

Extreme ENSO-driven torrential rainfalls at the southern edge of the Atacama Desert during the Late Holocene and their projection into the 21th century

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Extreme precipitation events and multi-annual droughts, especially in arid to semi-arid subtropical regions, are among the most critical El Niño Southern Oscillation (ENSO) and global climate change impacts. Here, we assess the variability of torrential rainfall during the Late Holocene and its projection into the 21st century at the southern edge of the hyperarid Atacama Desert. The analysis of historical data since the beginning of the 20th century reveals that most (76.5%) alluvial disasters in the southern Atacama Desert (26°-30°S) have resulted from extreme rainfall events occurring between March and September under El Niño conditions, and more frequently during the warm phase of the Pacific Decadal Oscillation. Particular rainfall events under these ocean-climate conditions are associated with the convective phase of the Madden-Julian Oscillation (MJO) near the central-equatorial Pacific, resulting in warmer sea surface temperature (SST) there and in the trigg