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# VOLCANIC METALLOGENIC DATABASE: AN OVERVIEW OF ITS APPLICATION AND DATA

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## INTRODUCTION

The Volcanic Metallogenic Database compilation project is nearing the end of its third year. The database will be released on diskette at the end of the 1993-94 fiscal year, accompanied by a user manual and application. The application will provide an interface by which the user can query the database and print or export data of interest. This article provides a summary of the database in its present form to provide potential users with an indication of how this product might be of use to them. A brief description of the general features of the application is also provided. The database is not complete and it is planned to make updated releases, possibly on a yearly basis.

## HARDWARE REQUIREMENTS

The database in its present form will require 6.5 megabytes of disk space, and together with the application and runtime module, will require a total of about 8.5 megabytes. There is one version of the application but the runtime module that runs it will be available in two versions that differ in the way they access memory. A version for users of 386DX or better computers requires two megabytes of extended memory and 200K of free conventional memory. A version for users of 386SX or lower computers requires 470K of free conventional memory and does not require any extra extended memory. Users will find the application runs much faster on more advanced computers.

## THE APPLICATION

The application will be menu driven and will guide the user through various tasks such as:

1) viewing data in any one table
2) viewing data in linked tables
3) printing analytical data in standard geological format
4) printing analytical data in a one-sample-per-page format
5) printing field data (units, rock type, ntsmap, etc.)

The user will be able to output reports to a file, to the screen or to a printer.

The following example (viewing data in one table) shows the basic style of navigating through the menu system in the application.

First a menu of tables is posted:

*Choose a table*

```
FIELDDAT
GEOCHEM
CLASSIFY
rock
method
analyst
refs
catgroup
duplicat
standard
accepted
```

*Press [F1] if no changes*
*Move cursor to choice and press [Enter] or [F2]*
*Press [Esc] to abort*

The user selects a table (FIELDDAT in this example) by highlighting it with the cursor and pressing [Enter]. A menu of columns from the chosen table is posted:

*Choose one or more columns*

```
✓ labnum
✓ fieldnum
✓ majunit
✓ minunit
✓ subunit
  ntsmap
  utmzone
  utmeast
  utmnorth
✓ rocktype
✓ rockclas
  owner
  refcode
  age
  restrict
✓ info
```

*Press [Enter] to select or unselect—shift-[F6] to select all*
*Press [F2] when done; [F1] if no changes*

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The user selects several columns as indicated by the check marks. Conditions are then set to limit the data selection. The application provides more than one way of doing this. The method most commonly used involves use of the default R:base condition builder, shown below:

*Choose conditions to limit data viewed–press [F2] when done*
*Do not enter quotes or parentheses–they are inserted for you*
*You can pick conditions from any column whether selected or not*
*Press [Esc] to return to previous screen* ← *general instructions*

| | Column | Operator | Value |
|---|---|---|---|
| | labnum<br>fieldnum<br>majunit<br>minunit<br>subunit<br>ntsmap | | |

← The arrow indicates more columns appear when scrolling down

*Select column for condition.* ← R:base posts instructions here for immediate action

The user highlights any column, whether selected for viewing or not, presses [Enter] and is then prompted to enter an operator from a menu:

| | Column | Operator | Value |
|---|---|---|---|
| | majunit | = EQUAL<br>< > NOT EQUAL<br>> GREATER THAN<br>>= GREATER THAN OR EQUAL<br>< LESS THAN<br><= LESS THAN OR EQUAL | |

Choose an operator. this menu is different for numeric columns

In this example the EQUAL operator is chosen and the user is then prompted for a value, which must be typed in. The value must match exactly, including proper placement of apostrophes or periods when this operator is chosen. Either upper or lower case may be used as the program does not distinguish between the two. The condition builder automatically includes quotes around strings and parentheses where needed.

| | Column | Operator | Value |
|---|---|---|---|
| | majunit | = | *wild bight group* |

R:base posts instructions here → *Enter a comparison value.* for immediate action

In the above example the user has typed in *wild bight group.* After pressing [Enter] the condition builder responds with:

| | Column | Operator | Value |
|---|---|---|---|
| AND<br>OR<br>AND NOT<br>OR NOT<br>(Done) | majunit | = | *"wild bight group"* |

*Choose an operator to combine conditions or choose (Done).*

The condition builder has placed quotes around *wild bight group* and has posted another menu. The user can select another operator if there is to be another condition (for example 'Rocktype = "BSLT") or can select '(Done)'.

Another menu lets the user add a sort clause and the results of the query are then posted to the screen.

## DATA INCLUDED IN THE FIRST RELEASE

The database now contains data for over 2500 samples from more than thirty sources. Information includes sample location, unit names and rock type for each sample. The sample distribution of the database to date is shown in Table 1. The samples are grouped by major unit or minor unit where they have not been assigned to a major unit. Minor units are not listed for samples that belong to a major unit.

Table 2 shows the sources from which data has been acquired. Note that some reference codes list more than one reference. This most commonly occurs where a subset of data from a thesis has subsequently been published. A user will most likely wish to refer to both references.

**Table 1.** Distribution of samples by Major or Minor unit

| *Majunit* | Number of Occurrences |
|---|---|
| Adeyton Group | 9 |
| Advocate Complex | 1 |
| Baie d'Espoir Group | 98 |
| Bay du Nord Group | 102 |
| Bay of Islands Complex | 20 |
| Betts Cove Complex | 183 |
| Botwood Group | 2 |
| Buchans Group | 354 |
| Burin Group | 25 |
| Cape Brule Porphyry | 2 |
| Cape St. John Group | 56 |
| Connaigre Bay Group | 15 |
| Connecting Point Group | 3 |
| Coy Pond Complex | 10 |
| Diversion Lake group | 15 |
| Flatwater Pond Group | 13 |
| Gander Group | 1 |
| Gander River Complex | 9 |
| Glover Group | 10 |
| Grand Lake Complex | 3 |
| Harbour Main Group | 64 |
| Harcourt Group | 21 |
| King George IV Lake Complex | 3 |
| Little Port Complex | 20 |
| Love Cove Group | 52 |
| Lushs Bight Group | 21 |
| Marystown Group | 9 |
| Mortier Bay Group | 16 |
| Musgravetown Group | 146 |
| New World Island complex | 6 |
| Otter Neck Group | 5 |
| Pacquet Harbour Group | 65 |
| Pipestone Pond Complex | 16 |
| Point Rousse Complex | 1 |
| Snooks Arm Group | 22 |
| Springdale Group | 1 |
| Topsails Intrusive Suite | 6 |
| Victoria Lake Group | 275 |
| Wild Bight Group | 101 |

| *Minunit* | Number of Occurrences |
|---|---|
| Cape Brule Porphyry | 3 |
| Caribou Lake fm. | 1 |
| Carter Lake fm. | 3 |
| Carter Lake volcanics | 2 |
| Cold Spring Pond Fm. | 27 |
| Harbour Round basalts | 9 |
| Lake Douglas basalts | 4 |
| Lemotte's Lake basalts | 6 |
| Pine Falls fm. | 10 |
| Skinner Cove Fm. | 54 |
| Stony Lake volcanics | 109 |

**Table 2:** Source references for geochemical data

| refcode | refname |
|---|---|
| 1 | Newfoundland Department of Mines and Energy, St. John's, unpublished data |
| 2 | Saunders, C.M., 1982: Controls of mineralization in the Betts Cove ophiolite. M.Sc thesis, Memorial University of Newfoundland, St. John's, 200 p. |
| 3 | Thurlow, J.G., 1981: Geology, ore deposits and applied rock geochemistry of the Buchans Group, Newfoundland. Ph.D. thesis, Memorial University of Newfoundland, St. John's, 305 p. |
| 4 | Gale, G.H., 1971: An investigation of some sulfide deposits of the Rambler area, Newfoundland. Ph.D. thesis, University of Durham, Durham, 157 p. |
| 5 | Coish, R.A., 1977: Igneous and metamorphic petrology of the mafic units of the Betts Cove and Blow-Me-Down ophiolites, Newfoundland. Ph.D. thesis, University of Western Ontario, London, Canada, 228 p. |
| | Coish, R.A., Hickey, R. and Frey, F.A., 1982: Rare earth element geochemistry of the Betts Cove ophiolite, Newfoundland: complexities in ophiolite formation. Geochimica et Cosmochimica Acta, 46, p. 2117-2134. |
| 6 | Fleming, J.M., 1970: Petrology of the volcanic rocks of the Whalesback area, Springdale Peninsula, Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 107 p. |
| 7 | Hibbard, J., 1983: Geology of the Baie Verte Peninsula, Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Memoir 2, 279 p. |
| 8 | Dunning, G.R., Swinden, H.S., Kean, B.F., Evans, D.T.W. and Jenner, G.A., 1991: A Cambrian island arc in Iapetus: geochronology and geochemistry of the Lake Ambrose volcanic belt, Newfoundland Appalachians. Geological Magazine, 128, p. 1-17. |
| 9 | O'Neill, P., 1991: Geology of the Weir's Pond area, Newfoundland (NTS 2E/1). Newfoundland Department of Mines and Energy, Geological Survey Branch, Report 91-3, 144 p. |
| 10 | Colman-Sadd, S.P., 1985: Geology of the Burnt Hill Map Area (2D/5), Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 85-3, 94 p. |
| 11 | Harris, A., 1973: Geology of the Osmonton Arm—Glovers Arm area, central Notre Dame Bay, Newfoundland. B.Sc. thesis, Memorial University of Newfoundland, St. John's, 115 p. |

**Table 2:** *Continued*

| refcode | refname |
|---|---|
| 12 | Baker, D.F., 1978: Geology and geochemistry of an alkali volcanic suite (Skinner Cove Formation) in the Humber Arm Allochthon, Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 314 p. |
| 13 | Huard, A.A., 1989: Epithermal alteration and gold mineralization in Late Precambrian volcanic rocks on the northern Burin Peninsula, southeastern Newfoundland, Canada. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 273 p. |
| 14 | Hussey, E.M., 1979: The stratigraphy, structure and petrochemistry of the Clode Sound map area, northwestern Avalon Zone, Newfoundland. M.Sc thesis, Memorial University of Newfoundland, St. John's, 312 p. |
| 15 | Hurley, T.D., 1982: Metallogeny of a volcanogenic gold deposit, Cape St. John, Tilt Cove, Newfoundland. B.Sc. thesis, McMaster University, Hamilton, 69 p. |
| 16 | Kennedy, D.P.K., 1981: Geology of the Corner Brook Lake area, western Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 370 p. |
| 17 | Knapp, D.A., 1982: Ophiolite emplacement along the Baie Verte–Brompton Line at Glover Island, western Newfoundland. Ph.D. thesis, Memorial University of Newfoundland, St. John's, 338 p. |
| 18 | Malpas, J.G., 1971: The petrochemistry of the Bull Arm Formation near Rantem Station, southeast Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 95 p. |
| 19 | Reusch, D.N., 1983: The New World Island Complex and its relationship to nearby formations, north-central Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, Newfoundland, 248 p. |
| 20 | Taylor, S.W., 1976: Geology of Marystown map sheet (E/2), Burin Peninsula, southeastern Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, 164 p. |
| 21 | Upadhyay, H.D., 1973: The Betts Cove Ophiolite and related rocks of the Snooks Arm Group, Newfoundland. Ph.D. thesis, Memorial University of Newfoundland, St. John's, 224 p. |
| 22 | Cameron, K.J., 1986: Petrochemistry of mafic rocks from the Harbour Main Group (Western Block), Conception Bay, Avalon Peninsula, Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 209 p. |

**Table 2:** *Continued*

| refcode | refname |
|---|---|
| 23 | Hudson, K.H., 1988: Gold and base metal mineralization in the Nippers Harbour ophiolite, Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 305 p. |
| 24 | Wynne, P.J., 1983: A lithogeochemical study of the Strickland Showing. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 313 p. |
| 25 | O'Driscoll, C.F., 1977: Geology, petrology and geochemistry of the Hermitage Peninsula, southern Newfoundland. M.Sc. thesis, Memorial University of Newfoundland, St. John's, 144 p. |
| 26 | Swinden, H.S., 1987: Ordovician volcanism and mineralization in the Wild Bight Group, central Newfoundland: a geological, petrological, geochemical and isotopic study. Ph.D. thesis, Memorial University of Newfoundland, St. John's, 452 p. |
| | Swinden, H.S., Jenner, G.A., Fryer, B.J., Hertogen, J. and Roddick, J.C., 1990: Petrogenesis and paleotectonic history of the Wild Bight Group, an Ordovician rifted island arc in central Newfoundland. Contributions to Mineralogy and Petrology, 105, p. 219-241. |
| 27 | Swinden, H.S., 1988: Geology and economic potential of the Pipestone Pond area (12A/1 NE; 12A/8 E), central Newfoundland. Newfoundland Department of Mines and Energy, Geological Survey Branch, Report 88-2, 88 p. |
| 28 | Hayes, J.P.H., 1988: The petrology and geochemistry of the Bull Arm Formation at Bull Arm, Trinity Bay. B.Sc. thesis, Memorial University of Newfoundland, St. John's, 152 p. |
| 29 | Taylor, R.P., Strong, D.F. and Kean, B.F., 1980: The Topsails igneous complex: Silurian-Devonian peralkaline magmatism in western Newfoundland. Canadian Journal of Earth Sciences, 17, p. 425-439. |
| 30 | DeGrace, J.R., Kean, B.F., Hsu, E. and Green, T., 1976: Geology of the Nippers Harbour map area (2E/13), Newfoundland. Newfoundland Department of Mines and Energy, Mineral Development Division, Report 76-3, 73 p. |
| 31 | Greenough, J.D., 1984: Petrology and geochemistry of Cambrian volcanic rocks from the Avalon Zone in Newfoundland and New Brunswick. Ph.D. thesis, Memorial University of Newfoundland, St. John's, 487 p. |

Table 3 shows the distribution of rock types as coded in the *Rocktype* column. This column uses the rock name assigned by the collecting geologist with some simplification (e.g., mafic pillow lava has been coded as basalt–'BSLT'). The degree to which this rock name reflects the chemical composition of the rock varies depending on the source. Samples from theses and published papers have generally had a rigorous classification imposed on them. For example, some geologists have classified their samples as alkali basalt, ankaramite or pantellerite, terms that may provide some indication of a rock's genetic history. For other samples, the rock name may be more of a field term applied loosely to a rock that chemically would fit into another category. The user should refer to the source reference or check with the collecting geologist where data is unpublished.

**Table 3.** Distribution of rock types by *Rocktype*

| *Rocktype* | *Rockname** | Number of Occurrences |
|---|---|---|
| ALKB | alkali basalt | 20 |
| ANDS | andesite | 71 |
| ANKA | ankaramite | 7 |
| BAND | basaltic andesite | 4 |
| BSLT | basalt | 723 |
| BSNT | basanite | 3 |
| BTUF | basaltic tuff | |
| DACT | dacite | 17 |
| DIAB | diabase | 167 |
| FFLW | felsic flow | 45 |
| FLST | felsite | 2 |
| FPER | felsic perknite | 6 |
| FPFL | felsic porphyritic flow | 27 |
| FPOR | felsic porphyry | 1 |
| FPPP | feldspar porphyry | 1 |
| FTUF | felsic tuff | 234 |
| GBRO | gabbro | 2 |
| GRNT | granite | 2 |
| IFLW | intermediate flow | 1 |
| IGNB | ignimbrite | 2 |
| ITUF | intermediate tuff | 16 |
| MFLW | mafic flow | 8 |
| MPOR | mafic porphyry | 3 |
| MTUF | mafic tuff | 29 |
| PANT | pantellerite | 6 |
| PERK | perknite | 3 |
| PORP | porphyry | 2 |
| QZFP | quartz feldspar porphyry | 11 |
| RHDC | rhyodacite | 4 |
| RPOR | rhyolite porphyry | 2 |
| RYLT | rhyolite | 298 |
| SCHS | schist | 6 |
| SDST | sandstone | 1 |
| STUF | silicic tuff | 4 |
| TRAC | trachyte | 9 |
| TRCB | trachybasalt | 8 |
| TRHJ | trondhjemite | 1 |
| TUFF | tuff | 273 |
| VEIN | vein | 1 |

* Non-volcanic rock types (granite, gabbro, etc.) are listed because they belong to analytical duplicate samples, which are included regardless of lithology

Another column, *Rockclas,* is based on a more generalized and simplified code with the intent of making searching easier (Table 4). The anhydrous $SiO_2$ content of the rock was determined and following the usage of Carmichael *et al.* (1974, page 557), volcanic flows were coded accordingly as either basalt, basaltic andesite, andesite, dacite or rhyolite.

**Table 4:** Explanation of Codes for the *Rockclas* column

| $SiO_2$ (%) | Rock | Code |
|---|---|---|
| **FLOWS** | | |
| < 45.00 | low $SiO_2$ mafic flow | LSMF |
| 45.00–51.99 | basalt | BSLT |
| 52.00–54.99 | basaltic andesite | BAND |
| 55.00–62.99 | andesite | ANDS |
| 63.00–67.99 | dacite | DACT |
| >= 68.00 | rhyolite | RYLT |
| **TUFFS** | | |
| < 52.00 | basaltic tuff | BTUF |
| 52.00–67.99 | intermediate tuff | ITUF |
| >= 68.00 | silicic tuff | STUF |
| **HYPABYSSAL ROCKS** | | |
| < 63.00 | diabase | DIAB |
| >= 63.00 | felsite | FLST |

Flows with $SiO_2$ less than 45 percent have been coded LSMF–low silica mafic flow. Tuffs have been divided into three divisions as it was felt that a more rigorous division is not warranted for such variable rocks. Hypabyssal rocks, which include ophiolitic dykes and subvolcanic felsic rocks, have been simplified even more and are classified as either diabase (DIAB) if $SiO_2$ is less than 63 percent or felsite (FLST) if $SiO_2$ is greater than or equal to 63 percent.

The *Rockclas* column is to be used mainly as a device for more easily searching the database without having to list the multiple codes that arise as a result of different classification schemes and terminology used by various geologists. For example, all felsic hypabyssal rocks can be retrieved with the code 'FLST'. Without this simplification the user would have to ask for a variety of codes (FLST, FPPP, FPOR, QZFP, and QZPP).

The distribution of samples as coded in the *Rockclas* column is shown in Table 5.

**Table 5.** Distribution of rock types by *Rockclas*

| *Rockclas* | *Rockname** | Number of Occurrences |
|---|---|---|
| ANDS | andesite | 182 |
| BAND | basaltic andesite | 166 |
| BSLT | basalt | 465 |
| BTUF | basaltic tuff | 41 |
| DACT | dacite | 29 |
| DIAB | diabase | 172 |
| FLST | felsite | 15 |
| GBRO | gabbro | 2 |
| GRNT | granite | 2 |
| ITUF | intermediate tuff | 105 |
| LSMF | low silica mafic flow | 31 |
| RYLT | rhyolite | 385 |
| SDST | sandstone | 1 |
| STUF | silicic tuff | 423 |
| TRHJ | trondhjemite | 1 |
| VEIN | vein | 1 |

* Non-volcanic rock types (granite, gabbro, etc.) are listed because they belong to analytical duplicate samples, which are included regardless of lithology

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