MOBI-DIC: A multi-sensor digital image correlation workflow and QGIS Plugin for displacement mapping

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MOBI-DIC **M**ulti-purp**O**se displacement **B**ehavior **I**dentifier **D**igital **I**mage **C**orrelation Tool

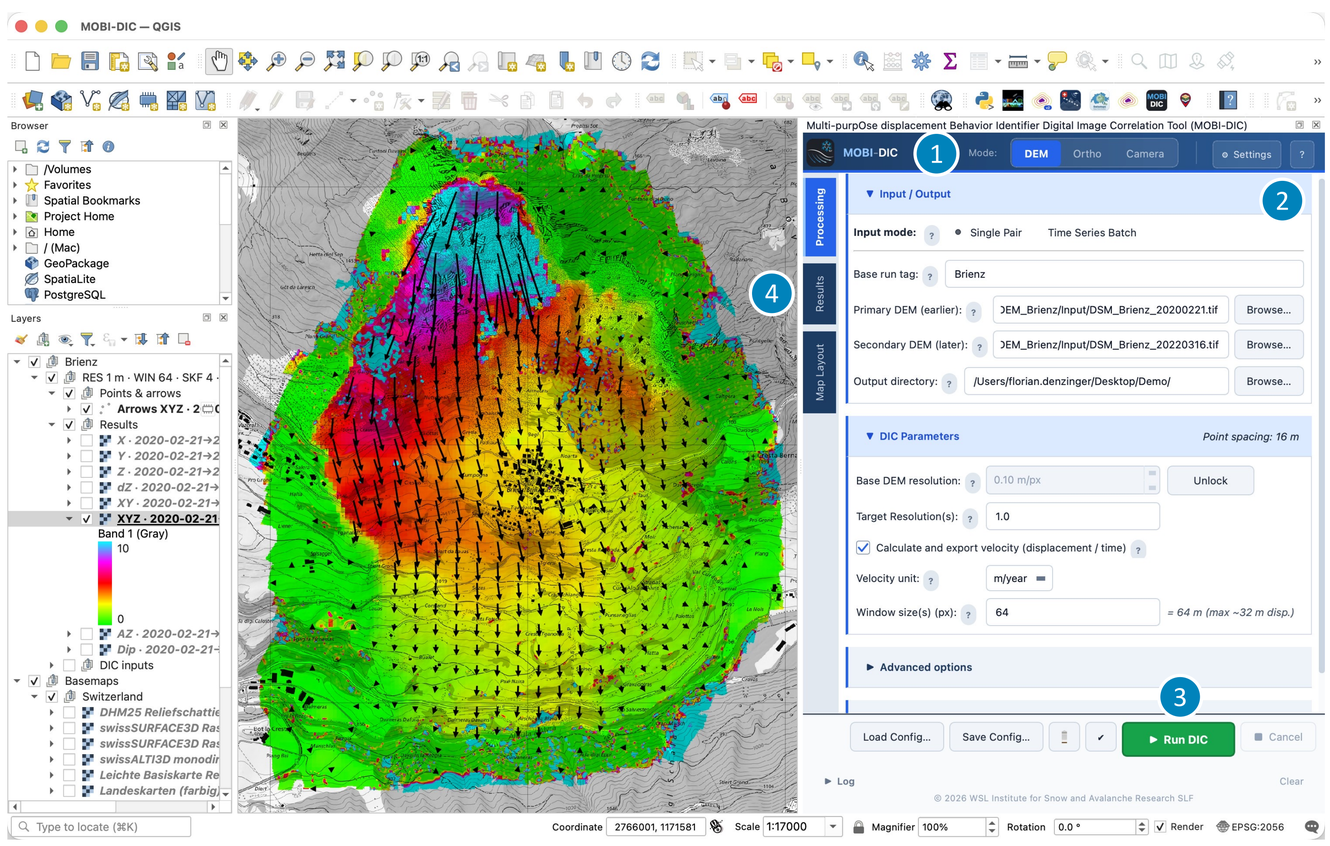
Sub-pixel displacement tracking across DEMs, satellite imagery and fixed cameras, run entirely **inside QGIS**.

Built for researchers and practitioners. Developed at SLF Davos by the Alpine Remote Sensing Group.

Why?

- GNSS and total stations are precise, but often sparse
- **DIC** adds dense, full-surface displacement fields
- Results are most useful in a GIS, combined with other data
- Running DIC should be easy, also without programming

1 MOBI-DIC in QGIS: from two images to a displacement map



Easy to run

1. Choose the mode: DEM, Ortho or Camera
2. Load two files or a time series
3. Press **Run DIC**: defaults are ready to use
4. Results load as styled maps and displacement arrows

☆ Built-in features

- Displacement arrows (vectors)
- Co-registration (optional)
- Outlier filters
- Time series
- Velocity export
- Automatic symbology
- Map Layout Builder
- Google Earth KMZ
- Save and load settings
- Command-line batch runs

Easy installation

- Install from a ZIP file
- One-click Python set-up
- QGIS 3.16–4.x, macOS, Linux, Windows

Interactive docs

- Step-by-step run guides
- Every parameter explained
- Online: scan the QR code

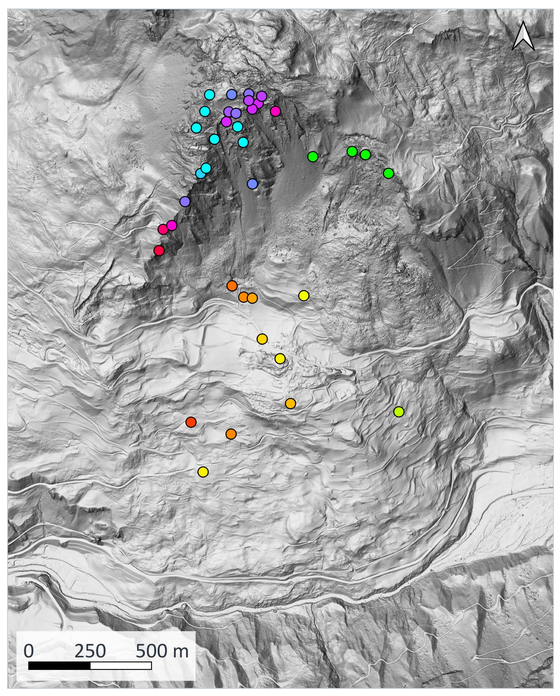
Works with: DEMs (GeoTIFF) · Orthophotos · Satellite scenes · UAV mosaics · Time-lapse cameras · Terrestrial photos

2 How it works: three modes, one workflow

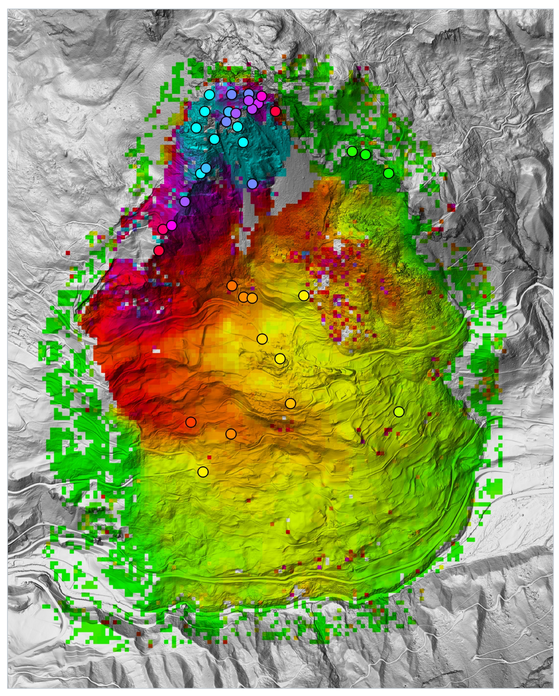
INPUT — choose a mode	WORKFLOW — same for all modes	OUTPUT — maps + arrows in QGIS
DEM 2 DEMs (GeoTIFF)	1 Feature image: hillshade, grayscale or orientation 2 Co-registration (optional) 3 Horizontal shift: FFT correlation 4 Vertical change with shift-back (**DEM only**) 5 Outlier filtering	**3D displacement** East-West, North-South, vertical, azimuth, dip
Ortho 2 orthoimages or satellite scenes		**2D displacement** East-West, North-South, azimuth
Camera 2 photos, no georeferencing		**2D displacement** X pixel shift, Y pixel shift, azimuth

3 Validation at the Brienz/Brinzauls landslide, 2020-2022

In-situ: GNSS & total station



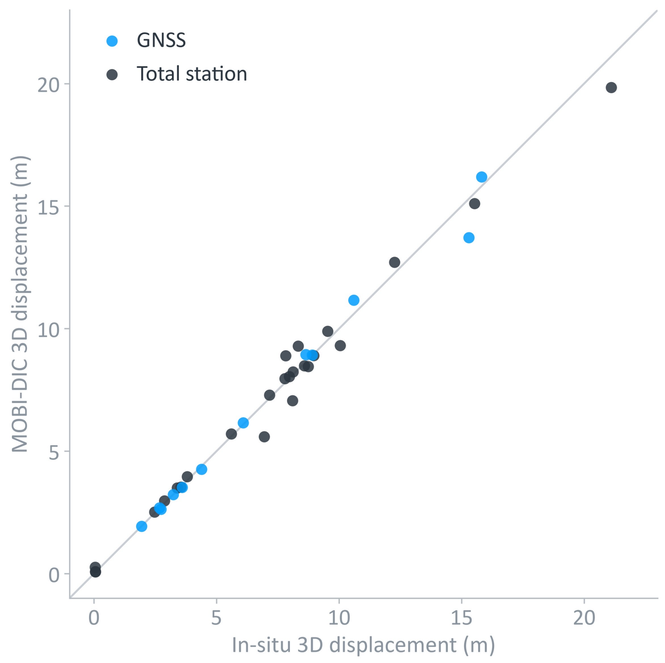
MOBI-DIC



3D displacement 2020-2022 (m)

0 2.5 5 7.5 ≥10

Validation: 3D displacement



MOBI-DIC from 1 m UAV DEMs (64 × 64 px windows). Circles: in-situ values (first map) and MOBI-DIC values at the same points (second map).

Key facts

0.34 m
mean absolute 3D error at 37 in-situ points

0.1 to >20 m
displacement range within one slope

~1 min
per run on a laptop (Brienz, 1 m resolution)

Take-home

- **One QGIS plugin** for DEM, orthophoto and camera data
- **From input files to maps and arrows** without programming
- **3D displacement from DEMs**, validated against GNSS and total stations

Get started

More info: scan the QR code

Contact: mobi-dic@slf.ch

References

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