Estimating long-term ice thinning rates from cosmogenic exposure dates

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Terrestrial evidence of the Antarctic Ice Sheet's adjustment from the last glaciation to the warm conditions of the Holocene is provided by glacial deposits on nunataks that lie above the present-day ice surface. The ages of these elevated deposits are commonly estimated using cosmogenic exposure dating, a technique that relies on the accumulation of rare chemical species (cosmogenic nuclides) in surface rocks over time. However, cosmogenic exposure dates from Antarctic rocks are commonly "too old," creating apparent stratigraphic reversals when samples from different levels on the same nunatak are compared, and complicating the estimation of ice surface lowering rates from the dates. Here, we present progress toward an internally-consistent method for estimating ice surface lowering rates from cosmogenic exposure dates in Antarctica, and we apply this preliminary method to a selected group of studies that are geographically well-distributed around the edges of the Antarctic Ice Sheet. We further comment on how our estimated thinning rates can be used as a tuning data set for ice sheet models.