



Goose-necks of the San Juan River, Utah

Investigation of Fault Control at Mather Gorge and Petrographic Analysis of Lamprophyre Dikes



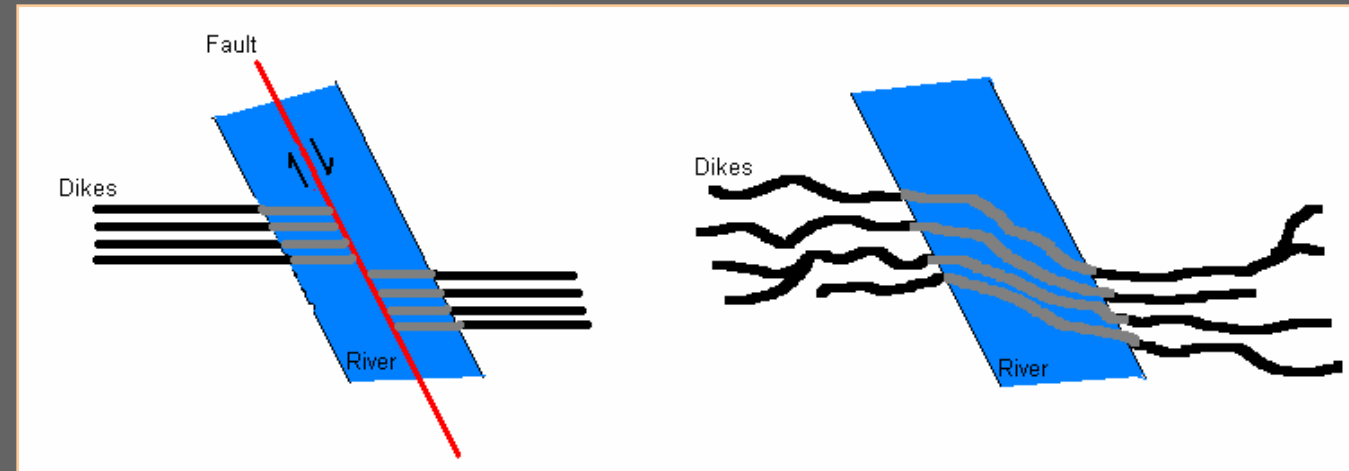
Grand Canyon of the Yellowstone River, Wyoming

Importance

This investigation will help answer the over-arching question of how river channels evolve. There are many examples of rivers incising through bedrock, and many of those examples differ in character from one another. The goose-necks of the San Juan River meander around tight curves, while the Yellowstone River erodes a relatively straight channel. In the case of the Potomac River, Mather Gorge is a deeply incised, narrow reach whose trend is speculated to be fault-controlled. Constraining the cause of the unusual incision of Mather Gorge can further our understanding of the erosive processes of rivers into bedrock.

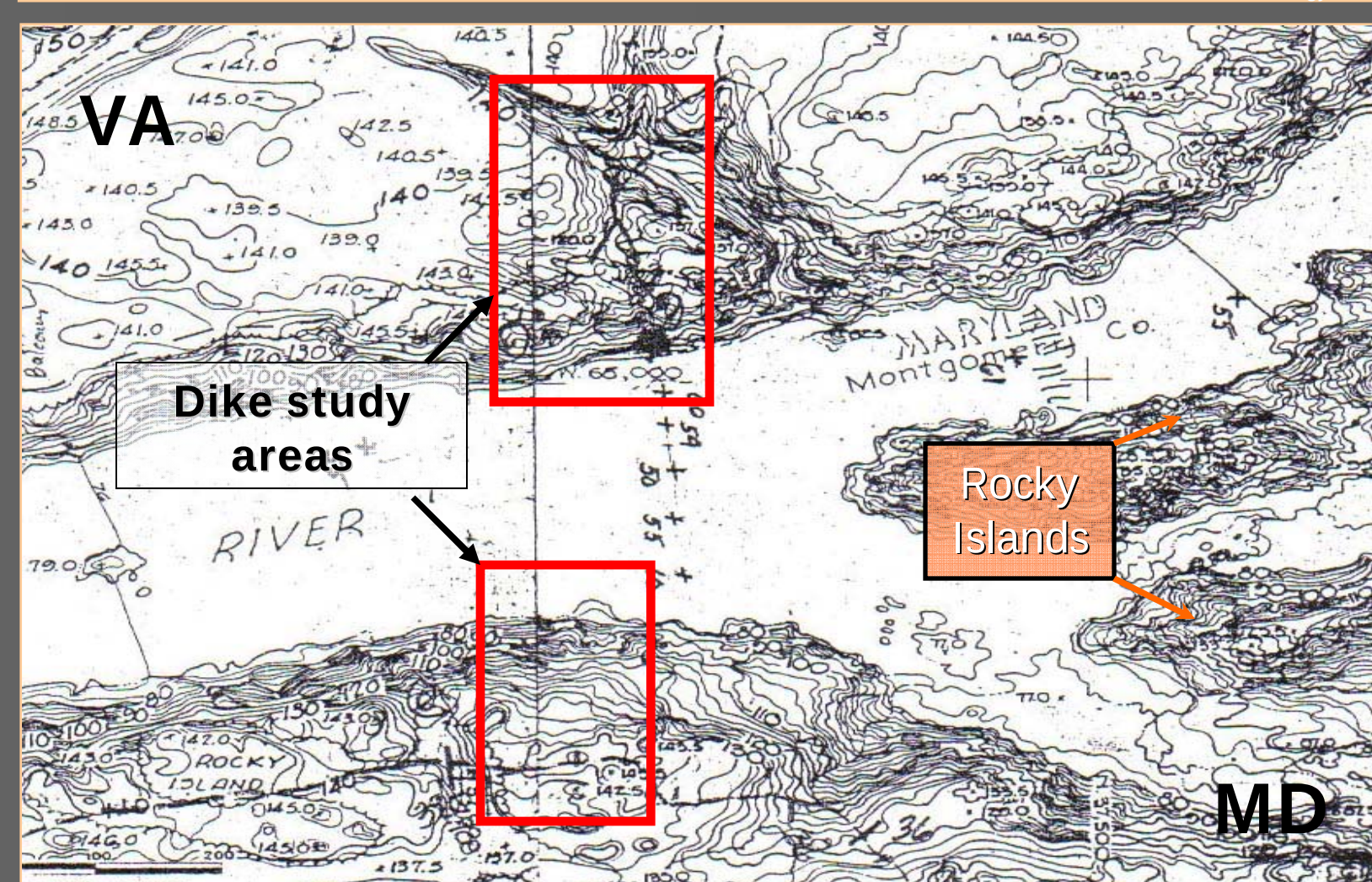
Hypotheses

1. The trend of Mather Gorge is not controlled by a fault.



2. There are multiple generations of biotite growth in the lamprophyre dikes at Mather Gorge.

Study Areas

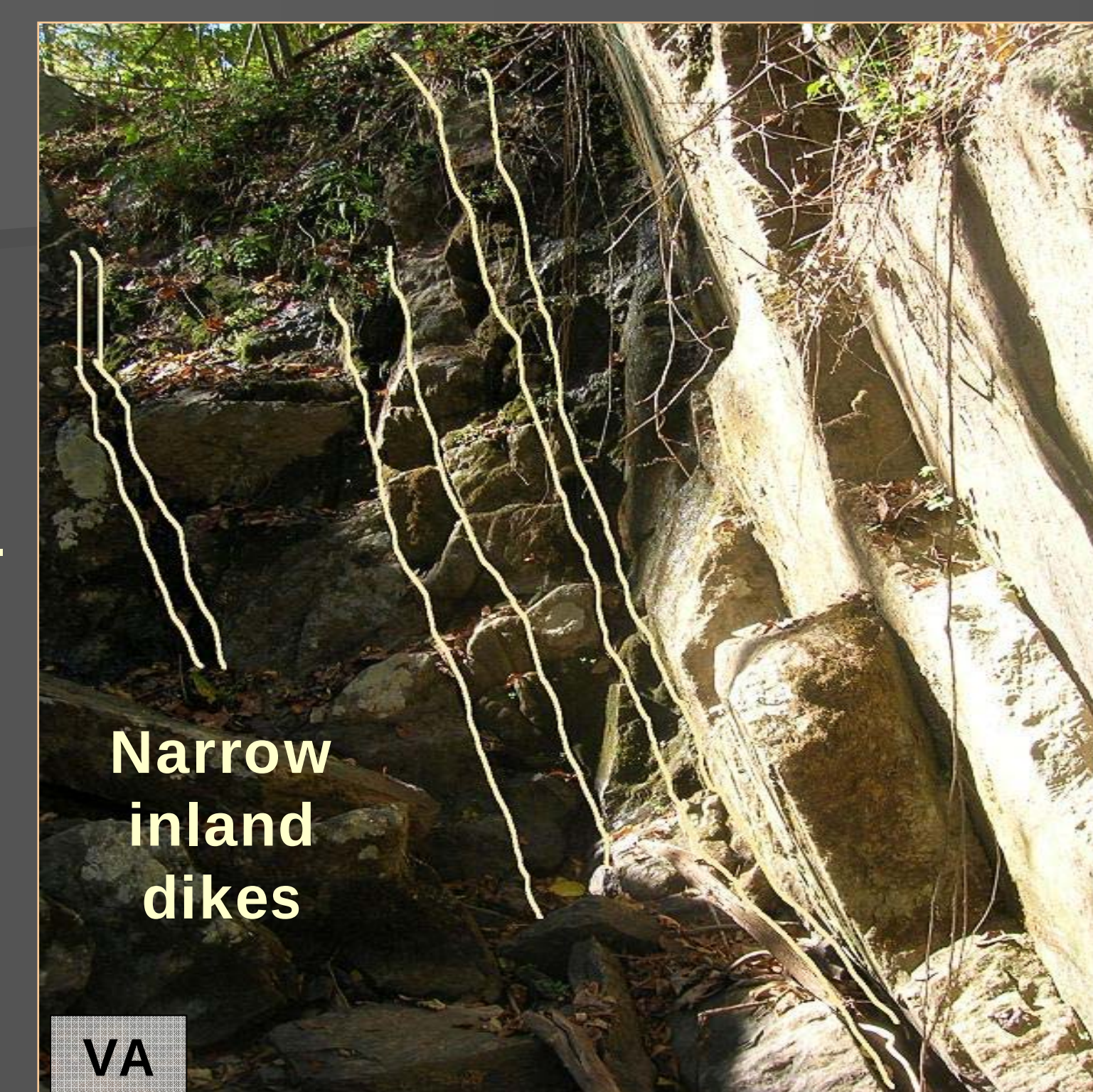
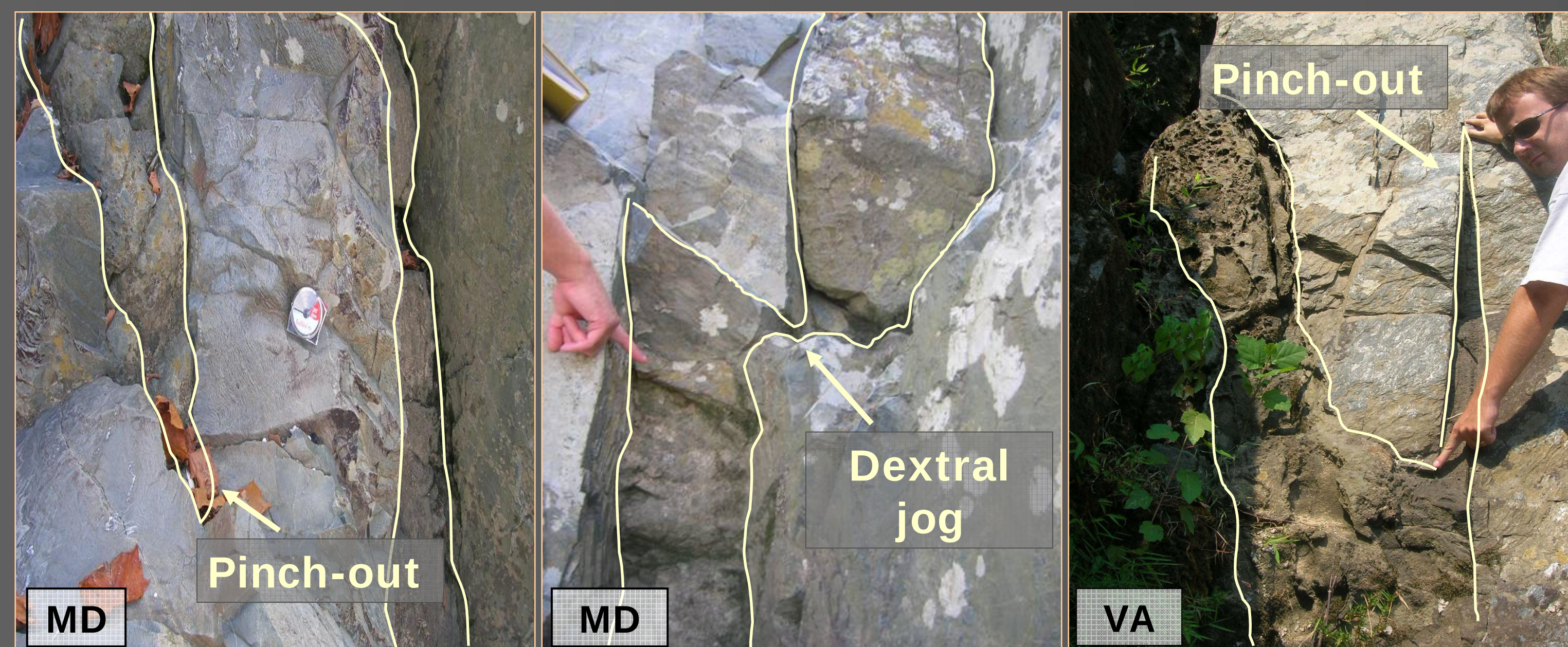
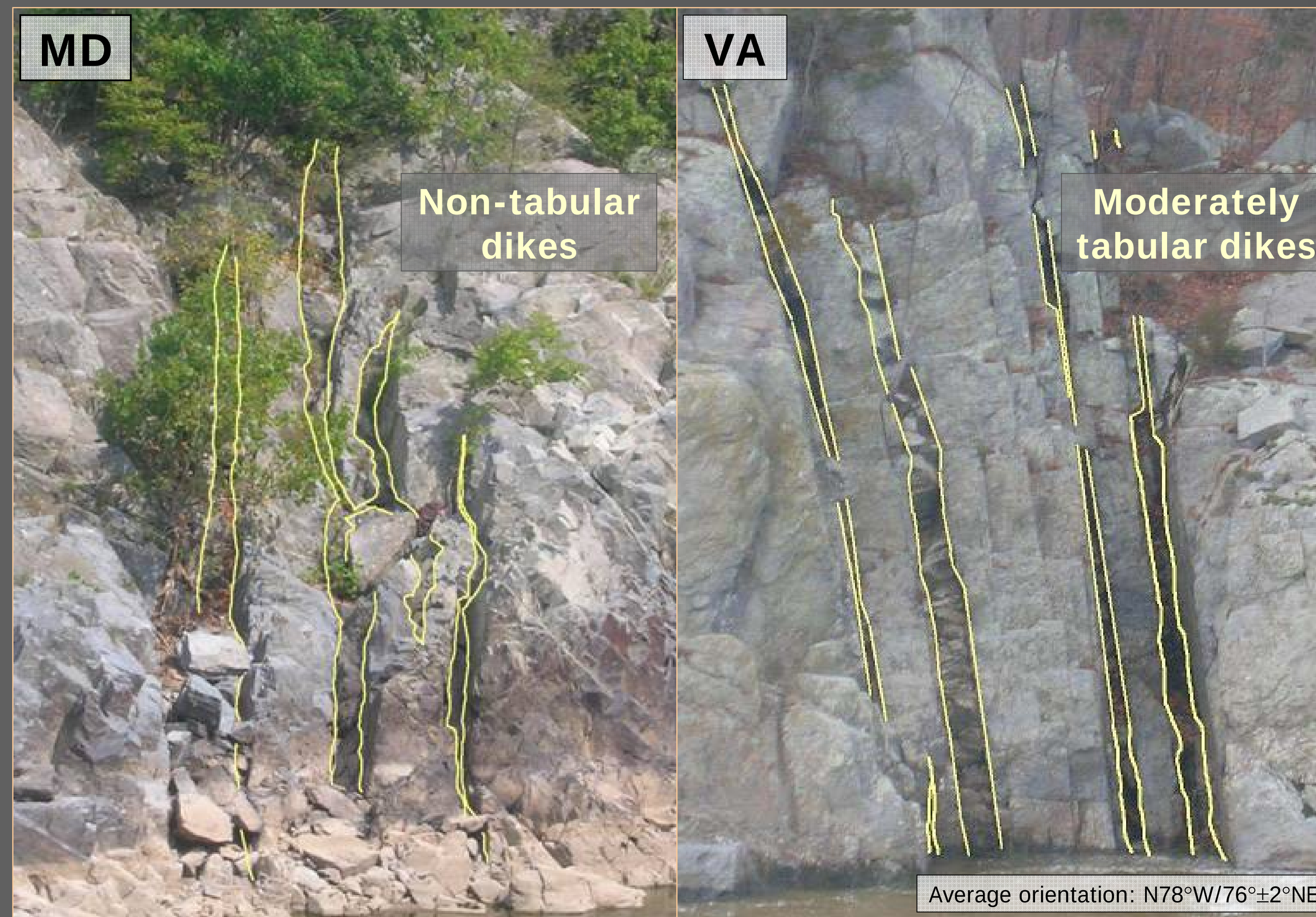


Methods

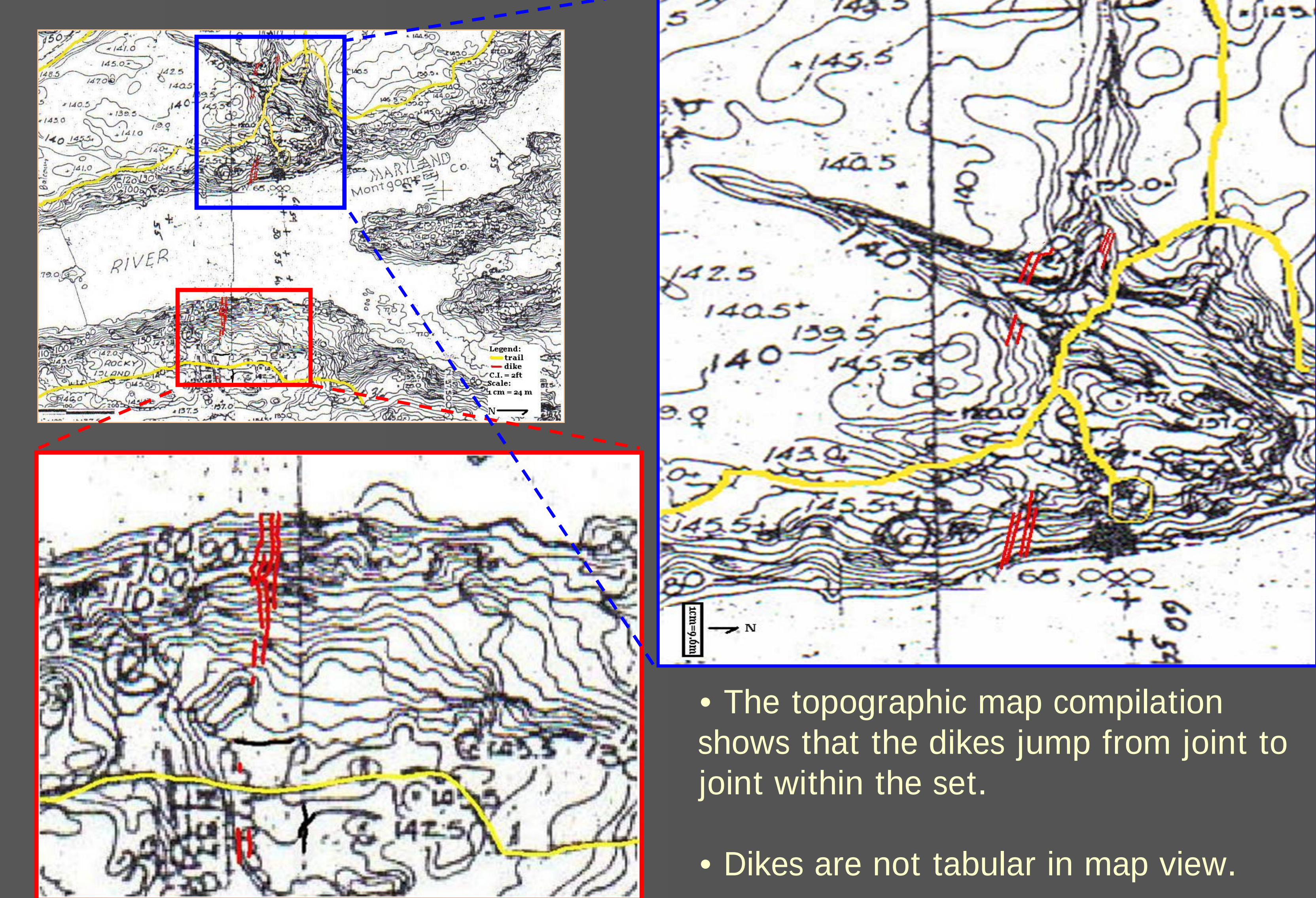
- Photograph and map the dikes in three dimensions using.
 - Use photographs for the vertical dimension; outcrops on cliff faces and steep walls.
 - Use topographic maps for the horizontal (map view) dimension.
 - Use visual indicators (dark, igneous rock; recessed joints in the wall rock) to trace the dikes for mapping.
 - Use a magnetometer to trace the dikes where vegetation and weathering have made them indistinguishable from their surroundings.
- Search for evidence of motion on the Rocky Islands to the north of the gorge.
- Analyze thin sections of lamprophyre to classify biotite generations.
 - Use a petrographic microscope to look for signs of foliation or differential growth patterns.

Casey Soneira
Advisor: Dr. Aaron Martin
Spring, 2007

Results



Results

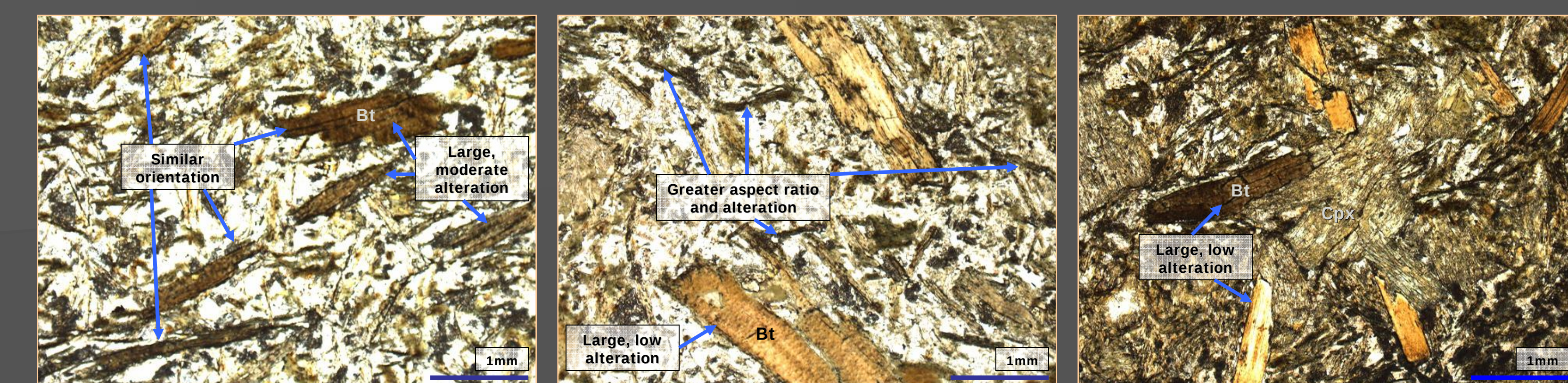


The fracture on the western Rocky Island shows evidence of movement.

Strike of fracture is not aligned with Mather Gorge.

Thin sections show at least two generations of biotite.

- Level of alteration
- Aspect ratio and size
- Orientation (sometimes)



Conclusions

- The ~25m offset of the dikes does not require a fault to be explained.
- Evidence of movement of a fracture on the Rocky Islands is present, however, it is not aligned with the gorge. The presence of said fracture does not simply explain the trend of Mather Gorge.
- Hypothesis 1 is confirmed.
- At least two generations of biotite exist in the lamprophyre dikes.
- Hypothesis 2 is confirmed.