

Motivation & Objective

AutoATES v2.0 uses a single, conservative alpha-angle parameter to model runout exposure, however observed runout varies widely in Western Canada. To represent this, AutoATES v3.0 uses two parameters, a typical and an infrequent alpha-angle, to model runout exposure, creating a need for regional calibration.

- In this project, we aim to:
- a) Estimate avalanche toe locations, thalwegs (flow paths), and crown locations with GIS tools
 - b) Process occurrence records with this data to create regional alpha-angle distributions
 - c) Determine parameters for AutoATES v3.0

Results & Discussion

- Applying occurrences to thalwegs, a path's alpha-angle distribution, histogram, and quantiles are created (Figure 1)
- Regionally, alpha-angle distributions (Figure 2) are calculated for a full and a size 3+ dataset

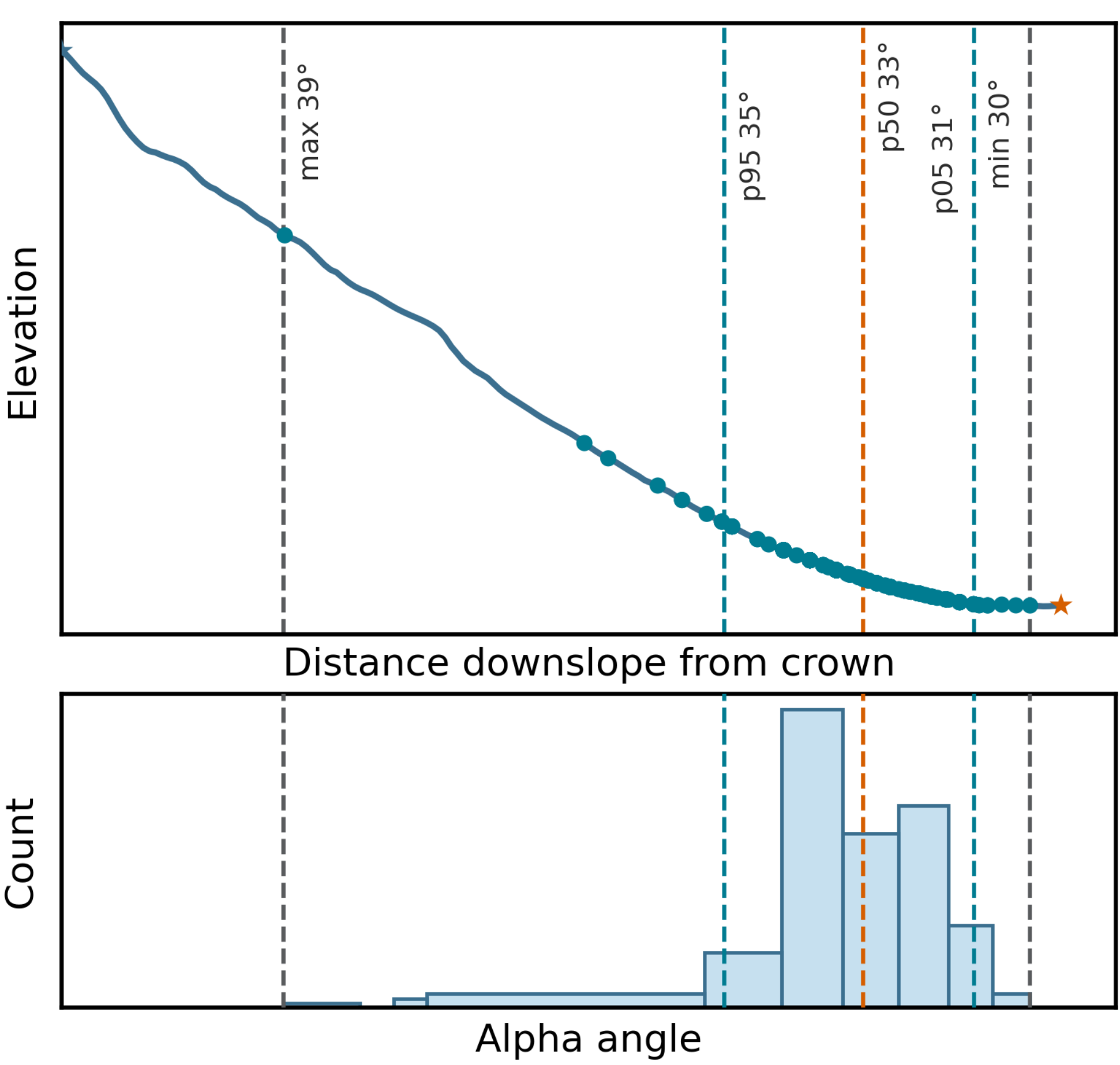


Figure 1: Avalanche toe location distribution over a path's thalweg; associated alpha-angle histogram and quantiles. Eagle, Bear Pass.

Alpha-angle uncertainty is driven by start- and end-zone quality, observational biases, DEM resolution, and thalweg selection.

With improvement to the method, typical and infrequent parameters can be statistically derived from regional distributions.

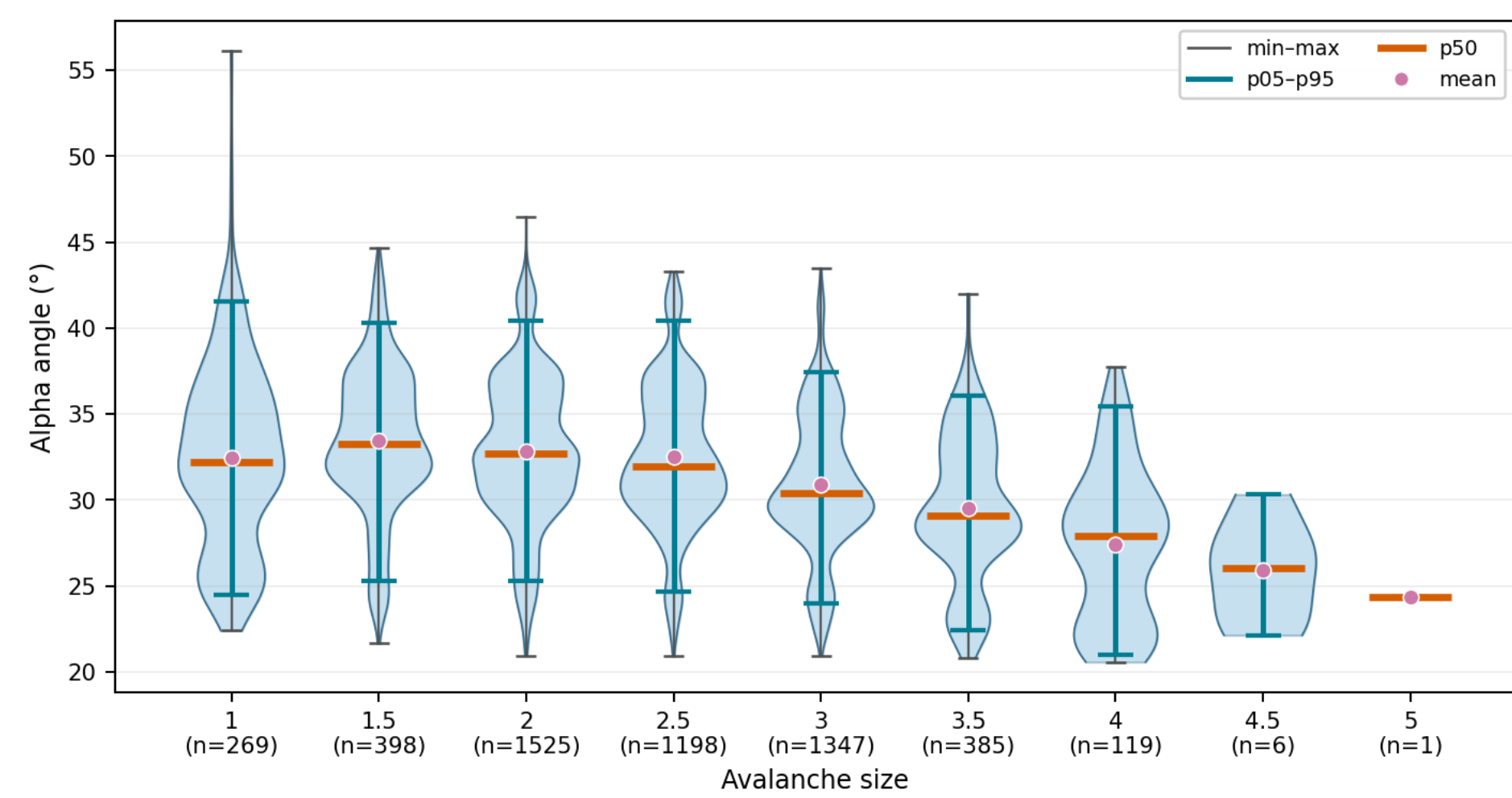
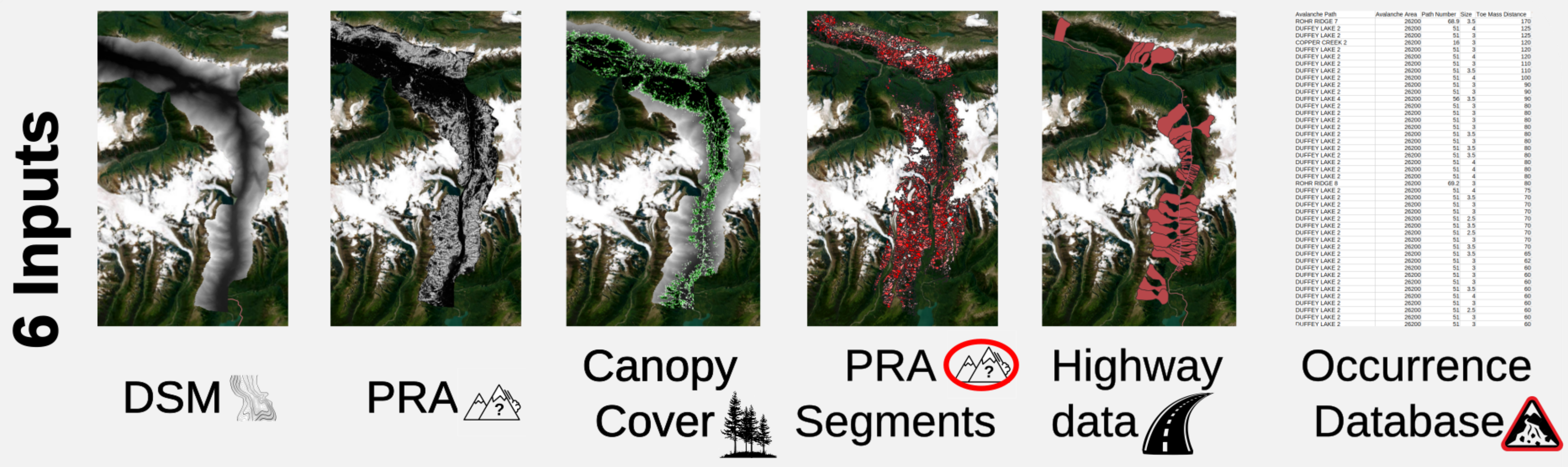


Figure 2: Alpha-angle distribution by avalanche size within Bear Pass using full dataset.

As size increases, alpha-angle decreases.

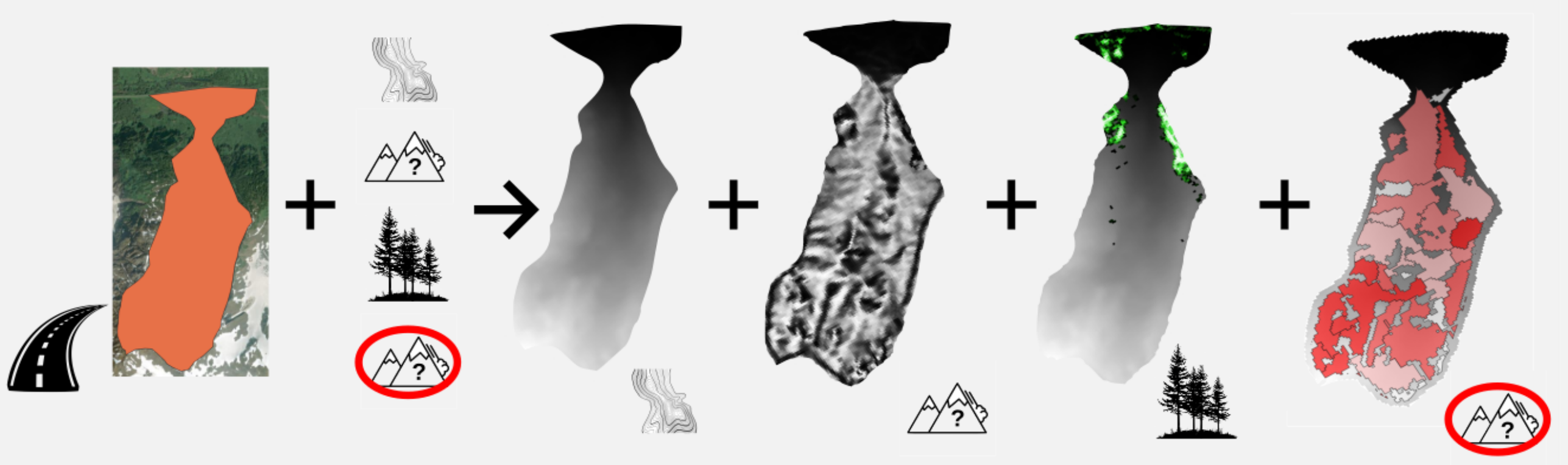
Methodology



5 Steps to determine alpha-angle parameters

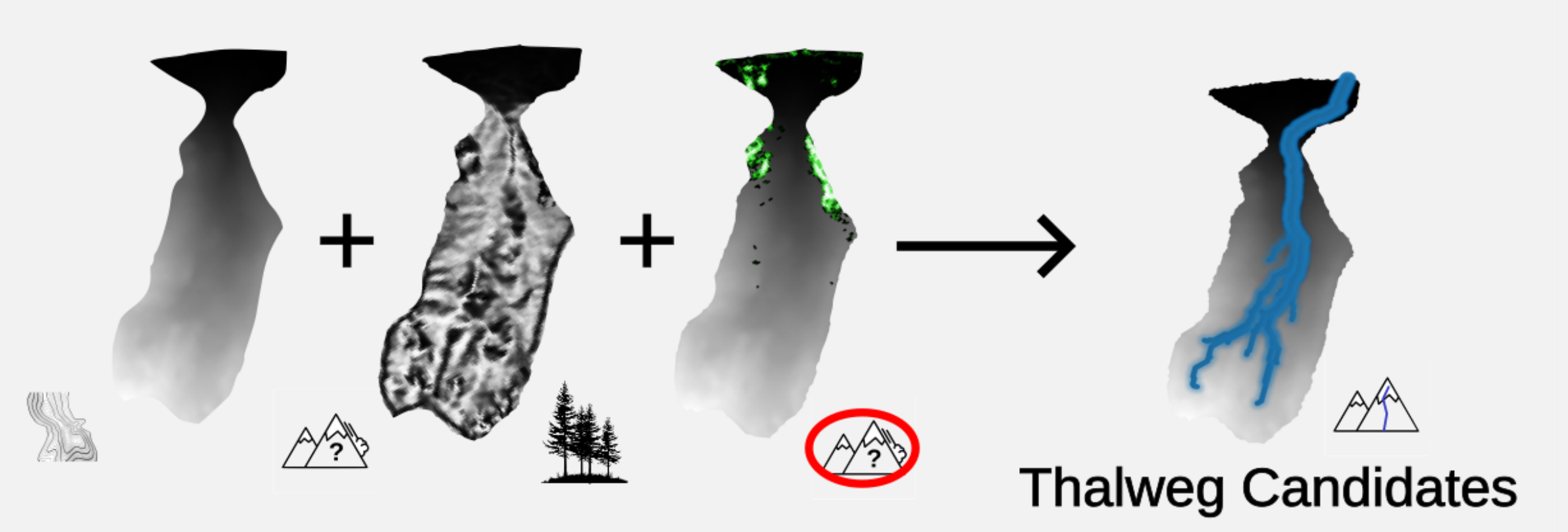
(1) Pre-processing

Prepare inputs for each path



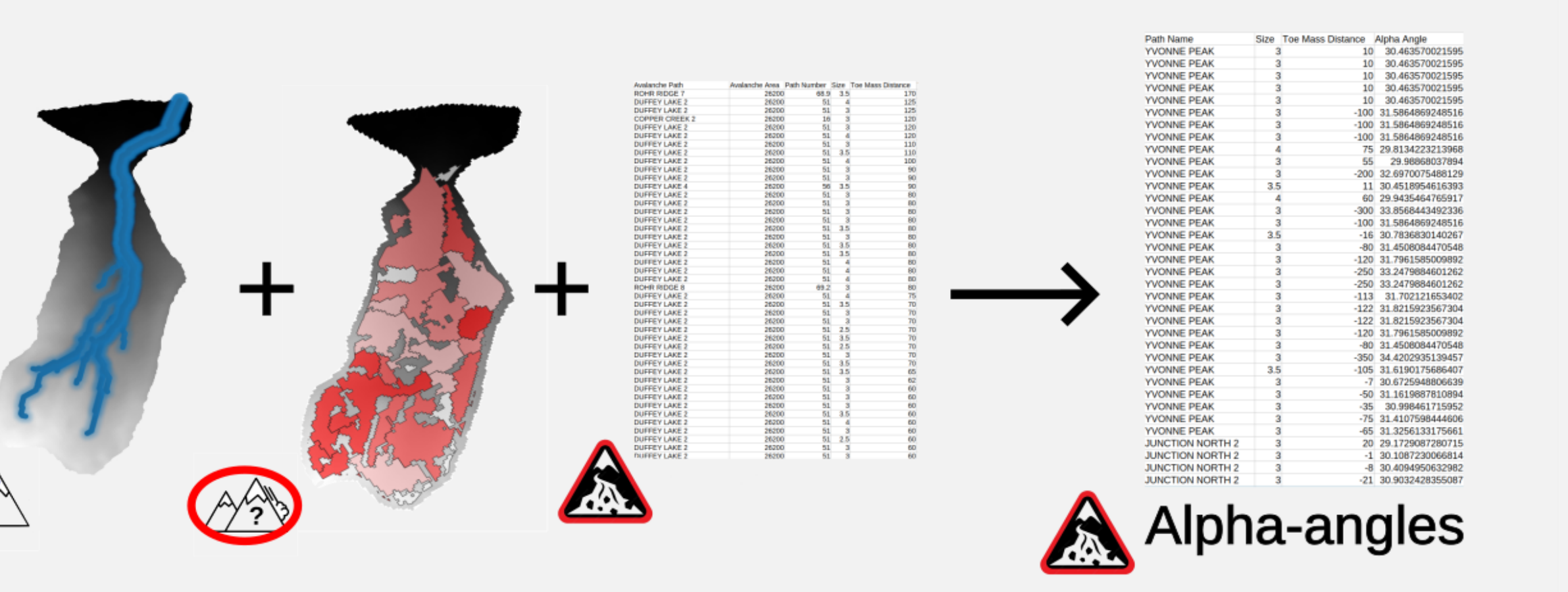
(2) Thalweg Calculation

Combine inputs to generate thalwegs



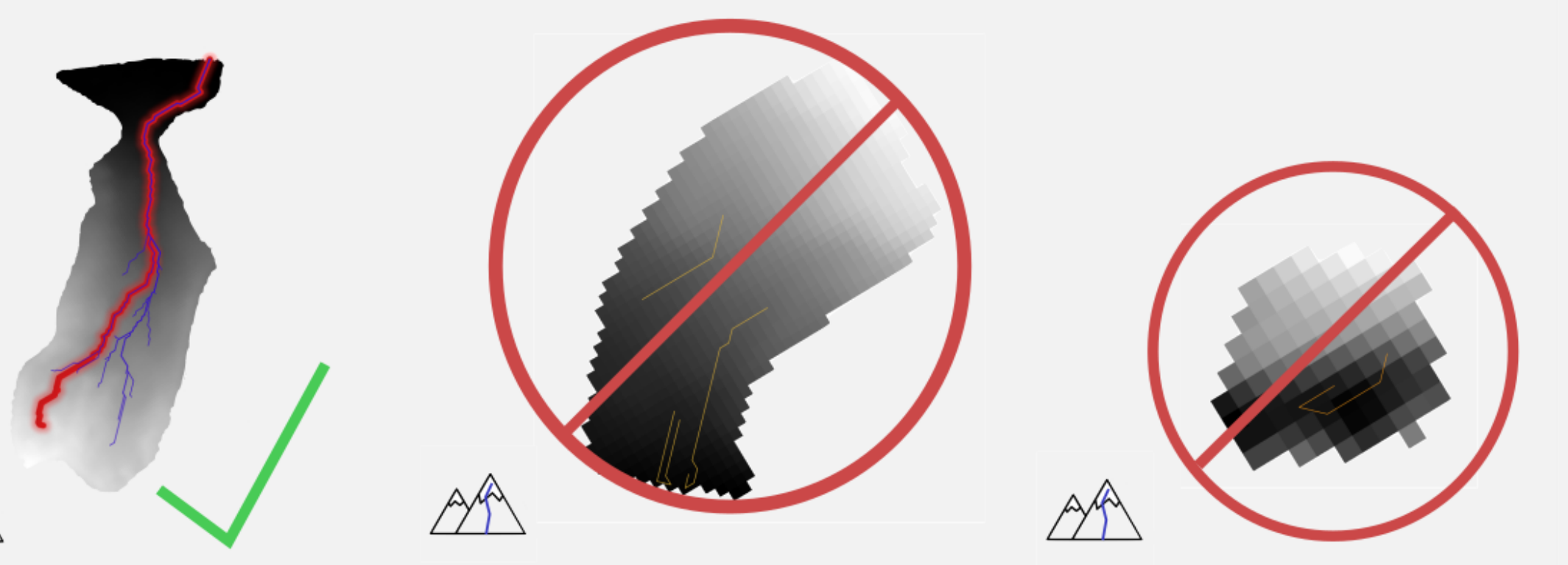
(3) Alpha Angle Calculation

Estimate the best thalweg, then calculate alpha-angles



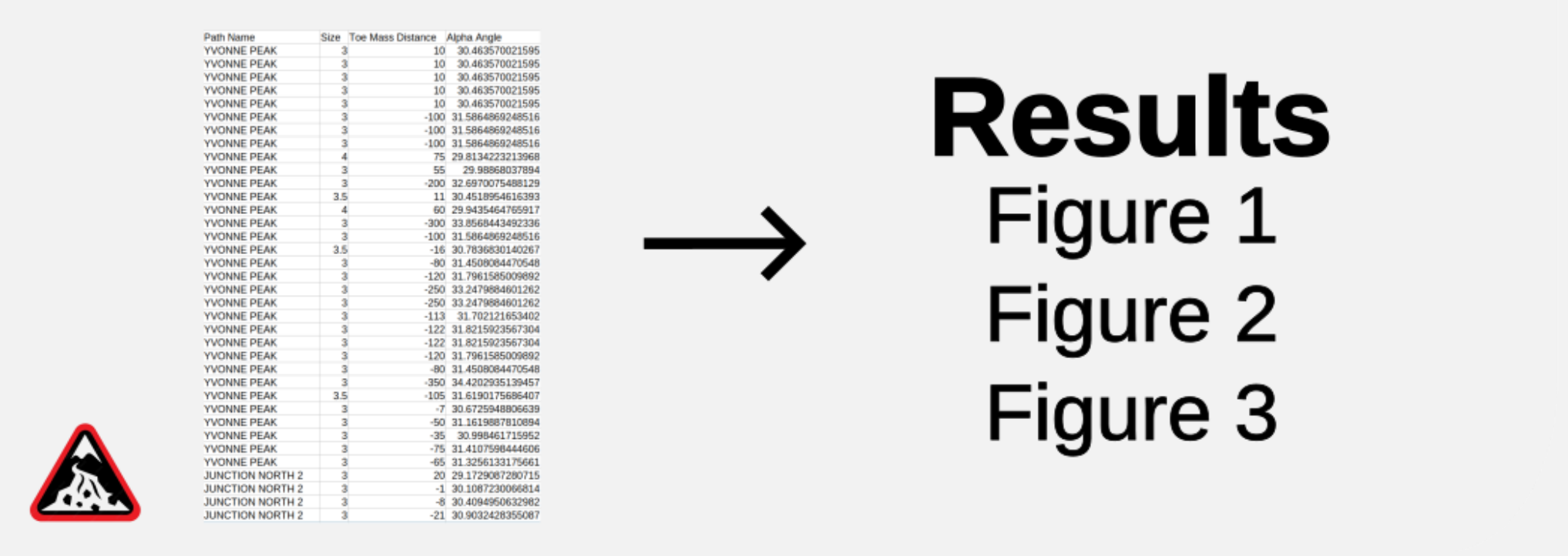
(4) Quality Control

Manually assess path and thalweg quality, keep good paths



(5) Analysis

Compare alpha-angles within paths, region, and against sizes.



Results
Figure 1
Figure 2
Figure 3

Want to know more?

Reach out to Declan at declan_knies@sfu.ca for more information



Companion paper