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Cosmogenic exposure dating the Pre-Columbian archaeological structures at Tiwanaku, Bolivia

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We use in-situ cosmogenic ^{10}Be to date the construction of stone platform from the Kalasasaya UNESCO Heritage archaeological site at the ancient city of Tiwanaku, Bolivia. The unique site is located within the altiplano valley of Tiwanaku at 3870 masl near the southern shores of Lake Titicaca. The monuments at Tiwanaku were constructed as ceremonial and civic buildings of exceptional precision and quality by an Andean civilization, who were precursors of the Inca Empire. The pillars, ~5 meters tall and of square meter section, frame the outer perimeter wall of the 120m square Kalasasaya Platform which is made of andesite and sandstone blocks quarried from outcropping bedrock tens of kilometres distant and at ~4300 masl. The date of construction of Tiwanaku is unknown. Earliest settlement is believed to be at least ~3,000 years ago and archeological evidence supports a drought-based empire collapse in the first half of the 12th century. Radiocarbon dating of construction material and other debris ranges from 300 to 950 AD. At its apogee Tiwanaku settlement is estimated to have extended over an area of as much as 6 sq km and to have housed between 70,000 and 125,000 inhabitants. We gained permission to sample the very tops of 3 of these pillars, multi-meter size cuboid sandstone blocks excavated at the quarries, bedrock surfaces of the cavity from where blocks originated, and unmodified bedrock outcrop. We were able to re-orient extracted blocks back into their original excavated cavity and thus determine pre-excavated buried and post-excavated exposed vertices which allowed us to measure how long ago the block was carved out of bedrock and rotated in the process.

Our results show that the cosmogenic signal in platform pillar tops is dominated by inheritance but that blocks had been quarried as recently as 2500-3500 years ago, the age range depending on the magnitude of the steady state erosion rate for the site and choice of attenuation length. Details of sampling, ^{10}Be measurements and age calculations will be presented.

Student Submission

No

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