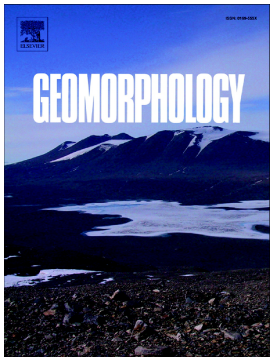

Residence times and alluvial architecture of a sediment superslug in response to different flow regimes

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Residence Times and Alluvial Architecture of a Sediment Superslug in Response to Different Flow Regimes

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Key words: Disturbances; evolution; transit-time distributions; age-distributions; geomorphic processes; chronostratigraphic units

ABSTRACT

A superslug was deposited in a basin in the Colorado Front Range Mountains as a consequence of an extreme flood following a wildfire disturbance in 1996. The subsequent evolution of this superslug was measured by repeat topographic surveys (31 surveys from 1996 through 2014) of 18 cross sections approximately uniformly spaced over 1500 m immediately above the basin outlet. These surveys allowed the identification within the superslug of chronostratigraphic units deposited and eroded by different geomorphic processes in response to different flow regimes.

Over the time period of the study, the superslug went through aggradation, incision, and stabilization phases that were controlled by a shift in geomorphic processes from generally short-duration, episodic, large-magnitude floods that deposited new chronostratigraphic units to long-duration processes that eroded units. These phases were not contemporaneous at each channel cross section, which resulted in a complex response that preserved different chronostratigraphic units at each channel cross section having, in general, two dominant types of alluvial architecture—laminar and fragmented. Age and transit-time distributions for these two alluvial architectures evolved with time since the extreme flood. Because of the complex shape of the distributions they were best modeled by two-parameter Weibull functions. The Weibull scale