

PALEOFLOOD AND DEBRIS-FLOW DEPOSITS IN THE ILO REGION, FAR SOUTH COAST OF PERU: A 38,000 YEAR RECORD OF SEVERE EL NIÑO EVENTS?

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The far south coast of Peru is part of one of the driest deserts on earth. During historic times, flood and debris-flow deposits have been produced only during periodic El Niño events, which can bring torrential rains to the region. El Niño events in 1982-83, 1992, and 1997-98 caused widespread flooding in the region. Two older region-wide flood deposits are dated to the fourteenth and seventeenth centuries. These deposits are thicker, coarser-grained, and more extensive than those deposited by the late twentieth century El Niño events, indicating that they were deposited during events that were significantly more severe than anything known from the later historical record. The fourteenth century event, known as the Miraflores flood, had a devastating impact on the indigenous population.

Radiocarbon and infrared-stimulated luminescent dating at archaeological sites on three alluvial fans in this region has now provided dates for many earlier episodes of such large-scale flooding and debris-flow activity dating from as early as 38.2 ka. At Quebrada Tacahuay, two major floods are recorded between an archaeological horizon dating to c. 12,000-12,900 cal. yr B.P. and c. 11,600-11,700 cal. yr B.P. Other major floods date to c. 10,800-11,100, c. 9500, c. 8700, and c. 5300 cal. yr B.P. Two much smaller floods, similar in scale to those associated with the 1982-83, 1992, and 1997-98 El Niño events, occurred between c. 9000 and c. 5300 cal. yr B.P. Below the archaeological horizon is a sequence of deposits with a basal TL date of 38.2 ka, recording at least 10 earlier major floods. At Quebrada Miraflores, debris-flow deposits underlying the late fourteenth century deposit are interbedded with middens dated to c. 8400, c. 9600-9900 and c. 10,600 cal. yr B.P. The two older debris-flow deposits at Miraflores Quebrada may well result from two of the same events that produced deposits at Quebrada Tacahuay. At Quebrada Yara a single debris flow deposit is bracketed between two middens dating to c. 3000-3100 and 3900-4200 cal. yr B.P.

The composite record from the Ilo region thus shows three distinct periods within the Holocene with differing temporal distributions of large-scale paleoflood and debris-flow deposits presumably caused by particularly severe flood events: (1) an early period (between c. 12,000 and c. 8700 cal. yr B.P.) with a high frequency of such deposits, (2) a middle period (between c. 8700 and c. 5300 cal. yr B.P.) with no large-scale deposits but with deposits comparable to those observed in the late twentieth century El Niño events, and (3) the most recent period (since c. 5300 cal. yr B.P.) with a moderate frequency of large-scale deposits. Additional large-scale events also occurred in the late Pleistocene, as evidenced by deposits dated as early as c. 38.2 ka, but the temporal distribution of those Pleistocene events cannot be determined in any more detail from the available data. Characteristics of all these deposits indicate that they were produced by intense runoff in an arid environment, similar to that of the present day, suggesting that they also resulted from El Niño events.