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Cosmogenic ^{10}Be from uplifted bedrock marine terraces indicates revised Holocene earthquake intensity for northeast South Island, New Zealand

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Sequences of Holocene marine terraces are widely used in paleoseismic research to understand the timing and magnitude of earthquakes along tectonically active coastal margins worldwide. But the potential for marine terraces to be destroyed through erosion after uplift can result in incomplete records of paleoseismicity as derived from terrace chronologies, leading to misinterpretations of the paleoseismic history of a region. Here, we present measurements across a unique set of exposed bedrock marine terraces in the north-eastern South Island, NZ, to quantify the ages and erosion rates of the surfaces and produce a new chronology for paleoseismic interpretation. Surface exposure dating and multi-nuclide approaches offer the potential to quantify marine terrace preservation and destruction, potentially elucidating where terraces may be missing or removed from a sequence. Needles Point, Marlborough, NZ exhibits three well defined bare rock marine terraces and a gravel covered shore platform which was recently uplifted ~2.5m in the M_W 7.8 2016 Kaikōura earthquake. ^{10}Be-derived ages for the platform surface and terrace 1 (T1) align with known ground surface rupturing earthquakes on the Kekerengu fault. T2 and T3 preserve older events not previously identified, potentially extending the earthquake record in this region. However, other known ground surface rupturing earthquakes on the Kekerengu fault are not preserved as terraces at Needles indicating that the preserved terraces at Needles Point do not therefore represent a full record of local paleoseismicity. As such, estimates of fault throw derived from these terraces would over-estimate earthquake magnitude.