Glacial exposure ages
insights from a global compilation

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Outline

Introduction

Exposure age compilation

Exposure ages and statistics
Glacial exposure dating

Glacial erosion
Shielding from cosmic rays

Full exposure to cosmic rays
(no post-depositional shielding)

Sampling
Correct age ???
Glacial exposure dating – problems

a Ideal case

b Prior exposure

c Incomplete exposure
Exposure age compilation

Sample information extracted from publications

Lat, longitude, altitude, sample thickness, shielding... $^{10}$Be standard

All samples divided into glacial landform/deposit groups
(Global) glacial $^{10}$Be exposure age compilation

- Tibet Plateau: 1789 samples
- Europe: 662 samples
- North America: 835 samples
- South America: 562 samples
- New Zealand: 266 samples

$\sum 4114$ samples
Recalculation of exposure ages

All exposure ages recalculated using CRONUS online code with Lal/Stone time-dependent production rate scaling and a reference production rate of $4.11 \pm 0.39$ atoms g$^{-1}$ yr$^{-1}$.
Exposure ages

South America

North America

Europe

Tibetan Plateau

New Zealand

Exposure age (yr)

Nr of sample

South America

North America

Europe

Tibetan Plateau

New Zealand
Exposure ages

South America

North America

Europe

Tibetan Plateau

New Zealand

Exposure age (yr)

Nr of sample
Reduced chi-square

Boulder sample groups
Total: 561 groups
$R_{\chi^2} < 2$: 111 groups \(20\%\)

Bedrock sample groups
Total: 59 groups
$R_{\chi^2} < 2$: 21 groups \(36\%\)
Reduced chisquare

Bedrock sample groups
Total: 59 groups
$R\chi^2 < 2$: 26 groups 44%

Boulder sample groups
Total: 561 groups
$R\chi^2 < 2$: 195 groups 35%
Error weighted mean exposure ages for groups with $R\chi^2 < 2$
Error weighted mean exposure ages for groups with $R\chi^2 < 2$
Conclusions

• Many (perhaps most) glacial exposure ages do not show the deglaciation age

• Sample groups with good clustering are mostly from the last major deglaciation
Thank you!