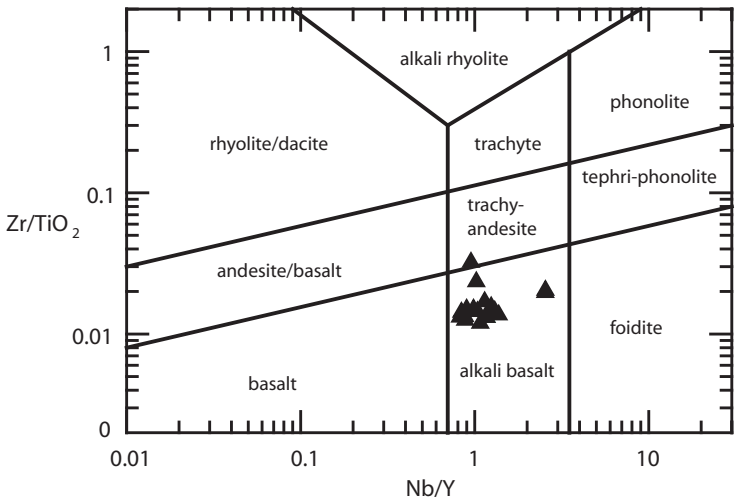
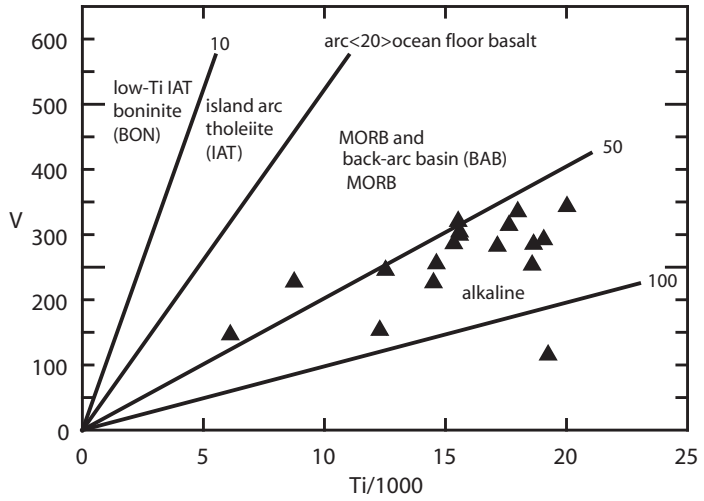
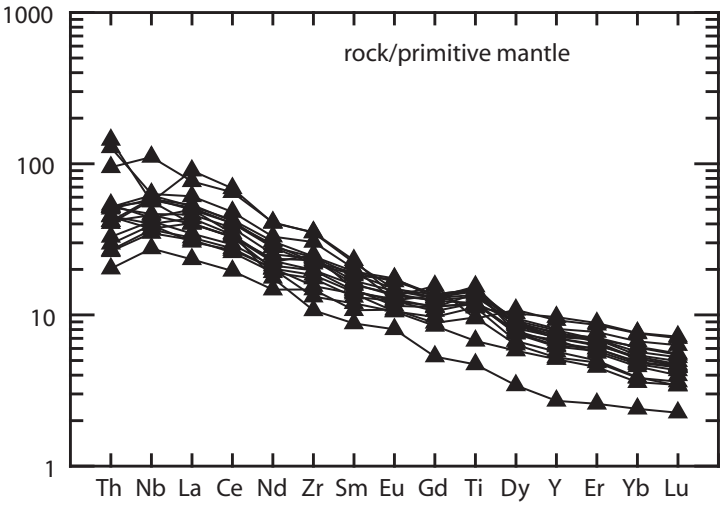
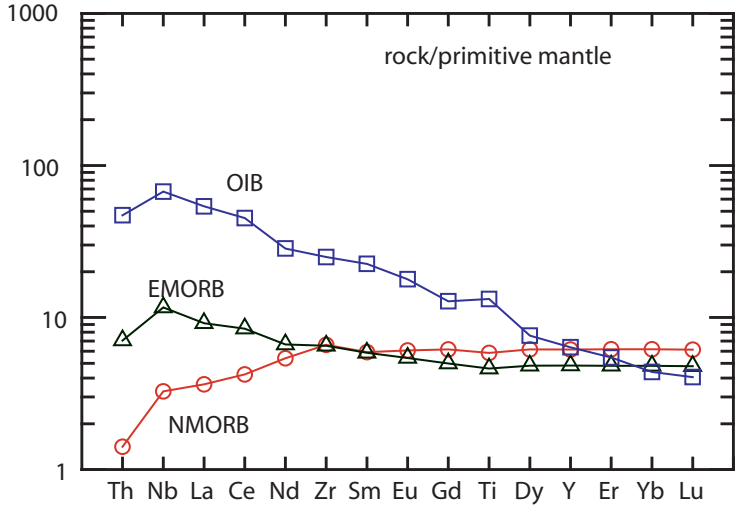
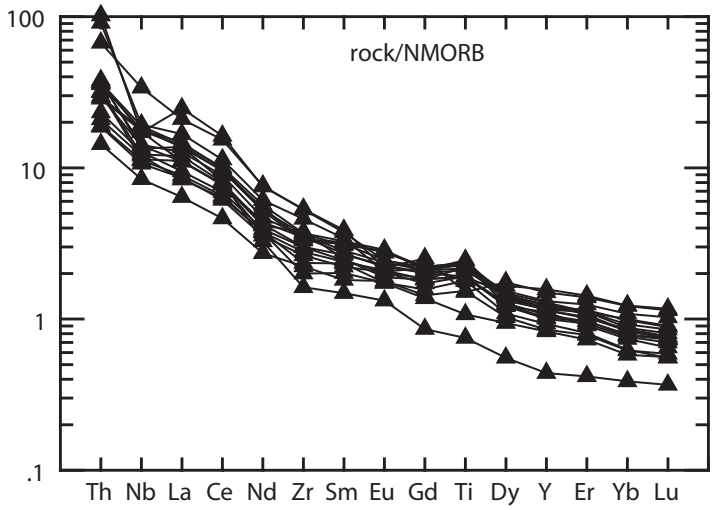
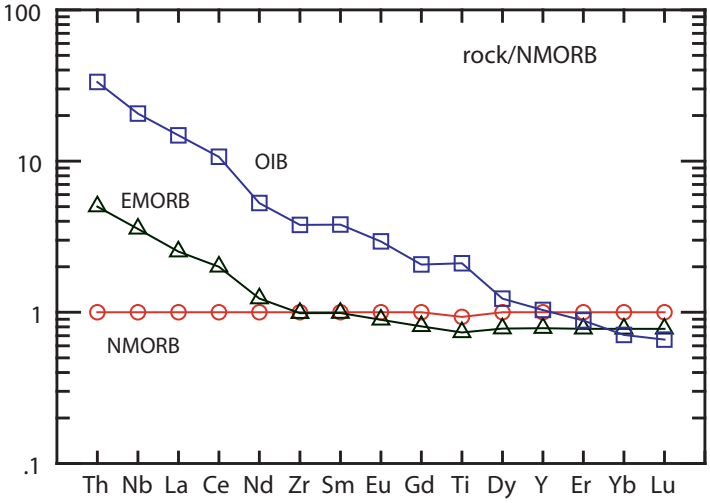

alkali rhyolite
phonolite
rhyolite/dacite
trachyte
tephri-phonolite
trachy-
andesite
andesite/basalt
foidite
basalt
alkali basalt
Zr/TiO 2
Nb/Y
1
0.1
0.01
0
0.01
0.1
1
10


10
arc<20>ocean floor basalt
low-Ti IAT
boninite
(BON)
island arc
tholeiite
(IAT)
MORB and
back-arc basin (BAB)
MORB
50
alkaline
100
V
Ti/1000
600
500
400
300
200
100
0
0
5
10
15
20
25


rock/primitive mantle
1000
100
10
1
Th Nb La Ce Nd Zr Sm Eu Gd Ti Dy Y Er Yb Lu


rock/primitive mantle
OIB
EMORB
NMORB
1000
100
10
1
Th Nb La Ce Nd Zr Sm Eu Gd Ti Dy Y Er Yb Lu


rock/NMORB
100
10
1
.1
Th Nb La Ce Nd Zr Sm Eu Gd Ti Dy Y Er Yb Lu


rock/NMORB
OIB
EMORB
NMORB
100
10
1
.1
Th Nb La Ce Nd Zr Sm Eu Gd Ti Dy Y Er Yb Lu