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A climatic fingerprint recorded in fluvial terraces and alluvial fans, Valley de Pisco, Peru

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The Late Quaternary development of the Valley de Pisco in Central Peru (13.5˚S) is characterized by three major phases of sediment accumulation and erosion, forming alluvial fans and cut-and-fill terraces. Here, we present, along with sedimentological data, a detailed chronology of the aggradational phases of the Rio Pisco and its tributaries. The sediments where dated using Optically Stimulated Luminescence (OSL) which indicates the time of deposition of the sediment.

There are several concepts about the formation of cut-and-fill terraces and alluvial fans. Amongst others, climate change is an important factor which may trigger the transition between aggradational and degradational behaviour of a fluvial system. The ages of the cut-and-fill terraces as well as the alluvial fans correlate very well with wet periods on the Altiplano (Minchin (47.8-36 ka), Tauca (26-14.9 ka) and Coipasa (11.4-10.2 ka)). Evidence of these wet periods is found in northern Chile, Bolivia, southern Peru and northwestern Argentina. The correlation of wet periods on the Altiplano and the aggradational phases suggests that the aggradation occurred during periods of enhanced precipitation.

Because of their spatial extent throughout the valley, the absence of neotectonic deformation and the aggradational phases being out-of-phase with sea-level changes, we conclude that the terrace sequences reflect the response of the drainage basin to climate changes. An enhanced Atlantic influence during the wet periods brings a monsoonal climate and humidity to the Rio Pisco drainage basin. An increase in storm magnitude and/or frequency would result in a stripping of the regolith from the bedrock, before vegetation cover could be established. Erosion of the regolith cover on the hillslopes and a subsequent establishment of a vegetation cover result first in an increase and then in a decrease of the downslope flux of sediment. The response of the trunk stream is

sediment aggradation followed by incision and terrace formation.