ELECTRON PROBE MICROANALYTICAL DATA OF MINERALS AND GLASS FROM ROCK SAMPLES FROM OKMOK VOLCANO, ALASKA

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ELECTRON PROBE MICROANALYTICAL DATA OF MINERALS AND GLASS FROM ROCK SAMPLES FROM OKMOK VOLCANO, ALASKA

Jessica F. Larsen[1], Janet. R Schaefer[2], and Cheryl E. Cameron[2]

INTRODUCTION

This report includes electron probe microanalytical data (EPMA) from minerals and glasses from samples collected at Okmok volcano by Alaska Volcano Observatory (AVO) geologist Jessica Larsen (fig. 1). AVO geologists conducted fieldwork at Okmok volcano between 1998 and 2016. The samples included in this report are from the 2050 ±50 yBP Okmok II eruption of Okmok caldera (Begét and others, 2005).

Okmok Volcano

Okmok is a frequently active, basaltic to basaltic andesite composition shield volcano, truncated by two nested calderas that are ~10 km in diameter, covering the northeastern sector of Umnak Island in the Fox Islands, Eastern Aleutians, Alaska. Umnak Island is located approximately 100 km to the southwest of the City of Unalaska and the Port of Dutch Harbor, and approximately 1,400 km to the southwest of Anchorage, Alaska. There have been 13 confirmed eruptions since the year 1800, with eruptive activity confined to vents and cones within the caldera (https://www.avo.alaska.edu). The most recent eruption from the new Ahmanilix cone within the caldera began on July 12, 2008 and ended August 23, 2008. This explosive event was due to interactions between the magma and groundwater and surface water within the caldera (Larsen and others, 2009; Larsen and others, 2015).

Okmok was first mapped by U.S. Geological Survey geologist Frank Byers after the 1945 eruption was observed by personnel at the Fort Glenn military base (Byers, 1959). The purpose of the AVO Okmok fieldwork was to produce an updated geologic map and hazard report (Begét and others, 2005), as well as document the stratigraphy of two Pleistocene-Holocene caldera-forming eruptions that occurred ~12,000 yBP (Okmok I). This publication focuses on analytical data from glass and mineral phases from samples from the Okmok II eruption deposits.

The Okmok II caldera-forming eruption produced magmas that are separated into three distinct lithologies: early erupted, crystal-poor rhyodacite (67 to 68 wt. % SiO_2), followed by crystal-poor andesite (~58 wt. % SiO_2), and culminating in voluminous basaltic andesite (~54 to 56 wt. % SiO_2) pyroclastic flow deposits accompanying caldera collapse. Stratigraphic observations from the Okmok II eruption are presented in Burgisser (2005) and Larsen and others (2007). This data release includes electron probe microanalyses collected on glass and minerals from the three Okmok II lithologies from samples collected between 1998 and 2016. Electron probe micro-analyzer (EPMA) data reported include analyses from glass, plagioclase, clinopyroxene, and olivine.

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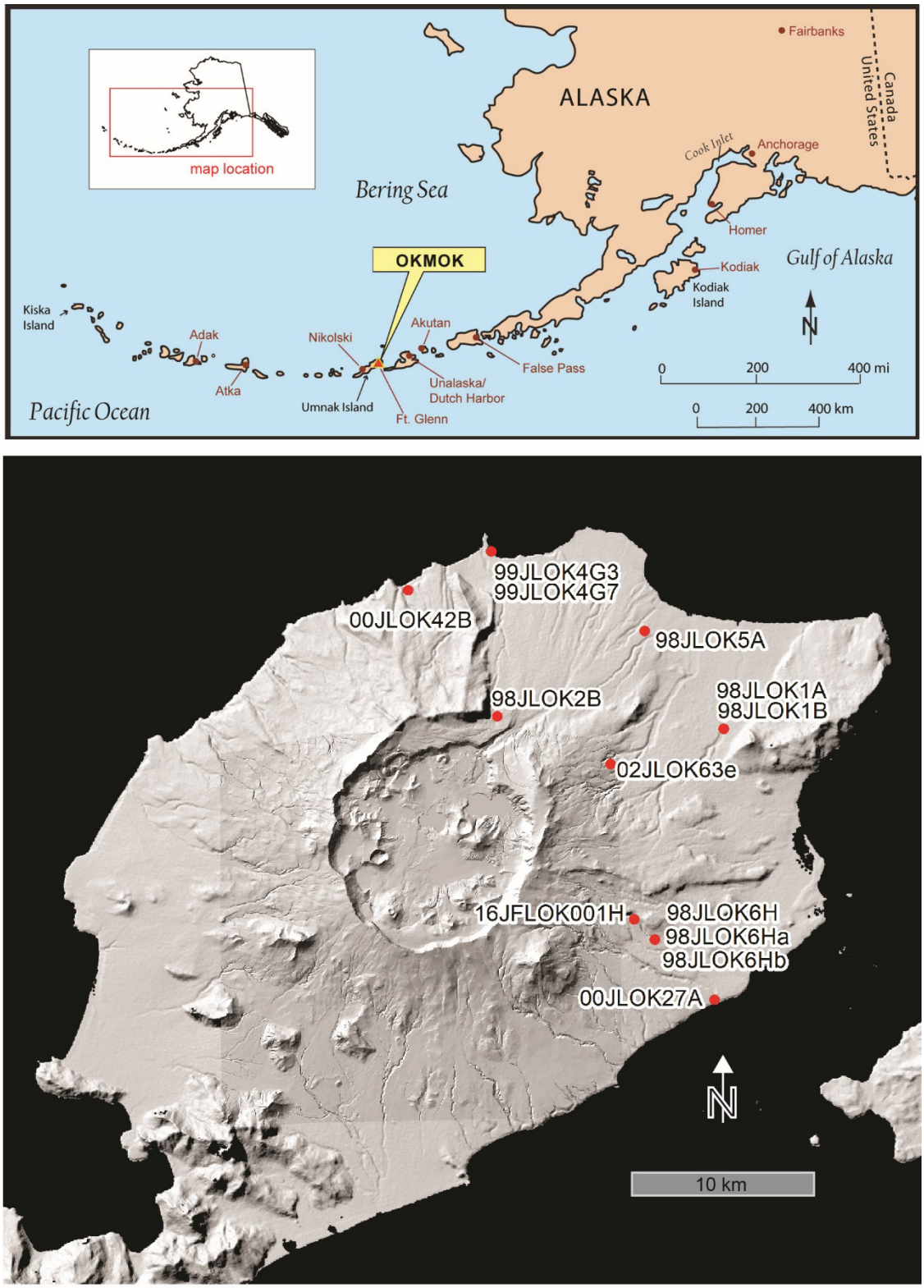

Figure 1. Location map of samples presented in this report. Basemap shaded relief image from Schaefer (2005) and Schaefer and others (2012).

The analytical data associated with this report is available in digital format as .csv (https://doi.org/10.14509/30853) and in .html and .csv from the AVO Geochemical Database (https://avo.alaska.edu/geochem; Cameron and others, 2019). Sample descriptions, locations, and types are included in the metadata associated with the analytical data table. Samples collected during this project, including hand sample material, remaining powder from these whole-rock analyses, and partially crushed sample remains are currently stored at the Alaska Geologic Materials Center in Anchorage.

DOCUMENTATION OF METHODS

Sample Preparation and Analysis Methods

Electron probe microanalyses were collected from commercially prepared polished thin sections. Thin sections were carbon-coated using an Edwards System carbon coater in the Advanced Instrumentation Laboratory (AIL) at the University of Alaska, Fairbanks. Electron microprobe analyses were obtained using the AIL JEOL JXA -8530F Electron Probe Microanalyzer, with five wavelength dispersive spectrometers all with large area crystals.

Metadata, including count times, spectrometers, percent error on each atom, and working standard data from each mineral phase or glass analytical session is reported in the accompanying data tables. Briefly, analytical conditions were set to 15 keV and 10 or 25 nA, with a focused beam for the mineral phases and a de-focused, 10-micron diameter beam for the glass analyses to mitigate sodium drift. Sodium (Na) was analyzed first on spectrometer four or five, and a self-calibrating, timed intensity correction was applied to the glass analyses to correct for decreasing Na counts due to migration away from the spot.

The glass data reported here are normalized to 100 percent volatile-free compositions, with original totals reported. Mineral core-to-rim transect analyses are reported for plagioclase and pyroxenes, along with the backscattered electron images from each grain, annotated by a red arrow to show the transect location and direction (app. A). Mineral analyses that do not include transects consist of core and rim data points, or single points on individual microlites.

ACKNOWLEDGEMENTS

This material is based on Alaska Volcano Observatory work supported by the U.S. Geological Survey in a cooperative agreement with the UAF Geophysical Institute and under Cooperative Agreement No. G19AC00060 to the Alaska State Division of Geological & Geophysical Surveys. We thank the Advanced Instrumentation Laboratory in the College of Natural Sciences and Mathematics at the University of Alaska, Fairbanks, and Ken Severin for making the facility available to researchers and assistance with the instrumentation. We thank Tina Neal, James Begét, and Chris Nye for their dedication and contributions to the Okmok geologic mapping effort. Bering Pacific Ranches Ltd. supported this work through lodging and logistics support. Access to Umnak Island was by charter flights or boat from the Port of Dutch Harbor. Maritime Helicopters and pilots Bill Springer, Rick Farrish, and Jon Combs provided efficient, safe, and professional transportation in the field areas.

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APPENDIX A.

Images of the individual mineral grains showing the location of the transects analyzed by electron microprobe (EPMA). Each image is labeled with the sample and transect number that correlates with the analyses reported in the geochemical database.

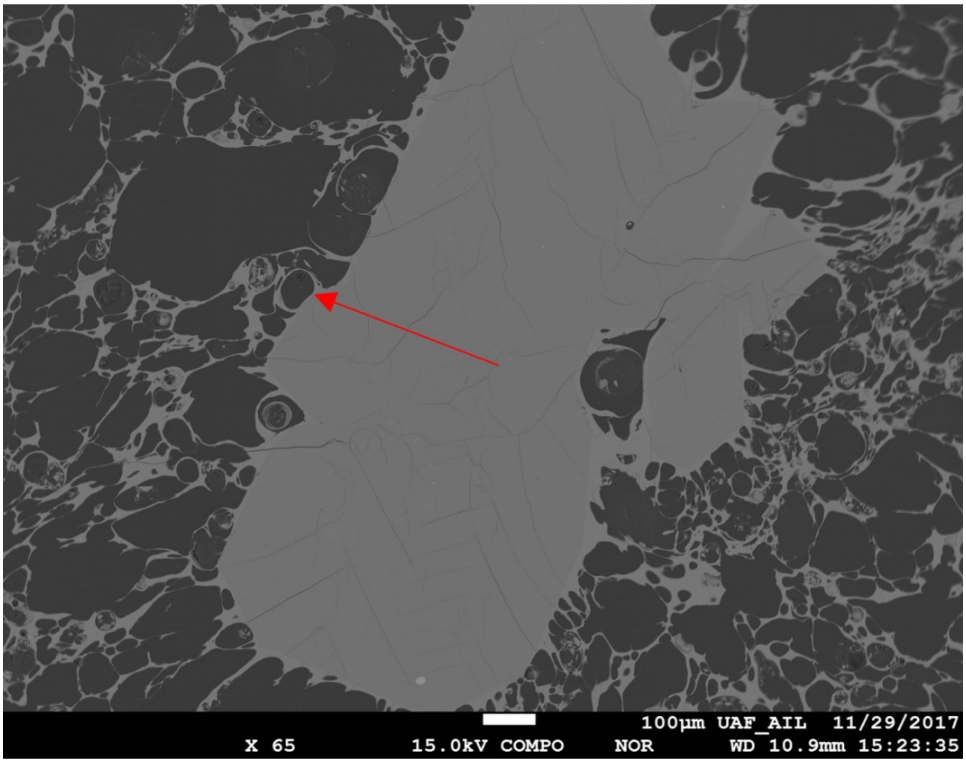

Figure A1. 00JLOK42B Plagioclase Transect 1.

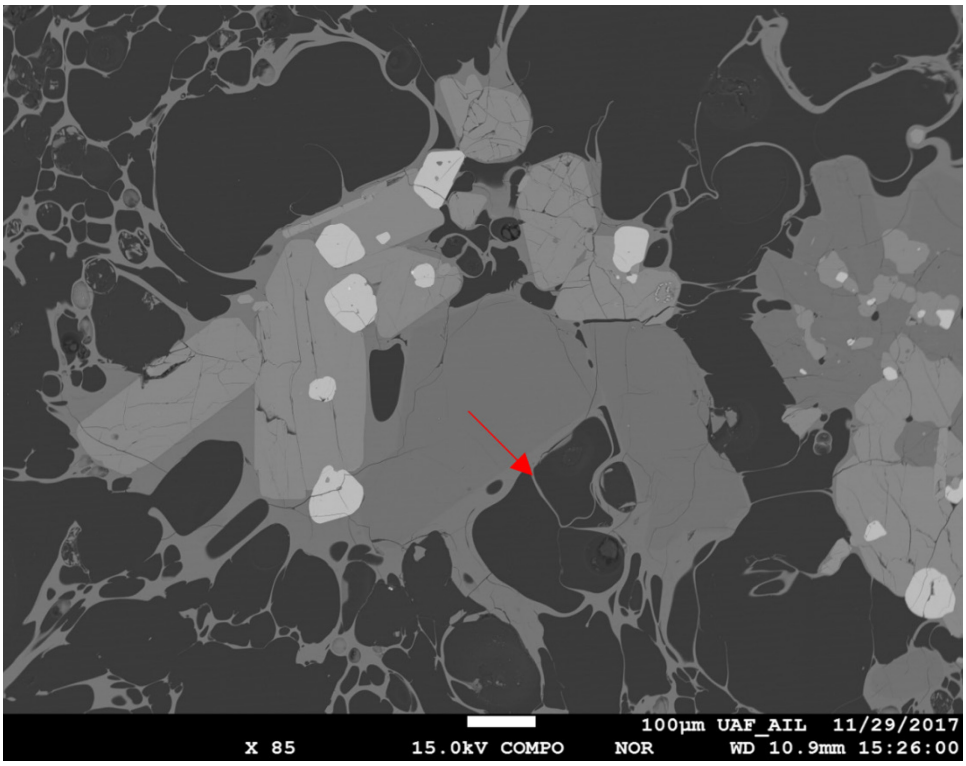

Figure A2. 00JLOK42B Plagioclase Transcect 2.

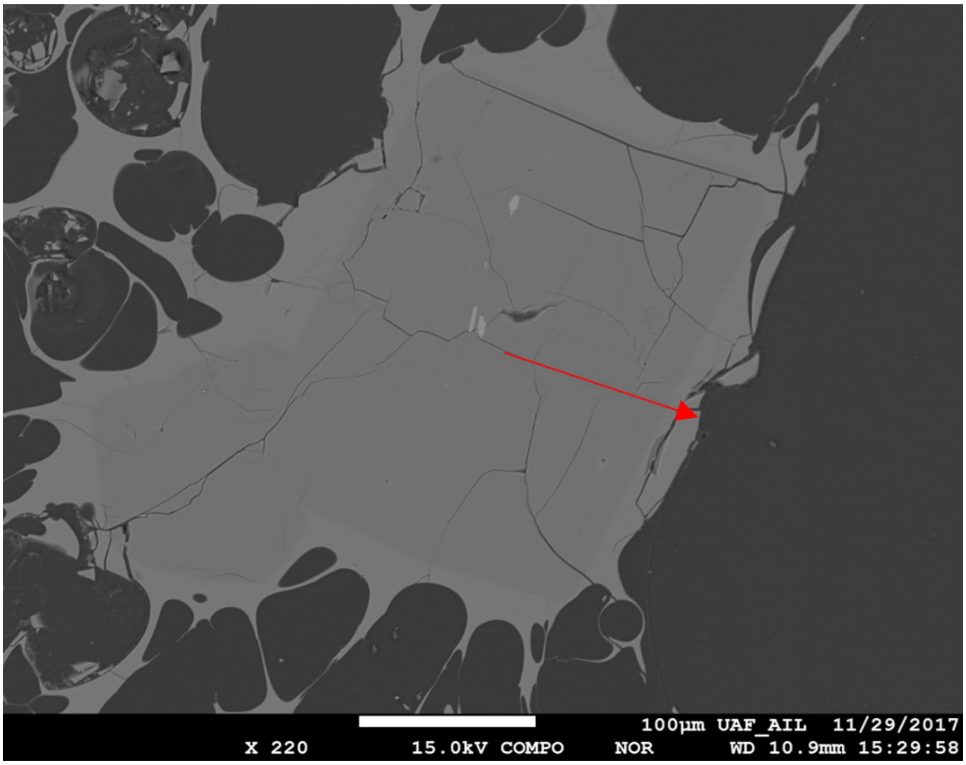

Figure A3. 00JLOK42B Plagioclase Transcect 3.

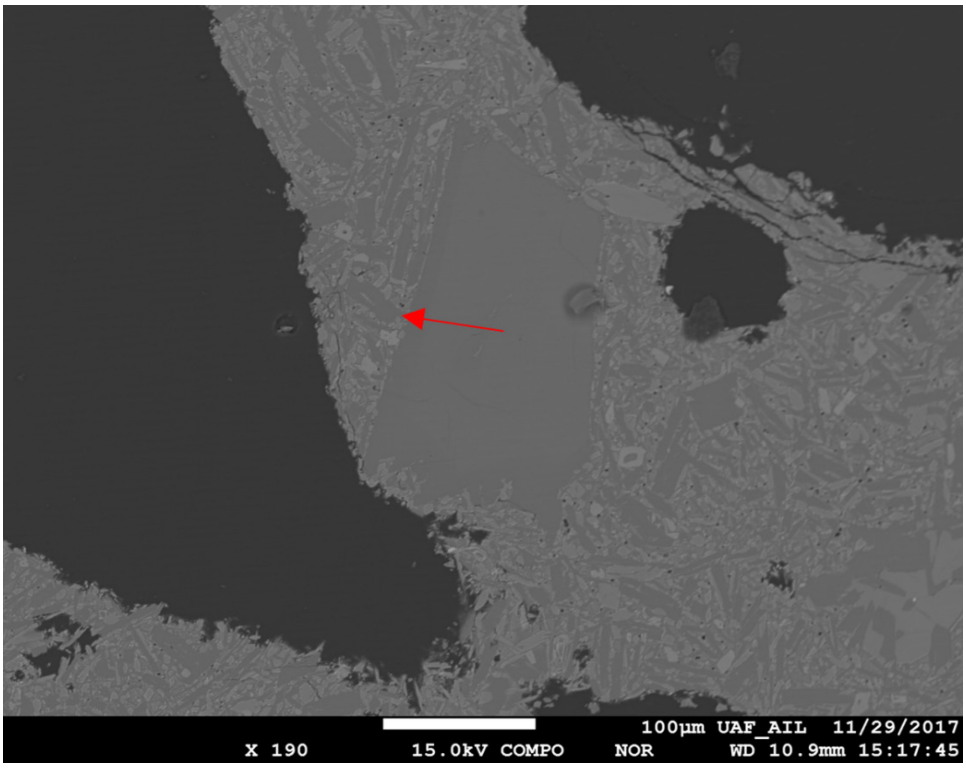

Figure A4. 99JLOK4G7 Plagioclase Transect 1.

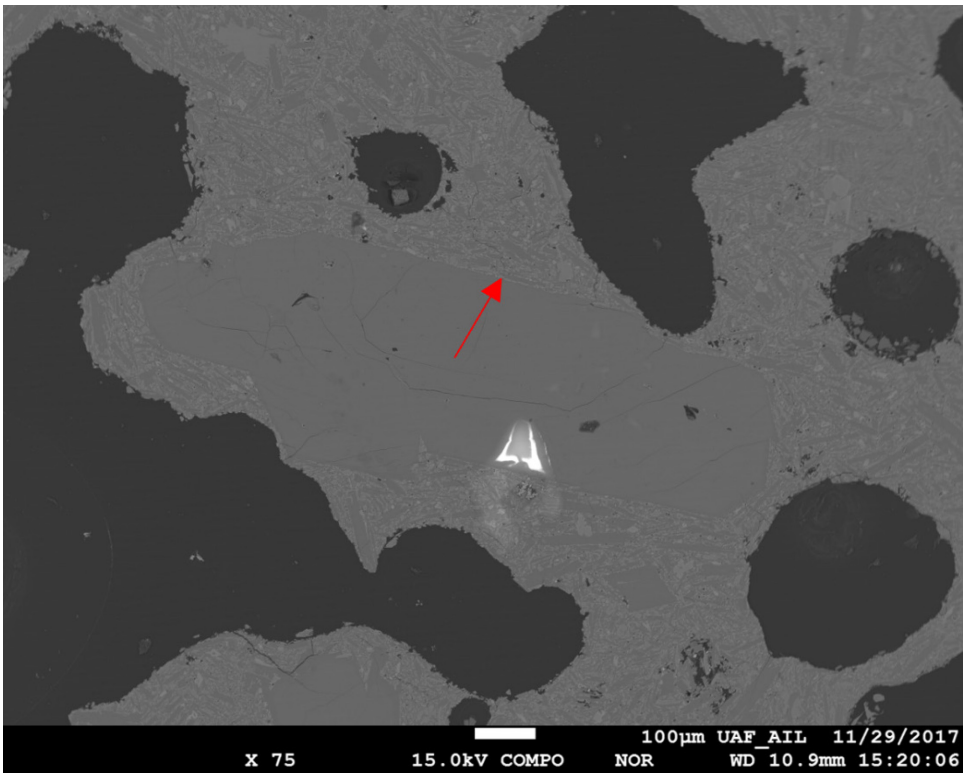

Figure A5. 99JLOK4G7 Plagioclase Transect 2.

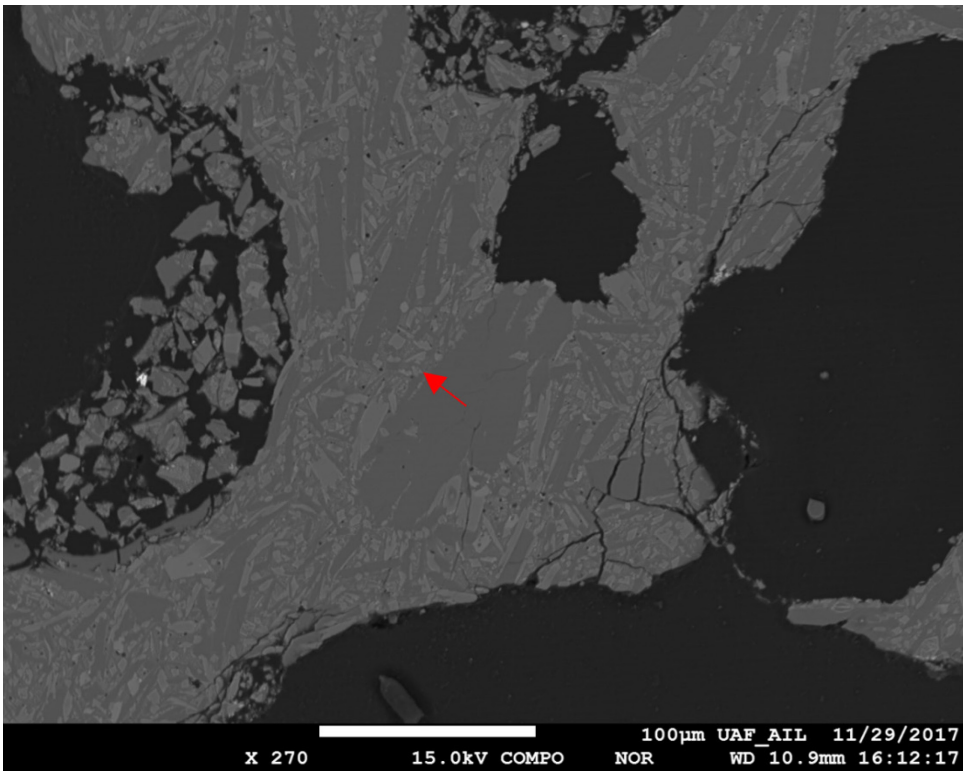

Figure A6. 99JLOK4G7 Plagioclase Transect 3.

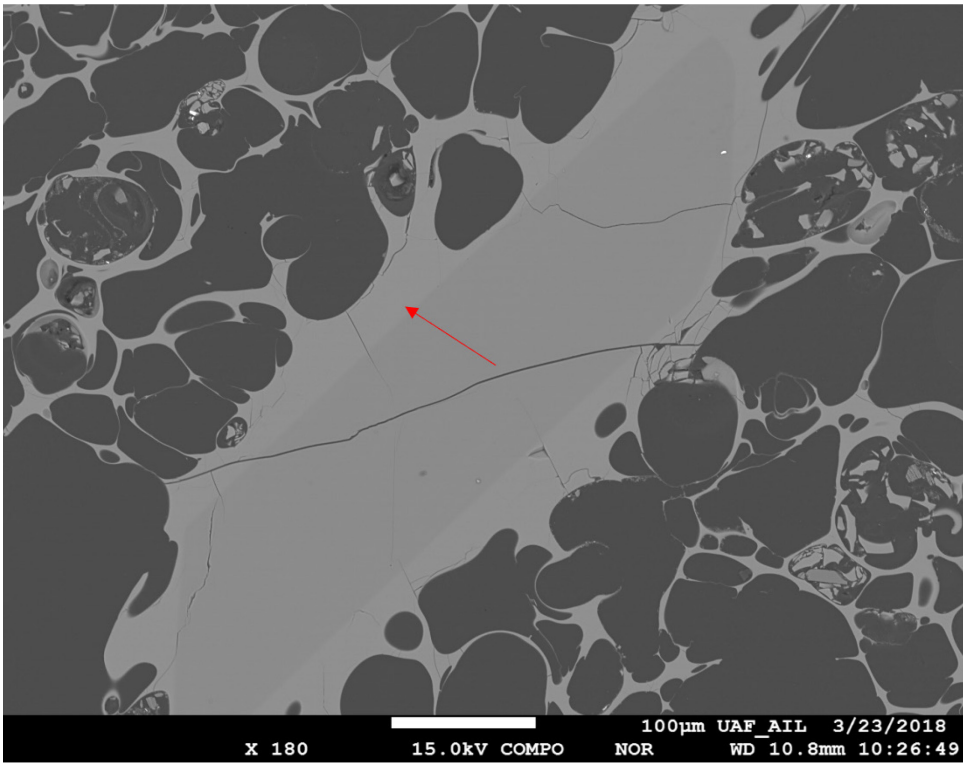

Figure A7. 00JLOK42B Plagioclase Transect 4.

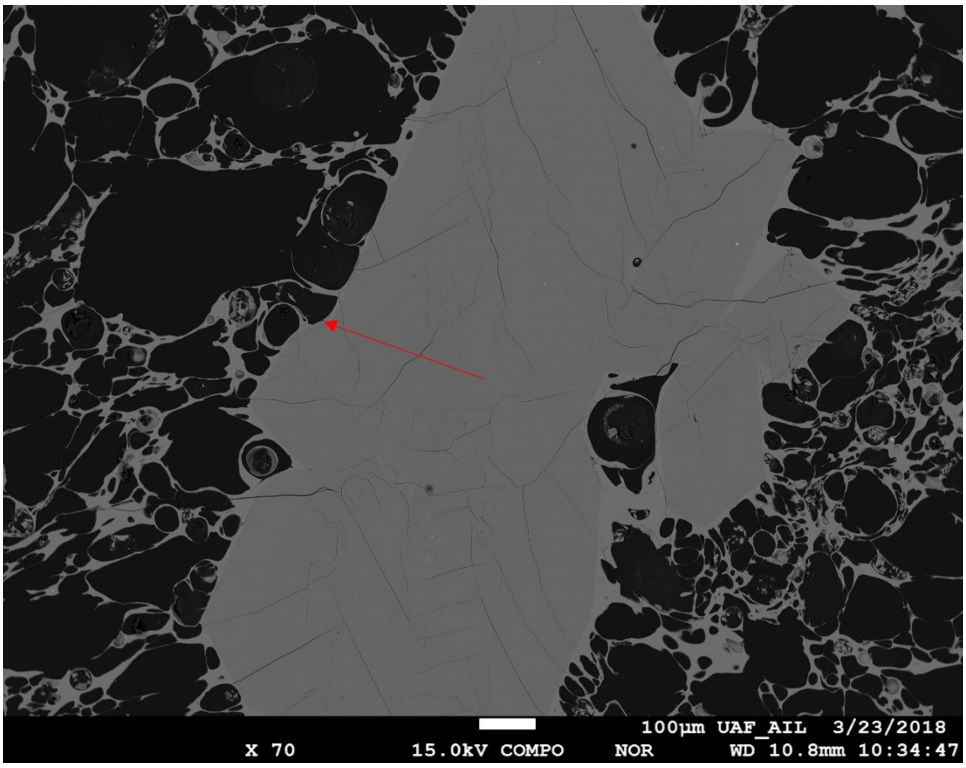

Figure A8. 00JLOK42B Plagioclase Transect 5.

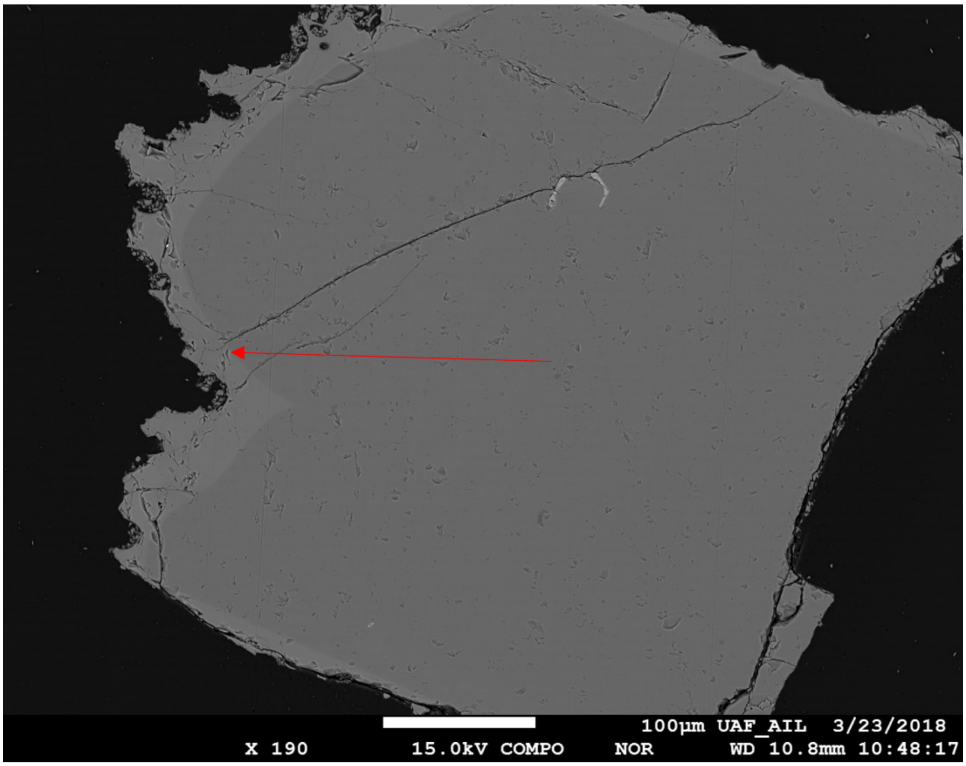

Figure A9. 02JLOK63e Plagioclase Transect 1

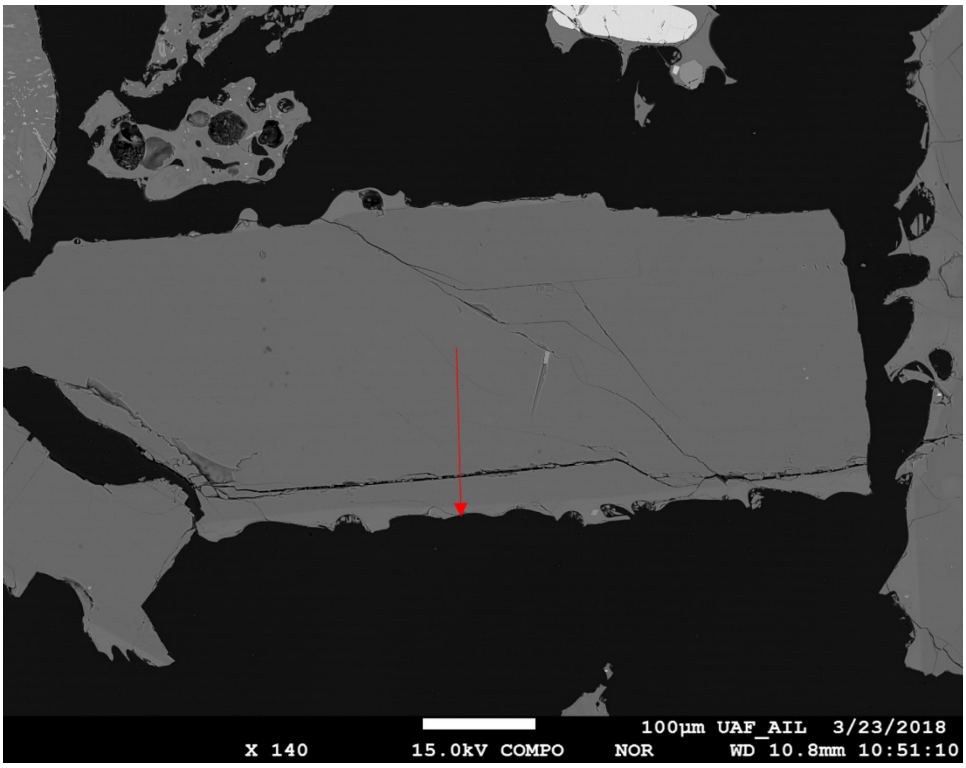

Figure A10. 02JLOK63e Plagioclase Transect 2.

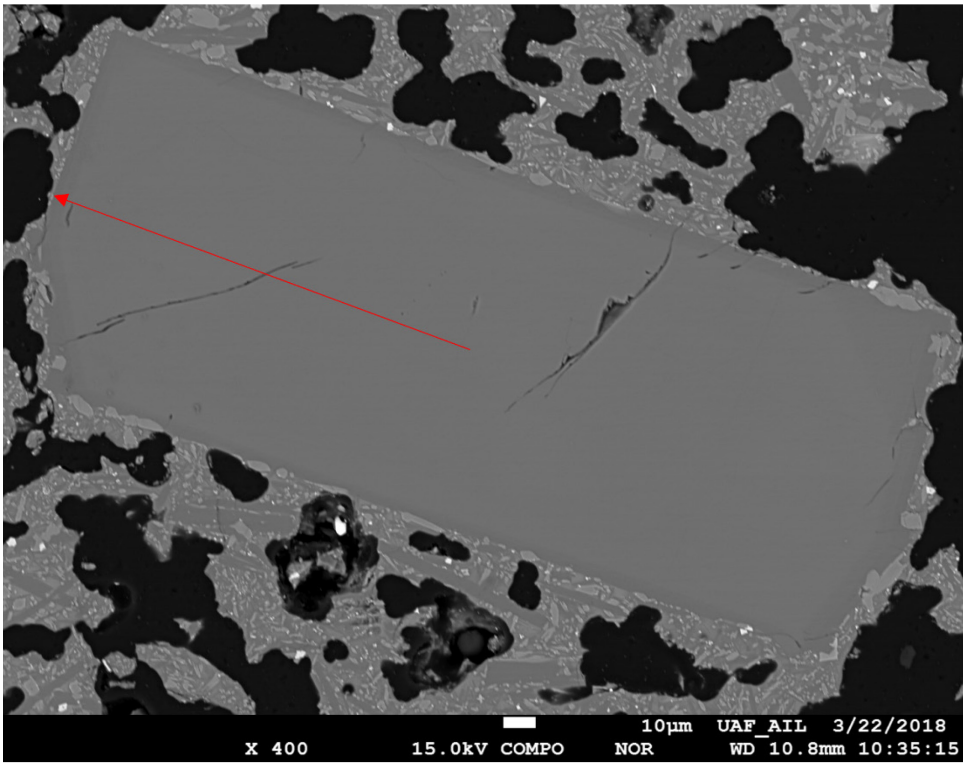

Figure A11. 98JLOK1B Plagioclase Transect 1.

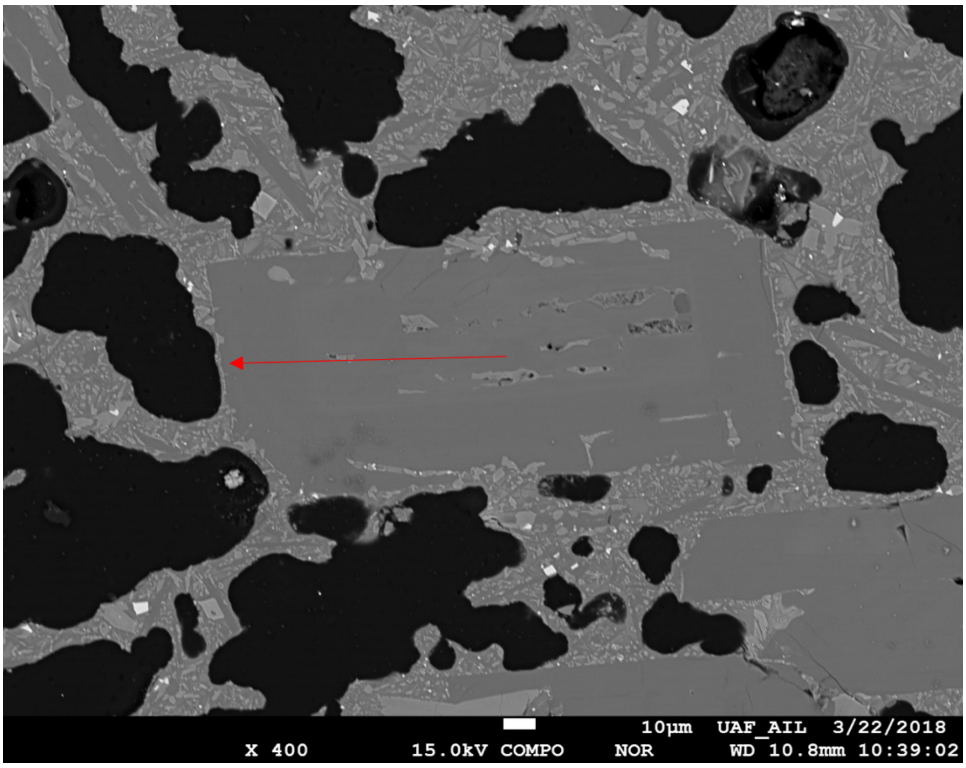

Figure A12. 98JLOK1B Plagioclase Transcect 1

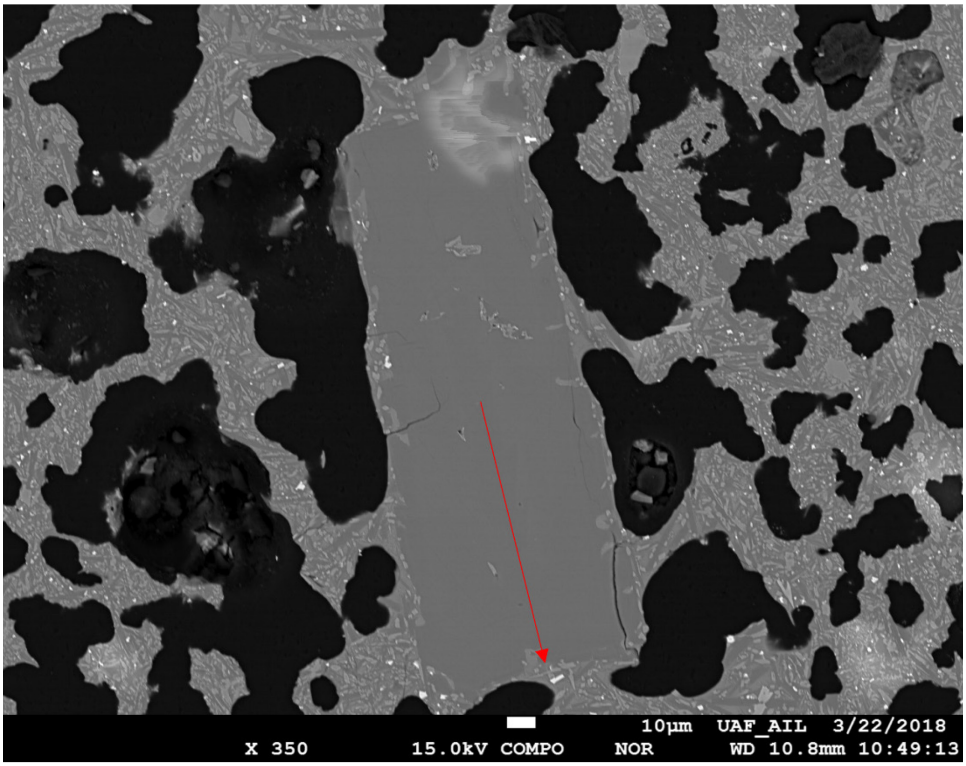

Figure A13. 00JLOK27A Plagioclase Transect 1.

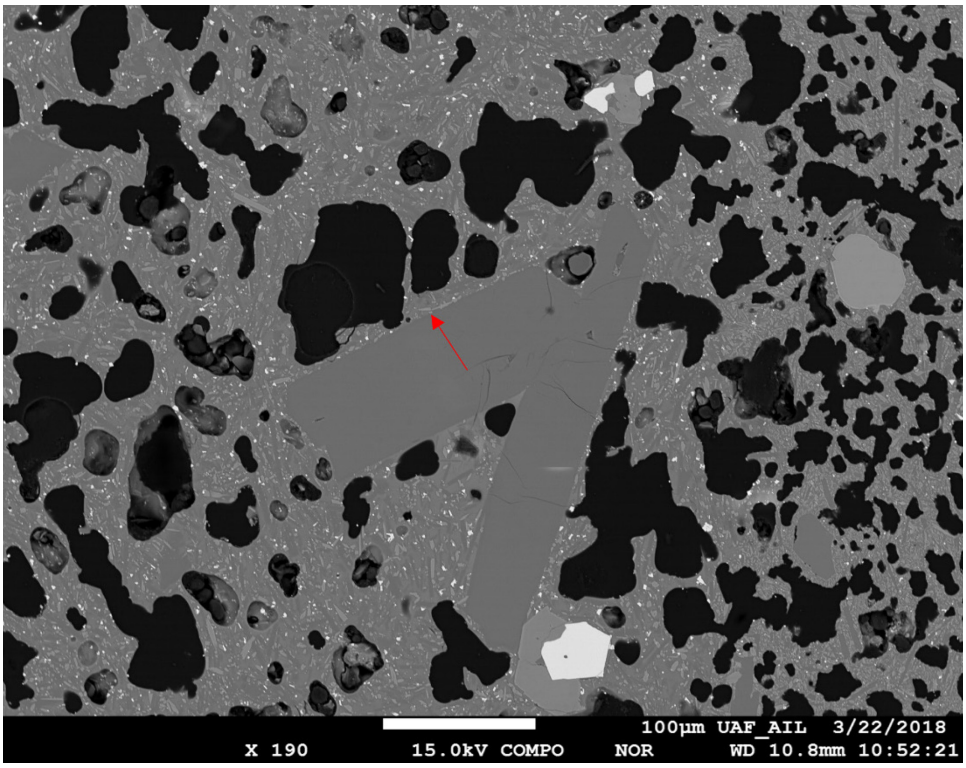

Figure A14. 00JLOK27A Plagioclase Transcect 2.

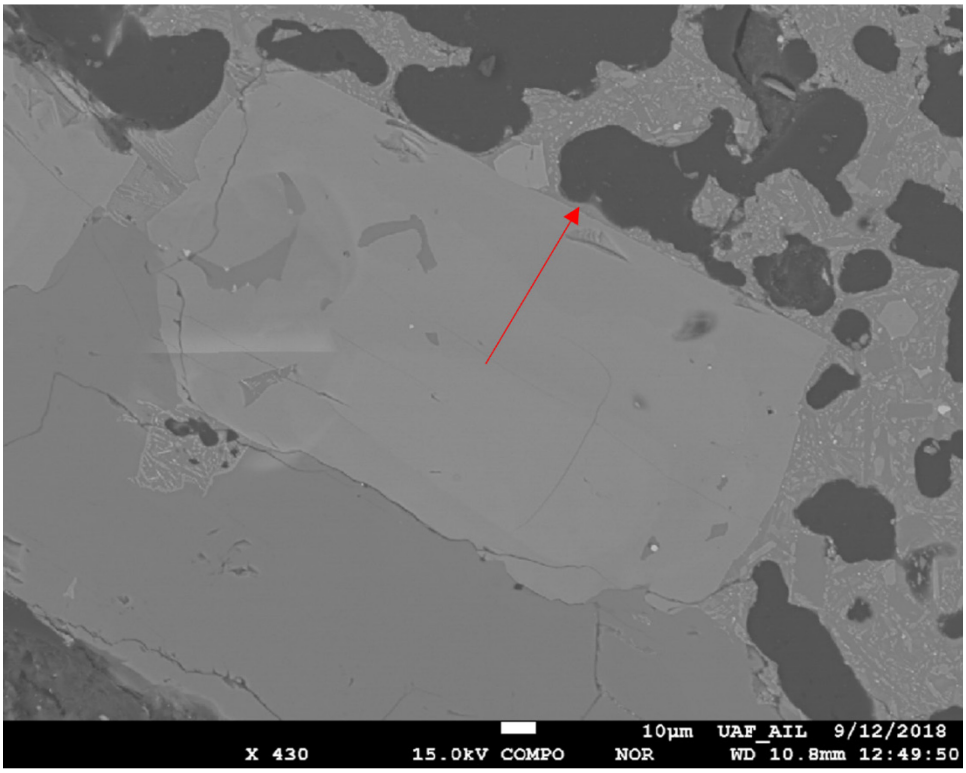

Figure A15. 98JLOK5A Clinopyroxene Transect 1.

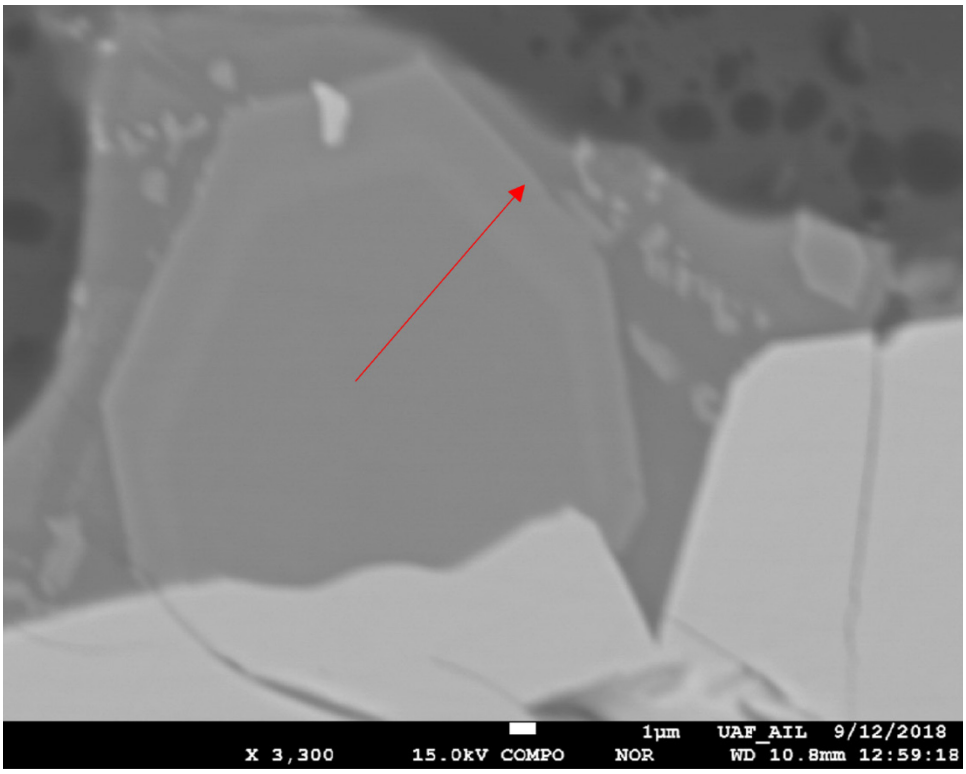

Figure A16. 98JLOK5A Clinopyroxene Clot Transect 3.

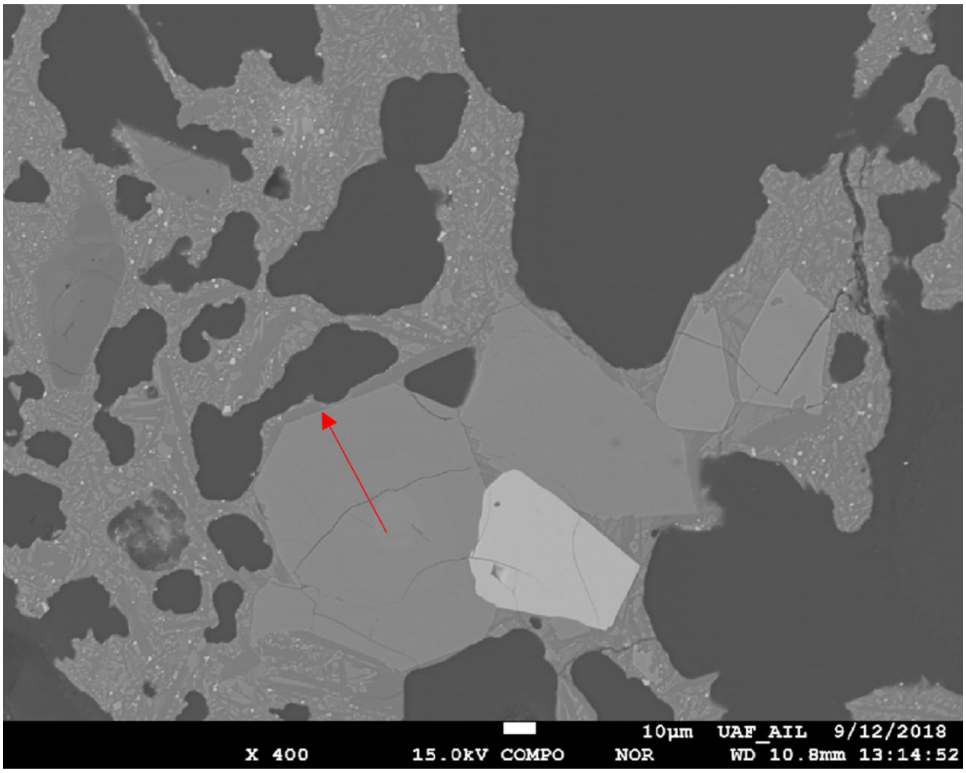

Figure A17. 00JLOK27A Clinopyroxene Clot 1 Transect.