

Cathodoluminescence zoning images of Lower El Cajete quartz and sanidine crystals, Valles Caldera, New Mexico, USA (<https://doi.org/10.5880/fidgeo.2025.021>)

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2. Citation

When using the data please cite:

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Table of contents

1. Licence.....	1
2. Citation	1
3. Data Description.....	1
3.1. Sampling method.....	2
3.2. Analytical procedure	2
3.3. Data processing.....	2
4. File description	2
4.1. File inventory	2
4.2. File naming convention.....	2
4.3. Description of data tables.....	2
5. References.....	2

3. Data Description

The Valles Caldera, New Mexico, USA was created by two caldera-forming eruptions at ~1.6 and ~1.1 Myr. Since then, post-caldera activity has consisted of lava domes, lava flows, large explosive phases, and a hydrothermal system active today. Possibly the youngest eruption sequence, El Cajete, was emplaced 74.4 ± 1.3 ka (Zimmerer et al., 2016) and began with pyroclastic surges, followed by pyroclastic density currents (PDCs) and pumice-rich Plinian pyroclastic fall (Self et al., 1988).

The objective of this project was to characterize crystal grains from the early El Cajete sequence, in terms of morphology and textures, using scanning electron microscopy (SEM). The early El Cajete differs from the later part of the sequence in its greater stratigraphic and lithologic complexity, having been formed from not only pyroclastic fall (like the later El Cajete) but also surge beds and PDCs.

This dataset was collected under the national open access action at Istituto Nazionale di Geofisica e Vulcanologia, Sezione di Pisa SEM/EDS facility supported by WP3 ILGE – MEET project, PNRR – EU Next Generation Europe program, MUR grant number D53C22001400005. This allowed me to obtain the present dataset of 31 cathodoluminescence (CL) images of 30 quartz crystals and one sanidine crystal.

3.1. Sampling method

Laboratory: Depths of the Earth lab, Arizona State University, Tempe, AZ, USA

El Cajete Units A, B, and C crystals were collected as part of bulk pumice sampling efforts. The 1-2 mm and 0.5-1 mm size fractions were then handpicked for quartz and sanidine crystals. The crystals were individually mounted in epoxy disks ~0.345 inches in diameter and polished in the Depths of the Earth lab at Arizona State University, USA. The samples were carbon coated at the INGV Pisa SEM/EDS facility before analysis. The samples do not have IGSNs.

3.2. Analytical procedure

Laboratory: Laboratorio di Microscopia Ottica Ed Elettronica (SEM-EDS), Istituto Nazionale di Geofisica e Vulcanologia, Pisa, Italy

The CL detector is part of a ZEISS EVO101 SEM. The SEM acquired high-magnification CL images at high resolution (3072x2304 pixels) at high vacuum conditions (10-5 mbar).

3.3. Data processing

Image files were edited for brightness and contrast in Apple Photos.

4. File description

The file 2025-021_Kim-et-al_ABC-crystals.zip includes the SEM images in Tag Image File format.

4.1. File naming convention

2025-021_Kim-et-al_LetterNumber.tif where the letter represents either Unit A, B, or C and the number represents the sample number.

5. References

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- Self, S., Kircher, D. E., & Wolff, J. A. (1988). The El Cajete Series, Valles Caldera, New Mexico. In *Journal of Geophysical Research: Solid Earth* (Vol. 93, Issue B6, pp. 6113–6127). <https://doi.org/10.1029/jb093ib06p06113>
- Zimmerer, M. J., Lafferty, J., & Coble, M. A. (2016). The eruptive and magmatic history of the youngest pulse of volcanism at the Valles caldera: Implications for successfully dating late Quaternary eruptions. In *Journal of Volcanology and Geothermal Research* (Vol. 310, pp. 50–57). <https://doi.org/10.1016/j.jvolgeores.2015.11.021>