



Effect of ENSO events on sediment production and transfer in a large coastal basin in northern Peru

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Although the potential importance of El Niño-Southern Oscillation events on hydrological anomalies has been recognised, the variations in sediment fluxes caused by these extreme events are poorly documented. The effect of ENSO events is not limited to an increased sediment mobilisation, since ENSO events can have profound effects on terrestrial ecosystems. ENSO events may therefore have important effects on sediment production and transport in river basins over time spans that are considerably longer than the duration of the event itself.

The Catamayo-Chira basin on the border between Ecuador and Peru is an interesting case study for investigating the geomorphic implications of extreme climate events. The objectives of this research were: (i) to study the effect of ENSO phenomena on stream flow and sediment yields in the Catamayo-Chira basin, (ii) to investigate if ENSO events affect sediment yields in the post-ENSO period and (iii) to understand which factors control the ENSO and post-ENSO basin response. During strong ENSO periods, mean annual stream flow discharge at the inlet of the Poechos reservoir in the lower basin was 5.4 times higher than annual discharges during normal years. Average sediment fluxes during these periods exceeded those of normal years by a factor of about 11. In two periods affected by strong ENSO events, 45.9% of the total sediment yield in the 29 years observation period was generated. Sediment fluxes in the post-ENSO period are lower than expected, which proves post-ENSO event dynamics are significantly different from pre-event dynamics. Our analysis indicates that the possible increase of vegetation growth in the lower basin is not the main reason explaining the considerable decreases in sediment flux in the post-ENSO periods. During strong ENSO events, sediment in alluvial stores in the lower part of the basin is removed due to enlarging and deepening of channels. In the post-ENSO period, normal discharges combined with persisting sediment supply from the middle and upper basin lead to river aggradation and narrowing, and storage of large amounts of sediment in developing alluvial plains. The decrease in sediment export will last for several years until the equilibrium is re-established. The main effect of ENSO is the mobilisation of footslope sediments: this may have important consequences for sediment mobilisation in the uplands as it allows rivers to incise more efficiently.