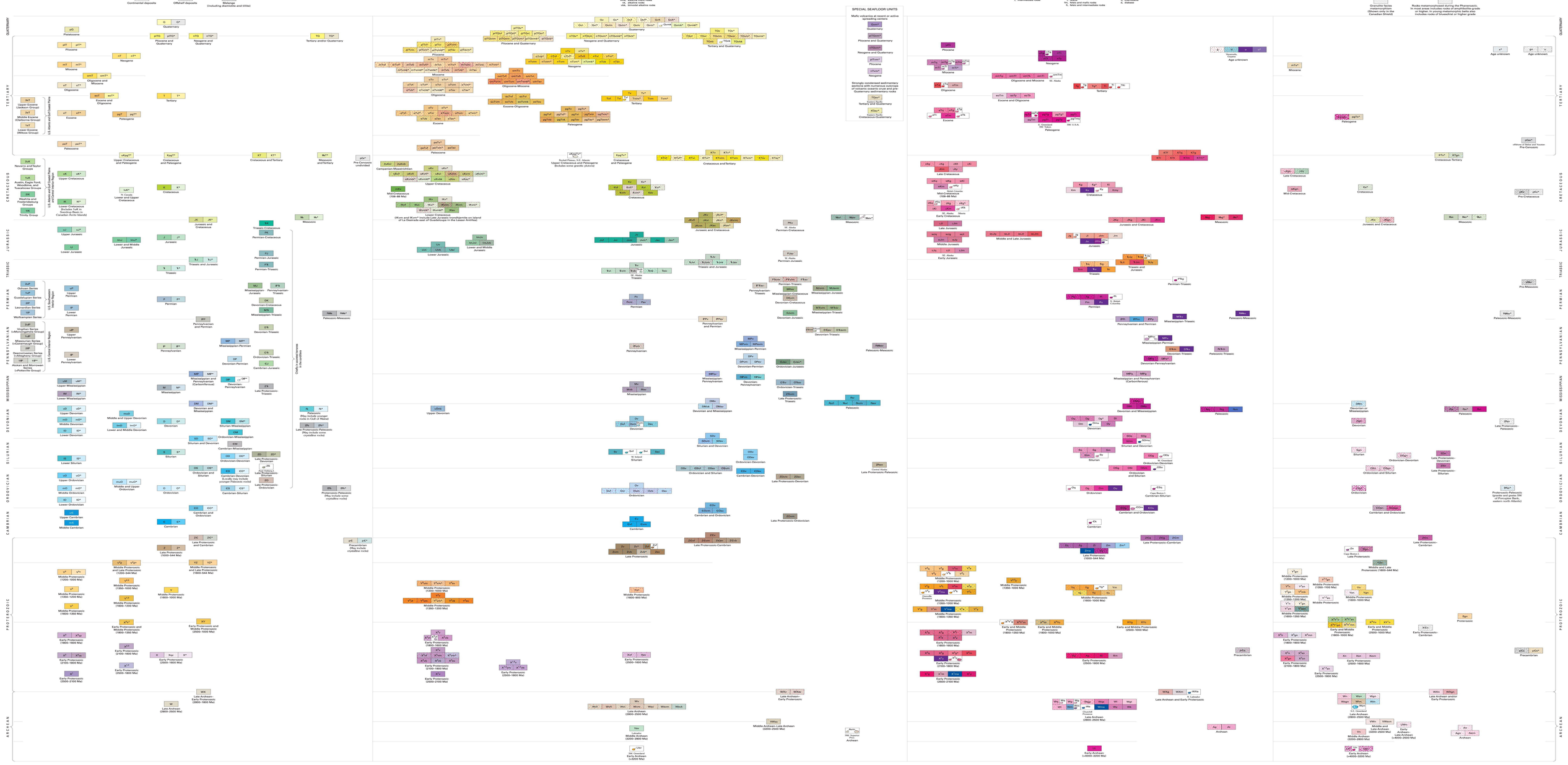
SEDIMENTARY ROCKS
Seafloor units are indicated by asterisks (*) in the explanation. Asterisks are not used in labels on the map.
For seafloor outcrops a query (?) before the label indicates uncertainty about age; a query (?) after the label indicates uncertainty about composition, or whether the rock is in situ.
Selected lithologies are indicated by suffixes as follows:
cs, conglomerate and sandstone (Early Proterozoic)
cl, carbonate (W. Canada)
qz, quartzite (Early Proterozoic)
e, evaporite (W. Canada)
Selected depositional environments and tectonic settings where known are indicated by patterns:
Continental deposits
Offshore deposits
Molasse (including diamictite and tillite)
VOLCANIC ROCKS
Seafloor units are indicated by asterisks (*) in the explanation. Asterisks are not used in labels on the map.
For seafloor outcrops a query (?) before the label indicates uncertainty about age; a query (?) after the label indicates uncertainty about composition, or whether the rock is in situ.
Lithologies are indicated by suffixes as follows:
vb, bimodal rocks
vbs, brecciated alkaline rocks
vbsb, brecciated basaltic rocks
vm, mafic rocks
vmb, mafic and intermediate rocks
vmbs, mafic and intermediate brecciated rocks
vmbsb, mafic and intermediate brecciated basaltic rocks
vmbsbs, mafic and intermediate brecciated alkaline rocks
vmbsbsb, mafic and intermediate brecciated basaltic and alkaline rocks
vmbsbsbs, mafic and intermediate brecciated alkaline and alkaline rocks
vmbsbsbsb, bimodal alkaline rocks
vn, interlayered sedimentary and volcanic rocks
vnm, interlayered sedimentary and mafic volcanic rocks
vnmb, interlayered sedimentary and mafic and intermediate volcanic rocks
vnb, interlayered sedimentary and volcanic rocks
vnbs, interlayered sedimentary and alkaline volcanic rocks
SPECIAL SEAFLOOR UNITS
Mafic volcanics at recent or active spreading centers
Quaternary
Pliocene and Quaternary
Miocene
Neogene and Quaternary
Pliocene
Neogene
Strongly condensed sedimentary rocks and (or) extensive outcrops of volcanic oceanic crust and pre-Quaternary sedimentary rocks
Tertiary and Quaternary
Tertiary
Cretaceous-Quaternary
PLUTONIC ROCKS
Seafloor units are indicated by asterisks (*) in the explanation. Asterisks are not used in labels on the map.
For seafloor outcrops a query (?) before the label indicates uncertainty about age; a query (?) after the label indicates uncertainty about composition, or whether the rock is in situ.
Lithologies are indicated by suffixes as follows:
g, granite
gb, undivided granitic rocks
i, rocks of intermediate composition
t, trona in the Superior province
tn, nepheline syenite
qm, two-mica granite
I, intermediate rocks
p, early tonalite plutons in the Superior province
m, monzonite
mz, intermediate and mafic rocks
n, nepheline rocks
u, ultramafic rocks
ma, mafic rocks
mb, felsic and mafic rocks
fb, felsic and intermediate rocks
a, anorthosite
mg, gabbro-anorthosite
ag, alkali feldspar granite
mq, alkali-rich gabbro and syenite
ub, undivided ultramafic rocks
b, alkaline complex
k, carbonatite
s, diatreme
METAMORPHIC ROCKS AND UNDIVIDED CRYSTALLINE ROCKS
Seafloor units are indicated by asterisks (*) in the explanation. Asterisks are not used in labels on the map.
For seafloor outcrops a query (?) before the label indicates uncertainty about age; a query (?) after the label indicates uncertainty about composition, or whether the rock is in situ.
Age symbols generally indicate protolith ages. Lithologies of gneissic rocks are indicated by patterns and by suffixes as follows:
x, undivided crystalline rocks
sgn, orthogneiss and paragneiss
vrn, granite gneiss
i, undivided intermediate rocks
m, volcanic gneiss
ewn, sedimentary and volcanic gneiss
v, undivided volcanic rocks
gr, granite gneiss
hr, impact breccia
gn, orthogneiss
n, undivided gneissic rocks
Metamorphic rocks are indicated by overprints:
Greenschist facies
Amphibolite facies
(Shown only in the Canadian Shield)
Granulite facies
Rocks metamorphosed during the Phanerozoic
(Shown only in the Canadian Shield)
Rocks metamorphosed during the Phanerozoic
or higher. In young metamorphic belts also
includes rocks of blueschist or higher grade
QUATERNARY
TERTIARY
CRETACEOUS
JURASSIC
TRIASSIC
PERMIAN
PENNSYLVANIAN
MISSISSIPPIAN
DEVONIAN
SILURIAN
ORDOVICIAN
CAMBRIAN
PROTEROZOIC
ARCHEAN
Pliocene
Miocene
Oligocene
Eocene
Paleocene
Neogene
Tertiary
Cretaceous
Late Cretaceous
Mid-Cretaceous (100–88 Ma)
Early Cretaceous
Jurassic
Late Jurassic
Middle Jurassic
Early Jurassic
Triassic
Permian
Pennsylvanian
Mississippian
Devonian
Silurian
Ordovician
Cambrian
Paleoproterozoic
Mesoproterozoic
Neoproterozoic
Paleozoic
Mesozoic
Cenozoic
Paleozoic-Mesozoic
Paleozoic-Cenozoic
Proterozoic
Precambrian
Late Archean and/or Early Proterozoic
Archean
Nonbasaltic volcanic rocks
Basaltic volcanic rocks
Plutonic rocks
Metamorphic rocks
Contact—Dashed where approximately located, dotted where inferred
Unclassified fault—Dashed where approximately located, dotted where concealed or inferred
Normal fault—Dashed where approximately located, dotted where concealed or inferred; ticks on downthrown block
Thrust fault—Dashed where approximately located, dotted where concealed or inferred; teeth on upper plate
Strike-slip fault—Dashed where approximately located, dotted where concealed or inferred
Shear zone
Growth fault
Limit of Wisconsin glaciation—Shown only east of the Rocky Mountains
Limit of pre-Wisconsin glaciation—Shown only east of the Rocky Mountains
Volcanic feature—Caldera rim dotted where concealed or inferred
Crater cone or lava dome
Volcano
Caldera
Impact structure—Approximate outlines of larger structures shown to scale; numbers refer to table; symbols without numbers are suspected impact structures; many structures are largely or wholly concealed by younger rocks; structures in oceans or in unstudied areas other geologic features clearly indicate location of structure
>10 km diameter
<10 km diameter
Diapire—Chiefly salt diapirs in and around the Gulf of Mexico, Scotian margin, and on the Grand Banks; serpentite diapirs in the Canadian Arctic Islands; shale diapirs on northwest Alaskan shelf and off Pacific coast; mud diapirs in Cascadia basin; serpentinite off Honduras. Blue lines in areas of abundant diapiric structures show general trends of crest lines of elongate diapirs
Dome >10 km diameter
Dome <10 km diameter
Areas of abundant diapiric structures. Lines indicate trends of elongate structure
Small bodies of unusual igneous rocks
Carbonatite
Kimberlite
Alkaline complex
Alaskan type ultramafic rocks
Diatreme
Special Submarine Features
Submarine escarpment
Steep scar or growth fault
Bathymetric contours and contours on base of Greenland Ice—Contours at -1000 m and -2000 metres and at 1000 metre intervals beginning at -1000 meters. Depression contours shown by ticks
Axis of submarine canyon, sea valley, or channel—Dotted where approximately located
Axis of sediment drift
Isochrons in oceanic crust—Solid where basement is exposed, dashed where basement is not exposed, dotted where inferred
Spreading center, nonfingering spreading center—Solid where active, dashed where abandoned
Transform fault or accommodation offset of spreading center—Solid where active, dashed where inactive
Shear zone, diffuse
Frontal thrust fault of active accretionary wedge
Fossil subduction zone
Pseudofault in oceanic crust
Polymetallic sulfide deposits
Hydrothermal vent
Gas/oil seep
Gas/fluid seep
Rock in seafloor sample
Ultramafic
Felsic
Granite
Manganiferous deposits
Undifferentiated
Crusts
Nodules
Blocks, slabs, and pavements
Crusts, blocks, slabs, and pavements
Nodules, blocks, slabs, and pavements
Crusts and nodules
Crusts, nodules, blocks, slabs, and pavements
Phosphate nodules or pavement
Chemosynthetic-specialized biological communities
Cold-water coral biological communities
DIKES AND SILLS
Suffixes denoting lithology are same as those for volcanic rocks. Dashed lines indicate concealed dikes. Dikes are Proterozoic unless otherwise noted. Letter symbols on the map may include upper case suffixes that identify named dike swarms. Map showing provinces of the Canadian shield referred to in descriptions is shown to the right. U indicates uranium-lead age.
Tertiary dikes
Includes:
Trend, mafic and alkaline dikes, east Greenland (55–15 Ma)
Trend, mafic dikes, southwest Greenland (55 Ma)
Trend, mafic dikes, Prince Rupert, British Columbia
Trend, mafic and ultramafic dikes, Queen Charlotte Islands (55–13 Ma)
Trend, peralkaline mafic dikes, coastal British Columbia (15–10 Ma)
pg750, Sneg Nalos dikes, Yukon Territory (94–40 Ma)
pg710, Tuktusuyuk felsic dikes, northern British Columbia (84–40 Ma)
pg750b, felsic and intermediate dikes in Spanish Peaks and Marshall Pass, southwest Colorado
pg710n, intermediate and mafic dikes, Absaroka volcanic field, southwest Wyoming, and Crazy Mountains, south-central Montana
Cretaceous-Tertiary dikes
Trend, mafic alkaline dikes, northern Greenland (-65 Ma)
Cretaceous dikes
Includes:
Trend, Sandy Brook mafic dikes, Canadian Arctic Islands (100–90 Ma)
Early Cretaceous dikes
Includes:
Trend, Jurassic-Cretaceous, Labrador (-130 Ma)
Triassic and Jurassic dikes and sills
Kalo, mafic dikes and sills, U.S. Appalachian Piedmont and Blue Ridge and Canadian Appalachians (U 200±2 Ma)
Late Proterozoic mafic dikes
Includes:
Trend, Lac Pelletier dikes, southern Grenville province (590–31 Ma)
Trend, Long Range dikes, Newfoundland and northeast Grenville province (615±2 Ma)
pZ1, Gardar province, southwest Greenland (700–600 Ma)
pZ1, Franklin dikes, northern Canadian shield (U 723 ±6–2 Ma; 718 ±2 Ma)
pZ1, Mackenzie dikes, Bear province (U 739±2 Ma)
pZ1dl, Mackenzie Mountains dikes, northeast Canadian Cordillera (U 739±2 Ma)
pZ1, Shabogamo dikes, eastern Canadian Cordillera (U 739±2 Ma)
Middle Proterozoic mafic dikes (1200–1000 Ma)
Includes:
pZ1mb, Molson dikes, southern Superior province (1210–1060 Ma)
pZ1mfd, Pipestone River dikes, northwest Superior province (U 1070–1060 Ma)
pZ1m, Abitibi dikes, southeast Superior province (U 1141±1 Ma)
pZ1m2, Abitibi dikes, southeast of Nain province (1000 Ma)
Middle Proterozoic mafic dikes (1500–1320 Ma)
Includes:
pZ1d, Gardar mafic alkalic dikes, south Greenland (1300–1150 Ma)
Middle Proterozoic mafic dikes and sills (1450–1200 Ma)
Includes:
pZ1m, Sudbury dikes, Southern province (U 1235±3 Ma)
pZ1mb, Midcontinent dolerite sills, northeast Greenland (-1250 Ma)
pZ1mb, Thule dikes, northwest Greenland (-1250 Ma)
pZ1m1, Marathon dikes, southeast Superior province (U 1141±1.7 Ma)
pZ1m1, Biscoveanu dikes, southeast Superior province (U 2187±2 Ma)
pZ1m1, Matachewan dikes, southeast Superior province (U 2168±1.2 Ma; partim (2200 Ma included with Archean dikes)
pZ1m1, Dogrib dikes, southeast Slave province (U 2190 Ma)
pZ1m1, Malley dikes, southeast Slave province (U 2200 Ma)
pZ1m, Indin dikes, southeast Slave province (U 2200 Ma)
pZ1m1, Kotaneelee dikes, northwestern Superior province (U 2200±1 Ma)
pZ1m1, Ennadai dikes, southeast Superior province (U 2200 Ma)
pZ1m1, Senneterre dikes, southeast Superior province (U 2216±8–4 Ma)
pZ1m1, Mistinibi dikes, southeast Slave province (U 2230 Ma)
pZ1m1, Nipissing dikes, southeast Superior province (U 2219±2 Ma)
pZ1m1, Matachewan dikes, Superior province (U 2446±1 Ma; U 2473±1 Ma)
pZ1m1, Matachewan dikes, Superior province (U 2446±2 Ma; U 2473±1Ma)
Early Proterozoic mafic dikes (2100–1800 Ma)
Includes:
pZ1m1, Abitibi-Bourlamaque dikes, southeast Superior province (2170–1880 Ma)
pZ1m1, Fort Frances dikes, northwest Superior province (2220–1880 Ma)
Early Proterozoic mafic dikes (2500–2100 Ma)
Includes:
pZ1m1, Marathon dikes, south Superior province (U 2121±17.7 Ma)
pZ1m1, Biscoveanu dikes, southeast Superior province (U 2187±2 Ma)
pZ1m1, Matachewan dikes, southeast Superior province (U 2168±1.2 Ma; partim (2200 Ma included with Archean dikes)
pZ1m1, Dogrib dikes, southeast Slave province (U 2190 Ma)
pZ1m1, Malley dikes, southeast Slave province (U 2200 Ma)
pZ1m, Indin dikes, southeast Slave province (U 2200 Ma)
pZ1m1, Kotaneelee dikes, northwestern Superior province (U 2200±1 Ma)
pZ1m1, Senneterre dikes, southeast Superior province (U 2216±8–4 Ma)
pZ1m1, Mistinibi dikes, southeast Slave province (U 2230 Ma)
pZ1m1, Nipissing dikes, southeast Superior province (U 2219±2 Ma)
pZ1m1, Matachewan dikes, Superior province (U 2446±1 Ma; U 2473±1Ma)
pZ1m1, Matachewan dikes, Superior province (U 2446±2 Ma; U 2473±1Ma)
Middle-Archean mafic dikes
Includes:
Vmat, Amaranda-Tarsiatoq dikes, west Greenland (Isobella–3270 Ma, U 3267±3 Ma)
Vmd, Dawes dikes, Bear province (3700 Ma)
Vmcl, Cleaver dikes, Bear province (3790–3680 Ma)
Vmd, Mafic dikes in Beaver province
Vmd, Mafic dikes in Slave province
Vmd, Mafic dikes in Superior province
Vmd, Mafic dikes in Grenville province
Vmd, Mafic dikes in Nain province
Vmd, Mafic dikes in Southern province
Vmd, Mafic dikes in Rae province
Vmd, Mafic dikes in Bell Supergroup, Montana and Idaho (-1440 Ma)
Early Proterozoic mafic dikes (1900–1800 Ma)
Includes:
pZ1m, Abitibi-Bourlamaque dikes, west Greenland (-1860 Ma)
pZ1m, Dawes dikes, Bear province (1700 Ma)
pZ1m1, Cleaver dikes, Bear province (1790–1680 Ma)
MAP SHOWING LOCATIONS OF IMPACT STRUCTURES
Nonbasaltic volcanic rocks
Structures 20 km or less in diameter
Structures more than 20 km diameter
IMPACT STRUCTURES
(Modified from Planetary and Space Science Center, University of New Brunswick, 2003)
NO. NAME LOCATION LATITUDE LONGITUDE AGE (Ma) SIZE (km) EXPOSED
1 Ames Ames, Iowa, U.S.A. 42°0'N 93°13'W 470±30 10 no
2 Avak Alaska, U.S.A. 71°15' 156.38° (-)15 12 no
3 Beaverhead Montana, U.S.A. 44°38' -113°58' (-)600 60 yes
4 Bee Bluff Texas, U.S.A. 29°23' -99°52' (-)35.5 8.5 no
5 Calvin Michigan, USA 41°56' -85°51' 450±15 8.5 no
6 Carswell Saskatchewan, Canada 58°27' -109°30' 115±10 39 yes
7 Charlevoix Quebec, Canada 47°32' -70°18' 357±15 54 yes
8 Chesapeake Bay Virginia, U.S.A. 37°17' -76°01' 35.5±0.5 85 no
9 Chicxulub Yucatan, Mexico 21°20' -89°30' 64.98±0.05 180 no
10 Clearwater East Quebec, Canada 56°05' -74°07' 290±25 26 yes
11 Clearwater West Quebec, Canada 56°13' -74°32' 290±25 36 yes
12 Cloture Quebec, Canada 50°8' -79°29' 430±25 9 yes
13 Crooked Creek Missouri, U.S.A. 37°50' -91°23' 320±80 7 yes
14 Decaturville Missouri, U.S.A. 37°54' -92°43' <380 6 yes
15 Deep Bay Saskatchewan, Canada 56°24' -102°58' 100±10 13 yes
16 Dellen Sweden, Sweden 62°42' 17°40' 154±4 19 yes
17 Eagle Butte Alberta, Canada 49°42' -110°34' <85 10 no
18 El'gygytgyn Russia 67°30' 172°0' 3.5±0.5 18 yes
19 Elbow Saskatchewan, Canada 50°9' -106°42' 395±25 8 no
20 Flynn Creek Tennessee, U.S.A. 36°17' -85°40' 360±20 3.55 yes
21 Gardnos Sweden, Sweden 60°39' 8°12' 546±2 5 yes
22 Glover Bluff Wisconsin, U.S.A. 42°58' -89°12' <500 8 no
23 Goat Saskatchewan, Canada 56°23' -104°29' <250 5 yes
24 Haughton Nunavut, Canada 75°22' -89°41' 23±1 24 yes
25 Hensfield Kansas, U.S.A. 37°30' -99°10' <0.001 0.013 yes
26 Holleford Ontario, Canada 44°28' -76°42' 550±30 2.4 yes
27 Ile Rouleau Quebec, Canada 56°16' -73°52' <300 4 yes
28 Kentland Indiana, U.S.A. 40°45' -87°24' <97 13 yes
29 La Malbaie Quebec, Canada 47°52' -70°22' 51.0±0.4 5 yes
30 Lake Manicouagan Quebec, Canada 51°23' -68°42' 214±1 100 yes
31 Manson Iowa, U.S.A. 42°35' -94°32' 73.8±0.3 35 no
32 Maple Creek Saskatchewan, Canada 49°48' -109°56' <75 5 no
33 Marquez Texas, U.S.A. 31°12' -96°18' 58±2 15 no
34 Middlesboro Kentucky, U.S.A. 36°37' -83°44' <300 3 yes
35 Mistastin Newfoundland/Labrador, Canada 55°53' -63°18' 36±4 28 yes
36 Montagnais Nova Scotia, Canada 43°52' -64°13' 50.5±0.76 45 yes
37 New Quebec Quebec, Canada 61°17' -73°40' 1.4±0.1 3.44 yes
38 Newporte North Dakota, U.S.A. 48°58' -102°08' <200 3.2 yes
39 Nicholson Northwest Territories, Canada 62°40' -102°31' <400 12.5 yes
40 Odessa Texas, U.S.A. 31°46' -102°29' <0.05 0.168 yes
41 Pilot Northwest Territories, Canada 60°23' 111°01' 445±2 5 yes
42 Presqu'Ile Quebec, Canada 49°42' -74°48' <300 24 yes
43 Red Wing North Dakota, U.S.A. 47°38' -103°33' 200±25 9 no
44 Saint Martin Manitoba, Canada 51°47' -98°32' 220±32 40 yes
45 Sierra Madera Texas, U.S.A. 30°36' -102°54' 100±20 13 yes
46 Serpent Mound Texas, U.S.A. 39°36' -83°40' <100 13 yes
47 Slate Islands Ontario, Canada 48°40' -87°00' <450 30 yes
48 Town Bluff Alberta, Canada 50°35' -113°38' 35±7 25 no
50 Sudbury Ontario, Canada 46°36' -81°11' 1850±3 250 yes
51 Tenoumer Quebec, Canada 56°02' -76°08' 1.95±0.2 4 yes
52 Upheaval Dome Utah, U.S.A. 38°26' -109°54' <65 10 yes
53 Versailles Kentucky, U.S.A. 38°05' -84°41' <65 1.5 yes
54 Vredefort Saskatchewan, Canada 49°32' -103°04' 185±20 2.5 no
55 Wanapitei Ontario, Canada 46°40' -80°45' 37.2±1.2 7.5 yes
56 Wells Creek Tennessee, U.S.A. 36°30' -87°40' 200±100 12 yes
57 West Hawk Manitoba, Canada 49°46' -95°11' 190±5 2.44 yes
MAP SYMBOLS
EXPLANATION
GEOLOGIC MAP OF NORTH AMERICA
MAP SHOWING GEOLOGIC PROVINCES OF THE CANADIAN SHIELD
REFERRED TO IN THE EXPLANATION OF DIKES
Bear
Churchill
Grenville
Nain
Slave
Southern
Superior