



# Did earthquakes strike Machu Picchu?

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**Abstract** The Historic Sanctuary of Machu Picchu (Cusco, Peru) is one of the most important archaeological monuments in Peru and worldwide. Machu Picchu is classified as a UNESCO World Heritage site and at risk from climatic change. However, the seismic centennial history of Peru reports large earthquakes generated both along the subduction zone (Mw8) and on active crustal faults along the Andean Cordillera (Mw7). It is therefore important to know if Machu Picchu is located in an area of seismic hazard and then to take measures to mitigate potential seismic hazards. Due to the short historical earthquake catalogue (< 500 years) and the absence of significant recent instrumental seismicity in the site's vicinity

(radius of < 30 km), our knowledge about the seismic hazard in Machu Picchu is limited. The earthquakes of 1650 and 1950 affected Cusco city and surrounding areas, but without damage descriptions in Machu Picchu (80 km away) (Silgado Ferro 1978). In this study, we make the first attempt to use the analysis of earthquake archaeological effects (EAEs) and their differentiation from the effects generated by slope movements (creep) to investigate the past occurrence of strong earthquakes at the site. The application of geological structural analysis to the deformations observed in Machu Picchu shows two directions of the mean ground movement: N020° E and N110° E. Two earthquakes that affected Machu Picchu during its

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