Your Abstract Submission Has Been Received

Click here to print this page now.

You have submitted the following abstract to AGU23. Receipt of this notice does not guarantee that your submission was free of errors.

Mineral Chemistry and Petrologic Observations from IODP Expedition 391 Lavas Suggest a Complex Magmatic Plumbing System

Olivia Wilkerson, University of Tennessee, Knoxville, TN, United States, Jesse Scholpp, Department of Geology, Utah State University, Logan, United States, Nicholas Dygert, University of Tennessee, Department of Earth and Planetary Sciences, Knoxville, TN, United States, Wendy R Nelson, Towson University, Department of Physics, Astronomy, and Geosciences, Towson, United States, John W Shervais, Utah State University, Department of Geosciences, Logan, UT, United States, Mbili Tshiningayamwe, University of Namibia, Geosciences, Keetmanshoop, Namibia and Scientists Expedition 391, International Ocean Discovery Program, College Station, United States

Abstract Text:
Initial chemical and textural observations of basaltic lavas collected during International Oceanic Discovery Program (IODP) Expedition 391 indicate the crystal cargo represents a mixture of primary phenocrysts from evolved magmas and cumulates that formed in more primitive melts. Basalts from the Walvis Ridge (sites U1575, U1576, and U1577) and Guyot province (site U1578) exhibit textural or mineralogical similarities. Basalts primarily contain phenocrysts of augite, bytownite, and rare Fo77-55 olivine with groundmass clinopyroxene, labradorite to anorthoclase feldspar, titanomagnetite, ilmenite, and Fo38-16 olivine. Glomerocrysts containing bytownite and augite are present in all observed lavas and are 2-9 mm in size. Augite phenocrysts often exhibit oscillatory zoning with correlated Cr- and Mg-enrichments that indicate magma recharge occurred. Augite phenocryst cores display sector zoning (most prominently in site U1578) in Si, Mg, Cr, Ca, Al, and Ti elemental maps, suggesting the clinopyroxenes experienced a low degree of undercooling during or prior to magma ascent (Figure 1). Augite rims exhibit oscillatory zoning with elevated Mg concentrations around the sector zoned core, consistent with a change in host melt chemistry upon injection into a secondary chamber or a change in undercooling conditions. Large (0.5-1.5 mm) forsteritic olivine crystals are rare and exhibit normal zoning with Fo 91-81 cores and Fo 77-70

rims. Given the size and core composition of these olivine crystals, we infer they represent cumulates from magma chambers that were entrained in the melts prior to eruption, rather than being direct crystallization products of the host melts. Suspected xenoliths in section U1578A-52R4 are 10-15 mm in size and contain Fo 82-81 olivine, Mg-rich (Mg# 86-85) augite, and An85-83 plagioclase. Olivine and augite crystals within these xenoliths have some of the highest Cr_2O_3 and NiO concentrations measured in the Expedition 391 samples, suggesting they represent magma chamber cumulates that formed from primitive melts. Collectively, the observations suggest that Expedition 391 basalts passed through a magma chamber system that experienced frequent magma recharge events resulting in entrainment of primitive cumulates within evolved melts, producing complex mineral zoning patterns.

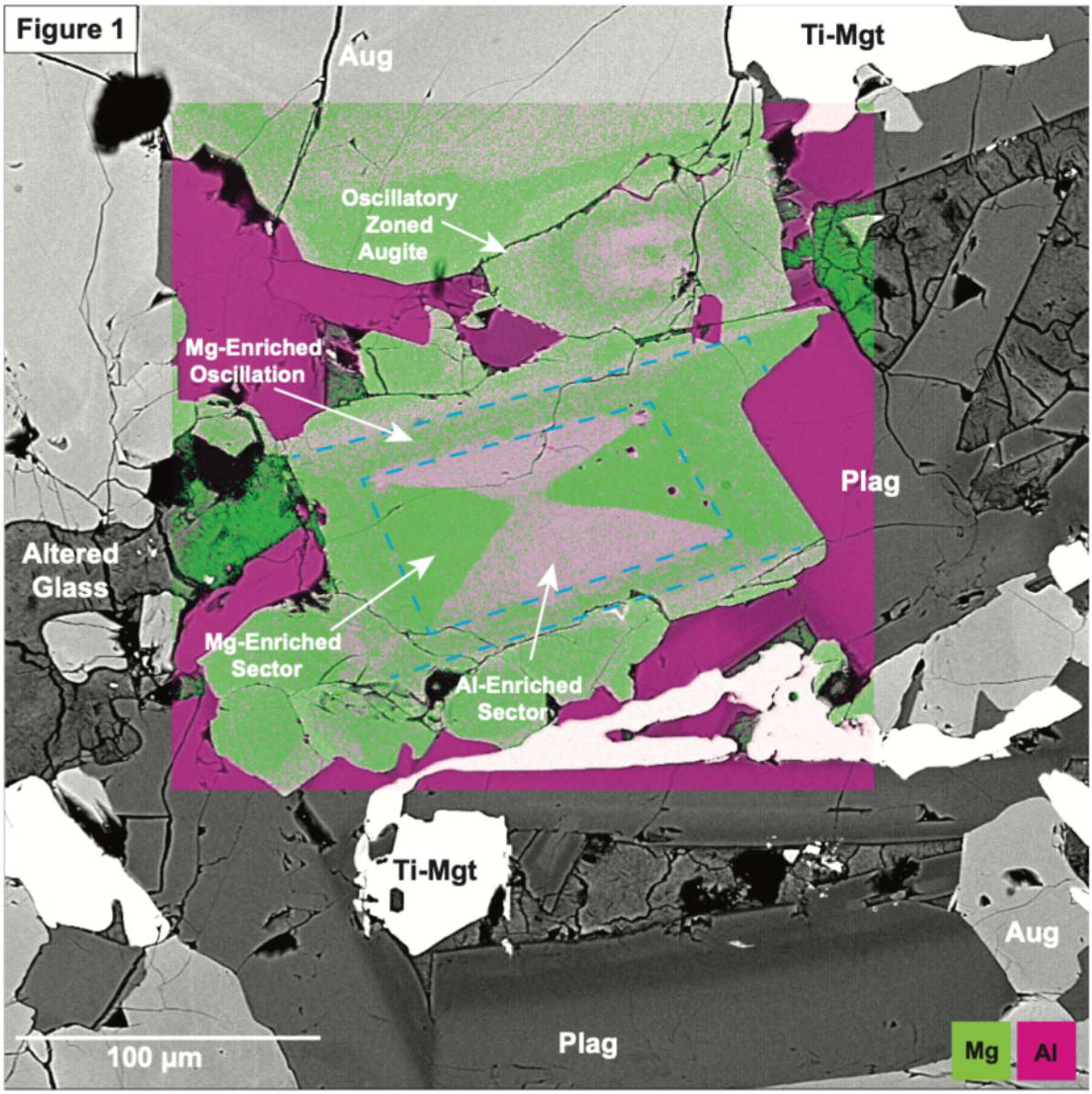

Figure 1: Backscatter electron image of sample 78A-29R2-9/11 with EDS map superimposed on a region of interest, showing the Mg-Al concentrations in different sectors of the clinopyroxene. ('Aug' is augite, 'Plag' is plagioclase, 'Ti-Mgt' is titanium magnetite, 'Mg' is magnesium, and 'Al' is aluminum).

Session Selection:
PP41C. Cretaceous–Paleogene Large Igneous Province Emplacement and Ocean History: Impacts on Crustal Structure, Climate, and Circulation I Poster

Slot:
PP41C: In-Person: Thursday, 14 December 2023: 08:30-12:50

Submitter's E-mail Address:
owilkers@vols.utk.edu

Final Paper##:
PP41C-1667

Abstract Title:
Mineral Chemistry and Petrologic Observations from IODP Expedition 391 Lavas Suggest a Complex Magmatic Plumbing System

Requested Presentation Type:
Poster Only

Virtual Participation:
In-person

Recording Permission Given?
Yes

Previously Published?:
No

Abstract Payment:
Paid (agu-fm23-1350639-5883-7246-6520-8409)

I would not like to volunteer as an OSPA Reviewer.

First Presenting Author
Presenting Author

Olivia Wilkerson
Primary Email: owilkers@vols.utk.edu

Affiliation(s):

University of Tennessee
Knoxville TN 37922 (United States)

Student and Membership Information is only visible to Program Committee and Staff

Self-Disclosed Student Status: N
AGU Membership Type: Student
AGU Membership Status: Active

Second Author

Jesse Scholpp
Primary Email: jscholpp@vols.utk.edu

Affiliation(s):

Department of Geology
Utah State University
Logan 84322 (United States)

Student and Membership Information is only visible to Program Committee and Staff

Self-Disclosed Student Status: N
AGU Membership Type: Student
AGU Membership Status: Active

Third Author

Nicholas Dygert
Primary Email: nick.dygert@gmail.com

Affiliation(s):

University of Tennessee
Department of Earth and Planetary Sciences
Knoxville TN 37996 (United States)

Student and Membership Information is only visible to Program Committee and Staff

AGU Membership Type:
AGU Membership Status:

Fourth Author

Wendy R Nelson
Primary Email: wrnelson@towson.edu

Affiliation(s):

Towson University
Department of Physics, Astronomy, and Geosciences
Towson (United States)

Student and Membership Information is only visible to Program Committee and Staff

Self-Disclosed Student Status: N
AGU Membership Type: Regular
AGU Membership Status: Active

Fifth Author

John W Shervais
Primary Email: john.shervais@usu.edu

Affiliation(s):

Utah State University
Department of Geosciences
Logan UT 84322 (United States)

Student and Membership Information is only visible to Program Committee and Staff

Self-Disclosed Student Status: N
AGU Membership Type: Regular
AGU Membership Status: Active

Sixth Author

Mbili Tshiningayamwe
Primary Email: mtshiningayamwe@gmail.com

Affiliation(s):

University of Namibia
Geosciences
Keetmanshoop (Namibia)

Student and Membership Information is only visible to Program Committee and Staff

AGU Membership Type:
AGU Membership Status:

Seventh Author

Scientists Expedition 391
Primary Email: expedition_391_participants@iodp.tamu.edu

Affiliation(s):

International Ocean Discovery Program
College Station (United States)

Student and Membership Information is only visible to Program Committee and Staff

AGU Membership Type:
AGU Membership Status:

If necessary, you can make changes to your abstract submission

To access your submission in the future, point your browser to: User Portal
Your Abstract ID# is: 1350639.
Any changes that you make will be reflected instantly in what is seen by the reviewers.
After the abstract proposal is submitted, you are not required to go through all submission steps to make edits. For example, click the "Authors" step in the Abstract Submission Control Panel to edit the Authors and then click save or submit.
When you have completed your submission, you may close this browser window or submit another abstract proposal: Call for Abstracts.

Tell us what you think of the abstract submission process

Reset Confirmation