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Postglacial slip rate increase on the Teton normal fault, northern Basin and Range Province, caused by melting of the Yellowstone ice cap and deglaciation of the Teton Range

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Along the eastern front of the Teton Range, Wyoming, prominent fault scarps offset Pinedale deposits by up to 30 m and document that multiple earthquakes ruptured the range-bounding Teton normal fault after the last glacial period. Paleoseismological data suggest that ∼70 per cent of the postglacial slip on the southern Teton fault accumulated during or shortly after deglaciation, before 8 ka (Byrd et al., JGR, 1994). Here we use a three-dimensional finite-element model to show that melting of the Yellowstone ice cap and the valley glaciers in the Teton Range may have caused the postglacial slip rate increase on the Teton fault (Hampel et al., Geology, 2007). During deglaciation, slip on our model fault accelerates by a factor of ∼6 with respect to the long-term rate. Our model further shows that the impact of the melting Yellowstone ice cap on fault slip increases along-strike of the fault from south to north and is everywhere larger than the effect of the former valley glaciers in the Teton Range. The results demonstrate that postglacial slip on faults in glaciated regions may not be uniform through time. Rather, a significant fraction of slip may have accumulated within a few thousand years after the last glaciation. We hypothesize that the rebound caused by the Yellowstone ice cap has also triggered clusters of earthquakes on other normal faults in the surrounding Basin and Range Province.