive rocks are included in the geochemistry on the premise that some may represent synvolcanic intrusions or may be extrusive rocks. Again users are cautioned to critically examine the geochemistry in any area in which they are interested.

DESCRIPTION OF CONTENTS

Data for the two areas described in this MRD are located in the main folders labelled **Grenville_final** (Grenville Province) and **NW_Final** (Northwestern Ontario). The files comprising this digital data release are organized into 4 subfolders: 1) **BASE**, 2) **GEOCHEMISTRY**, 3) **GEOLOGY**, and 4) **MINERALIZATION**. A map project file (*.mxd) is also available for each geographic area in its main folder. The additional data folders, 5) **GEOCHRONOLOGY** and 6) **MDI2**, were included only for the **NW_Final** folder. A description of the folder contents follows.

1) The **BASE** folder includes shapefiles and/or layers containing geographic and cultural information (major lakes, roads and townships).

2) The **GEOCHEMISTRY** folder contains two folders: **EXCEL** and **SHAPEFILES**.

The **EXCEL** subfolder contains Microsoft® Excel® 2003 spreadsheets of geochemical data organized by UTM zones. The files in **NW_Final** contains data in NAD27 and NAD83 datum co-ordinate systems. Whole rock and trace element geochemical analyses for approximately 3200 samples, details of sample locations (in latitude and longitude and in UTM), and other information such as rock type are included in the files.

The **SHAPEFILES** subfolder contains shapefiles of geochemical data for samples taken within the following UTM zones: zones 15 and 16 (**NW_Final**) and 17 and 18 (**Grenville_final**). The layers include only those

samples where SiO₂ values are greater than 65%. Although an attempt was made to collect all recent and archived geochemical data for these layers, it is likely that samples were missed, especially where the data only exist as analogue tables in OGS Open File Reports, or comprise thesis material.

3) The files in the **GEOLOGY** folder are associated with the bedrock geology of the map area and contain geology shapefiles and the layers *Geolines.lyr* and *Geopoly.lyr* and the rhyolite location layer *Rhyolite_Units.lyr* (OGS 2010a).

4) The **MINERALIZATION** folder contains various shapefiles and layers related to mineral occurrences located within the geographic boundaries of the rhyolite database compilation. Information regarding the location of present and past-producing VMS deposits, and Cu and Zn mineral occurrences are presented geospatially on bedrock geology. The folder also contains one data file as a Microsoft® Excel® 2003 spreadsheet (.xls) of producing and past producing mines in the area. Information in this folder was obtained from OGS' Mineral Deposit Inventory (OGS 2010b).

5) The **GEOCHRONOLOGY** folder contains two folders, **EXCEL** and **SHAPEFILES** and layer files that provide U/Pb ages for various rock units within northwestern Ontario map area.

The **EXCEL** subfolder contains one data file as a Microsoft® Excel® 2003 spreadsheet (.xls and .csv) of U/Pb ages for various rock units in the map area.

The **SHAPEFILES** subfolder contains shapefiles that provide a list of ages for various rock units in the map area where available and may not include the most up-to-date analyses.

6) The **MDI2** folder contains files associated with the Mineral Deposit Inventory layer (OGS 2010b) and presents various shapefiles and layers related to mineral occurrences located within the geographic boundaries of the rhyolite database compilation.

DESCRIPTION OF LAYERS

Base: The base layer provides geographic and cultural information for the bedrock geology.

Bedrock Geology: The bedrock geology layers (*Geolines.lyr* and *Geopoly.lyr*) are taken from the Ontario Geological Survey's Miscellaneous Release—Data 126—Revised, *1:250 000 Scale Bedrock Geology of Ontario*, (OGS 2010a). Left clicking (in ArcGIS software v9.3.1) the "identify" button will provide a geological description for each polygon.

The rhyolite location layer (*Rhyolite_Units.lyr*) contains polygons of known felsic metavolcanic rocks in northwestern Ontario and the Grenville geological province. The shape of each polygon may not conform to the bedrock geology layer as more recent mapping may supersede the compilation map and these changes have been incorporated into the Rhyolite unit layer. Left clicking on each polygon will provide basic geological information and a reference to the most recent mapping. Further, many polygons on the bedrock geology layer coded as "intermediate to felsic" (units 2 and 6) contain mainly intermediate metavolcanic rocks and are not known to host rhyolite.

Geochemistry theme: Geochemistry layers contain whole rock analyses with 65% SiO₂ or greater for UTM zones 16 and 15 in northwestern Ontario and for UTM zones 17 and 18 in the Grenville province. Although an attempt was made to collect all recent and archived geochemistry it is likely that samples were missed, especially analogue tables in OGS Open File Reports, or thesis material.

Geochronology: This layer provides a list of ages for various rock units in the map area. The layer provides geochronological data where it is known and may not include the most up-to-date analyses.

Mineralization theme: One layer contains present and past producing volcanogenic massive sulfide (VMS) deposits in Northwestern Ontario. A second layer shows mineral occurrences where copper is the primary mineral commodity regardless of genetic model (i.e. VMS, vein hosted or otherwise). A third layer shows mineral occurrences where zinc is the primary commodity regardless of genetic model. All data are taken from the OGS' Mineral Deposit Inventory (OGS 2010b).

MAP PROJECTIONS, SCALE AND BASE MAP INFORMATION

Themes contained in this MRD are set to the Geographic Co-ordinate System: GCS_North_American_1983, using North American Datum 1983 (NAD83). UTM co-ordinates for point data are available in the appropriate attribute tables. The database was compiled from data at various scales. The base map information was derived from data downloaded from Land Information Ontario with modifications by staff of the Ministry of Northern Development and Mines. The map project file (.mxd) is set to a Lambert Conic Conformal projection for a more aesthetically pleasing display of data.

REFERENCES

- Cox, K.G., Bell, J.D. and Pankhurst, R.J. 1979. The interpretation of igneous rocks, Allen and Unwin, London. 450p.
- Haus, M. and Pauk, T. 2010. Data from the PETROCH lithogeochemical database; Ontario Geological Survey, Miscellaneous Release—Data 250.
- Haus, M. and Pauk, T. 1993. PETROCH lithogeochemical database: supporting documentation for PETROCH data; Ontario Geological Survey, Open File Report 5855, 18p.
- LeBas, M.J., LeMaitre, R.W., Streckeisen, A., and Zanettin, B. 1986. A chemical classification of volcanic rocks based on the total alkali silica diagram; Journal of Petrology, v.27, p.745-750.
- Lemkow, D.R., Sanborn-Barrie, M., Bailes, A.H., Percival, J.A., Rogers, N., Skulski, T., Anderson, S.D., Tomlinson, K.Y., McNicoll, V., Parker, J.R., Whalen, J.B., Hollings, P. and Young, M. 2006. GIS compilation of geology and tectonostratigraphic assemblages, western Uchi Subprovince, Western Superior Province, Ontario and Manitoba; Geological Survey of Canada, Open File 5269, Manitoba Geological Survey, Open File Report 2006-30, Ontario Geological Survey, Miscellaneous Release—Data 203.
- Neuendorf, K.K.E., Mehl, Jr., J.P. and Jackson, J.A. eds. 2005. Glossary of Geology, 5th Edition; American Geological Institute, Virginia, U.S.A
- Ontario Geological Survey 2010a. 1:250 000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release—Data 126—Revised.
- 2010b. Mineral Deposit Inventory—2010; Ontario Geological Survey, December 2010 release.
- Peccerillo, A. and Taylor, S.R. 1976. Geochemistry of Eocene calc-alkaline volcanic rocks from the Kastamonu area, northern Turkey; Contributions to Mineralogy and Petrology, v.58, p.63-81.
- Winchester, J. A. and Floyd, P. A. 1977. Geochemical discrimination of different magma series and their differentiation products using immobile elements; Chemical Geology, v.20, Issue 4, p.325-343.