Insights into Segmentation and Surface Rupture History of the Oquirrh - Great Salt Lake Fault System, Utah, USA, from Fault Scarp Heights and Lake Bonneville Shoreline Elevations

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**Background**

The Oquirrh Mountains in Utah, USA, are known for their complex faulting and seismic activity. The Oquirrh Fault is a prominent feature in this region, with evidence of multiple seismic events recorded over time. The study aims to investigate the segmentation between the Great Salt Lake Fault, North Oquirrh Fault, and South Oquirrh Fault to understand recent surface rupturing events.

**Methods**

Fault displacement since the formation of the pluvial Lake Bonneville Highstand was measured using wave-cut benches. Vertical Displacement were made using LiDAR digital elevation data. The distribution of offsets along the fault in the basin and range was separated by a large structural fault in the basin and range. We used the criteria described above to fit lines and calculate trends on the data.

**Results**

- Scarp heights were measured at 200 locations using profiles extracted from a digital elevation model (DEM).
- Lake Bonneville shoreline elevations were measured at 200 locations.
- The shoreline runs along the mountain front, parallel to the fault trace, and displaced by the most recent event.
- We anticipated seeing maximum displacement and scarp height near the center of the ruptured segment, tapering to lower heights and displacement near the segment ends.
- The 1 event scarp profiles have an increasing scarp offset height towards the northern end of the distribution.
- The 2 event scarp profiles have a decreasing scarp offset height towards the northern end of the distribution.

**Conclusions**

- Faults in the salient that provide links between the North and South Oquirrh Faults are necessary to explain the segmentation patterns observed.
- The segmentation observed along the Oquirrh Fault system is likely due to a combination of differential displacement and strain patterns.

**Key Points**

- Investigate segmentation between Great Salt Lake Fault, North Oquirrh Fault, and South Oquirrh Fault in recent surface rupturing events using fault scarp heights and elevations of Lake Bonneville shorelines.
- Has the southern portion of the Great Salt Lake Fault co-ruptured with the North Oquirrh Fault in recent surface rupturing events?
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