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Petrography and Chemistry of Dykes in the Queen Charlotte Islands, British Columbia

by J.G.Souther and Ebo Bakker

F.G.P. (Queen Charlotte Basin) Contribution

Cordilleran and Pacific Geoscience Division
Geological Survey of Canada
Energy, Mines and Resources, Canada

Sample Number	Field Number	Lithology	Specific Gravity	Formation Intruded	PHENOCRYSTS % and mineralogy: Total %	Size Range	Feldspar	Quartz	Clinopyroxene	Orthopyroxene	Amphibole	Opaques	Pseudomorphs	GROUNDMASS AND APHYRIC ROCKS % Primary minerals: Size Range	Plagioclase	Alkali Feldspar	Quartz	Clinopyroxene	Orthopyroxene	Hornblende	Opaques	Other	Matrix	ALTERATION % Secondary minerals: Saussuritization of Plagioclase	Calcite	Chlorite	Biotite	Leucoxene	Other	Amygdules % and mineralogy
Rennell Sound Area																														
1*	1510087	R1	2.633	Syn	8	m-f	5 olg	x KF	3	-	-	-	-	x bi,Q,mus	mc-cc	3 pc	55	25	-	-	-	-	-	s-m	10	-	x	-	x ser,clay	3 cal,Q
2	1509087	R1	2.618	Syn	1	f	1 olg	-	-	-	-	-	-	-	mc-cc	8 pc	55	25	-	-	-	x py	-	s	10	-	-	-	x mus,ser	-
3	130187	R1	2.544	Ms	5	f-m	5 san	-	-	-	-	-	-	-	cc	45 pc	x	45	-	-	-	3	-	n	x	x	-	-	-	2 Q,cal
4	130387	R1	2.623	Ms	19	c-vf	15 olg	-	3 aug	-	-	-	1 bi,ep	-	cc	3 olg	-	-	-	-	-	5	-	m	-	-	-	-	-	-
5	130687	A2	2.718	Ms	x	m	x low an	-	x aug	-	-	-	-	-	vf-cc	55 olg	-	-	15	-	-	10	-	s	-	10	5	-	-	-
6	1516a87	A2	2.654	Syn	1	f	-	-	-	-	-	-	1 cal,pc,Q	-	vf	80 low an	-	1	-	-	-	-	-	m-s	3	10	-	2	2 ep	-
7	130587	A2	2.592	Ms	20	m-vf	15 lab-and	-	5 aug	-	-	-	-	-	vf-mc	50 pc	-	5	1	-	-	3	-	-	-	-	5	-	-	-
8*	130787	A2	2.510	Ms	30	m-vf	20 an-olg	-	4 aug	1	-	5	-	-	cc	-	-	-	-	-	-	-	70	-	-	-	-	-	-	x cpx,gl,pc,op
9*	141087	A3	2.875	Syn	3	m-f	2 lab	-	1 cpx	-	-	-	-	-	vf-mc	35 and-olg	-	3	20	-	-	15	x ap	-	-	15	5	5	-	x ep	-
10	141987	B3	2.773	Syn	-	-	-	-	-	-	-	-	-	-	f	40 lab-olg	-	10	10	-	3	7	x bi	-	m	x	15	-	x	x ep,Z	x cal,ch,Q,sp
11*	131887	B3	2.745	Syn	5	c-f	x pc	-	5 aug	-	-	-	x bi,cal,Q	-	f-vf	50 lab-olg	-	3	20	-	-	5	-	-	5	10	5	x	-	-	-
12*	132287	B3	2.760	Ms	5	m	5 pc	-	-	-	-	-	-	-	m-f	55 lab-olg	-	x	12	8	-	10	x ap	4	-	-	x	5	-	-	-
13*	120287	B4	2.808	Syn	x	f	x pc	-	-	-	-	-	-	-	f	50 lab-olg	-	-	30	-	-	10	x ap,bi	-	w	x	x	8	-	-	x op,pc
14	141287	B4	2.786	Syn	3	f	3 pc	-	-	-	-	-	-	-	f	47 lab-olg	-	-	30	-	-	8	x ap,bi	-	w	-	-	10	-	-	x bi,pc
15	150387	B5	2.580	Syn	-	-	-	-	-	-	-	-	-	-	m-f	45 olg	-	x	25	-	-	15	x ap,bi	-	s	x	2	8	1	-	-
Skidegate Channel Area																														
16	170887	R1	2.597	La	9	f-m	3 olg	5	-	-	-	-	1 bi,op,mus	mc-cc	10 pc	40	40	-	-	-	-	x tour	-	w	1	-	x	-	x mus,op	-
17*	020587	D1	2.654	Ku	35	m-vf	30 olg	x KF	-	-	-	-	5 ch,Q	mc-cc	35 pc	x	20	-	-	-	-	-	-	m	3	10	-	3	1 Z	-
18	020187	A2	2.837	Hd	-	-	-	-	-	-	-	-	x cal,op	m-f	40 and-olg	-	x	10	-	-	12	-	-	-	20	15	-	x	x zoi	-
19	1711a87	A2	2.720	Hd	-	-	-	-	-	-	-	-	-	f	50 and	-	10	x	-	-	8	x ap,il	-	m	5	10	10	5	-	2 ch,Q,cal
20	170287	A3	2.819	La	8	m	8 lab-olg	-	-	-	-	-	-	vf-mc	30 and-olg	-	5	30	-	-	5	1 bi	-	v	x	14	-	5	-	-
21	180387	B2	2.745	Ms	35	m-f	25 lab-olg	-	10 aug	-	-	-	x ch,Q	vf-mc	30 lab,olg	-	5	-	-	-	-	-	-	m-s	22	5	-	5	-	-
22	021087	B2	2.801	Ms	25	m-f	25 lab-and	-	-	-	-	-	-	vf-mc	35 and-olg	-	x	20	-	-	8	-	-	-	-	3	2	-	x	3 ch,sp,Q
23	170387	B3	2.767	Ms	3	m	3 pc	-	-	-	-	-	x ch,bi,Q	f	40 lab-olg	-	10	20	-	-	8	-	11	-	-	3	5	x	x	Z	-
Cumshewa - Selwyn Inlet Area																														
24	2314a87	R1	2.780	Ms	6	f-m	5 olg	-	-	-	-	-	1 ch,ep,op	cc-mc	f	f	x	-	-	-	x	x zir,ep	85	-	-	x	-	-	-	x ep,ch
25*	2206a87	R1	2.617	Ku	15	m	15 olg	-	-	-	-	-	-	mc-vf	f	f	-	-	-	-	x	x py	65	s	5	10	-	-	5 Z	-
26	091687	D1	2.687	Yk	20	f-m	5 olg	-	-	-	-	-	15 cal	vf	33 olg	10	35	-	-	-	x	-	-	s	x	x	-	x	x ser,clay	-
27	191287	D1	2.679	Yk	15	m-f	10 olg	-	-	-	-	-	5 ch,op,cal,sp	vf-cc	15 low an	25	15	-	-	-	x	x	-	s	10	3	-	5	10Z,ser,mus	-
28*	050387	A1	2.683	Post	10	f	5 pc	-	-	-	-	-	5 cal,pk	mc	60 pc	-	-	x	-	-	7	-	-	w-m	5	10	-	5	-	-
29	2305b87	A1	2.728	Yk	15	f-m	10 olg	x	5 aug	-	-	-	-	vf-mc	50 low an	-	5	-	-	-	10	-	-	s	x	15	-	x	x ser	x ch,ep,Q
30	200287	A1	2.676	Hd	11	f-m	10 olg	-	-	-	-	-	1 ch,cal	vf-mc	60 and-olg	-	x	x	-	-	-	-	-	vs	5	15	-	5	-	-
31*	190687	A1	2.661	Post	42	f-m	25 olg	-	-	-	-	-	2 15 ch,cal,op,sp	vf-cc	25 pc	-	10	-	-	-	7	x ep	-	m	x	15	-	2	-	-
32	191087	A2	2.721	Yk	3	c-m	3 and	-	-	-	-	-	-	f-mc	60 by-and	-	5	-	-	-	-	-	-	w	8	15	-	7	-	1 ch,cal,sp
33	222187	A2	2.748	Yk	x	m-f	-	-	-	-	-	x	-	vf-cc	40 low an	-	10	-	-	-	10	-	3	s	25	15	-	-	-	2 cal
34	2207a87	A2	2.732	Ku	-	-	-	-	-	-	-	-	-	m-f	55 olg	-	10	-	-	-	10	1 ep	-	s	5	15	-	1	-	x cal,Q
35	2206b87	A2	2.755	Ku	-	-	-	-	-	-	-	-	-	f	60 olg	-	3	-	-	-	5	x zir	-	m-s	5	20	-	10	-	x Q,cal
36*	2403a87	A2	2.762	Hd	12	m-f	3 pc	-	3 aug	-	-	1	5 cal,hb	vf-mc	60 low an	-	3	-	-	-	3	-	-	m-s	x	10	-	-	10 ep	x Q,op,cal
37	0905b87	A3	2.804	Ku	-	-	-	-	-	-	-	-	-	f	40 an-olg	-	10	20	-	-	x	-	-	w	5	15	-	10	-	x ch,cal,Q
38	241387	A3	2.759	Ms	-	-	-	-	-	-	-	-	-	f-vf	40 low an	-	10	20	-	-	10	x ap	-	s	-	15	-	x	3 Z; x ep	1 Q,Z
39*	231487	B3	2.780	Ms	1	m	1 low an	-	x aug	-	-	-	-	f	50 lab-olg	-	x	25	-	-	6	x bi	-	m	-	15	-	2	2 Z; x ep	-
40*	100187	B3	2.827	Ku	18	c-m	-	-	-	-	-	-	18 ch,ep,sp,amp	f-mc	60 lab	-	-	10	-	x	10	-	-	-	x	-	x	5	ep	-
41	240787	B3	2.885	Yk	5	m-f	5 by-olg	-	-	-	-	-	-	vf-mc	40 lab-olg	-	x	25	-	3	8	-	-	-	10	5	1	-	-	4 ch,bi
42	200487	B4	2.750	Hd	15	m	15 pc	-	-	-	-	-	-	f	25 lab-olg	-	-	30	-	-	8	x ap,bi	-	-	5	15	x	-	-	x bi
43	220887	B4	2.882	Ku	3	m	3 pc	-	-	-	-	-	-	f	42 lab-olg	-	x	35	-	-	8	x ap	-	w	1	8	2	x	-	x ch,cal,Q
44	230687	B4	2.865	Yk	5	c-m	5 pc	-	-	-	-	-	-	f	45 lab-and	-	-	35	-	-	5	x ap	-	-	x	2	8	1	-	x ch,cal,bi
45	240287	B4	2.914	Post	x	m	x pc	-	-	-	-	-	-	f	40 lab-olg	-	-	40	-	-	10	x ap	-	-	1	3	5	x	-	x ch,cal,Q
46	091387	B5	2.886	Yk	-	-	-	-	-	-	-	-	-	m-f	40 lab-olg	-	-	35	-	x	7	x ap,bi	-	w	x	10	5	x	-	x ch,bi,pc,op
Tasu Sound Area																														
47	2611a87	A2	2.736	Ku	-	-	-	-	-	-	-	-	-	vf	60 olg	-	5	-	-	-	-	-	-	w	8	10	5	8	-	5 ch,cal,Q
48	272087	A3	2.892	Ku	x	m-f	x lab-olg	-	-	-	-	-	-	f-vf	38 and-olg	-	5	15	-	x	20	x ap	-	w	5	10	5	x	x hem,zoi	1 ch,Q,cpx,cal
49	270687	A3	2.893	Syn	-	-	-	-	-	-	-	-	-	f	35 olg	-	10	20	-	-	12	x bi	-	s	2	10	10	3	3 ep	-
50	260687	A3	2.841	Yk	-	-	-	-	-	-	-	-	-	f-vf	40 olg	-	1	20	-	-	x	x ap	-	m	2	20	-	12	5 ep; x Z	-
51	290787	A3	2.913	Yk	-	-	-	-	-	-	-	-	-	f-vf	35 olg	-	5	25	-	x	20	x ap	3	s	x	5	5	-	1 ep,zoi	-
52*	261687	B3	2.974	Ku	-	-	-	-	-	-	-	-	-	f	30 lab-and	-	x	30	-	-	15	x bi	x	-	2	10	10	x	-	-
53	2611b87	B4	2.907	Ku	x	m	x pc	-	-	-	-	-	-	f	30 lab-and	-	x	35	-	-	8	x ap	-	w	4	15	5	1	x sid,ep	x ch,cal
54*	261487	B4	2.885	Yk	-	-	-	-	-	-	-	-	-	f	40 and-olg	-	2	25	-	-	15	x ap,bi	-	-	x	5	10	x	-	3 bi,Q,pc
55	270687	B4	2.918	Syn	x	m	x pc	-	-	-	-	-	-	f	35 and-olg	-	1	45	-	-	8	x ap	-	-	x	1	9	1	-	-
56	272487	B4	2.842	Ka	x	f	x pc	-	-	-	-	-	-	f	40 and-olg	-	x	35	-	3	8	x ap,bi	-	w	x	12	-	x	-	x bi,ch,Q,op
57	281587	B4	2.948	Ku	2	m	2 pc	-	-	-	-	-	-	f	35 lab-and	-	x	30	-	-	10	x ap,bi	-	-	5	8	x	x	-	x ch,cal,Q
58*	282287	B5	2.972	Ka	-	-	-	-	-	-	-	-	-	m	35 lab-olg	-	2	30	-	-	10	x ap,bi	-	w	5	7	10	x	-	-
59	290487	B5	2.874	Yk	-	-	-	-	-	-	-	-	-	m-f	45 olg	-	-	30	-	-	12	x bi	-	s	2	3	7	5	-	-
Lyell Island Area																														
60	070187	R1	2.631	La	12	m-f	10 olg	-	-	-	-	1	1 ch,cal,op	mc-cc	65 olg	x	15	-	-	-	4	-	-	-	2	2	-	-	x ep	-
61	001487	A2	2.719	Ms	4	f-vf	2 olg	-	2 pi	x	-	-	-	mc-cc	65 low an	x	5	-	-	-	-	-	5	-	-	x	5	-	-	20 ch,Q
62*	070387	A2	2.773	La	-	-	-	-	-	-	-	-	-	f-vf	60 lab-olg	-	5	3	-	x	10	-	-	-	x	15	-	5	-	-
63	070587	A2	2.703	La	1	f	1 olg	-	-	-	-	-	-	vf-mc	60 and	x	8	-	-	x	x	py	-	m	10	10	-	8	-	-
64	082287	B3	2.830	Ku	40	m-vf	10 pc	-	-	-	-	-	30 bi	vf-mc	30 lab-and	-	-	15	-	-	6	3 bi	-	s	x	3	x	-	x 8	1 ch
Burnaby Island - Carpenter Bay Area																														
65*	031187	T1	2.664	Ku	35	f-m	35 olg	-	-	-	-	-	5 cal,sp	mc-vf	10 olg	30	8	-	-	-	-	-	x	s	x	-	-	x	-	10 cal,sp
66	041687	D1	2.650	Ku	11	f	10 pc	1	-	-	-	-	x cal,Z	vf-mc	50 olg	x	15	-	-	-	3	-	-	m-s	x	-	-	x	5 Z; x zoi	10 op,cal,Z
67	041587	A1	2.628	Ku	40	m-f	30 olg	-	-	-	5	-	5 ch,sp,cal	mc-cc	+60 pc	-	-	-	-	-	-	-	60	-	x	x	-	8	-	-
68*	041387	A1	2.713	Ku	18	f	12 and-olg	-	-	-	5	-	1 ch,bi	vf-mc	55 low an	-	10	-	-	-	x	-	-	s	-	5	x	10	x Z	2 cal,ch,Q
69*	042387	A1	2.706	Ku	23	f-m	15 and	-	3 aug	-	5	-	-	vf-cc	50 pc	-	x	-	-	-	4	-	-	m	3	10	-	3	-	5 ch,sp
70	041887	A2	2.742	Ku	35	c-f	20 and-olg	-	-	-	-	-	15 ch,cal	vf-cc	25 pc	-	10	-	-	-	x	-	-	s-m	20	10	-	-	-	-
71	031387	A2	2.689	Ku	40	m-f	30 and-olg	-	-	-	-	-	10 ch,sp,cal	vf-mc	35 olg	-	5	-	-	-	-	x ep	-	m-s	10	x	-	5	-	10 ch,sp,cal
72	042187	A2	2.690	Ku	25	m-f	20 by-olg	-	-	-	-	-	5 ch,cal,sp,ep	vf-mc	50 olg	-	5	-	-	-	5	-	-	m-w	1	12	-	x	x ep	-
73	0602b87	A2	2.751	Ku	-	-	-	-	-	-	-	-	-	f-vf	50 lab-olg	-	-	-	-	-	7	-	-	-	20	15	-	-	-	-
74	041187	A2	2.745	Ku	-	-	-	-	-	-	-	-	-	vf	50 olg	-	3	-	-	-	3	-	-	m-s	2	20	-	x	15 Z	-
75*	040187	A3	2.775	Yk	10	m-f	7 and	-	-	-	-	-	3 bi,cal,Q	f-mc	30 low an	-	7	20	-	-	7	-	-	m	2	20	x	1	1 ep; x Z	2 ch,cal,Q,sp
76	061987	A3	2.670	La	3	m	3 pc	-	-	-	-	-	-	f	50 low an	-	3	20	x	x	12	x ap	-	s	x	10	5	x	-	2 Q,Z
77	0403a87	A3	2.836	Yk	3	m-vf	3 lab-and	-	-	-	-	-	-	f-vf	35 pc	-	15	20	-	3	-	-	-	w	3	2	-	5	15 Z	-
78	040287	A3	2.835	Yk	3	m	3 lab	-	-	-	-	-	-	f-vf	38 and-olg	-	3	15	-	-	3	x ap,bi	-	-	1	20	-	15	-	1 cal,Q,sp,ch
79	052787	B3	2.770	Ku	2	m	2 lab-and	-	-	-	-	-	-	f	35 lab-and	-	3	15	-	-	7	x ap,bi	-	-	23	20	-	-	7 Z	1 ch,cal,Q
80	050987	B4	3.003	Ku	x	m	x pc	-	-	-	-	-	-	f	30 lab-olg	-	3	45	-	x	10	x ap,bi	-	-	x	6	3	x	-	1 ch,cal,Q
81*	060787	B5	2.952	Ku	x	c	x pc	-	-	-	-	-	-	m-f	40 lab-olg	-	3	35	-	-	7	x ap,bi	-	w	5	6	1	x	-	x ch,Q

EXPLANATION

Lithology:
A - andesite
B - basalt
D - dacite
R - rhyolite
1-5 class (see text)

Formations:
Hd - Haida Formation
Ku - Kunga Group
La - Longarm Formation
Ms - Masset Formation
Post- Post-tectonic Pluton
Syn - Syntectonic Pluton
Yk - Yakoun Group

Grain Size:
cc - cryptocrystalline .01 mm
mc - microcrystalline .01 - .1 mm
vf - very fine grained .1 - .3 mm
f - fine grained .3 - 1 mm
m - medium grained 1 - 3.3mm
c - coarse grained 3.3 - 10 mm

Minerals:
amp - amphibole
an - andesine
and - anorthite
ap - apatite
aug - augite
bi - biotite
by - bytownite
cal - calcite
ch - chlorite
cpx - clinopyroxene
ep - epidote
F - felsitic
hem - hematite
KF - alkali feldspar
lab - labradorite
mus - muscovite
olg - oligoclase
op - opaque
pc - plagioclase
Q - quartz
san - sanidine
ser - sericite
sid - siderite
sp - sphene
tour- tourmaline
Z - zeolite
zir - zircon
zoi - zoisite

Symbols:
* Analyzed sample (see Table 2)
x Trace
- Not found

TABLE 1.

INTRODUCTION:

Kerogen-bearing sediments exposed on Queen Charlotte Islands, and presumably underlying Queen Charlotte Basin, include the Upper Triassic Kunga Group and the Lower Jurassic Maude Group (Cameron and Hamilton, 1988). Overlying Cretaceous and Tertiary sandstones are potential reservoir rocks but they also contain terrestrial organic material from which bitumen, found in local seeps, may have been derived (Snowden et al., 1988). The thermal history of these possible source and reservoir horizons includes at least two episodes of igneous activity which have caused intense local heating.

Preliminary data on dyke distribution suggest that most dykes on the Queen Charlotte Islands are confined to relatively narrow regional swarms which trend from 000° to 080° (Souther, 1988). The orientation of individual dykes within each swarm is fairly consistent but differences in lithology and deformation suggest more than one episode of intrusion within a single zone. Extensive dyke emplacement accompanied eruption of the Middle Jurassic Yakoun Group and the Tertiary Massett Formation. In addition, some dykes are clearly related to late phases of epizonal plutons which may be comagmatic with, or younger than, the Yakoun volcanics (Anderson, 1988). The data reported here were collected in an effort to find petrographic and/or chemical criteria which characterize dykes of a given age, orientation, or geographic setting.

DISTRIBUTION:

Dykes sampled during the 1987 field season are concentrated in six areas (map). The Rennell Sound, Cumshewa-Selwyn Inlet, Tasu Sound, and Burnaby Island-Carpenter Bay areas are dominated by major, regional swarms of subparallel dykes (Souther, 1988). The Skidegate Channel Area is characterized by relatively few, widely spaced small dykes. Data from the Lyell Island Area are incomplete and may not be representative.

PETROGRAPHY:

Petrographic data for 81 dykes (Table 1) were determined by flat-stage optical methods. Percentages are from visual estimates. Lithological names are based on the proportions of quartz, alkali feldspar, and plagioclase, using the classification scheme of Streckeisen (1967). Based on textures and alteration the samples are grouped into five classes (described below).

Class 1 Leucocratic, feldspar phyric rocks including rhyolite, dacite, trachyte and andesite. Feldspar phenocrysts are commonly hiatal and moderately to strongly altered but rocks of this class contain relatively little secondary calcite, chlorite or leucoxene.

Class 2 Pyroxene poor andesite, basalt and dacite. Rocks of this class commonly contain less that 15% pyroxene and total mafics (M = cpx + ch + bi + op) of 10%-30%. Hiatal microphenocrysts of zoned plagioclase (labradorite-oligoclase), augite, pigeonite, and rare amphibole are moderately altered and the groundmass of plagioclase laths contains abundant calcite and chlorite. Autoclastic texture, characterized by randomly oriented broken crystals, is common.

Class 3 Pyroxene-rich andesite and basalt. Rocks of this class commonly contain 10-25% pyroxene and M = 25-50%. They are either aphyric or contain sparse microphenocrysts of strongly zoned plagioclase (andesine-oligoclase in the andesites, labradorite-oligoclase in the basalts) and augite in a groundmass of plagioclase laths, chlorite, biotite, opaques and leucoxene.

Class 4 Doleritic basalt. These rocks contain 25-45% pyroxene. They are aphyric or contain sparse plagioclase phenocrysts. Textures are ophitic or subophitic and coarser than basalts in the previous classes. Alteration is slight but some chlorite and biotite are present in most specimens.

Class 5 Gabbroic basalt. The composition of these rocks is similar to that of the doleritic basalts of class 4 but they are coarser grained and the texture is hypidiomorphic-granular rather than ophitic. They are commonly aphyric and unaltered.

CHEMISTRY:

Twenty-two of the samples listed in Table 1 were analyzed for major elements. The results (Table 2) confirm the wide range of compositions indicated by petrography. Silica values range from 48.44 to 76.55%. All but two of the analyzed samples are quartz normative and only one, a trachyte from Carpenter Bay, is nepheline normative. The latter is an anomalous, K-feldspar-rich rock which is probably a late, comagmatic phase of the Carpenter Bay Pluton (Anderson 1988, Souther 1988). Disregarding the trachyte sample, the remaining data fall into two groups which plot in overlapping fields on the AFM, and Ab',An,Or diagrams (Fig. 1). Group 1, which includes data from the Burnaby Island-Carpenter Bay, Lyell Island, and Tasu Sound areas, is significantly less alkaline and higher in iron than Group 2, which includes data from the Rennell Sound, Skidegate Channel, and Cumshewa-Selwyn Inlet areas.

Sample No.	1	8	9	11	12	13	17	25	28	31	36	39	40	52	54	58	62	65	68	69	75	81
Field No.	151087	130787	141087	131887	130287	120287	020587	220687	092087	190987	240387	231487	100187	261887	261487	280287	070387	031187	041387	042387	040187	060787
SiO2	76.55	68.73	51.89	58.80	57.29	53.79	61.18	53.83	65.58	60.38	55.97	74.29	55.74	49.4	49.4	48.44	53.55	58.82	55.54	56.04	53.92	48.40
Al2O3	14.36	15.32	13.46	15.50	17.74	15.57	17.66	15.98	15.75	16.89	16.88	13.49	17.87	14.63	14.95	12.57	19.35	17.21	18.30	18.78	18.36	13.39
TiO2	0.10	0.65	3.11	1.46	0.88	1.96	0.72	2.07	0.62	0.82	1.33	0.31	0.99	2.13	1.94	3.76	1.18	0.75	1.09	0.74	0.83	3.21
Fe2O3	0.60	1.73	2.95	4.52	2.89	3.88	0.41	3.40	1.38	2.33	2.33	0.60	3.00	1.12	3.23	7.4	1.79	0.52	0.68	0.74	1.49	2.58
FeO	0.84	2.35	10.22	4.58	4.07	6.57	6.86	8.62	2.94	5.08	6.32	1.42	5.40	12.08	9.54	9.76	8.12	3.04	6.87	5.19	6.23	11.98
MnO	0.03	0.09	0.22	0.16	0.14	0.20	0.21	0.20	0.11	0.16	0.20	0.04	0.17	0.22	0.21	0.27	0.12	0.04	0.14	0.11	0.15	0.24
MgO	0.66	1.29	4.34	5.29	3.86	4.74	2.30	4.18	3.03	4.36	3.98	0.57	4.36	6.70	6.73	4.15	3.95	2.54	3.65	4.25	7.12	5.75
CaO	2.04	3.50	8.52	8.57	6.60	8.43	2.57	6.34	4.50	2.55	5.58	1.44	7.56	10.30	10.86	9.85	6.80	5.45	7.45	7.55	8.17	9.90
Na2O	4.20	4.34	3.46	3.40	4.03	3.68	5.67	4.24	4.27	3.58	4.72	4.13	3.05	2.29	2.40	2.25	3.52	7.73	4.12	3.79	3.37	2.54
K2O	1.59	1.45	1.05	1.12	1.01	0.90	0.91	0.74	2.35	3.46	1.39	3.00	1.64	0.27	0.17	0.62	0.67	4.37	1.16	1.40	0.74	0.25
P2O5	0.03	0.16	0.52	0.27	0.38	0.40	0.37	0.29	0.11	0.13	0.31	0.05	0.19	0.30	0.24	0.56	0.21	0.17	0.32	0.28	0.20	0.50
Totals	101.00	99.61	99.74	99.68	98.89	100.11	98.86	99.88	100.63	99.74	99.02	99.34	99.99	99.45	99.67	99.63	99.28	100.64	99.31	98.88	100.59	98.73
LOI	0.78	3.30	5.48	3.02	0.76	2.05	2.51	4.88	4.23	2.67	3.10	0.49	2.11	2.46	3.62	1.84	2.35	3.09	4.24	3.54	3.81	3.09
Normative Minerals, Molecular %																						
q	37.32	26.31	5.51	5.62	8.85	4.84	10.81	4.08	15.94	10.97	3.42	32.19	7.00	0.00	1.52	6.84	4.99	0.00	3.10	4.20	1.07	2.02
or	9.38	8.67	6.37	6.69	6.03	5.37	5.40	4.43	13.76	20.48	8.27	17.99	9.76	1.63	1.02	3.86	4.01	24.67	6.88	8.31	4.30	1.54
ab	37.66	39.43	31.90	30.85	36.58	33.37	51.17	38.56	38.01	32.21	42.69	37.64	27.57	21.05	21.99	21.30	32.04	34.44	37.16	34.17	29.79	23.77
an	9.91	16.51	18.59	23.98	27.63	23.54	10.39	22.68	16.72	11.83	20.92	6.92	30.44	29.54	30.12	23.59	32.81	0.00	28.15	30.23	32.28	25.43
ne	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	18.39	0.00	0.00	0.00	0.00
ol	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00

TABLE 2. XRF analyses by Stanya J. Horsky, University of British Columbia.

DISCUSSION:

The petrographic and chemical data reveal only slight differences in the lithology of dykes from the six geographic areas studied. Except for Tasu Sound, where only basalt and andesite dykes were found, each of the areas includes dykes which span a broad spectrum of petrographic and chemical types. The predominantly porphyritic dykes and closely associated plutonic rocks of the Burnaby Island-Carpenter Bay area are believed to be mostly Jurassic whereas the aphyric rocks of Tasu Sound are probably mostly of Masset age. The other swarms appear to contain significant numbers of dykes of both petrographic types and probably of both ages.

The degree of alteration appears to be more closely linked to composition than to age of emplacement or area. Saussuritization and other alteration is more intense in rocks of intermediate composition (andesite and basaltic andesite) than in either the rhyolites or more mafic basalts. This may reflect the preponderance of andesite in the older, Yakoun suite but it is probably also due to chemical factors which are independent of age. Dykes which cut Cretaceous or younger strata, and are therefore of post-Yakoun (probably Masset) age, reveal no obvious petrographic or chemical differences, or any systematic differences in alteration when compared with the suite of dykes as a whole.

Both Jurassic (Yakoun) and Tertiary (Masset) dykes appear to have been emplaced within the same relatively narrow zones. These zones may represent long-lived boundaries between small, discrete blocks in the deep crust underlying the Queen Charlotte Islands. Chemical differences between dykes in the northern and southern swarms (Groups 1 and 2, Fig. 1) may reflect differences in the composition of adjacent, deep crustal blocks. This could imply a fundamental structure trending northwesterly south of Louise Island, parallel with but slightly south of the Rennell Sound fold belt as defined by Thompson (1988).

Intense igneous heating, resulting in overmaturation of potential hydrocarbon source beds, may have been confined to haloes around the plutons and to relatively narrow zones along the major dyke swarms. However, the widespread alteration of both Yakoun and Masset dykes suggests that regional low grade metamorphism may also have occurred. Although some alteration of dykes clearly resulted from local autometamorphism during cooling the occurrence of chlorite in most dykes, regardless of age, is probably a good index to the grade of Masset or younger regional thermal metamorphism.

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