Holocene warming regional

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Research confirms regional — not global — climate change in New Zealand and European glaciers during the preindustrial Holocene

Across the globe in the past century, mountain glaciers have been melting in response to warmer atmospheric temperatures. They include peaks in the European and Southern Alps — formations found on opposite sides of the globe.

New research led by scientists at the University of Maine's Climate Change Institute has documented that unlike the concurrent, widespread melting occurring today, glaciers in the European and Southern Alps 11,500 years ago experienced regional climate and oceanographic variability.

The findings of the international research team, led by then UMaine Ph.D. student in Earth sciences Aaron Putnam, provide evidence that changes in glacier behavior in the preindustrial age were not caused by global atmospheric warming. As reported this week in *Nature Geoscience*, the researchers suggest that today's glacier recession in New Zealand and Europe is unlike what occurred in those mountain ranges in the preindustrial Holocene period, and corresponds with human-produced greenhouse gases.

Putnam and his team worked on Cameron Glacier in the central Southern Alps. They reconstructed glacier fluctuations and associated temperature variations for the past 11,000 years using moraine geomorphology and high-precision beryllium-10 (10Be) surface

exposure dating — a measure of the cosmogenic nuclide on rock faces to determine the age of landforms marking what were once the edges of glaciers. The researchers also used a geometrical method to reconstruct the height of past mountain snowlines, which are affected by atmospheric temperature.

Using this geologic record of mountain glaciers to quantify the history of atmospheric temperature, the research team found that Cameron and other glaciers in the Southern Alps retreated several centuries earlier than those in the European Alps.

Previous research has shown that beginning 11,500 years ago, glacier expansion occurred in the European Alps due to atmospheric cooling. That was followed in the 17th to 19th centuries by large-scale glacier retreat.

Putnam, a native of Chapman, Maine, now a postdoctoral researcher at Columbia University, collaborated in his research with George Denton of the UMaine Climate Change Institute and scientists from the Lamont-Doherty Earth Observatory, Columbia University, GNS Science in New Zealand, University of California, Berkeley and Victoria University.

Provided by University of Maine

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