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Evidence of a large "prehistorical" earthquake during Inca times? New insights from an indigenous chronicle (Cusco, Peru)

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ABSTRACT

A colonial chronicle written by the indigenous Peruvian author Pachacuti Yamqui Salcamaygua ([1613?]) relates a legend of the sudden appearance of a huge animal – kilometres in length and approximately 4 m in width – and described as the Andean snake-like deity *amaru*. Pachacuti Yamqui alleged that this fantastic event occurred on the day that the sovereign Pachacuti Inca Yupanqui's eldest son was born around 1440 CE, and was named "Amaru". We suggest that the underlying event was an earthquake, and that the propagation of the surface rupture across the landscape resembled a sudden appearance of a snake-like being wriggling over the mountains and leaving an undulating surface trace. The concordance between the snake's route and the layout of a major fault complex above Cusco, as well as several ethnographic testimonies, support this hypothesis. Although little is known about pre-1532 CE seismicity, the current tectonic settings of the Cusco area point to seismic awareness of the Incas (ca. 1300–1532 CE). Independent results from architectural and paleoseismological fields in the Cusco area corroborate a significant impact of large earthquakes on local societies. In Peru, without pre-Hispanic written sources, the oral folklore and traditions preserved in Spanish chronicles offer a relevant, but still underexploited resource for identifying paleo-extreme events. Combining multidisciplinary geomorphic observations, archaeological evidence and historical sources, we revisit this legendary episode and its possible implications.

1. Introduction

What could be the nature and degree of influence of thousands of years "long-term" geological dynamics on decade-scale, "short-term", human expansion and evolution? Without considering and adopting a deterministic perspective, this question remains nevertheless worthy of debate (Force and McFadgen, 2010; King and Bailey, 2006; Nomade et al., 2016). Severely affected by floods, climate variations, volcanic eruptions, and earthquakes, the Andes appear to be suited well for assessing the influence of natural phenomena on past human societies. In Peru, particularly, numerous studies have demonstrated correlations between climatic events and the emergence or demise of archaeological settlements (Binford et al., 1997; Chepstow-Lusty et al., 2003, 2009; Christol et al., 2017; Sandweiss, 2003; Sandweiss et al., 2009, 1996). Volcanoes and sudden eruptions have also had a great impact on the worldview and organization of the pre-Columbian cultures (Bouysse-Cassagne, 2006; Bouysse-Cassagne and Bouysse, 1984; Chávez Chávez, 2001; Reinhard, 1983). Few academic investigations, however, seem to have focused on the impact of earthquake activity, and almost exclusively in the Mesoamerican world (Garduño-Monroy et al., 2020; Garduño-Monroy, 2016). Although valuable work has been carried out in the aftermath of devastating earthquakes that struck the Peruvian coast during colonial and modern times (D'Ercole et al., 2007; Seiner Lizárraga, 2013; Walker, 2018, 1999), little has yet been done regarding pre-Hispanic seismic risk management and perception. Beyond megathrust earthquakes that affect mainly coastal areas, crustal faults within the Andes present a major threat for local populations as demonstrated by the 1946 Ancash (Silgado Ferro, 1951) and 1950 Cusco (Kubler,

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