Activity: Vertical change and uncertainty as applied to the 2014 Oso landslide

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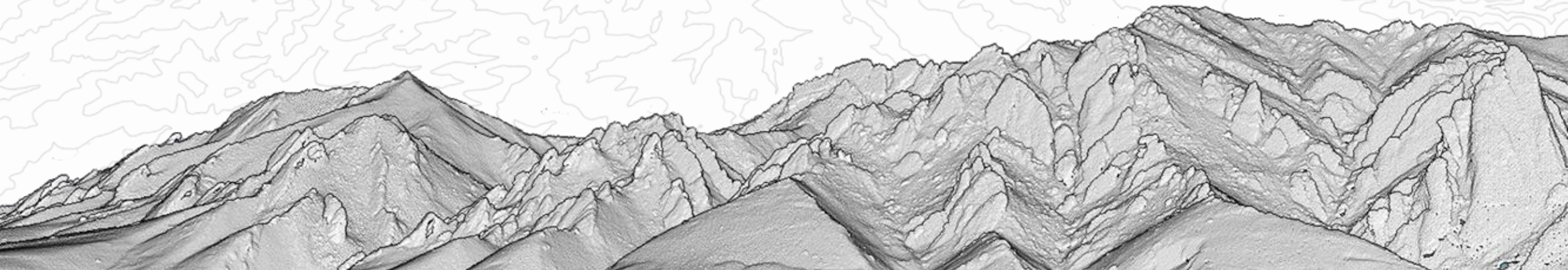
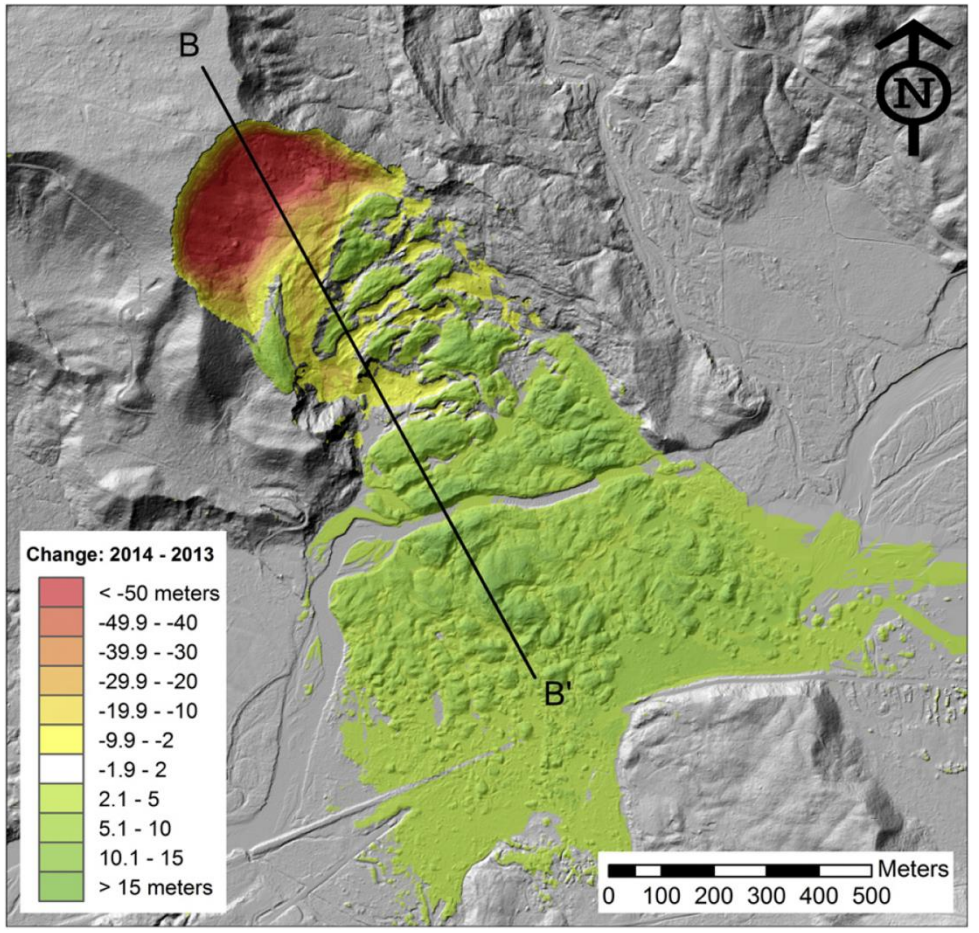


The 22 March 2014 Oso landslide

Mark Reid, USGS,
https://www.usgs.gov/media/images/2014-landslide-washington-state-7



Wartman et al., 2016, Geomorphology

What you'll do

- Difference a pre-event (2013) and post-event (2016) lidar DTM of the Oso valley
- Characterize the error on stable terrain: systematic bias, plus the spatially correlated structure captured by nested variograms
- Propagate that uncertainty to features of interest you draw yourself
- Compute volume change, with uncertainty, for the source area and the deposit
- Interpret the result: how does it compare to the published landslide volume, and why?

https://colab.research.google.com/github/Cassandra-Brigham/topochange-py/blob/main/Workshops/CLaSH2026/Oso_Landslide_differencing_colab.ipynb

Before you start

- Runs entirely in Google Colab; nothing to install on your own machine
- Add a Drive SHORTCUT to the shared data folder (the notebook walks you through it right after the first setup cell)
- The first setup cell installs packages and restarts the kernel once (expected, not an error; just continue from the next cell afterward)
- You'll draw two kinds of polygons on an interactive map: stable areas (no expected change) and features of interest (source area, deposit)
- Stuck? Flag one of us, or drop a question in Slido

Discussion

- What do positive and negative values in the 2013-2016 DTM differencing results represent? Which changes might reflect processes other than the 22 March 2014 landslide?
- Why is the gross positive volume from surface differencing different from the published total landslide volume?
- How large would a feature at this site need to be before its volume is confidently resolvable against the uncertainty? Is your landslide polygon comfortably above that threshold, or close to it?

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