Geophysical Research Abstracts
Vol. 19, EGU2017-6385, 2017
EGU General Assembly 2017

Response of the Indian Creek alluvial fan, Nevada, to glacial-interglacial climate change

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Alluvial fans have been shown to record signals of glacial-interglacial climate changes. Specifically, it has been suggested that their down-system grain size fining patterns may record changes in sediment flux. However, very few field studies have tested this because they require (i) robust fan chronologies, (ii) constraints on basin subsidence and 3D fan geometry, and (iii) a suitable model for inverting grain size fining for sediment flux. Here, we present a case study from the fluvially-dominated Indian Creek fan system in Fish Lake Valley, Nevada, which satisfies these criteria. We measure grain size fining patterns on a surface dating to the mid-glacial period $\sim$71 kyr ago, and a surface dating to the Holocene, which between them represent an overall warming ($\sim$3 $^{\circ}$C) and drying ($\sim$30%) of the regional climate. We use constraints on basin subsidence and a self-similar model of grain size fining to reconstruct sediment fluxes to the alluvial fan during the time periods captured by the two surfaces. Our results indicate a decline in sediment flux of $\sim$38% between the deposition of the $\sim$71 kyr and Holocene surfaces, implying significant sensitivity to climatic forcing over time periods of $>$10 kyr. This could represent a decrease in catchment erosion rates and/or a decrease in sediment export as the climate dried. Our results offer quantitative new constraints on how simple landscapes react to known glacial-interglacial climate shifts.