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Interhemispheric patterns of Holocene glacier fluctuations

J.M. SCHAEFER, R.C. FINKEL, M.R. KAPLAN, A. PUTNAM, A. DOUGHTY, S. KELLEY, R. SCHWARZ, G.H. DENTON, D.J.A. BARRELL, B.G. ANDERSEN, C. SCHLUECHTER

Glaciers and Climate Change

1860 AD

inge over the last 150



Drawing by Julius Haast 1863

Production of terrestrial cosmogenic nuclides



In-situ cosmogenic nuclides

- Production in upper meters of Earth's surface
- Dating range: 100 yr \rightarrow 10 Myr
- Precision ?!

$$N = \frac{P}{\varepsilon/L} (1 - e^{-(\varepsilon/L)t})$$

 $\varepsilon = \text{erosion rate}$ P = production rate

Local Production Rate Calibration in New Zealand's Southern Alps

Putnam et al., in review





FIGURE 9.



FIGURE 11.



Dating Terminations!

Sampling for Surface Exposure Dating



{|||]

2,100±100 x66

3,350±310 937 3,370±290 938 3,060±240 902 3,150±300 905

6,370±760 801

470±70 912 600±70 903 800±60 904 600±60 941 610±50 939 450±90 940

Holocene glacier fluctuations In New Zealand's Southern Alps

1,820±100 x79 1,930±140 926 1,960±90 x74 1,820±110 x73 1,830±160 957 1,720±100 x70 1,990±130 x71

530±50 ×60 270±20 ×61 320±40 ×59 170±20 ×57 290±30 ×58 270±50 914 250±50 908 310±50 907 340±50 906

190±20 943 220±20 958 160±20 944 230±20 959 130±20 942

> 480±60 ×46 400±40 ×45 330±40 ×42 390±60 ×43 280±40 ×44 420±90 ×36 480±40 ×38 450±50 ×62

410±50 x63

Schaefer et al., 2009



Regional atmospheric oscillations driving glaciers?

Interdecadal Pacific Oscillation and glaciers in the Southern Alps

Atlantic Multidecadal Oscillation And glaciers in the Alps





Broecker and Denton, 2008

Tropical Holocene glaciations?

Holocene glacier fluctuations in the Peruvian Andes indicate northern climate linkages

accepted, Science

Joseph M. Licciardi^{1.*}, Joerg M. Schaefer², Jean R. Taggart¹, David C. Lund³







Licciardi et al, Science, in revision

Detailed Mapping of moraines & Precise ¹⁰Be Dating

Near-Global Map of glacial fluctuations

Basic Earth Science

Applied Social Sciences

