NicoNavi microscope videos for quantitative thin-section analysis

This data publication contains 20 microscope videos (AVI) acquired under crossed polars for use with the NicoNavi optical workflow. The files cover (i) standard stage-rotation videos (XPL), (ii) stage-rotation videos with a first-order red (λ) plate, and (iii) λ-plate tilt/focus-sweep sequences required for quartz optic-axis orientation analysis.

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1. Licence

2. Citation

When using the data please cite:

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The data are supplementary material to:
Furukawa, Tan; Tsujimori, Tatsuki (submitted): Quantitative Petrography from Thin-Section Videos: A Unified Optical Workflow for Grain-Scale Microstructure Analysis. Journal of Petrology (submitted; DOI pending).

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3. Data Description

Polarized-light microscopy remains a cornerstone of petrographic analysis, but most observations are still performed qualitatively. The NicoNavi workflow converts standard petrographic microscope videos into quantitative maps and grain-scale measurements by tracking intensity and interference-color evolution during continuous stage rotation under crossed polars, optionally augmented by λ-plate and tilt datasets for uniaxial-mineral optic-axis orientation analysis. This dataset provides the

example raw video files used in the accompanying manuscript (submitted to Journal of Petrology) to demonstrate maximum-intensity imaging, extinction-angle mapping, grain-size and shape statistics, and quartz c-axis orientation analysis. Videos were acquired on an Olympus BX53 polarizing microscope with cellSens Standard v4.2.1. The dataset includes (a) a Yamagami pelitic schist used for workflow illustration; (b) application examples including a microfossil from the Orikabetoge Formation (Japan), a Takashima dunite xenolith (Japan), an albite porphyroblast from the Yamagami metamorphic rocks (Japan), a Nameirizawa Formation sandstone (Japan), a synthetic quartz thin section (after Muto et al., 2011), and a Franciscan Complex blueschist-facies quartz schist (USA).

3.1.Sampling method

Rock specimens were prepared as standard petrographic thin sections for observation under a polarizing microscope. Natural samples include: a pelitic schist and an epidote amphibolite (Yamagami metamorphic rocks, Japan), a microfossil-bearing clast from a conglomerate in the Orikabetoge Formation (Iwate Prefecture, Japan), a dunite xenolith from Takashima (Saga Prefecture, Japan), and a sandstone from the Late Ordovician–Silurian Nameirizawa Formation (Japan). A synthetic quartz thin section (~20 µm thickness) equivalent to the configuration of Muto et al. (2011) and a blueschist-facies quartz schist from the Franciscan Complex (USA) are also included.

3.2.Analytical procedure:

All rotation videos were recorded under crossed polars on an Olympus BX53 polarizing microscope. Video acquisition was managed using cellSens Standard v4.2.1. For each field of view, the stage was rotated continuously through 360° while recording. For quartz optic-axis orientation analysis, additional datasets were acquired with a first-order red (λ) plate and a slightly tilted thin section: two focus-sweep videos of the tilted section (stage at 0° and 45°), a short reference clip of the horizontal section at 45°, a 360° λ-plate rotation video (horizontal section), and a 360° XPL rotation video without the λ plate (horizontal section).

3.3.Data processing

The NicoNavi workflow subsamples each rotation video into ~100 evenly spaced frames, registers the frame stack, and estimates the true stage rotation center and inter-frame angles from the images. From per-pixel intensity/color evolution over the full rotation, NicoNavi derives maximum-intensity images and extinction-angle maps, converts maximum-intensity colors to quantitative retardation via a calibrated Michel–Lévy palette, and extracts grain boundaries from the maximum-intensity image. Grain objects inherit optical and morphological descriptors, enabling phase classification via semi-supervised label propagation and phase-specific statistics (grain size, shape, and preferred orientation). For quartz datasets, λ-plate and tilt sequences are combined with the rotation stack to estimate optic-axis polarity and full optic-axis orientations.

4. File description

All provided data files are video files in AVI container format, recorded directly from the microscope camera software. The videos contain no audio. Codec, frame rate, and image dimensions depend on acquisition settings and can be inspected using standard tools (e.g., ffprobe). The image coordinate system is the camera sensor plane; stage angles refer to microscope-stage markings with 0° defined by the acquisition alignment procedure (see NicoNavi documentation).

4.1.File inventory

Folder structure follows the figure numbers of the accompanying manuscript. Each subfolder (fig1, fig9–fig12) contains the raw videos used to produce the corresponding figure panels. The table below lists every file and its role.

Folder	File name	Acquisition type	Sample / material	Purpose / related figure
fig1	fig1_yamagami_xpl.avi	XPL rotation (no λ plate)	Yamagami pelitic schist (Japan)	Workflow overview example (Fig. 1)
fig1	fig1_yamagami_lambda.avi	λ-plate rotation (stage 0–360°)	Yamagami pelitic schist (Japan)	Workflow overview / λ-plate example (Fig. 1)
fig9	fig9_orikabetoge_xpl.avi	XPL rotation (no λ plate)	Microfossil from Orikabetoge Formation conglomerate (Iwate, Japan)	Maximum-intensity imaging example (Fig. 9a,b)
fig9	fig9_takashima_xpl.avi	XPL rotation (no λ plate)	Dunite xenolith (Takashima, Saga, Japan)	Undulose extinction example (Fig. 9c,d)
fig9	fig9_yamagami_xpl.avi	XPL rotation (no λ plate)	Albite porphyroblast in epidote amphibolite (Yamagami metamorphic rocks, Japan)	Twin-domain extinction-angle map example (Fig. 9g,h)
fig9	fig9_cazadero_xpl1.avi	XPL rotation (no λ plate)	Franciscan blueschist (Cazadero area, USA)	Garnet sector-zoning example, field 1 (Fig. 9e,f)
fig9	fig9_cazadero_xpl2.avi	XPL rotation (no λ plate)	Franciscan blueschist (Cazadero area, USA)	Garnet sector-zoning example, field 2 (Fig. 9e,f)
fig9	fig9_cazadero_xpl3.avi	XPL rotation (no λ plate)	Franciscan blueschist (Cazadero area, USA)	Garnet sector-zoning example, field 3 (Fig. 9e,f)
fig9	fig9_cazadero_xpl4.avi	XPL rotation (no λ plate)	Franciscan blueschist (Cazadero area,	Garnet sector-zoning example,

			USA)	field 4 (Fig. 9e,f)
fig10	fig10_nameirizawa_xpl.avi	XPL rotation (no λ plate)	Nameirizawa Formation sandstone (Japan)	Grain morphology/statistics example (Fig. 10)
fig11	fig11_muto_etal_2011_xpl.avi	XPL rotation (no λ plate)	Synthetic quartz thin section (~20 µm; after Muto et al., 2011)	Quartz CPO validation dataset (Fig. 11)
fig11	fig11_muto_etal_2011_lambda.avi	λ-plate rotation (stage 0–360°)	Synthetic quartz thin section (~20 µm; after Muto et al., 2011)	Quartz CPO validation dataset (Fig. 11)
fig11	fig11_muto_etal_2011_tilt_0.avi	λ-plate tilt focus-sweep (stage 0°)	Synthetic quartz thin section (~20 µm; after Muto et al., 2011)	Quartz optic-axis inclination dataset (Fig. 11)
fig11	fig11_muto_etal_2011_tilt_45.avi	λ-plate tilt focus-sweep (stage 45°)	Synthetic quartz thin section (~20 µm; after Muto et al., 2011)	Quartz optic-axis inclination dataset (Fig. 11)
fig11	fig11_muto_etal_2011_horiz.avi	λ-plate horizontal reference clip (stage 45°)	Synthetic quartz thin section (~20 µm; after Muto et al., 2011)	Reference for extinction-color mapping (Fig. 11)
fig12	fig12_cazadero_xpl.avi	XPL rotation (no λ plate)	Franciscan Complex blueschist-facies quartz schist (USA)	Phase mapping + quartz CPO example (Fig. 12)
fig12	fig12_cazadero_lambda.avi	λ-plate rotation (stage 0–360°)	Franciscan Complex blueschist-facies quartz schist (USA)	Phase mapping + quartz CPO example (Fig. 12)
fig12	fig12_cazadero_tilt_0.avi	λ-plate tilt focus-sweep (stage 0°)	Franciscan Complex blueschist-facies quartz schist (USA)	Quartz optic-axis inclination dataset (Fig. 12)
fig12	fig12_cazadero_tilt_45.avi	λ-plate tilt focus-sweep (stage 45°)	Franciscan Complex blueschist-facies quartz schist	Quartz optic-axis inclination dataset (Fig. 12)

			(USA)	
fig12	fig12_cazadero_horiz.avi	λ-plate horizontal reference clip (stage 45°)	Franciscan Complex blueschist-facies quartz schist (USA)	Reference for extinction-color mapping (Fig. 12)

4.2.File naming convention

Files are named as: fig<FIGURE>_<SAMPLE>_<TYPE>.avi. <TYPE> encodes the acquisition class:

- xpl: crossed-polars (XPL) stage-rotation video without λ plate (0–360°).
- lambda: crossed-polars stage-rotation video with first-order red (λ) plate (0–360°).
- tilt_0 / tilt_45: λ-plate focus-sweep videos of a slightly tilted thin section at stage 0° or 45°.
- horiz: short λ-plate reference clip of the horizontal section at stage 45°.

Numeric suffixes (e.g., xpl1–xpl4) indicate different fields of view for the same figure/sample.

5. References

Furukawa, T.; Tsujimori, T. (submitted): Quantitative Petrography from Thin-Section Videos: A Unified Optical Workflow for Grain-Scale Microstructure Analysis. Journal of Petrology.

NicoNavi documentation (Data Acquisition): https://tan-furukawa.github.io/niconavi/acquisition/ (accessed 2025).

Muto, J., et al. (2011): (reference for synthetic quartz thin section configuration; see manuscript).