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PALEOSEISMOLOGY OF THE NEPHI SEGMENT OF THE WASATCH FAULT ZONE, JUAB COUNTY, UTAH—PRELIMINARY RESULTS FROM TWO LARGE EXPLORATORY TRENCHES AT WILLOW CREEK

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RECURRENCE INTERVALS

From the preliminary dating results from Willow Creek, it appears that three surface-faulting events occurred between about 300 yr ago (estimated time of P1) and 2,320 yr ago (the average of several ages for faulted deposits). This period of less than about 2,000 yr spans two full recurrence intervals and perhaps part of a third (prior to P3). This means that the maximum average recurrence interval for events P1 and P2 is <1,000 yr. Previously, the average recurrence interval for the Nephi segment was reported to be about 2,500±2,100 yr (Lund, 2005).

DISPLACEMENTS

The offset in the WCN trench is larger (7–8 m, vs. 5–6 m for WCS), and the footwall deposits are older (WCN-R1: 6,238±57 cal yr) than in the WCS trench. However, in WCN, deposits on the hanging-wall block are younger than on the footwall, and have buried evidence for any faulting events between about 6,200 and 2,300 yr ago. Refinement of repeat times and slip rates awaits synthesis of radiocarbon dates and luminescence age estimates from both trenches.

SLIP RATES

Vertical slip rates are hard to determine at Willow Creek owing to the large amount of tilting associated with the fault's movement. However, if we assign most of the tilting (about 3–4 m) to P3, which has a small colluvial wedge compared to P1 and P2, then the remaining offset results mainly from the P1 and P2 events (4–5 m vertical offset in WCS; about twice the maximum thickness of Cw1 and Cw2). In this scenario, the average

minimum slip rate in the 2.0 kyr (maximum) P1–P3 interval is 2.0–2.5 mm/yr. Thus, our data suggest a 2 to 3 times higher slip rate than previously considered for the Nephi segment

CONCLUSIONS

The Willow Creek trenches record three surface faulting events in the past 2,300 yr, with the most recent event (MRE or P1) having occurred about 300 yr ago. We suspect that the fault has a late Holocene slip rate of 2.0–2.5 mm/yr, which would be the highest documented rate for the WFZ. However, further estimates of repeat times and slip rates await refinement and synthesis of radiocarbon dates and luminescence age estimates from both trenches.

Table 1. Luminescence age estimates from the Willow Creek trenches.

Table 2. Calibrated radiocarbon ages from the Willow Creek trenches.

Table 3. Description of units in northern trench (WCN) at Willow Creek, Nephi segment of the Wasatch fault zone. Location of described samples shown on trench logs by triangular symbol.

Table 4. Description of units in southern trench (WCS) at Willow Creek, Nephi segment of the Wasatch fault zone. Location of described samples shown on trench logs by triangular symbol.

Figure 6. Preliminary log of the Willow Creek North Trench, Nephi segment of the Wasatch fault zone.

Figure 7. Preliminary log of the Willow Creek South Trench, Nephi segment of the Wasatch fault zone.

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