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Late Pleistocene Regression of Lake Bonneville as Cause for the Postglacial Slip Rate Increase on the Wasatch Normal Fault, Utah

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Geologic and palaeoseismologic data document a marked increase in the slip rates of the Wasatch and three adjacent normal faults in the Basin and Range Province during the Late Pleistocene/Early Holocene epochs (Friedrich et al., *JGR*, 2003 and references therein). The cause of this synchronous acceleration of fault slip and the subsequent clustering of earthquakes during the Holocene has remained enigmatic, although it has been suggested that the coincidence between the acceleration of slip and the shrinkage of Lake Bonneville after the Last Glacial Maximum may indicate a causal relation. Here we present finite-element models of a discrete normal fault within a rheologically layered lithosphere to evaluate the relative importance of two competing processes that affect fault slip during glacial-interglacial cycles (Hetzel and Hampel, *Nature*, 435, 2005): postglacial unloading (the removal of mass), which decreases the slip rate, and lithospheric rebound, which promotes faster slip. The model results show that lithospheric rebound caused by regression of Lake Bonneville and deglaciation of adjacent mountain ranges provides a feasible mechanism for the high Holocene rates of faulting in the Wasatch region. Our analysis implies that climate-controlled changes in loads applied to Earth's surface may exert a fundamental control on the slip history of individual normal faults.