



Direct evidence of the feedback between climate and weathering

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Long-term climate moderation is commonly attributed to chemical weathering; the higher the temperature and precipitation the faster the weathering rate (1). Weathering releases divalent cations to the ocean via riverine transport where they promote the drawdown of CO₂ from the atmosphere by carbonate mineral precipitation (2,3). To test this widely-held hypothesis, we performed a field study determining the weathering rates of 8 nearly pristine north-eastern Iceland river catchments with varying glacial cover over a span of 44 years. The mean annual temperature and annual precipitation of these catchments varied by 3.2 to 4.5 °C and 80 to 530%, respectively during the study period (4). Significant linear positive correlations were found between mean annual temperature and chemical weathering in all 8 catchments and between mean annual temperature and mechanical weathering and runoff in 7 of the 8 catchments. The runoff, mechanical weathering flux, and chemical weathering fluxes in these catchments are found to increase from 6 to 16%, 8 to 30%, and 4 to 14% respectively, depending on the catchment for each degree temperature increase. In contrast, significant positive correlations between annual precipitation runoff, mechanical weathering and chemical weathering were only found in 3 of the least glaciated catchments.

References

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