

BASALTIC ANDESITES & BASALTS  
(45-54% SiO<sub>2</sub>)

"WINDY CRAGGY"  
after Muller, 1983.

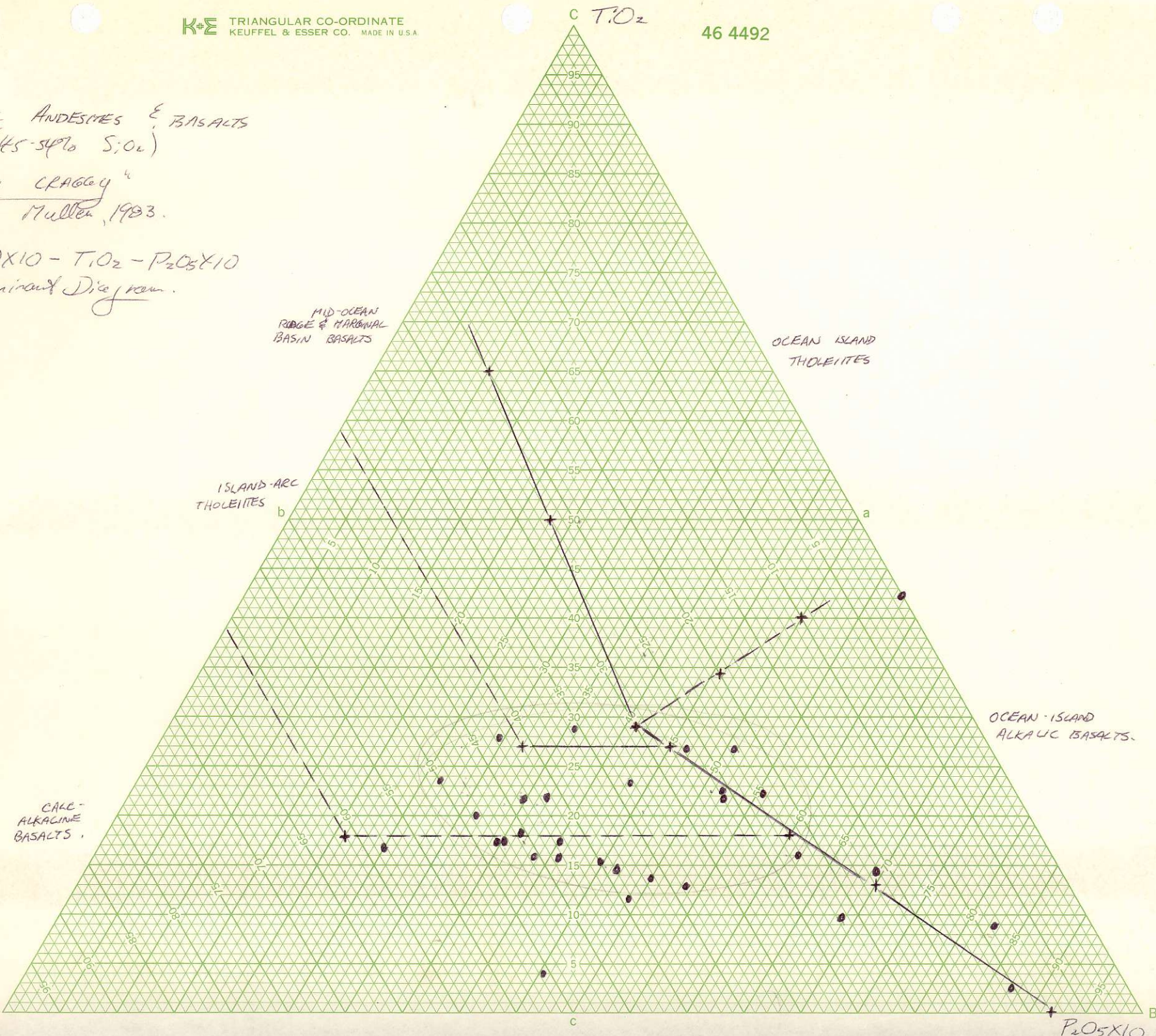
MnOx10 - TiO<sub>2</sub> - P<sub>2</sub>O<sub>5</sub>X10  
Discriminant Diagram.

676024

Windy Craggy  
114P/13

FIGURE 3

MnO X10



P<sub>2</sub>O<sub>5</sub> X10

MnO - TiO<sub>2</sub> - P<sub>2</sub>O<sub>5</sub> plot  
(after Hullen 1983)

- useful perhaps as silica content is typically in  
45% - 54% ~~total~~ (basaltic andesite)  
range

78614 :

$$\begin{aligned} \text{MnO} \times 10 &= 0.17 \times 10 \\ &= 1.7 \\ \text{TiO}_2 &= 0.5 \\ \text{P}_2\text{O}_5 \times 10 &= 0.21 \times 10 \\ &= 2.1 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{MnO} \times 10 \\ \text{TiO}_2 \\ \text{P}_2\text{O}_5 \times 10 \end{aligned}} \right\} 4.3$$

norms : M = 39.5  
T = 11.6  
P = 48.9

78615 :

$$\begin{aligned} \text{MnO} \times 10 &= 0 \\ \text{TiO}_2 &= 0.8 \\ \text{P}_2\text{O}_5 \times 10 &= \del{1.1} \times 10 \\ &= 1.1 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{MnO} \times 10 \\ \text{TiO}_2 \\ \text{P}_2\text{O}_5 \times 10 \end{aligned}} \right\} \del{4.9} 1.9$$

norms : M = 0  
T = ~~87.9~~ 42.1 ✓  
P = 57.9

78616 :

$$\begin{aligned} \text{MnO} \times 10 &= 0.17 \times 10 \\ &= 1.7 \\ \text{TiO}_2 &= 0.65 \\ \text{P}_2\text{O}_5 \times 10 &= 0.27 \times 10 \\ &= 2.7 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{MnO} \times 10 \\ \text{TiO}_2 \\ \text{P}_2\text{O}_5 \times 10 \end{aligned}} \right\} 5.05$$

norms : M = 33.7  
T = 12.9 ✓  
P = 53.4

78617 :

$$\begin{aligned} \text{MnO} \times 10 &= 0.19 \times 10 \\ &= 1.9 \\ \text{TiO}_2 &= 0.65 \\ \text{P}_2\text{O}_5 \times 10 &= 0.16 \times 10 \\ &= 1.6 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{MnO} \times 10 \\ \text{TiO}_2 \\ \text{P}_2\text{O}_5 \times 10 \end{aligned}} \right\} 4.15$$

norms : M = 45.8  
T = 15.7 ✓  
P = 38.5

78618 :

$$\begin{aligned} \text{MnO} \times 10 &= 0.18 \times 10 \\ &= 1.8 \\ \text{TiO}_2 &= 0.65 \\ \text{P}_2\text{O}_5 \times 10 &= 0.13 \times 10 \\ &= 1.3 \end{aligned} \quad \left. \vphantom{\begin{aligned} \text{MnO} \times 10 \\ \text{TiO}_2 \\ \text{P}_2\text{O}_5 \times 10 \end{aligned}} \right\} 3.75$$

norms : M = 48.0  
T = 17.3 ✓  
P = 34.7

78619 :

$$\text{MnO} \times 10 = 0.17 \times 10$$

$$= 1.7$$

$$\text{TiO}_2 = 0.8$$

$$\text{P}_2\text{O}_5 \times 10 = 0.09 \times 10$$

$$= 0.9$$

$$\text{norms} : M = 50.0$$

$$T = 23.5 \quad \checkmark$$

$$P = 26.5$$

3.4

78620 :

$$\text{MnO} \times 10 = 0.08 \times 10$$

$$= 0.8$$

$$\text{TiO}_2 = 0.7$$

$$\text{P}_2\text{O}_5 \times 10 = 0.16 \times 10$$

$$= 1.6$$

$$\text{norms} : M = 25.8$$

$$T = 22.6 \quad \checkmark$$

$$P = 51.6$$

3.1

78621 :

$$\text{MnO} \times 10 = 0.09 \times 10$$

$$= 0.9$$

$$\text{TiO}_2 = 0.65$$

$$\text{P}_2\text{O}_5 = 0.25 \times 10$$

$$= 2.5$$

$$\text{norms} : M = 22.2$$

$$T = 16.0 \quad \checkmark$$

$$P = 61.8$$

4.05

78622 :

$$\text{MnO} \times 10 = 0.08 \times 10$$

$$= 0.8$$

$$\text{TiO}_2 = 0.8$$

$$\text{P}_2\text{O}_5 = 0.2 \times 10$$

$$= 2.0$$

$$\text{norms} : M = 22.2 \quad \checkmark$$

$$T = 22.2$$

$$P = 55.6$$

3.6

78623 :

$$\text{MnO} \times 10 = 0.07 \times 10$$

$$= 0.7$$

$$\text{TiO}_2 = 0.7$$

$$\text{P}_2\text{O}_5 \times 10 = 0.12 \times 10$$

$$= 1.2$$

$$\text{norms} : M = 26.9 \quad \checkmark$$

$$T = 26.9$$

$$P = 46.2$$

2.6

78624 :

$$\text{MnO} \times 10 = 0.19 \times 10$$

$$= 1.9$$

$$\text{TiO}_2 = 0.7$$

$$\text{P}_2\text{O}_5 \times 10 = 0.14 \times 10$$

$$= 1.4$$

$$\text{norms} : M = 47.5 \quad \checkmark$$

$$T = 17.5$$

$$P = 35$$

4.0

78025 :

$$\text{MnO} \times 10 = 0.17 \times 10$$

$$= 1.7$$

$$\text{TiO}_2 = 0.65$$

$$\text{P}_2\text{O}_5 \times 10 = 0.19 \times 10$$

$$= 1.9$$

} 4.25

normas:  $M = 40$

~~T~~  $T = 15.3$

$P = 44.7$  ✓

78026

$$\text{MnO} \times 10 = 0.21 \times 10$$

$$= 2.1$$

$$\text{TiO}_2 = 0.6$$

$$\text{P}_2\text{O}_5 \times 10 = 0.09 \times 10$$

$$= 0.9$$

} 3.6

normas:  $M = 58.3$

$T = 16.7$  ✓

$P = 25.0$

78027 :

$$\text{MnO} \times 10 = 0.08 \times 10$$

$$= 0.8$$

$$\text{TiO}_2 = 0.95$$

$$\text{P}_2\text{O}_5 \times 10 = 0.18 \times 10$$

$$= 1.8$$

} 3.55

normas: ~~22.5~~  $M = 22.5$

$T = 26.8$  ✓

$P = 50.7$

78028 :

$$\text{MnO} \times 10 = 0.08 \times 10$$

$$= 0.8$$

$$\text{TiO}_2 = 0.65$$

$$\text{P}_2\text{O}_5 \times 10 = 0.08 \times 10$$

$$= 0.8$$

} 2.25

normas:  $M = 35.6$

$T = 28.8$  ✓

$P = 35.6$

78029 :

$$\text{MnO} \times 10 = 0.08 \times 10$$

$$= 0.8$$

$$\text{TiO}_2 = 0.7$$

$$\text{P}_2\text{O}_5 \times 10 = 0.17 \times 10$$

$$= 1.7$$

} 3.2

normas:  $M = 25$

$T = 21.9$  ✓

$P = 53.1$

78030 :

$$\text{MnO} \times 10 = 0.13 \times 10$$

$$= 1.3$$

$$\text{TiO}_2 = 0.85$$

$$\text{P}_2\text{O}_5 \times 10 = 0.09 \times 10$$

$$= 0.9$$

} 3.05

normas:  $M = 42.6$  ✓

$T = 27.9$

$P = 29.5$

78631 :

$$\begin{aligned}
 \text{MnO} \times 10 &= 0.1 \times 10 \\
 &= 1.0 \\
 \text{TiO}_2 &= 0.9 \\
 \text{P}_2\text{O}_5 \times 10 &= .43 \times 10 \\
 &= 4.3 \\
 \text{norms: } M &= 16.1 \\
 T &= 14.5 \quad \checkmark \\
 P &= 69.4
 \end{aligned}$$

78632 :

$$\begin{aligned}
 \text{MnO} \times 10 &= 0.17 \times 10 \\
 &= 1.7 \\
 \text{TiO}_2 &= 0.7 \\
 \text{P}_2\text{O}_5 \times 10 &= 0.11 \times 10 \\
 &= 1.1 \\
 \text{norms: } M &= 48.6 \\
 T &= 20.0 \quad \checkmark \\
 P &= 31.4
 \end{aligned}$$

78633 :

$$\begin{aligned}
 \text{MnO} \times 10 &= 0.18 \times 10 \\
 &= 1.8 \\
 \text{TiO}_2 &= 0.95 \\
 \text{P}_2\text{O}_5 \times 10 &= 0.16 \times 10 \\
 &= 1.6 \\
 \text{norms: } M &= 41.4 \\
 T &= 21.8 \quad \checkmark \\
 P &= 36.8
 \end{aligned}$$

78634

$$\begin{aligned}
 \text{MnO} \times 10 &= 0.1 \times 10 \\
 &= 1.0 \\
 \text{TiO}_2 &= 1.05 \\
 \text{P}_2\text{O}_5 \times 10 &= 0.98 \times 10 \\
 &= 9.8 \\
 \text{norms: } M &= ~~92~~ 8.4 \\
 T &= ~~97~~ 8.9 \quad \checkmark \\
 P &= 82.7
 \end{aligned}$$

78635 :

$$\begin{aligned}
 \text{MnO} \times 10 &= 0.1 \times 10 \\
 &= 1.0 \\
 \text{TiO}_2 &= 0.7 \\
 \text{P}_2\text{O}_5 \times 10 &= 0.13 \times 10 \\
 &= 1.3 \\
 \text{norms: } M &= 33.3 \\
 T &= 23.3 \quad \checkmark \\
 P &= 43.4
 \end{aligned}$$

78636 ..

$$\begin{aligned}
 \text{MnO} \times 10 &= .11 \times 10 \\
 &= 1.1 \\
 \text{TiO}_2 &= 0.5 \\
 \text{P}_2\text{O}_5 \times 10 &= .35 \times 10 \\
 &= 3.5 \\
 \text{norms: } M &= 21.6 \\
 T &= 9.8 \quad \checkmark \\
 P &= 68.6
 \end{aligned}$$

78637:

$$\text{MnOx10} = 0.15 \times 10$$

$$= 1.5$$

$$\text{TiO}_2 = 0.6$$

$$\text{P}_2\text{O}_5 \times 10 = 0.14 \times 10$$

$$= 1.4$$

} 3.5

normas:  $M = 42.9$

$$T = 17.1 \quad \checkmark$$

$$P = 40.0$$

48638

$$\text{MnOx10} = 0.15 \times 10$$

$$= 1.5$$

$$\text{TiO}_2 = 0.6$$

$$\text{P}_2\text{O}_5 \times 10 = 0.12 \times 10$$

$$= 1.2$$

} 3.3

normas:  $M = 45.5$

$$T = 18.2 \quad \checkmark$$

$$P = 36.3$$

48639

$$\text{MnOx10} = 0.18 \times 10$$

$$= 1.8$$

$$\text{TiO}_2 = 0.45$$

$$\text{P}_2\text{O}_5 \times 10 = 1.55 \times 10$$

$$= 15.5$$

} 17.75

normas:  $M = 10.2$

$$T = 2.5 \quad \checkmark$$

$$P = 87.3$$

48640

$$\text{MnOx10} = 0.13 \times 10$$

$$= 1.3$$

$$\text{TiO}_2 = 0.5$$

$$\text{P}_2\text{O}_5 \times 10 = 0.18 \times 10$$

$$= 1.8$$

} 3.6

normas:  $M = 36.1$

$$T = 13.7 \quad \checkmark$$

$$P = 50.0$$

48641

$$\text{MnOx10} = 0.21 \times 10$$

$$= 2.1$$

$$\text{TiO}_2 = 0.8$$

$$\text{P}_2\text{O}_5 \times 10 = 0.25 \times 10$$

$$= 2.5$$

} 5.4

normas:  $M = 38.9$

$$T = 14.8 \quad \checkmark$$

$$P = 40.3$$

48642

$$\text{MnOx10} = 0.19 \times 10$$

$$= 1.9$$

$$\text{TiO}_2 = 0.15$$

$$\text{P}_2\text{O}_5 \times 10 = 0.17 \times 10$$

$$= 1.7$$

} 3.75

normas:  $M = 50.7$

$$T = 4.0 \quad \checkmark$$

$$P = 45.3$$

40043 :

$$M_{NO} \times 10 = 0.15 \times 10 = 1.5$$

$$T_{O_2} = 0.75$$

$$P_{CO_2} = 0.12 \times 10 = 1.2$$

} 3.45

norms:  $M = 43.5$

$$T = 21.7$$

$$P = 34.8$$

40044 :

$$M_{NO} \times 10 = 0.19 \times 10 = 1.9$$

$$T_{O_2} = 0.7$$

$$P_{CO_2} \times 10 = 0.18 \times 10 = 1.8$$

} 4.4

norms:  $M = 43.2$

$$T = 15.9$$

$$P = 40.9$$