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Rates of erosion along actively growing normal faults: The cosmogenic ^{21}Ne inventory from quartz of the Bishop Tuff (California)

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The Bishop Tuff resulted from a caldera-forming eruption at 760 $\pm$1 ka as dated with ^{40}Ar/^{39}Ar [1]. Active E-W extension of the Volcanic Tableland, located in the SW part of the Bishop Tuff, has formed many N-S trending normal faults up to approximately 7 km in length. We sampled bedrock surfaces and desert pavements in the footwall of four normal faults along profiles extending from the fault center to the tip. 18 preliminary exposure ages – calculated from ^{21}Ne concentrations in quartz – range from 240 to 500 ka, i.e. about 35-70 percent lower than the eruption age of the Bishop Tuff. The discrepancy shows that about 1.0 to 1.8 m of material has been removed since the eruption. The ^{21}Ne ages vary rather systematically, with the oldest ages occurring at the tapering ends of the faults and the youngest ages at the fault centers, where the vertical displacement is maximal. As the faults are active and they propagate [2], our data indicates that the process of erosion is more pronounced on the relatively higher fault centers compared to the lower fault tips.

In general, ages from bedrock samples (n = 14) show more variation than desert pavement samples (n = 4).

In the future, the ^{21}Ne ages will be compared to ^{10}Be and ^{26}Al ages, to be obtained from the same quartz samples, and noble gases will be determined in coexisting magnetite (^{3}He), sanidine (^{21}Ne) and pyroxene (^{3}He, ^{21}Ne).

[1] Van den Bogaard, P. and Schirnick, C., Geology 23, 759-762, 1995.

[2] Dawers N. H., et al., Geology 21, 1107-1110, 1993.