Elevated Cosmogenic $^{26}Al/^{10}Be$ Production Ratio at High Latitude

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Abstract

The value for the cosmogenic 26Al/10Be surface production ratio in quartz is an important parameter in studies investigating the burial or subaerial erosion of long-lived surfaces and ancient sediment. Most two-isotope cosmogenic approaches involve assessing the measured 26Al/10Be ratio in sample material in relation to that of constant surface production, where lower measured 26Al/10Be ratios indicate longer burial durations or prolonged exposure times because 26Al decays more quickly than 10Be. Although the individual production rates of both isotopes vary with latitude and altitude, most studies assume that the ratio between the two isotopes during production remains constant at ~6.75. However, recent models and isotopic data suggest that the production ratio might not be constant over space and may be greater than the canonical value. We present 26Al/10Be ratios for 24 continuously exposed bedrock and boulder surfaces at four study sites between ~61-77 N in Greenland. Most rock surfaces at these study sites were deeply eroded during the last glaciation and exposed during ice margin retreat ~12-10 ka. Calculated 26Al/10Be ratios of bedrock and boulder surfaces average 7.4 0.1 (error-weighted, 1), and this value is robust to different blank corrections. The slope of a York regression, which accounts for the uncertainties in the measurements of both isotopes, is 7.3 0.3 (1). These data suggest that a 26Al/10Be surface production ratio of 6.75 is ~10% too low, at least at high latitude, and that 26Al and 10Be surface production rates may indeed scale differently with latitude. A higher 26Al/10Be production ratio has implications for two-isotope cosmogenic studies and will result in the conclusion of more samples experiencing burial, longer modeled burial durations, and greater modeled erosion rates.

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