Bonin fore-arc drilling (IODP Exp 352): The volcanic architecture of subduction initiation

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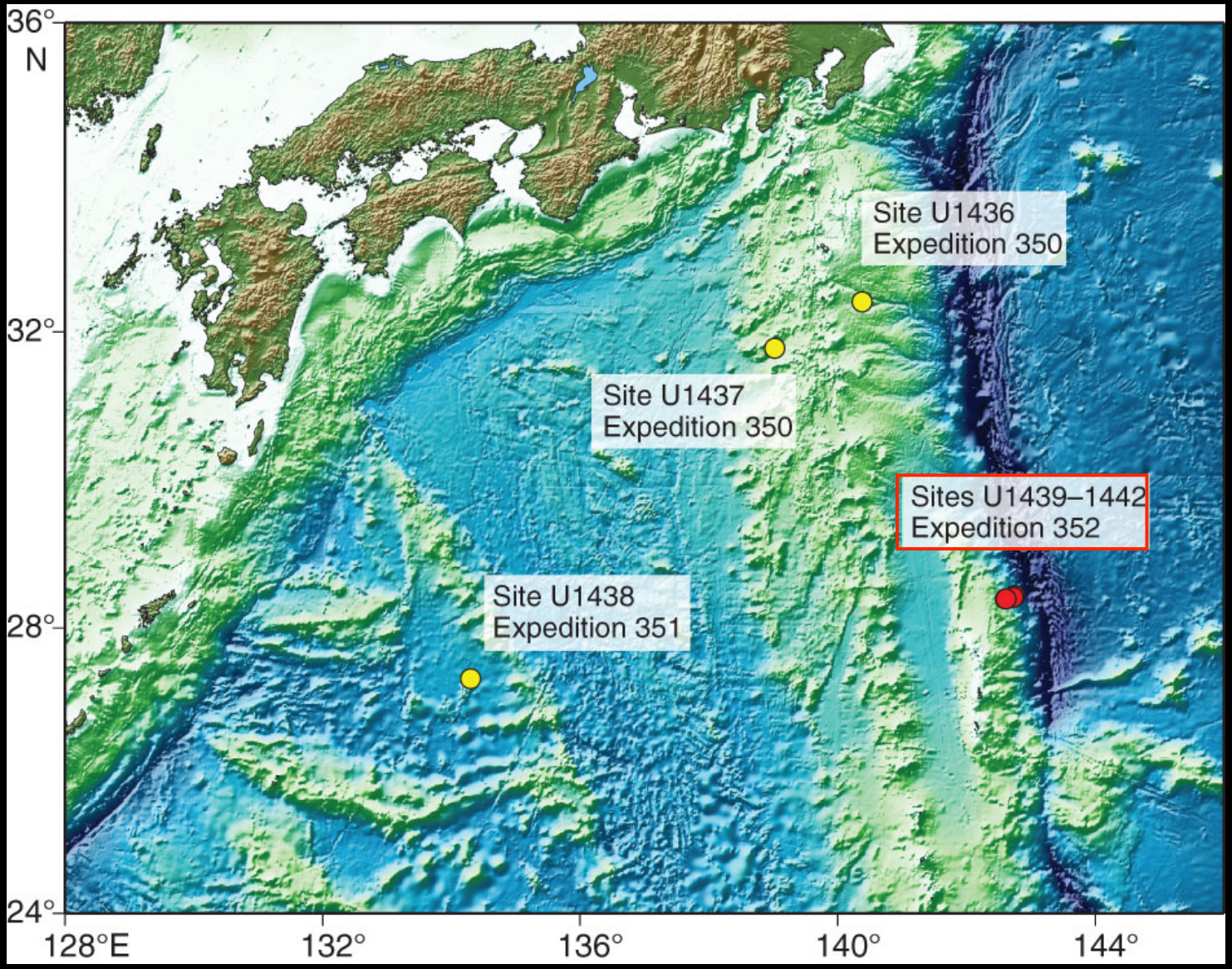
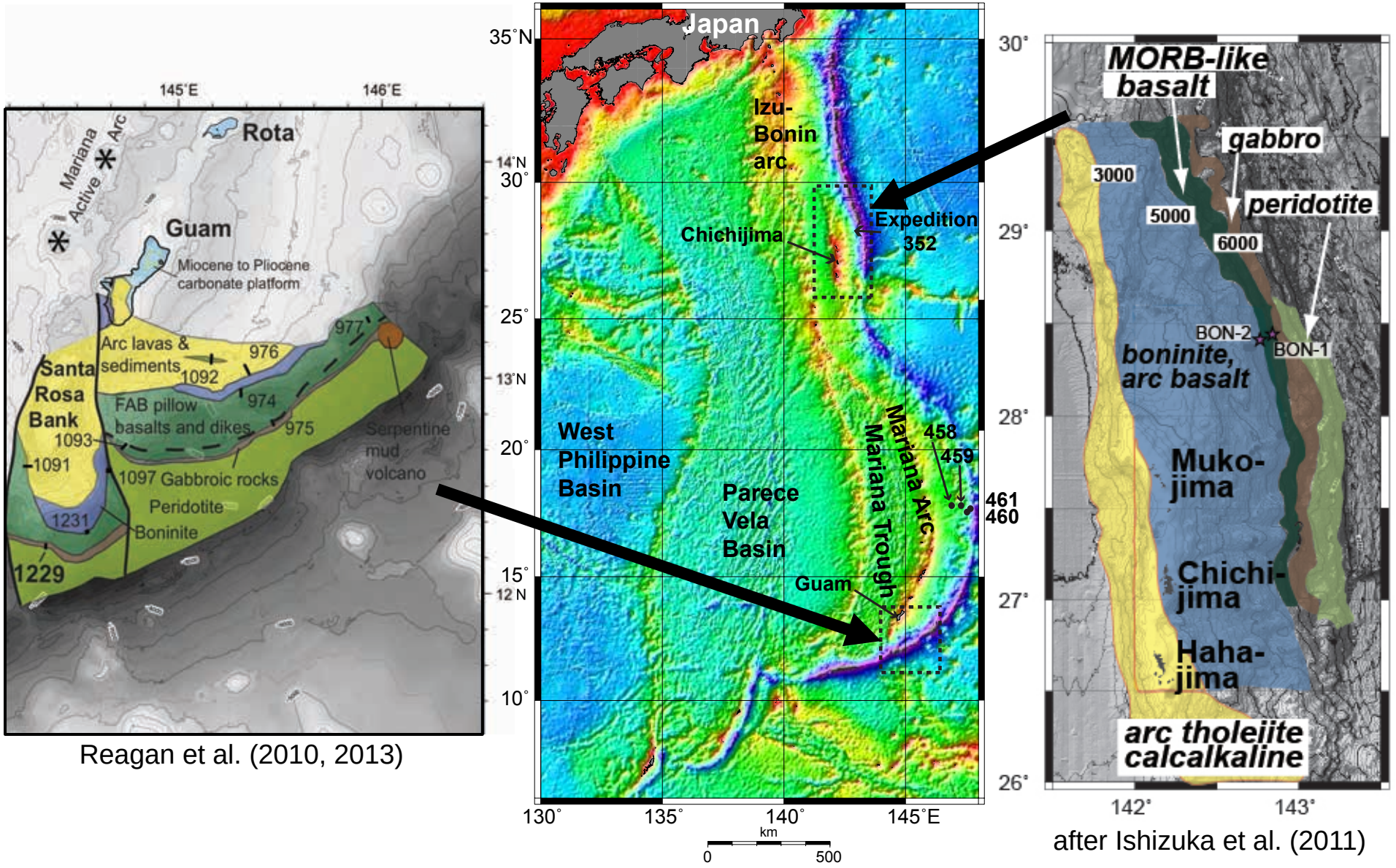
IODP
INTERNATIONAL OCEAN DISCOVERY PROGRAM

IODP drilling April-September 2014





Reagan et al. (2010, 2013)

after Ishizuka et al. (2011)

Exp. 352 Objectives

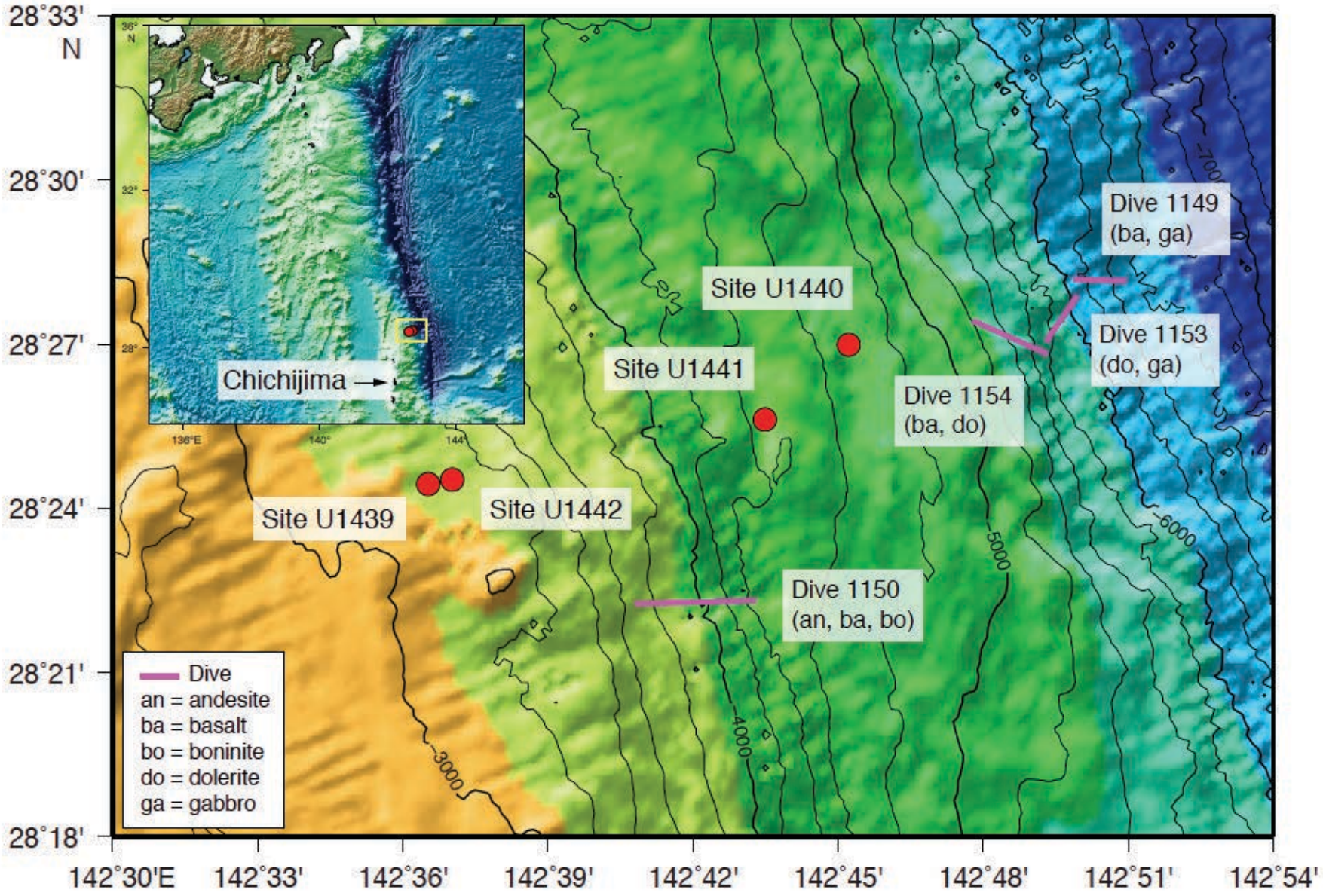
1. Obtain a **high-fidelity record** of magmatic evolution during subduction initiation.

2. Test the hypothesis that **fore-arc basalt lies beneath boninites**.

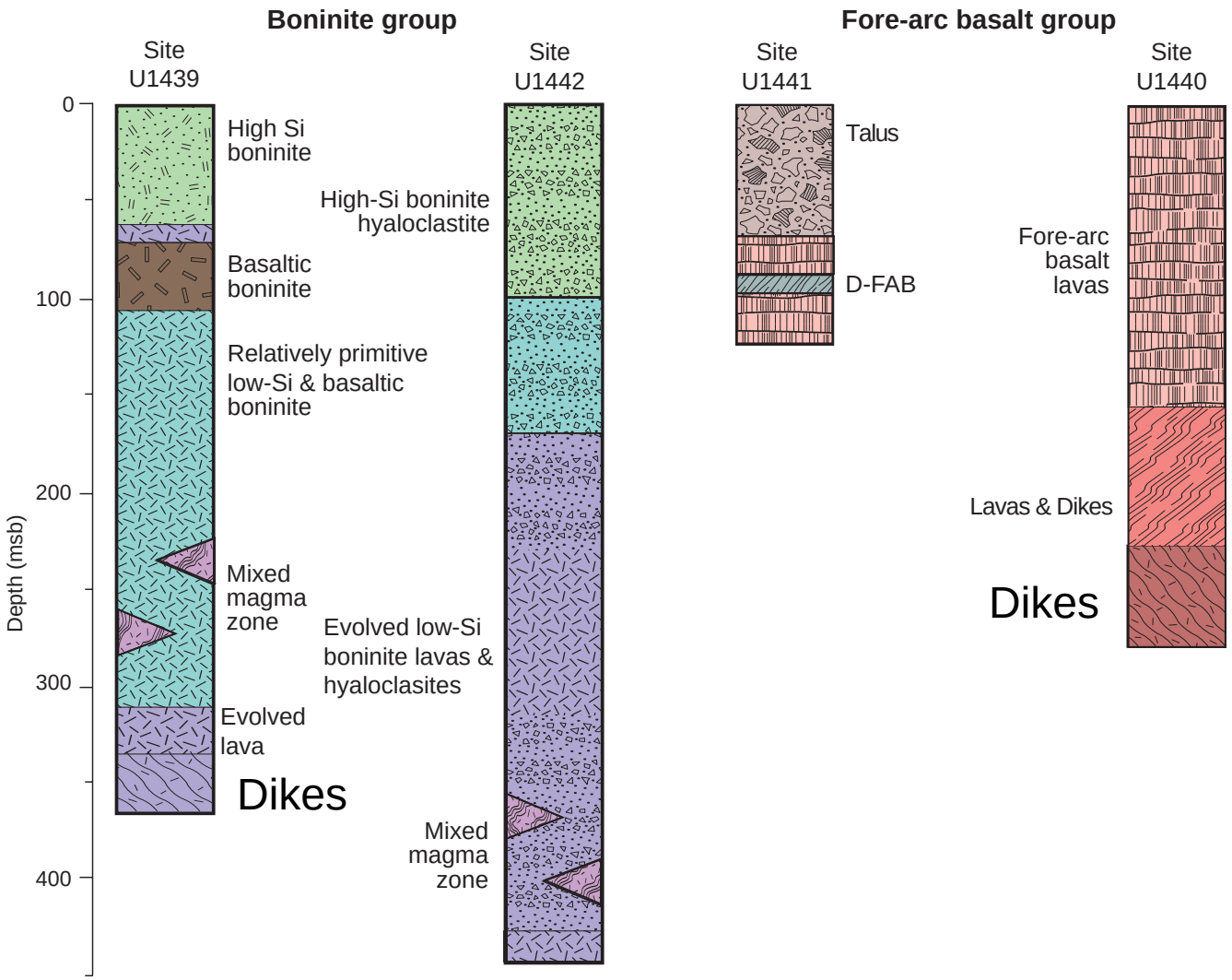
3. Document **chemical gradients** within these units and across their transitions to better understand how **mantle melting processes and sources evolve** during and after subduction initiation.

4. Test the hypothesis that the **fore-arc lithosphere** created during **subduction initiation** is the birthplace of supra-subduction zone **ophiolites**.

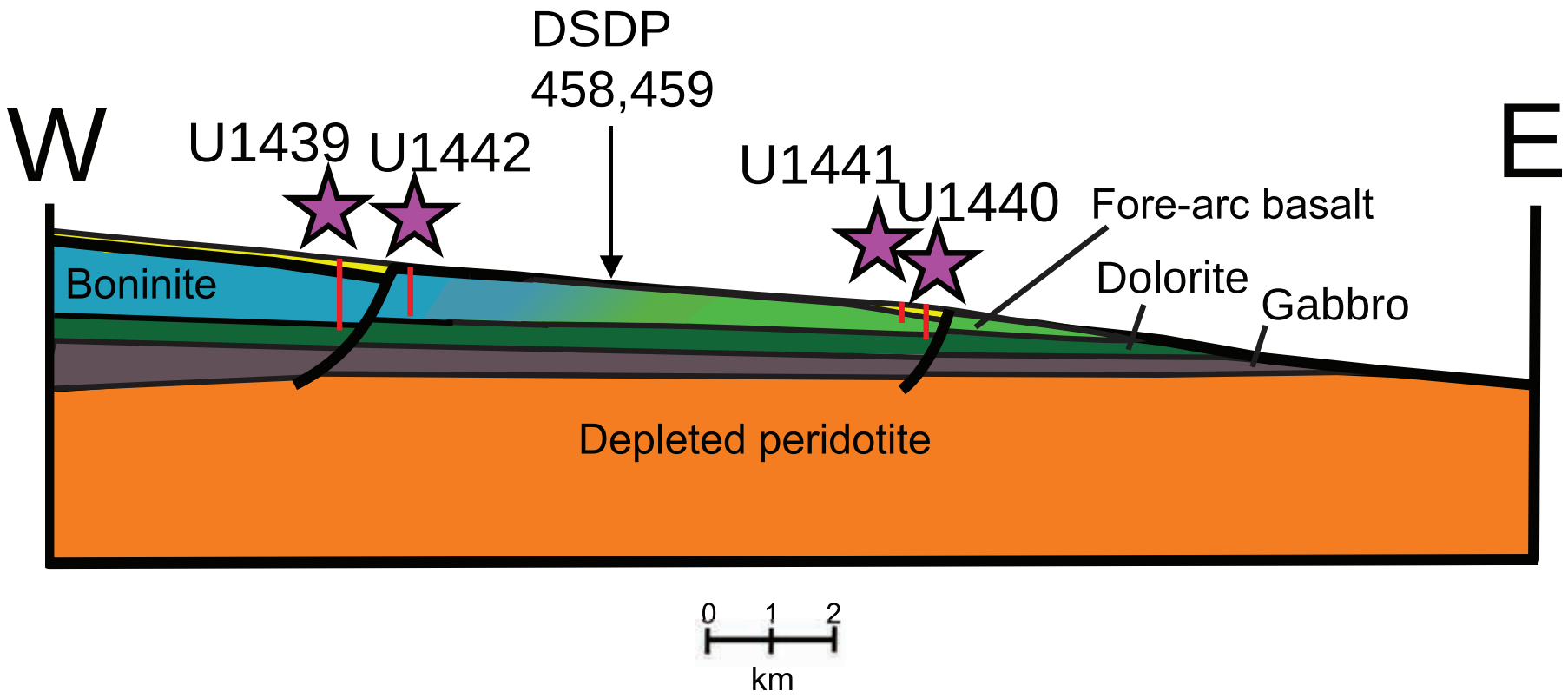
Drill Sites


28°33' N
28°30'
28°27'
28°24'
28°21'
28°18'
142°30'E
142°33'
142°36'
142°39'
142°42'
142°45'
142°48'
142°51'
142°54'
Chichijima
Site U1440
Site U1441
Site U1442
Site U1439
Dive 1149 (ba, ga)
Dive 1153 (do, ga)
Dive 1154 (ba, do)
Dive 1150 (an, ba, bo)
-3000
-4000
-5000
-6000
-7000
Dive
an = andesite
ba = basalt
bo = boninite
do = dolerite
ga = gabbro

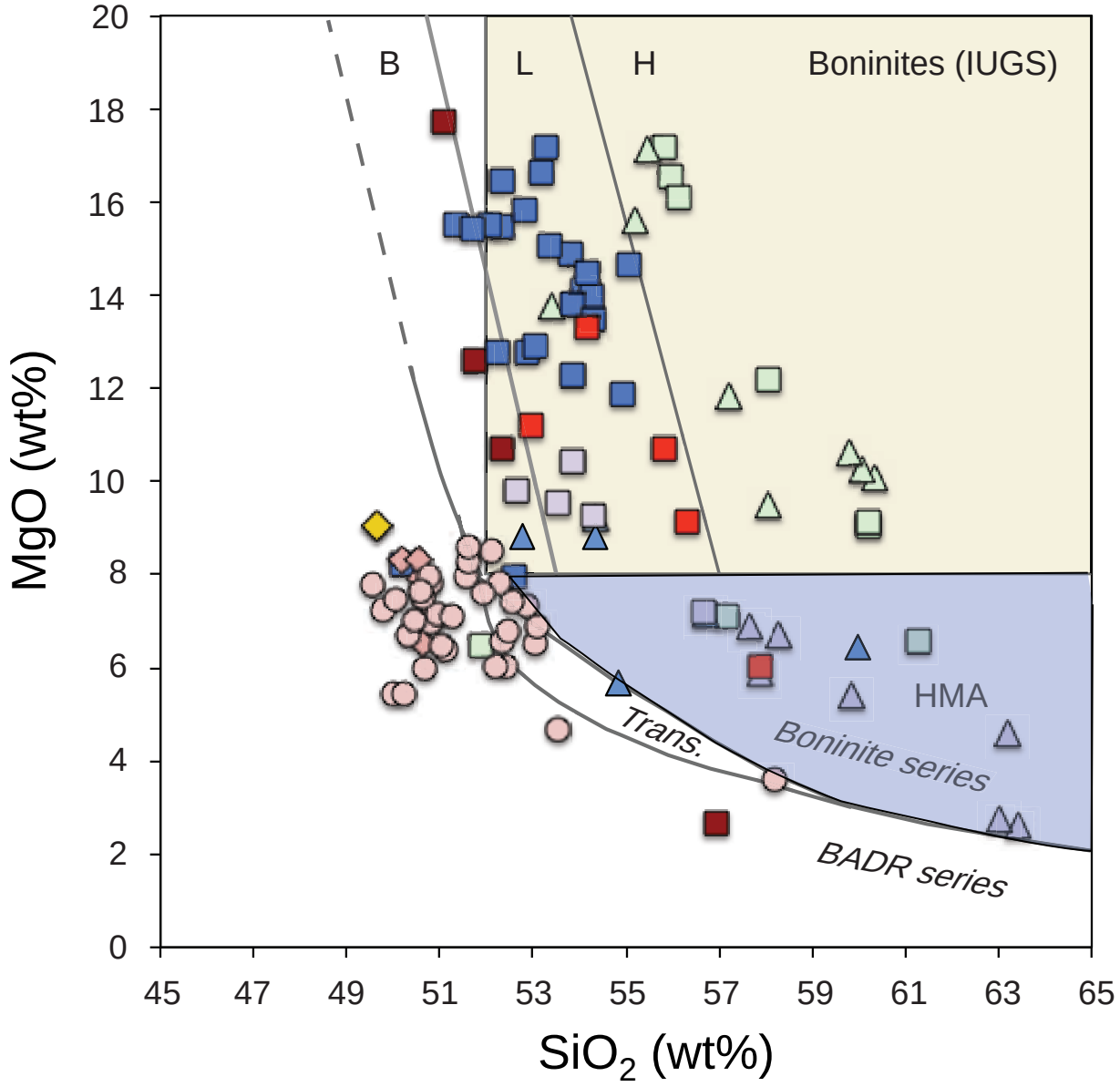
Lithostratigraphy



Schematic cross-section



Shipboard ICP-AES data



squares = U1439

triangles = U1442

circles = U1440

diamonds = U1441

classification after Pearce and Robinson (2010)

FAB

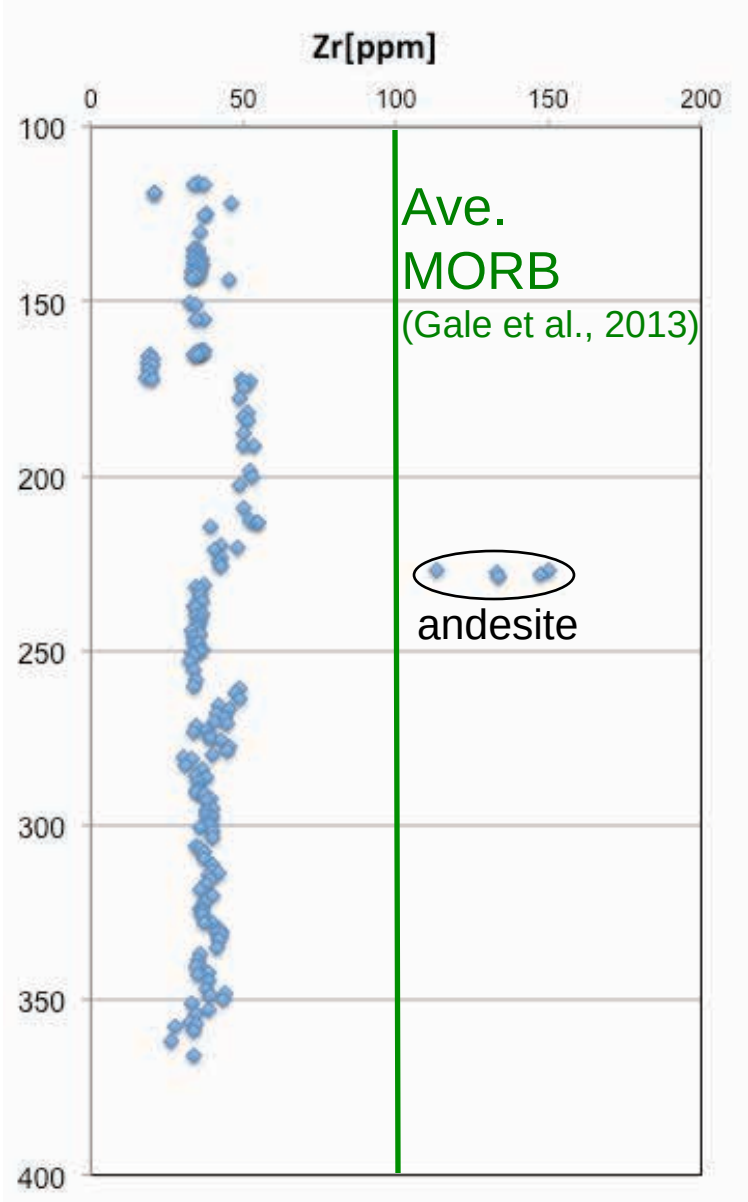
2.0 mm

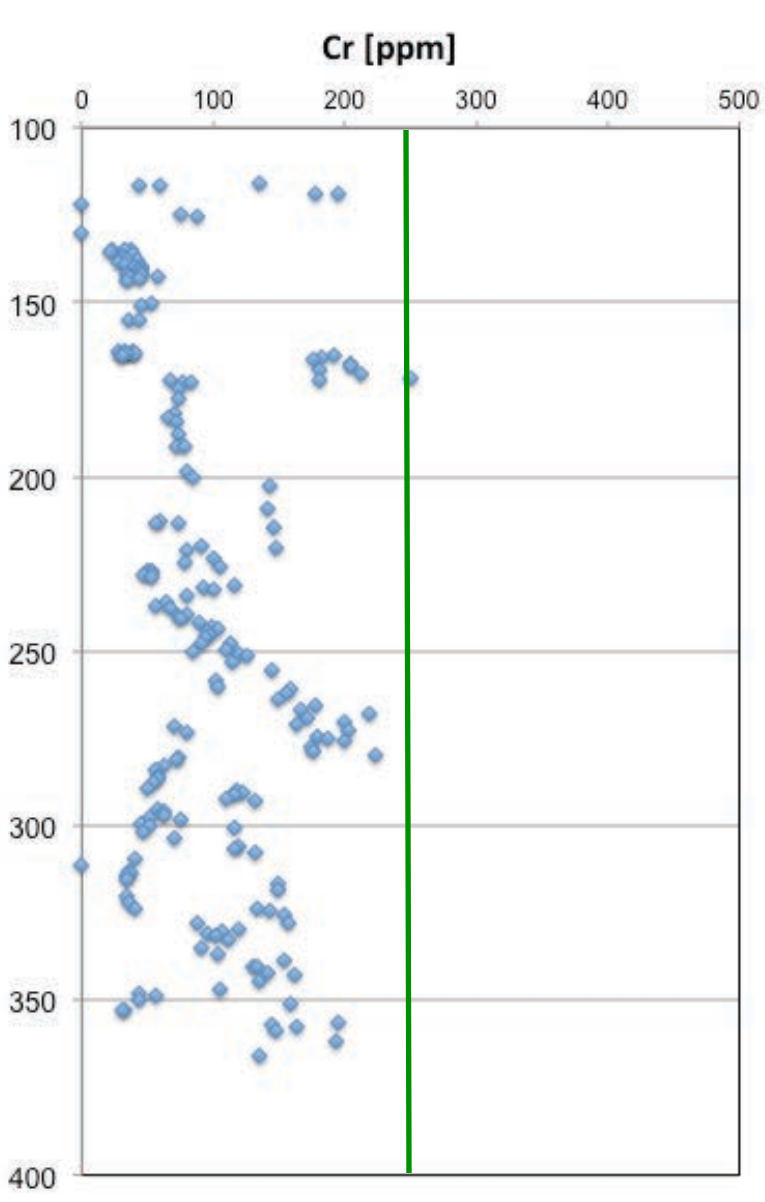
Dolerite

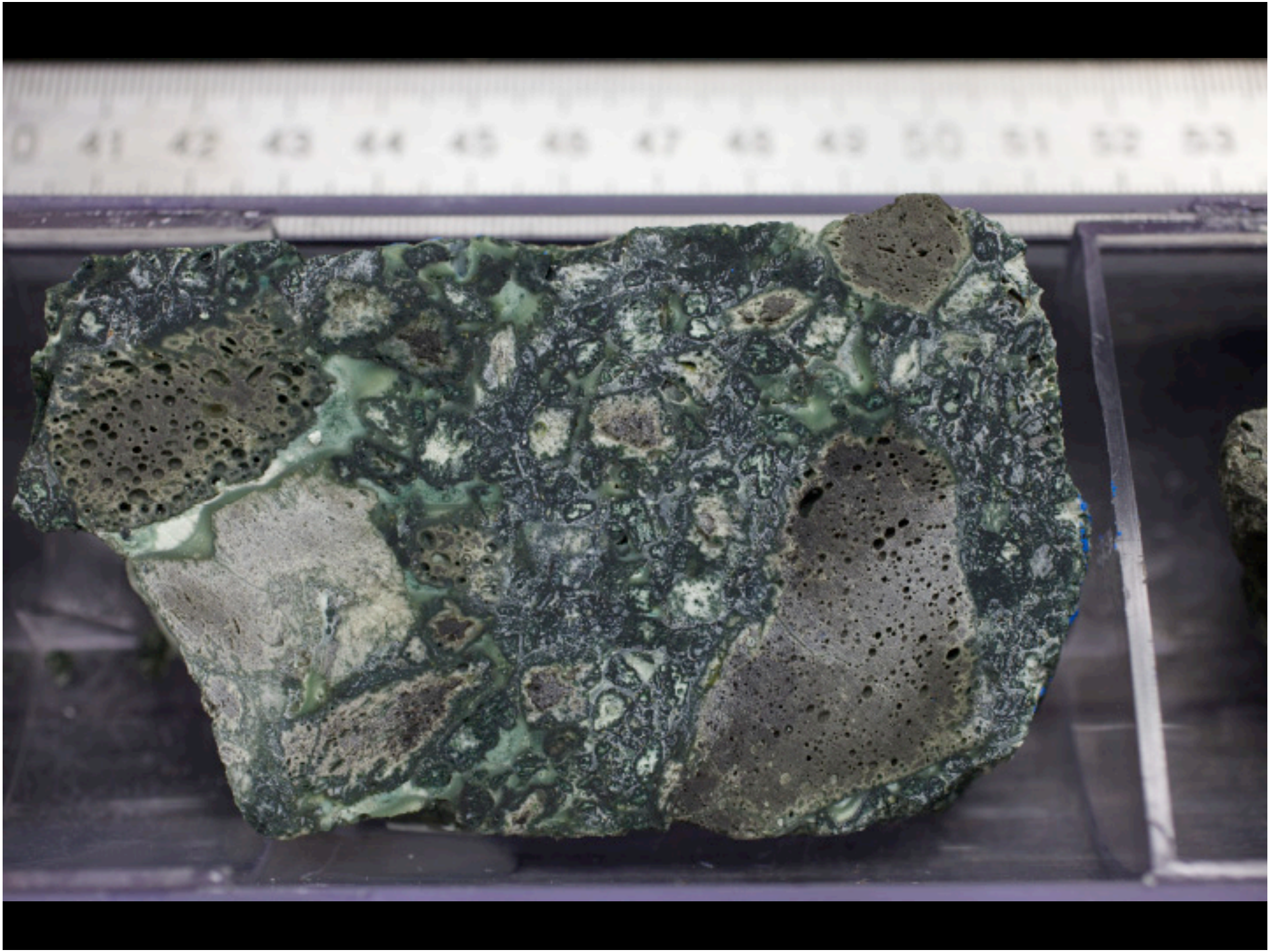
2.0 cm

pXRF Chemostratigraphy
Hole U1440B

Depth
mbsf



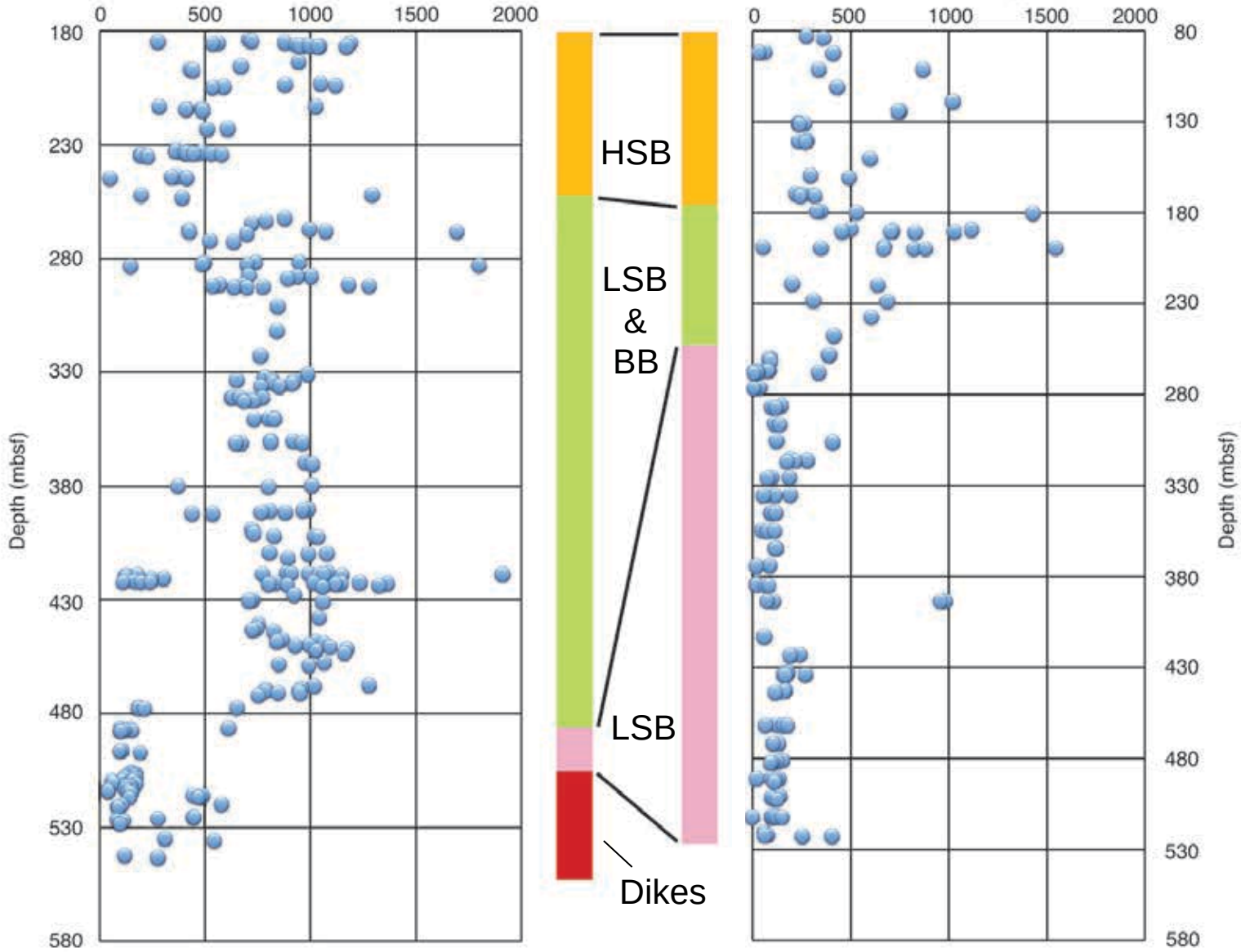




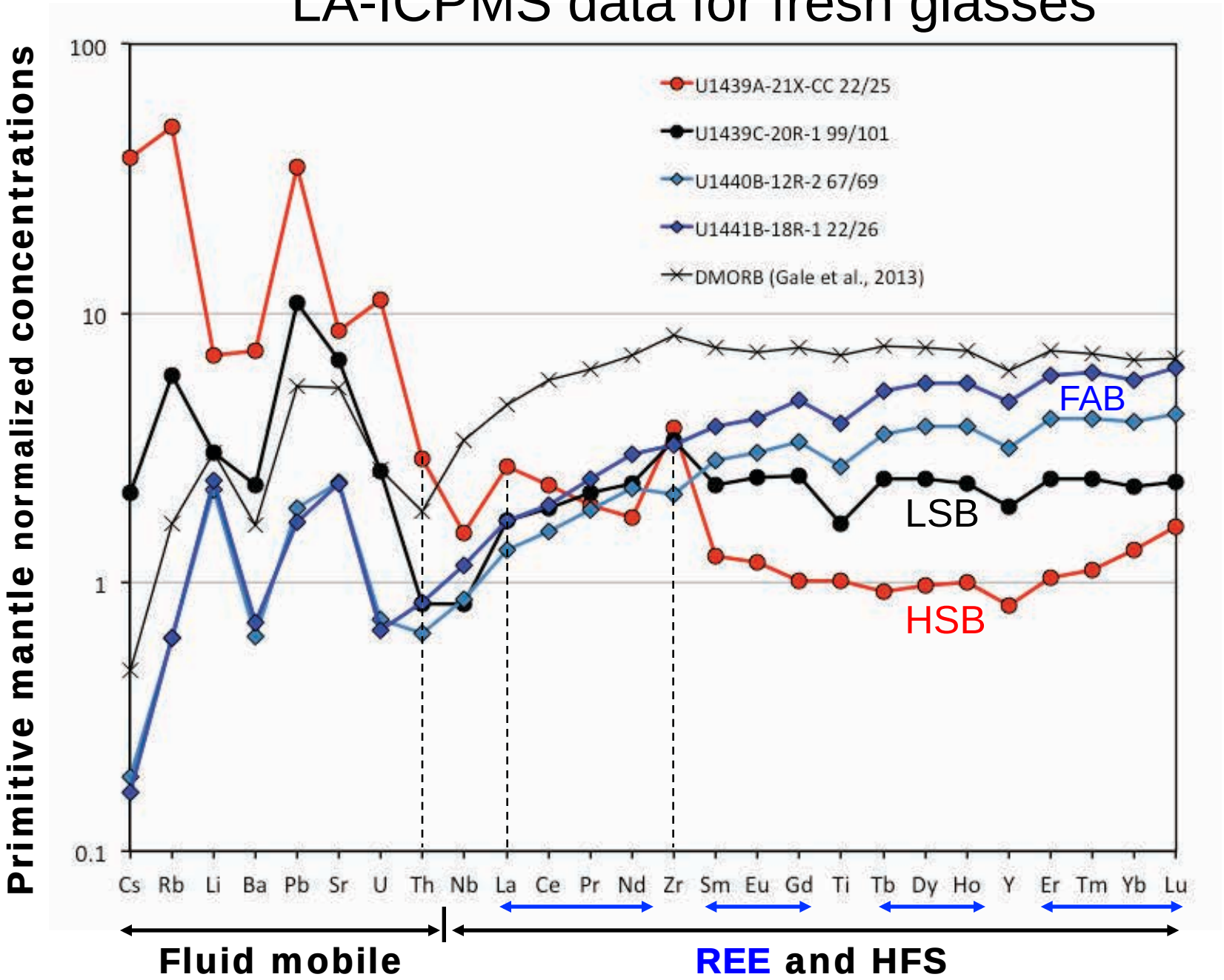

1E-1 mm

Cr chemostratigraphy

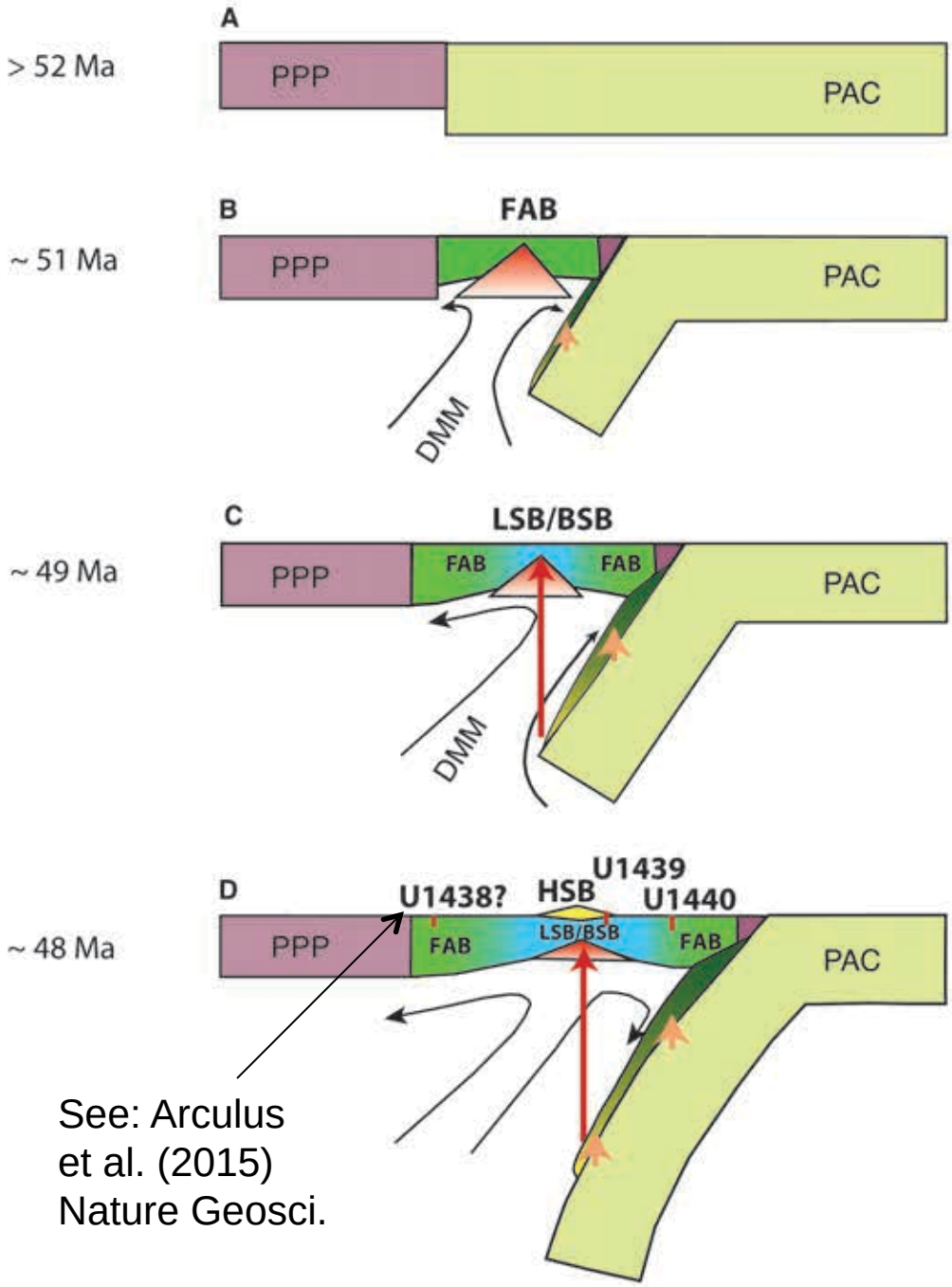
U1439C U1442A



LA-ICPMS data for fresh glasses

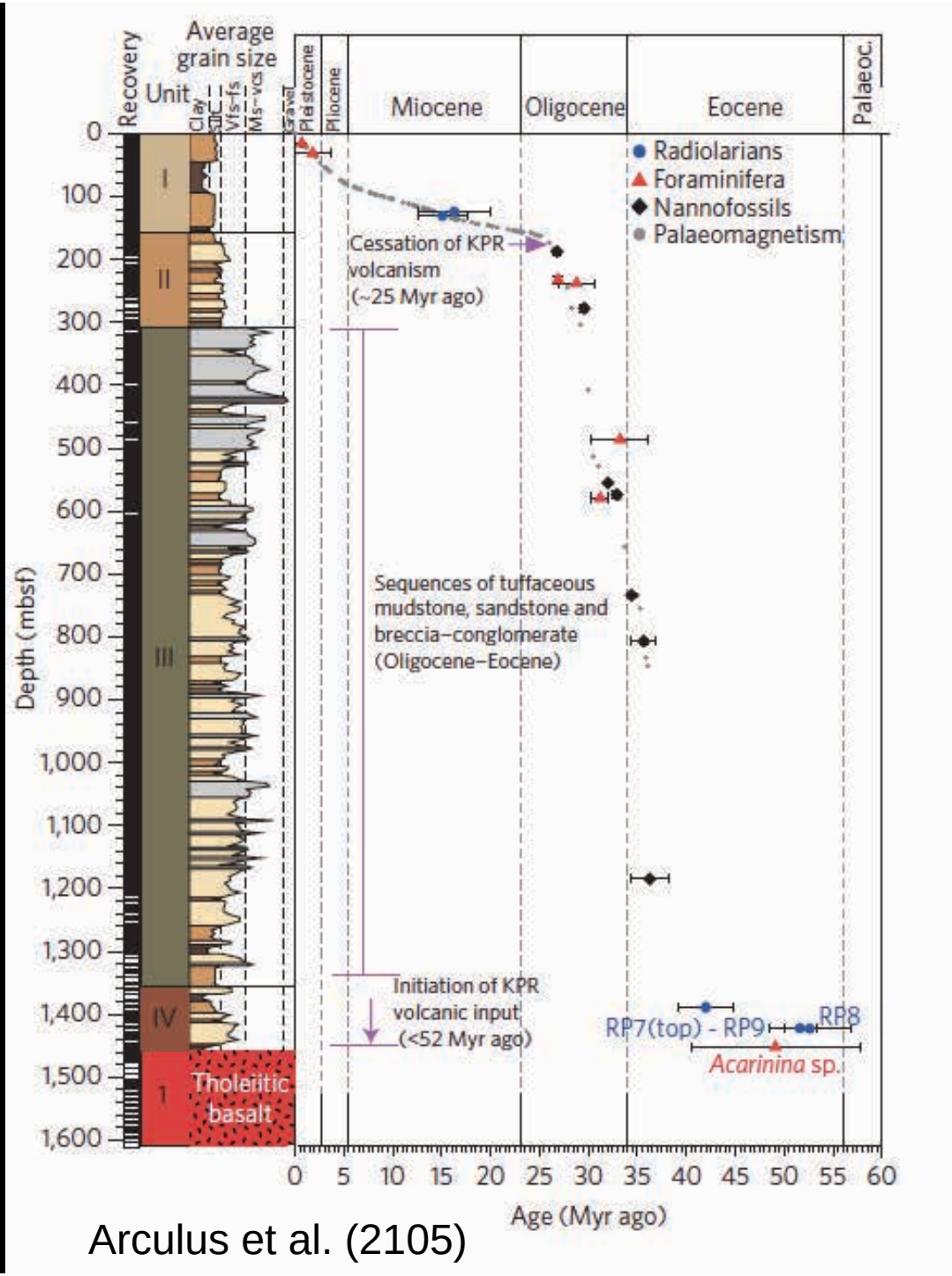


Thanks: D. Peate, K. Kelley

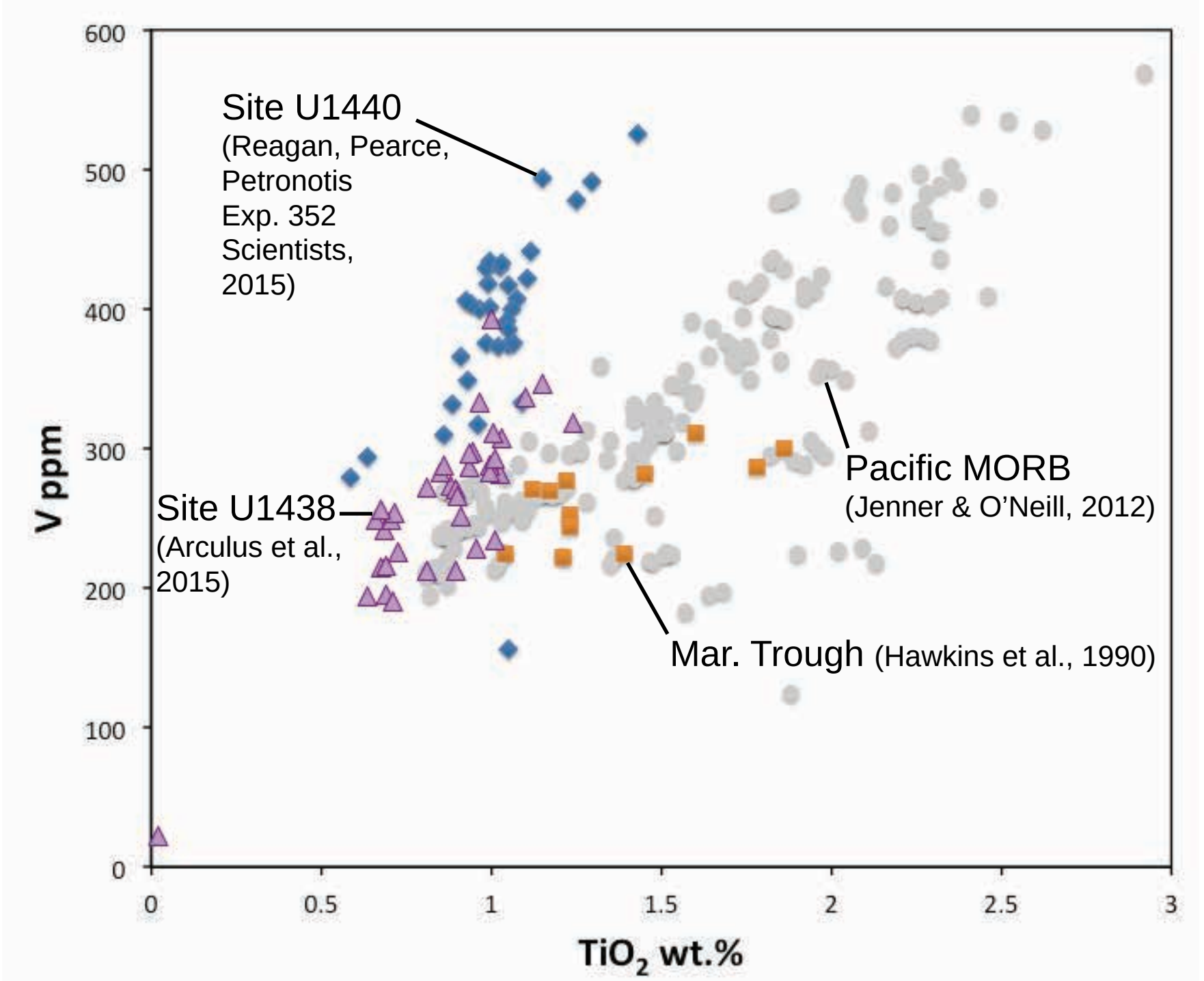


Ages:
Meijer et al. (1983)
Cosca et al. (1998);
Ishizuka et al. (2006);
Ishizuka et al. (2011);
Reagan et al. (2013);

See: Arculus et al. (2015) Nature Geosci.



Arculus et al. (2105)


Site U1440
(Reagan, Pearce, Petronotis Exp. 352 Scientists, 2015)
Site U1438
(Arculus et al., 2015)
Pacific MORB
(Jenner & O'Neill, 2012)
Mar. Trough (Hawkins et al., 1990)
V ppm
TiO2 wt.%
600
500
400
300
200
100
0
0
0.5
1
1.5
2
2.5
3

Stay Tuned!