

Figures et tables **Characterization of general and singular features of major aquifer systems in the Saguenay-Lac-Saint-Jean region**

Julien WALTER, Alain ROULEAU¹, Romain CHESNAUX², Mélanie LAMBERT³, Réal DAIGNEAULT⁴

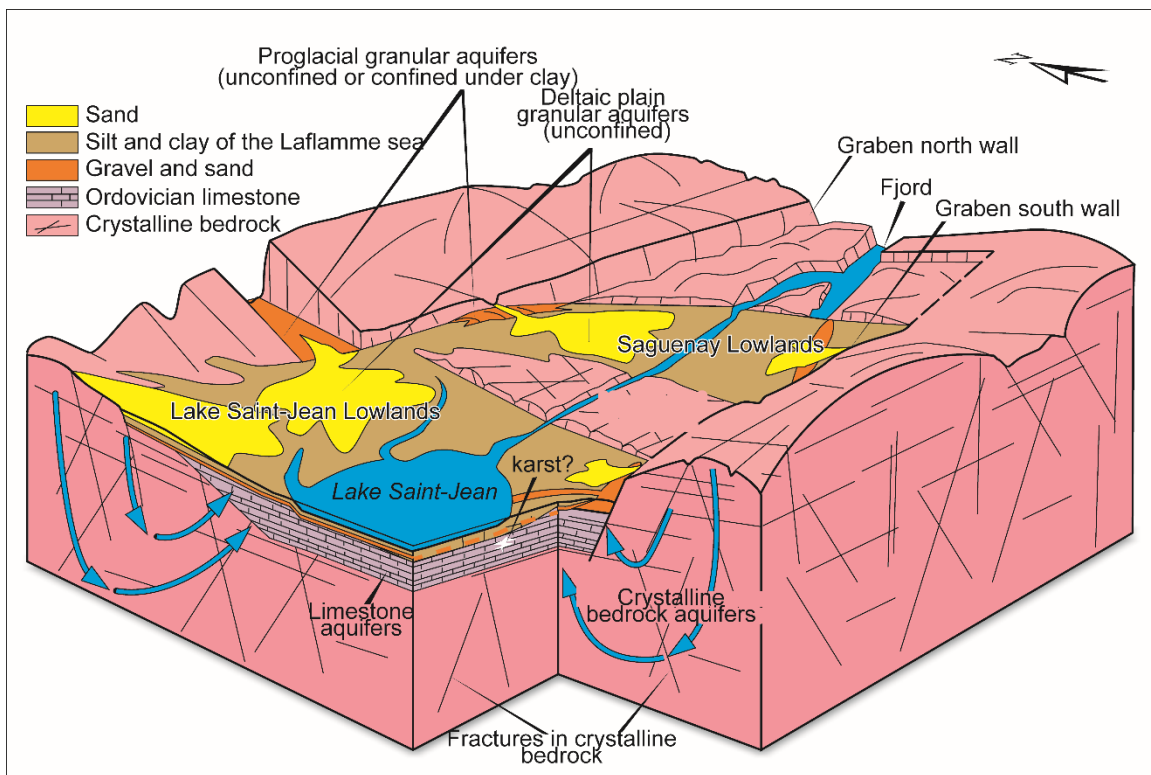
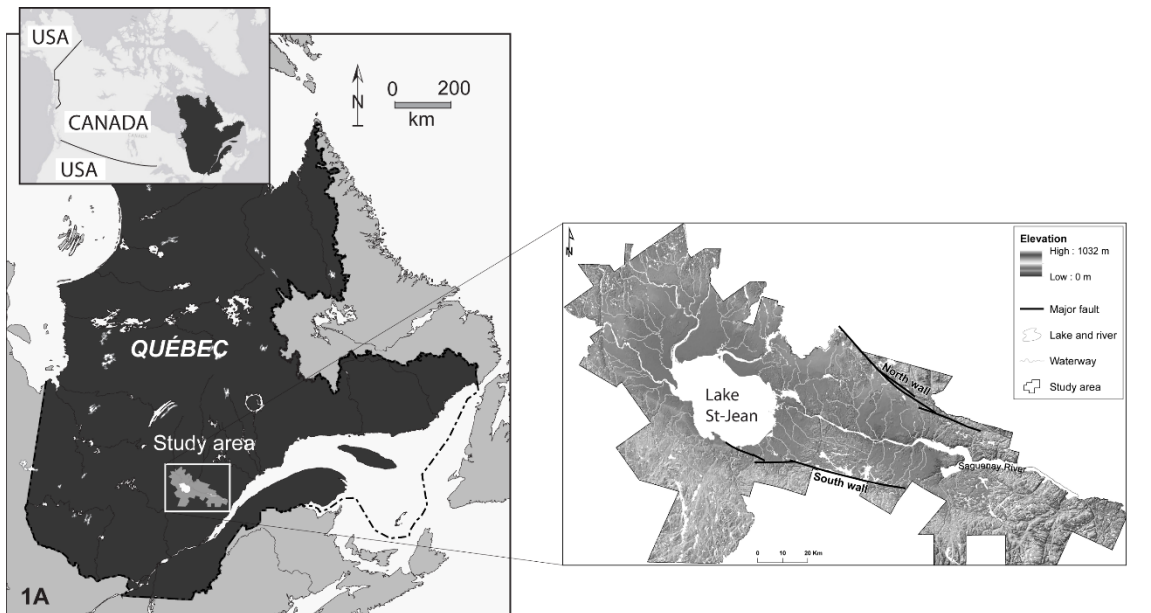
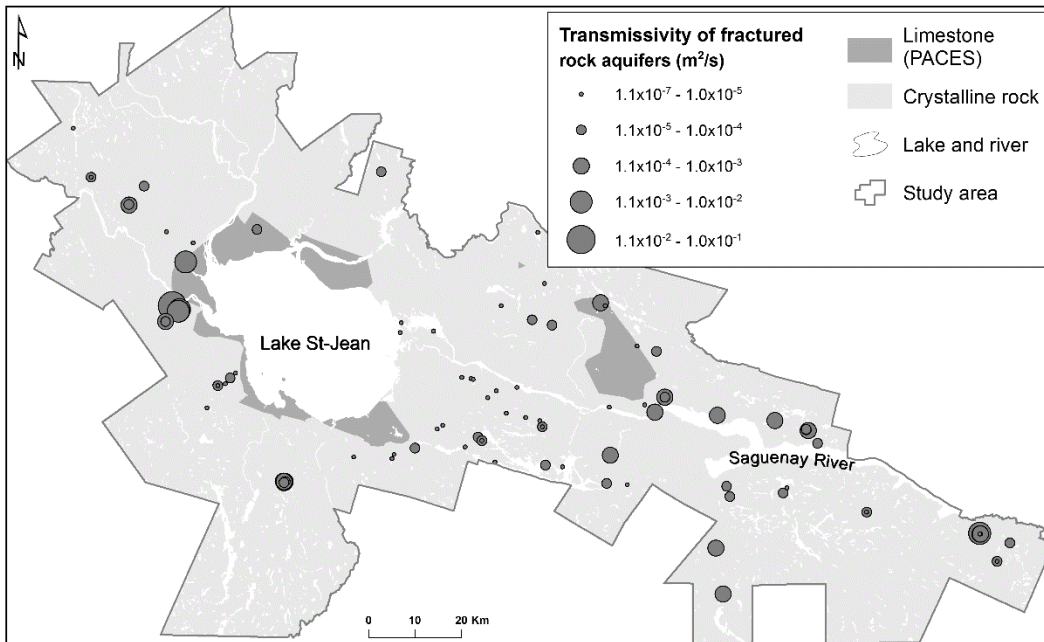
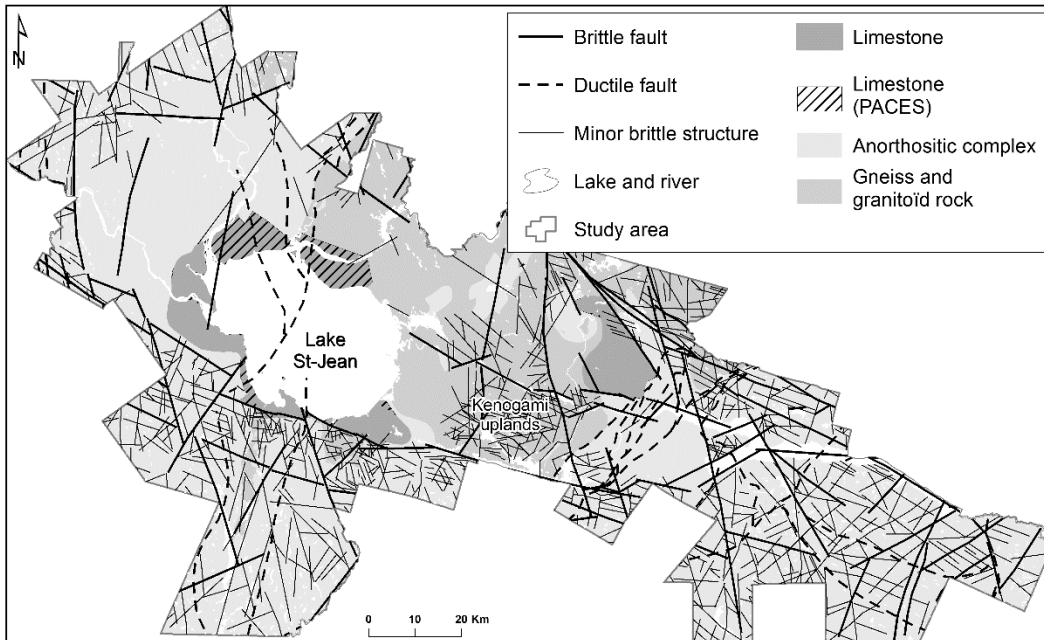
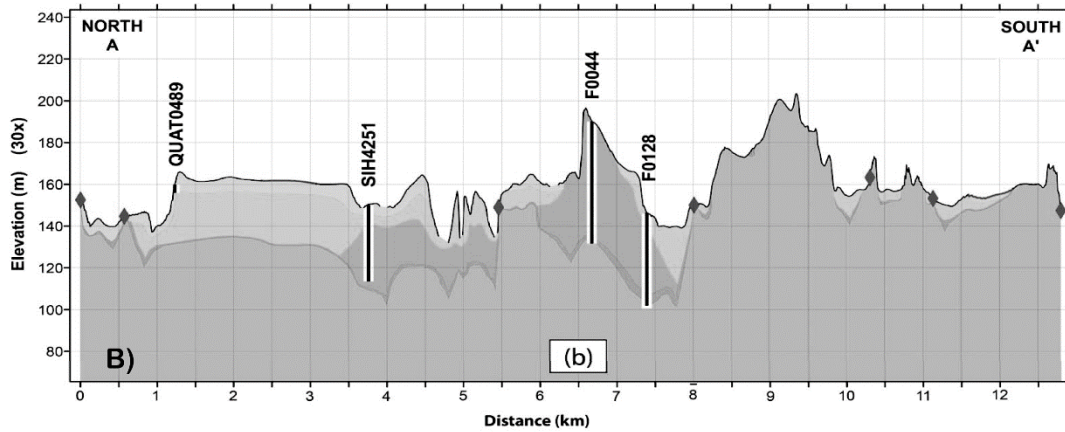
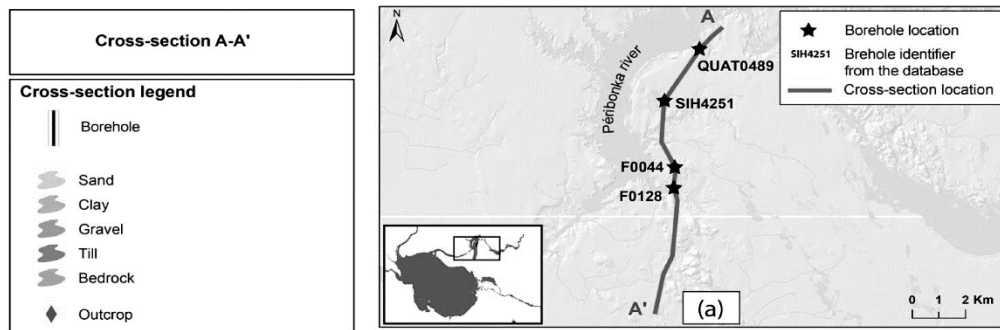
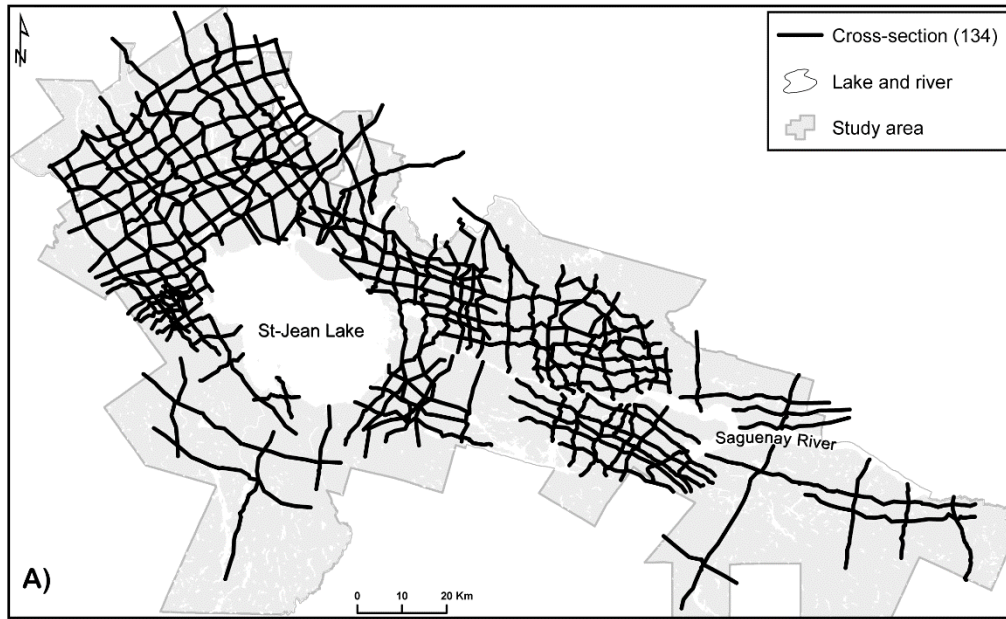


Figure 11.4– Schematic block diagram of aquifer types identified in the Saguenay-Lac-Saint-Jean region (modified from Rouleau et al., 2011)





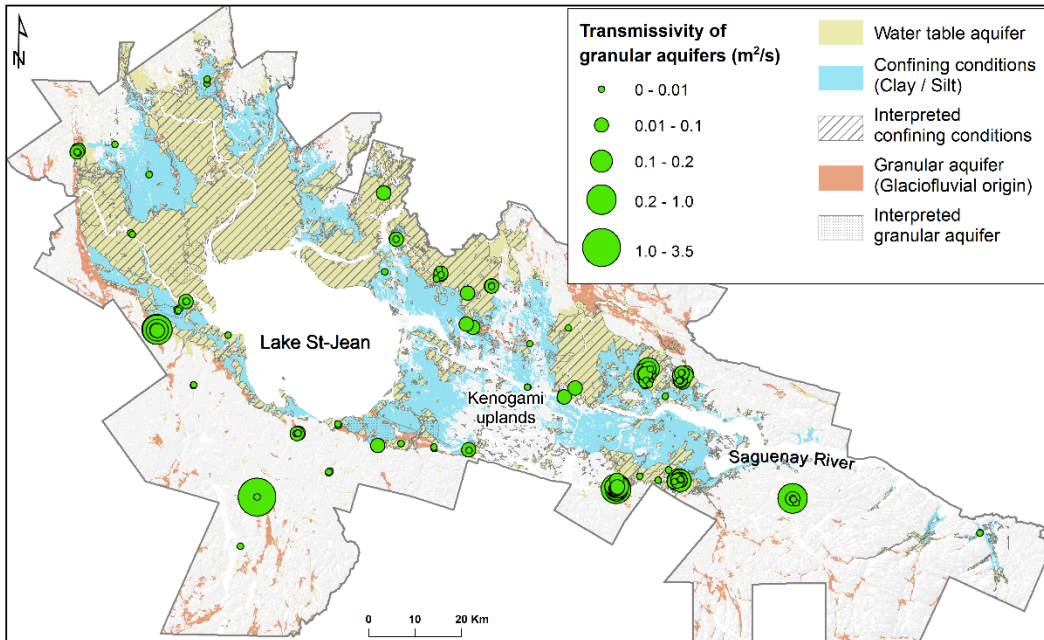


Table 1 Number of groundwater samples by aquifer type and water type

| Aquifer type | Water type | No of samples |
|---------------------|--------------------------|---------------|
| Fractured bedrock | (Na-Ca)-HCO ₃ | 127 |
| Fractured bedrock | (Na-Ca)-Cl | 26 |
| Quaternary granular | (Na-Ca)-HCO ₃ | 144 |
| Quaternary granular | (Na-Ca)-Cl | 19 |

Table 2: Descriptive statistics for groundwater chemistry (units are in ppm if not indicated otherwise).

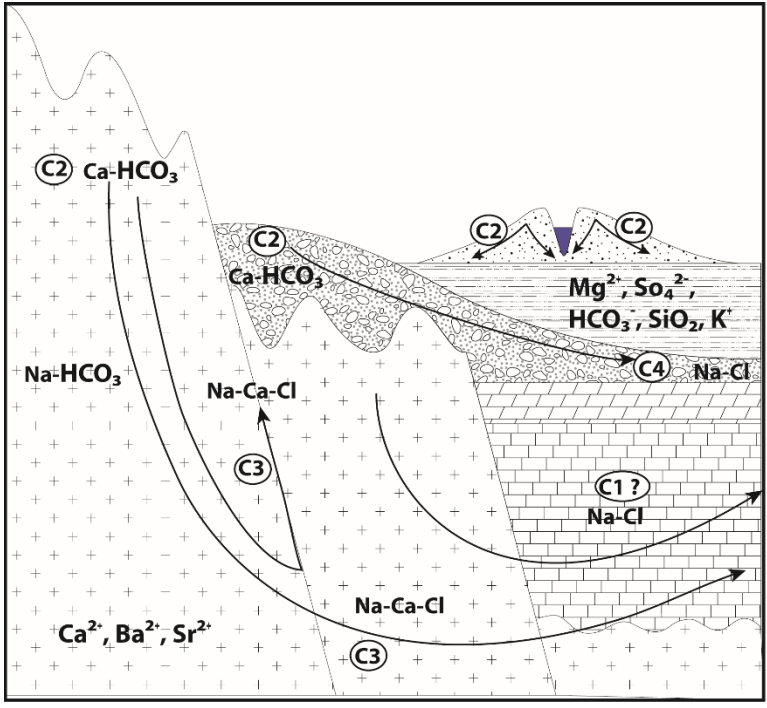
| Parameters | D.L (mg/L) | N | Min. | Q1- 25% | Median | Q3- 75% | Max. |
|--------------------------|------------|-----|---------|---------|---------|---------|---------|
| pH* | - | 316 | 4,4 | 6,5 | 7,6 | 8,1 | 10,1 |
| Temperature (Celcius)* | - | 316 | 1,7 | 6,9 | 7,5 | 8,6 | 17,5 |
| Dissolved oxygen (mg/L)* | - | 316 | 0 | 0 | 1,1 | 4,5 | 43,7 |
| Redox potential (mV)* | - | 316 | -156 | -31,5 | 70,5 | 101,0 | 195,2 |
| Conductivity. (uS/cm) | - | 316 | 4 | 134 | 278 | 470 | 10140 |
| Bicarbonates***** | 1 | 316 | 2 | 52,25 | 110 | 170 | 620 |
| Silicium** | 0.1 | 316 | 0,1 | 4,8 | 5,6 | 7,1 | 16 |
| Sodium** | 0.1 | 315 | 0,89 | 3,25 | 11 | 45,5 | 1800 |
| Calcium** | 0.1 | 314 | 0,12 | 9,5 | 23 | 50 | 1500 |
| Potassium** | 0.1 | 313 | 0,12 | 0,96 | 1,8 | 3,6 | 55 |
| Chloride*** | 0.05 | 312 | 0,14 | 1,87 | 8,7 | 36,25 | 4200 |
| Magnesium** | 0.01 | 312 | 0,02 | 1,47 | 3,85 | 8,13 | 140 |
| Strontium** | 0.002 | 312 | 0,003 | 0,06 | 0,18 | 0,5 | 37 |
| Sulfates*** | 0.5 | 311 | 0,2 | 4,5 | 10 | 17 | 420 |
| Barium** | | 298 | 0,0025 | 0,0163 | 0,0395 | 0,0898 | 1,2 |
| Aluminium** | 0.001 | 285 | 0,001 | 0,004 | 0,007 | 0,016 | 0,230 |
| Manganese** | 0.0004 | 277 | 0,0004 | 0,0029 | 0,014 | 0,053 | 2,40 |
| Zinc** | 0.005 | 262 | 0,0016 | 0,0082 | 0,015 | 0,03 | 0,71 |
| Amonium**** | 0.02 | 252 | 0,02 | 0,04 | 0,07 | 0,21 | 3 |
| Boron** | 0.005 | 234 | 0,005 | 0,011 | 0,032 | 0,100 | 0,75 |
| Lead** | 0.0001 | 225 | 0,0001 | 0,0002 | 0,0003 | 0,0006 | 0,0073 |
| Fluoride**** | 0.1 | 222 | 0,1 | 0,2 | 0,6 | 1,5 | 4,9 |
| Copper** | 0.0005 | 220 | 0,0005 | 0,0016 | 0,0045 | 0,0130 | 0,35 |
| Molybdene** | 0.0005 | 189 | 0,0005 | 0,0010 | 0,0018 | 0,0031 | 0,0240 |
| Nitrate*** | 0.1 | 154 | 0,02 | 0,10 | 0,30 | 1,08 | 8,60 |
| Iron** | 0.1 | 142 | 0,03 | 0,06 | 0,13 | 0,38 | 18 |
| Silver** | 0.0001 | 95 | 0,0001 | 0,0001 | 0,0002 | 0,0003 | 0,009 |
| Nickel** | 0.001 | 78 | 0,001 | 0,001 | 0,001 | 0,003 | 0,02 |
| Uranium** | 0.001 | 66 | 0,001 | 0,001 | 0,002 | 0,003 | 0,02 |
| Chromium** | 0.0005 | 48 | 0,0005 | 0,0007 | 0,0010 | 0,0016 | 0,011 |
| Bromide*** | 0.1 | 42 | 0,1 | 0,4 | 1,5 | 6,1 | 45,0 |
| Lithium** | 0.01 | 35 | 0,01 | 0,01 | 0,01 | 0,02 | 0,57 |
| Inorganic phosphorus**** | 0.03 | 22 | 0,04 | 0,05 | 0,07 | 0,10 | 0,50 |
| Vanadium** | 0.002 | 22 | 0,002 | 0,002 | 0,003 | 0,003 | 0,012 |
| Cobalt** | 0.0005 | 17 | 0,0006 | 0,0010 | 0,0013 | 0,0025 | 0,0066 |
| Sulfures (mg/l) | 0.02 | 15 | 0,02 | 0,05 | 0,16 | 0,55 | 16,00 |
| Cadmium** | 0.0002 | 9 | 0,0002 | 0,0003 | 0,0003 | 0,0007 | 0,0007 |
| Antimony** | 0.001 | 9 | 0,001 | 0,001 | 0,001 | 0,002 | 0,005 |
| Tin** | 0.001 | 4 | 0,001 | 0,001 | 0,001 | 0,002 | 0,003 |
| Titanium** | 0.001 | 3 | 0,001 | 0,001 | 0,001 | 0,002 | 0,004 |
| Beryllium** | 0.0005 | 2 | 0,0008 | 0,0017 | 0,0026 | 0,0035 | 0,0044 |
| Bismuth** | 0.00025 | 1 | 0,00070 | 0,00070 | 0,00070 | 0,00070 | 0,00070 |
| Selenium** | 0.001 | 1 | 0,001 | 0,001 | 0,001 | 0,001 | 0,001 |










ANALYTICAL METHODS

- * multiparameter probe (in situ)
 - **Inductively Coupled Plasma Mass Spectrometry
 - *** Ionic chromatography
 - **** Specific probe
 - ***** Titration
- Q1-25% and Q3-75 = first and the third quartiles

For major, minor and trace elements, data are given in mg/L

For the physical parameters, N = number of mesured data
 For the lab analysed parameters, N = Number of detected values
 If N = 1 or 2: data are underlined
 If N = 1: unique measured value is presented
 If N = 2: mean value is presented



-  Groundwater flow
-  Deltaic and shore deposits
-  Deep water deposits (Marine clay)
-  Glacial drifts and fluvio-glacial sediments
-  Normal fault
-  Ordovician shale
-  Ordovician limestones
-  Precambrian rocks of the Canadian Shield
-  Cluster number

