LIDAR at the University of Michigan Field Camp

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UNIVERSITY OF MICHIGAN

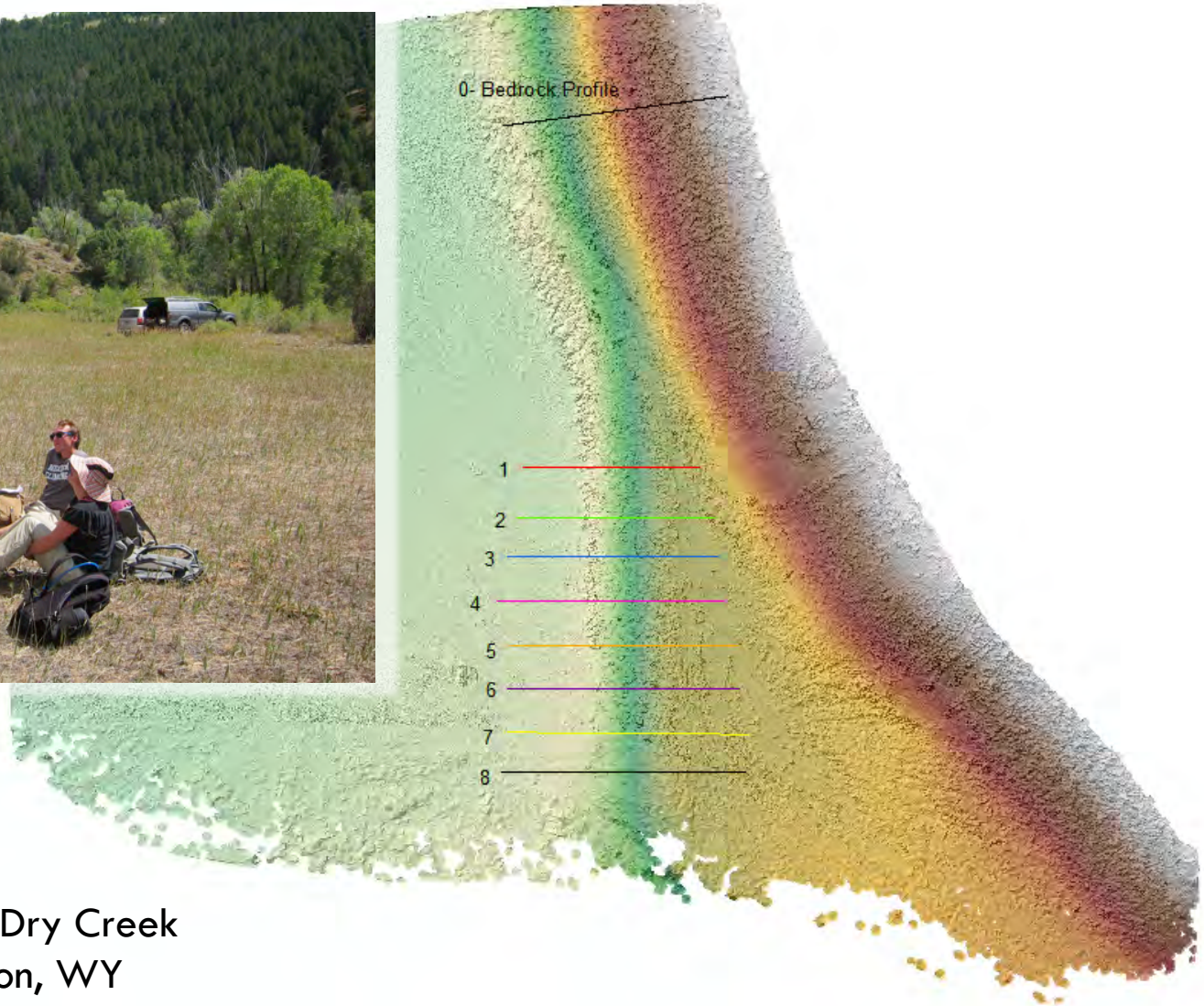
Implementation and Philosophy

- U-M has worked with UNAVCO to incorporate LIDAR into a 1-credit field course that follows immediately after our regular geology field course.
- We typically have enrollments of ~6 students in this course.
- Students want to engage in the technological end of field geology and data collection, but we have a difficult time doing that in our regular geology field program (which will serve 75 students this summer)

Program Goals

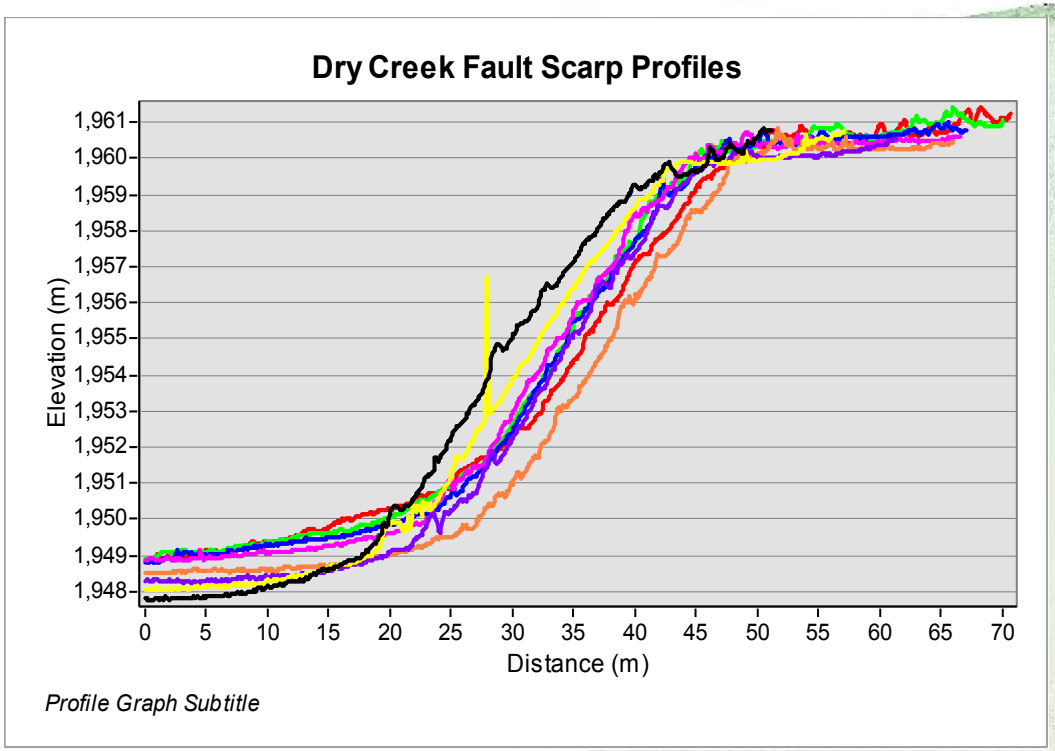
- Engage students in the use of LIDAR in addressing a real (or at least realistic) geologic or geotechnical problem.
- Given students confidence in operating the LIDAR instrumentation and GPS system
- Introduce students to topographic analysis tools in GIS to analyze the data they have collected and write a report on the outcome of their surveying

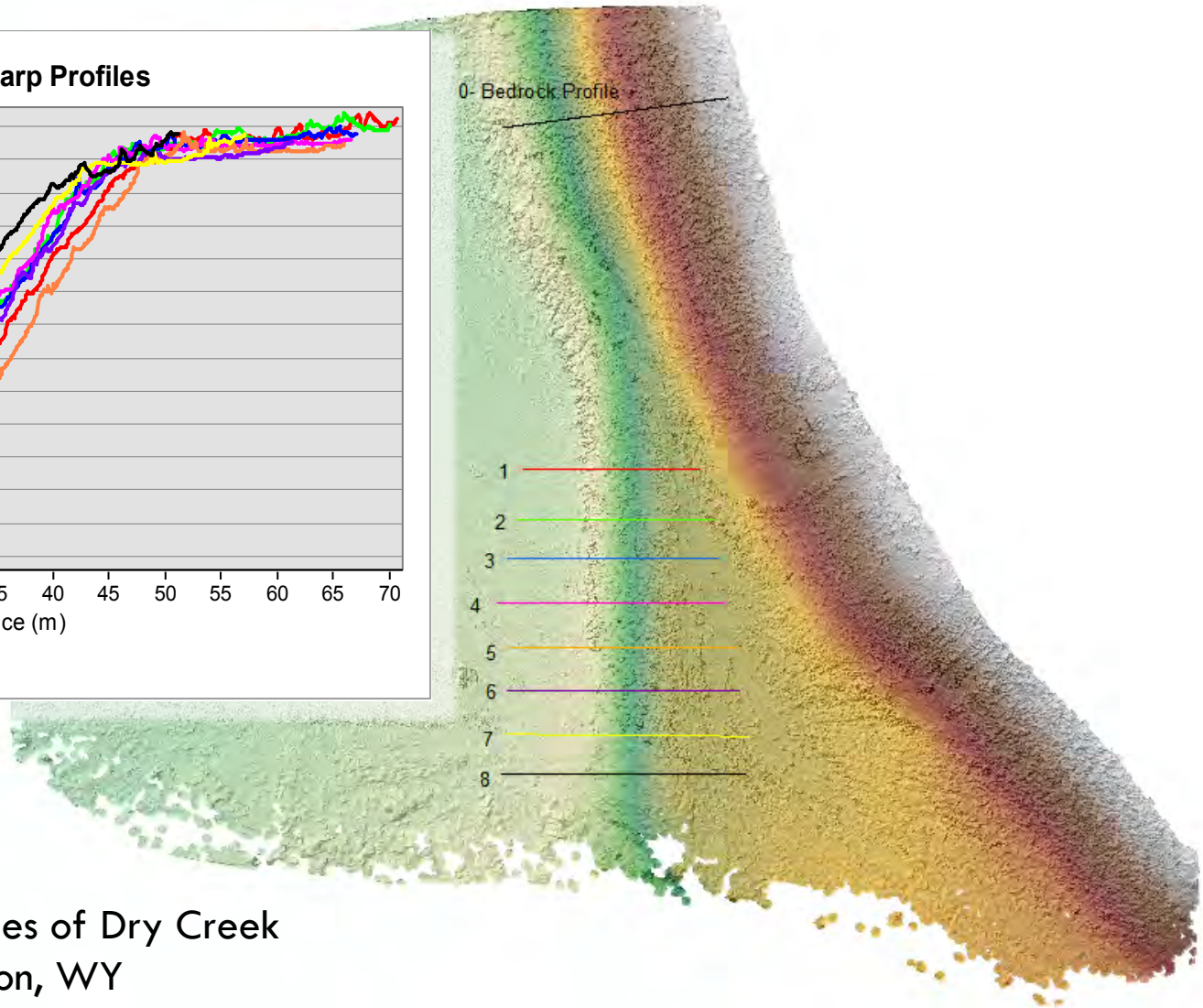
Fault Scarp Morphology and Age



LiDAR DEM and students at Dry Creek normal fault scarp near Afton, WY

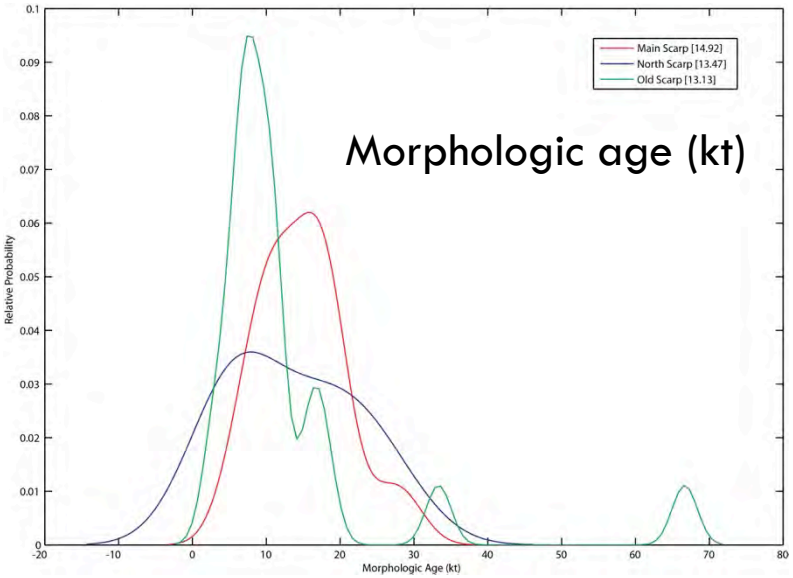
Fault Scarp Morphology and Age

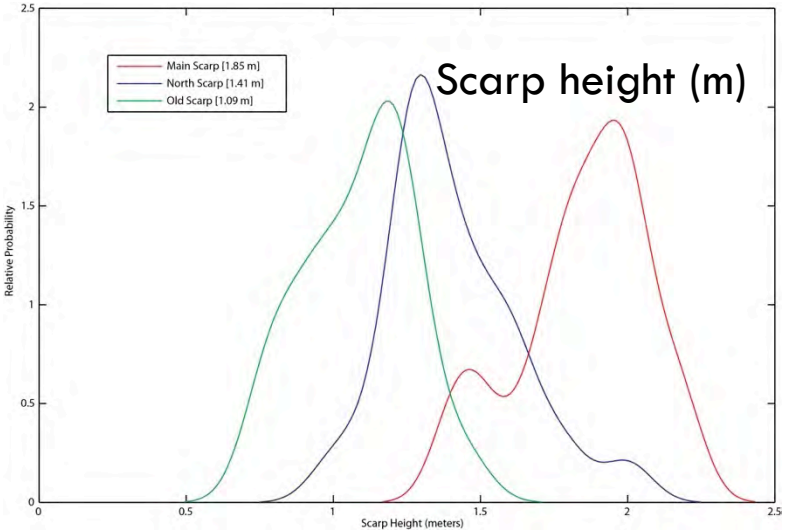




LiDAR DEM and scarp profiles of Dry Creek normal fault scarp near Afton, WY

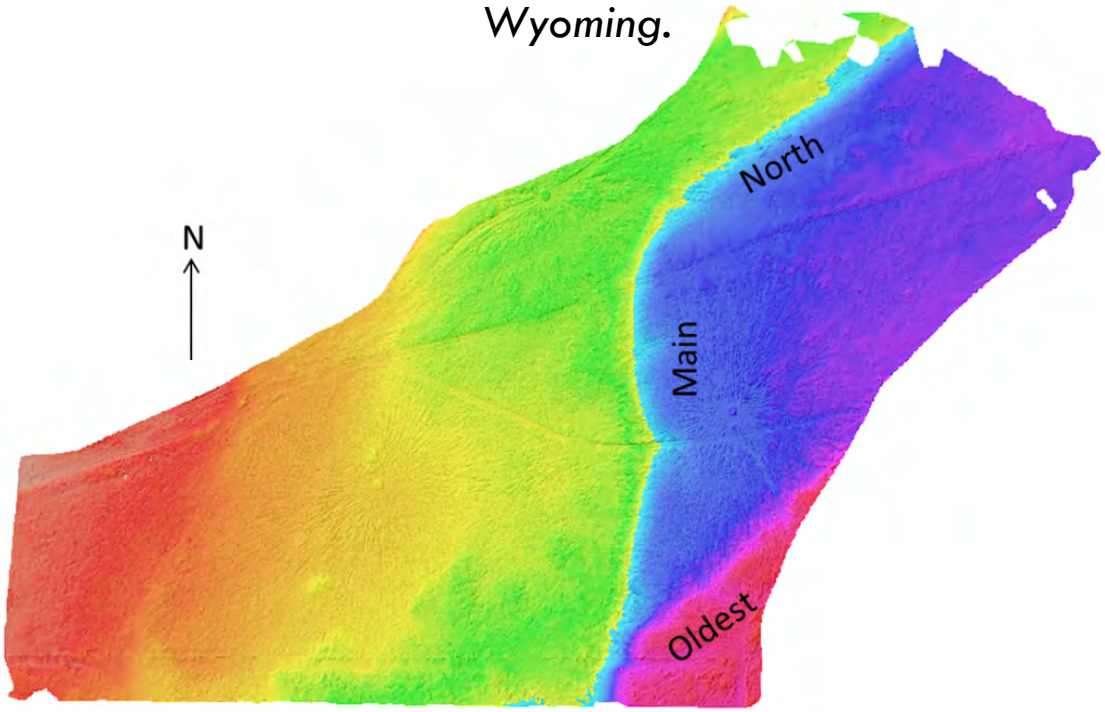
Scarp Analysis with Matlab





LiDAR DEM scarp age and offset estimates from diffusion hillslope modeling in Matlab using Penck 1-D code from Hilley and Arrowsmith.

LIDAR DEM and scarp analysis of the Hoback normal fault, Wyoming.



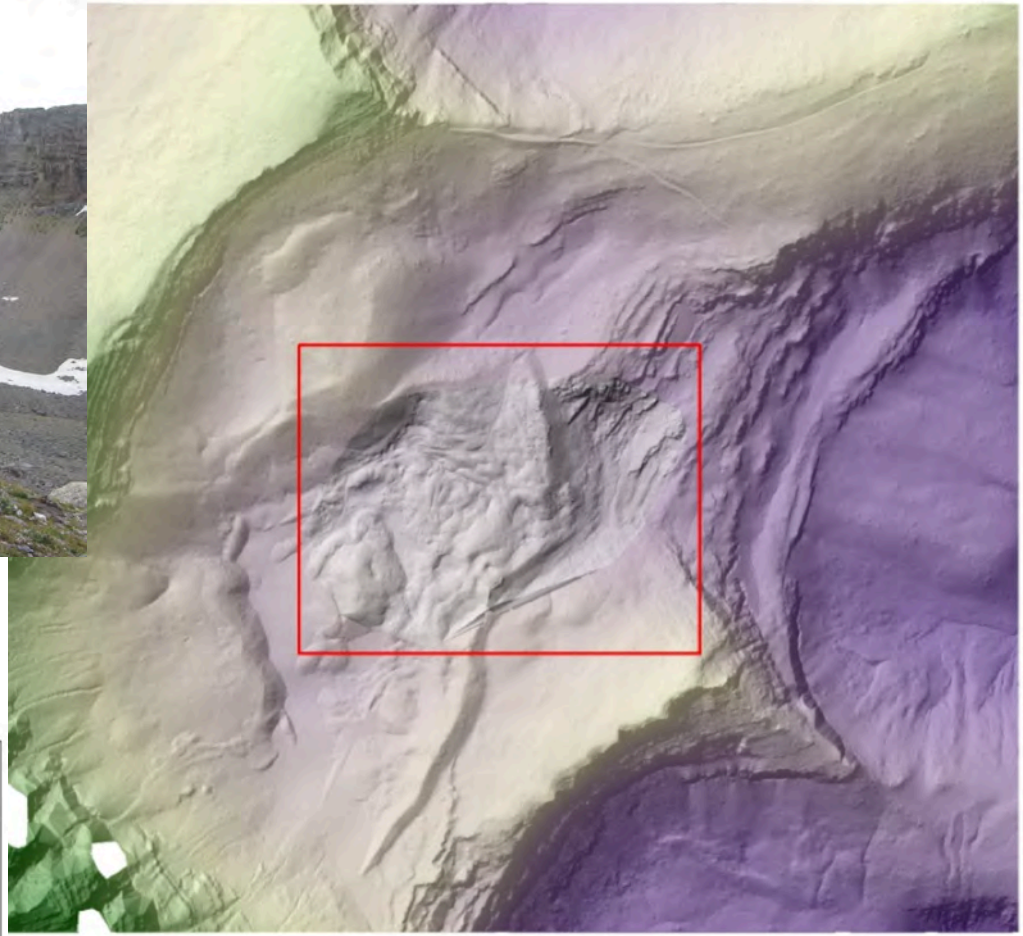
Surface Change Detection

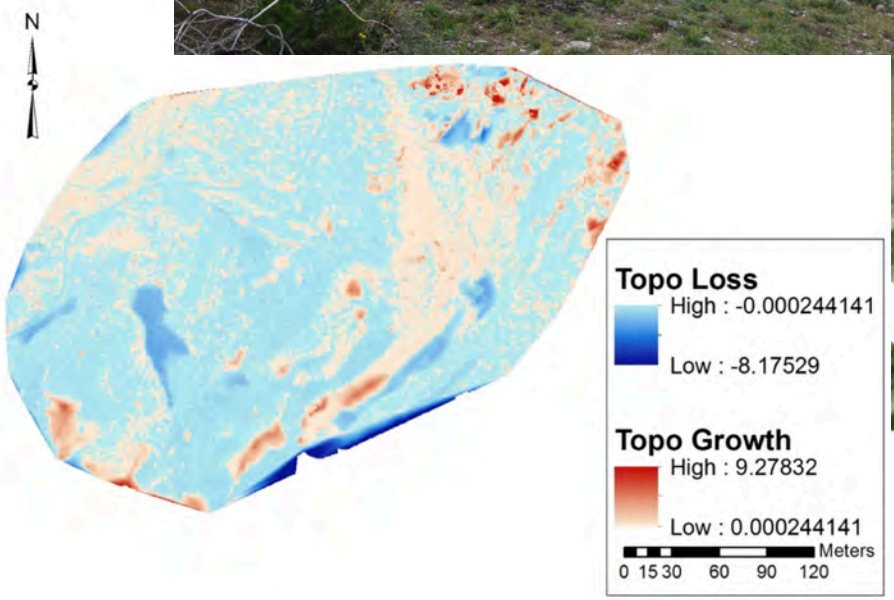
Budge Drive Landslide in Jackson, Wyoming

Differencing LIDAR DEMs

- Inspired to look for signatures of topographic change by differencing LIDAR DEMs (inspiration from the active Budge Drive Landslide in Jackson)
- Made use of existing LIDAR DEMs available through OpenTopography flown by NCALM and the Teton County Conservation Program
- Created change maps for one active rockslide, a channel evulsion in the Snake River, and created the first scan of an active landslide that we will return to in future years.

Active Rockslide on Rendezvous Mtn





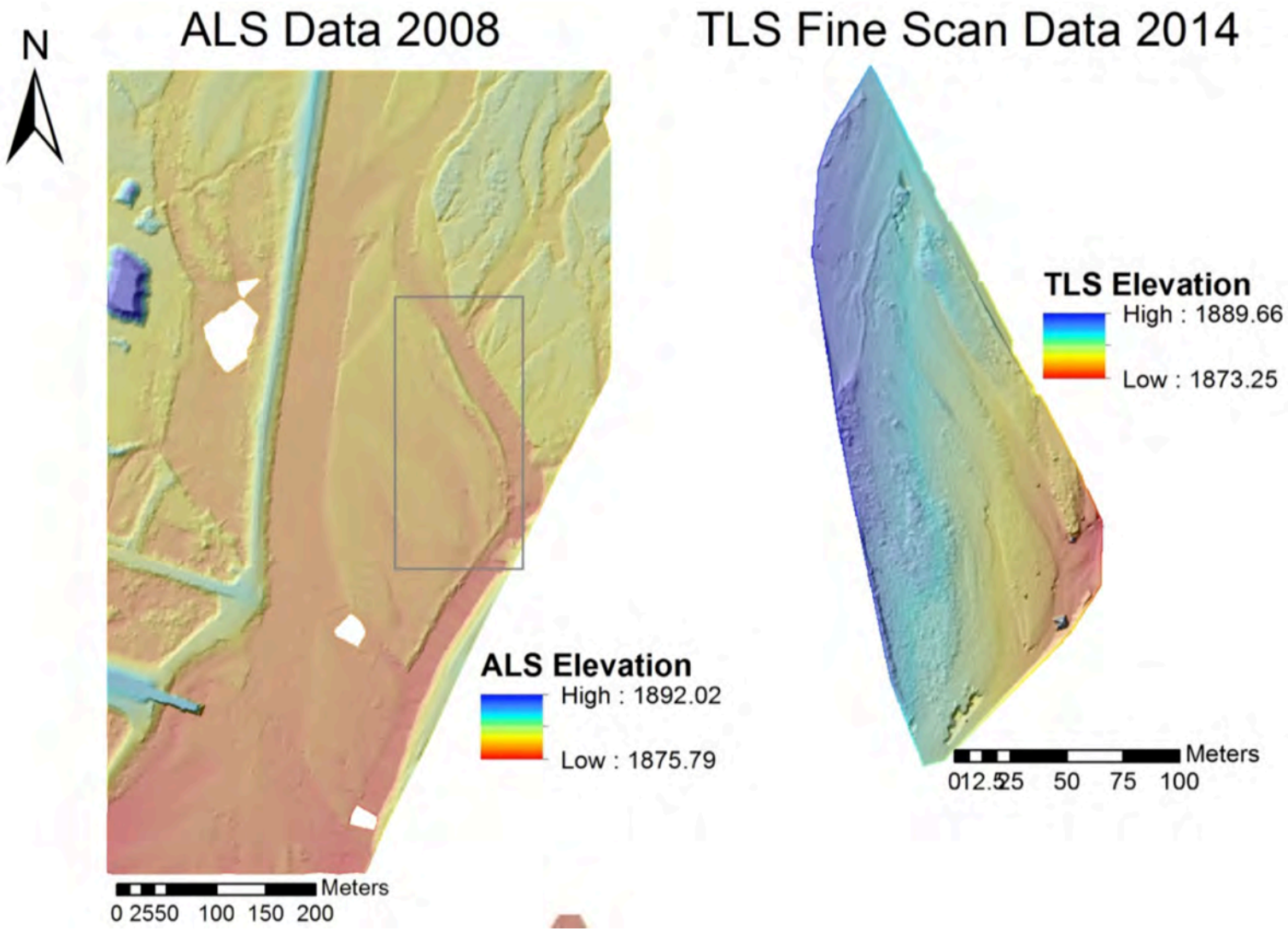
Establishing a New LIDAR Baseline

Snake River Evulsion

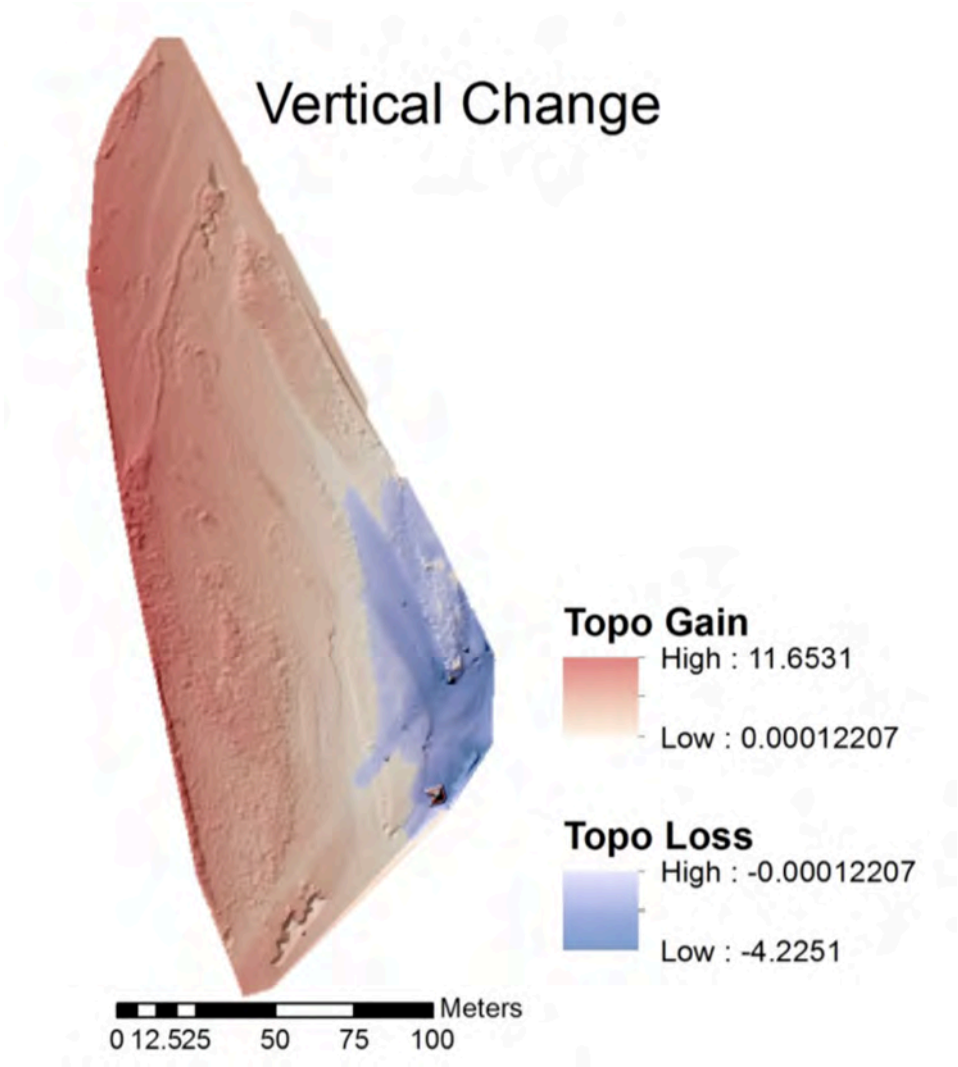
Snake River Channel 2009

Snake River Channel 2013

Snake River Evulsion



Snake River Evulsion



Challenges with LIDAR at Field Camp

- Logistics-
  - Same issues as developing any new field project, with the addition that you can't scout with the LIDAR
- Costs-
  - UNAVCO works to keep costs down, but there are direct and indirect costs to implementing LIDAR
- Technical-
  - Hardware and software for analysis
  - Availability and reliability of internet access
  - Data, data, data, data, data

Successes with LIDAR at Field Camp

- High degree of student satisfaction with the LIDAR project (based on anecdotal evidence and annual teaching surveys of the LIDAR course)
- Student demand has led to a new earth science centric GIS course on campus (leveraged from the positive reviews of the LIDAR course).
- Engagement with alumni in industry who have positively viewed this addition to our field course

Recommendations and thoughts

- Communicate early and often with UNAVCO about your needs and plans
- Outline a proposed field schedule and discuss with UNAVCO technicians the anticipated goals and outcomes of the project prior to their arrival and with time to make changes to your plans
- Be prepared to be flexible if the data or field site aren't optimal for your intended purpose (teachable moments on how science actually progresses…)