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A new paleoaltimeter using multiple radioactive cosmogenic nuclides

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Determining absolute paleoaltitudes over geological timescales is one of the most challenging issues in Earth Sciences. We present here the theoretical basis of a new paleoaltimetric approach, based on the analysis of at least two cosmogenic nuclides with different radioactive decay, that have been produced in paleo-exposed surfaces.
Applying this method to the existing 21Ne-10Be-26Al datasets in the dry Andes shows a very good agreement between the computed and the sampling elevations. Limitations and uncertainties of our new approach are evaluated using several numerical simulations. In many cases, the uncertainty at the 1-sigma level will be lower than 1000 m.
The two main advantages of this method are i) the computed altitude is almost insensitive to the impact of erosion and ii) it does not require an independent determination of the duration of the paleo-exposure. However it has the inconvenient to require long paleoexposure (> 500 ka), which can be difficult to find in fast eroding mountainous environments.