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Evidence for Quaternary Reverse Slip of Rattlesnake Mountain Fault, Yakima Fold Belt, Eastern Washington, USA.

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Rattlesnake Mountain, which lies within the Yakima Fold Belt of eastern Washington, is part of a longer structure, the Rattlesnake Mountain–Wallula segment of the Rattlesnake Hills structure (RAW). Since detailed studies of this region were initiated in the late 1970s, controversy has existed regarding the style and rate of contemporary deformation on this system of faults. Previous mapping, which focused on structure and stratigraphy within the Miocene basalt units identified two steeply-dipping reverse faults along its steep northeastern slope and an anticline ~1 km outboard of the range front (Reidel, in press). More recently, it has been postulated that streams originating in the range exhibit right-lateral deflections of up to 250 m, suggesting significant Quaternary strike-slip movement (Blakely et al 2013). Desktop analysis of LiDAR data, field mapping, and dating of pedogenic carbonate using U-series analysis, conducted for the Hanford SSHAC Level 3 PSHA finds geologic evidence of reverse Quaternary faulting along both the main range front fault and on a blind fault underlying the outboard anticline. Although some component of oblique slip is possible, the lack of displaced fan heads or features, such as shutter ridges, argue against significant strike-slip movement. Of the three mapped late Pleistocene alluvial fans and one early to middle Pleistocene bajada surface, only the oldest bajada surface (Qaf 4) is demonstrably offset or deformed across both the range front fault and anticline. The age of Qaf 4, which is vertically displaced 20–30 m across the fault zone, is estimated to be middle Pleistocene (> 400 ka to 1 Ma) yielding a Quaternary slip rate of ~ 0.02–0.075 mm/yr. A long-term slip rate based on the structural relief of the Saddle Mountains basalt is similar (0.07–0.12 mm/yr). The timing of the most recent event is constrained by the estimated age (12–31 ka) of the oldest alluvial fan unit (Qaf 2) that clearly is not offset by the fault.

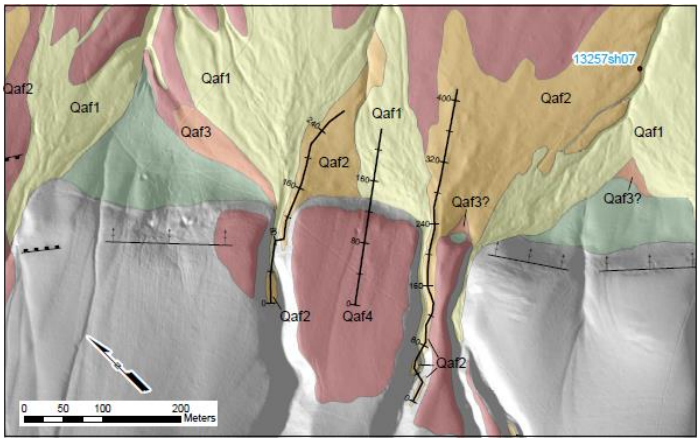

Figure 1: Quaternary mapping of the Rattlesnake Mountain range-front fault, Washington, USA

References:

[1] Baker V et al. (1991) Geol Soc of Amer., Boulder CO

[2] Blakely R et al. (2013) Tectonophysics 624-625:32-45

[3] Reidel S (in press) 1:24k map Washington State Dept. of Res.

[4] Paces J (2014) Unpub Report.