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Balanced and Restored Cross-Sections Representing Post-Miocene Crustal Extension of Fluvial Deposits, North-Central Montana to Southeast Idaho

Benjamin B. Johnson Mr.

University of Montana - Missoula, benjamin1.johnson@umontana.edu

Dain A. Schuhmacher

University of Montana - Missoula, d_schuhmacher@live.com

Gerri K. Mason

University of Montana - Missoula, gm142278@gmail.com

Thomas R. Rodriguez Mr

University of Montana - Missoula, btoolman@gmail.com

Jason J. Subatch

University of Montana - Missoula, jsubatch@hotmail.com

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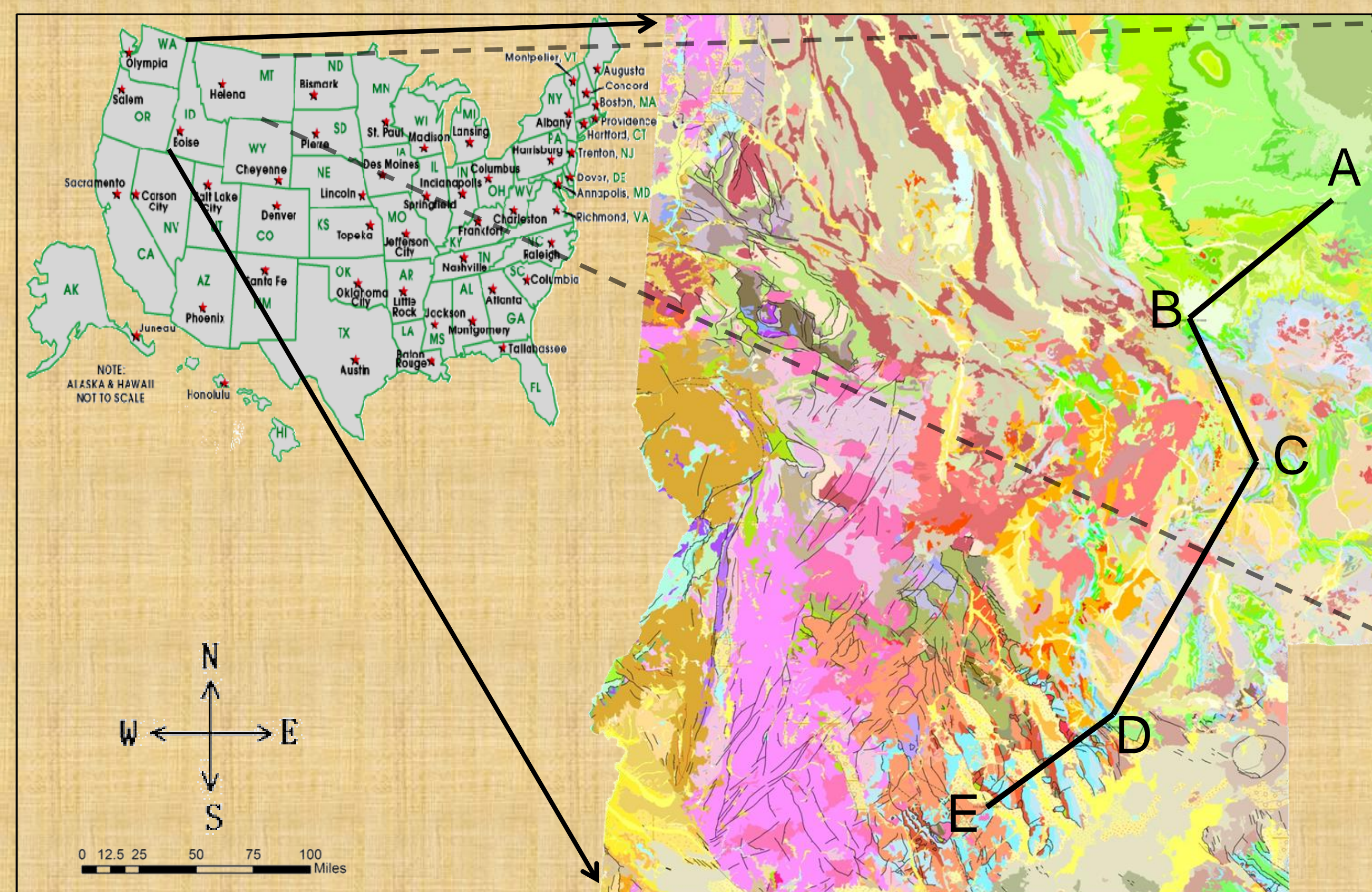
BALANCED AND RESTORED CROSS-SECTIONS REPRESENTING POST-MIOCENE CRUSTAL EXTENSION OF FLUVIAL DEPOSITS, NORTH-CENTRAL MONTANA TO SOUTHEAST IDAHO

Dain A. Schuhmacher, Thomas R. Rodriguez, Jason J. Subatch, Benjamin B. Johnson, Gerri K. Pearson. University of Montana Department of Geosciences

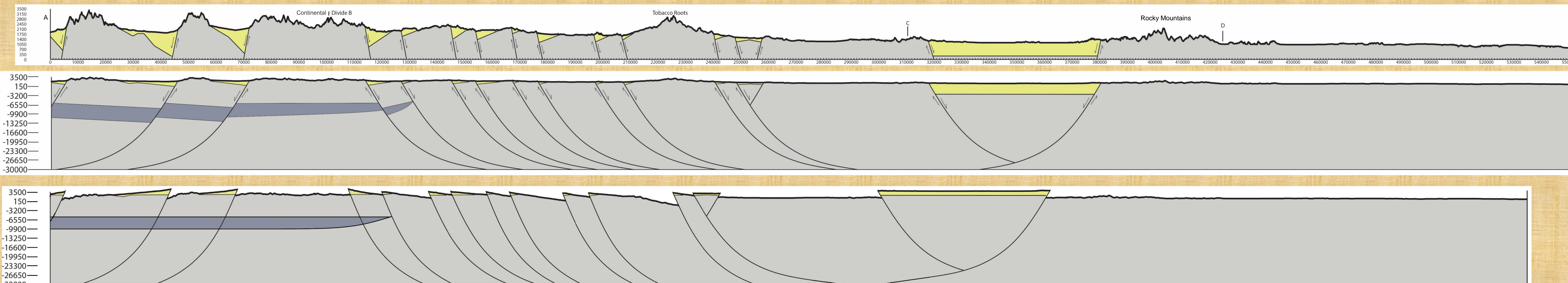
Introduction

- This research is part of a larger project based on the theory of the existence of a pre-ice age, Amazon-scale river that had headwaters in the southern Colorado Plateau and flowed north through the western United States and Canada before discharging into the Labrador Sea during Miocene time.
- The reconstructed trend of the Miocene river bed provides a reference line against which to measure active faulting.
- Western Montana and adjacent Idaho occupy the Intermountain Seismic Zone and have the potential for large earthquakes. Detailed cross-sections through this zone can provide information for development projects in faulted areas, and target potential aquifer locations where the thick river gravel has been down-faulted into the sub-surface.
- This research will be an important contribution to understanding the evolution of the tectonic landscape of Montana and Idaho.

Combined ID & MT Geologic Map w/ Line



Cross Sections ~7% Extension



Conclusions

- About 7% Crustal Extension determined by displacement of Miocene River deposits.
- Since 1929, Montana has been one of the most tectonically active states in the US.
- Montana's Extension occurs mostly in the Western third of the state along the Intermountain Seismic Belt.
- Geologically young faults bound most large mountain blocks in the region and can be the source of large earthquakes in the future.
- Sand/Gravel valley fills and Miocene river deposits provide potential aquifer formations throughout this region.

Legend

- Direction of relative displacement
- Quaternary Alluvium
- Belt Groups

Scale
4cm = 30km

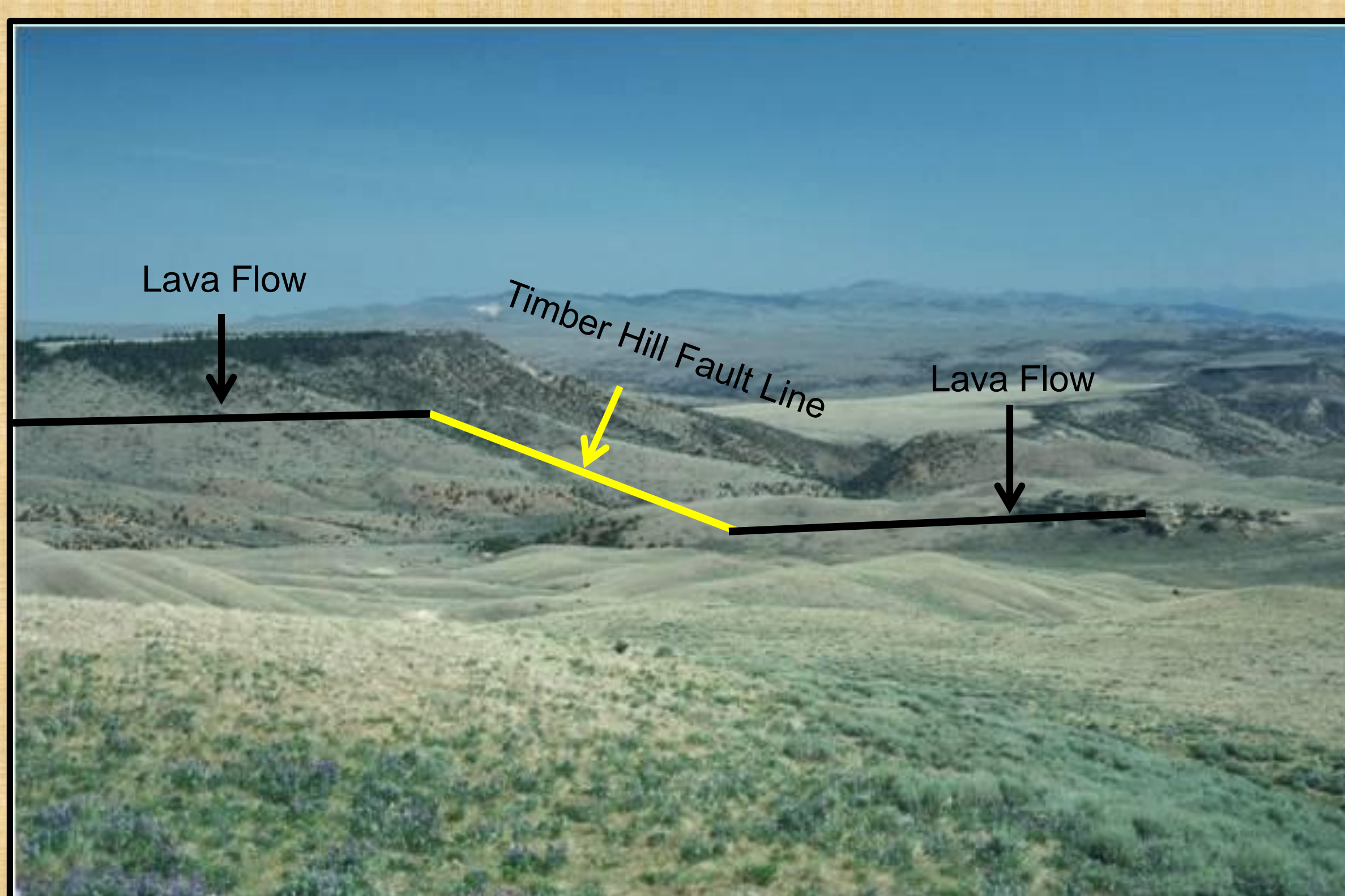
Acknowledgements

James W. Sears, Dept. of Geosciences, University of Montana, Missoula, Montana 59812, USA, james.sears@umontana.edu

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References

Sears, James. "4 GSA TODAY | NOVEMBER 2013 Late Oligocene–early Miocene Grand Canyon: A Canadian connection?." *GSA Today*. (2013): 4-10.
<<http://www.geosociety.org/gsatoday/archive/23/11/article/i1052-5173-23-11-4.htm>>.



Methods

- Five balanced cross sections were drawn along lines designated on the map and connected at endpoints. Cross section 1 is vertically exaggerated to accentuate topography.
- Cross section 2 is at true scale which was derived from the geologic map.

Objectives

- To Estimate the amount of crustal deformation/extension along Miocene River Deposits in N-C MT and S-E ID.
- To define total crustal extension as percent.
- To determine Earthquake hazards based on historical quakes and literature.