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1 Footwall drainage evolution in response to increasing fault displacement: Loreto fault, BCS, Mexico.

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The initiation, propagation and displacement along normal faults had a profound influence through coupling on the pattern of drainage within the uplifting footwall region. Specifically, an uplifting footwall provides a key source region to be exploited either by headward erosion of rivers into the scarp, or by drainage development along the back-tilting dip slope. Clasts derived from this uplifting area should be detected as a source signal within sediments preserved in the basin fill. While modeling and field studies have begun to address the response of individual rivers and their catchments to normal fault activity, fundamental questions remain: (1) how does the initiation of fault activity influence pre-existing drainage patterns; (2) what is the lag time between faulting initiation and drainage system response; (3) what is the effect of increasing fault displacement?

In this investigation we have undertaken a provenance analysis of in excess of 1500 clasts from sediments preserved in a stacked delta series in the Loreto basin, Baja California Sur, Mexico. These deltas were deposited during a period of overall rapid subsidence within the basin; and are stacked due to episodically accelerating displacement during individual progradational units (PUs). Furthermore, and an overall increase in displacement rate occurs up-section. The investigated section ($>$1500m) is from immediately above basement, up through the deltaic units. Counts were also undertaken in Quaternary deposits. The clast data have been related to the occurrence of source-rock lithologies within the footwall.

Our data reveal that a pre-existing drainage pattern was established during sequence 1, with headwaters **5** km back from the Loreto fault. A distinctive new clast-type occurs within PU 1, which is related to a source in the immediate footwall of the fault. This new source rock increases in abundance systematically throughout the section.

We propose that this source region in the immediate footwall reflects initiation of displacement along the Loreto fault; and drainage capture and reorganization in response to the associated footwall uplift. The coincidence of its occurrence with the earliest delta units suggests a very rapid response of the system to the fault activity ($<$20Ka) over a short transfer into the basin. Continued increase in displacement rate also contributes to the significant increase in the abundance of this source lithology up-section. The initial source region ceases to be a source when the drainage divide is forced to the basinward side by a later normal fault.