

Rapid, widespread changes may be coming to Antarctica's Dry Valleys, study finds

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A member of the research team inspects buried ice melting out from beneath a thin soil cover. Credit: Joseph Levy

Antarctica's sandy polar desert, the McMurdo Dry Valleys, has undergone changes over the past decade and the recent discovery of

thawing permafrost, thinning glaciers and melting ground ice by a Portland State University-led research team are signs that rapid and widespread change could be on the horizon.

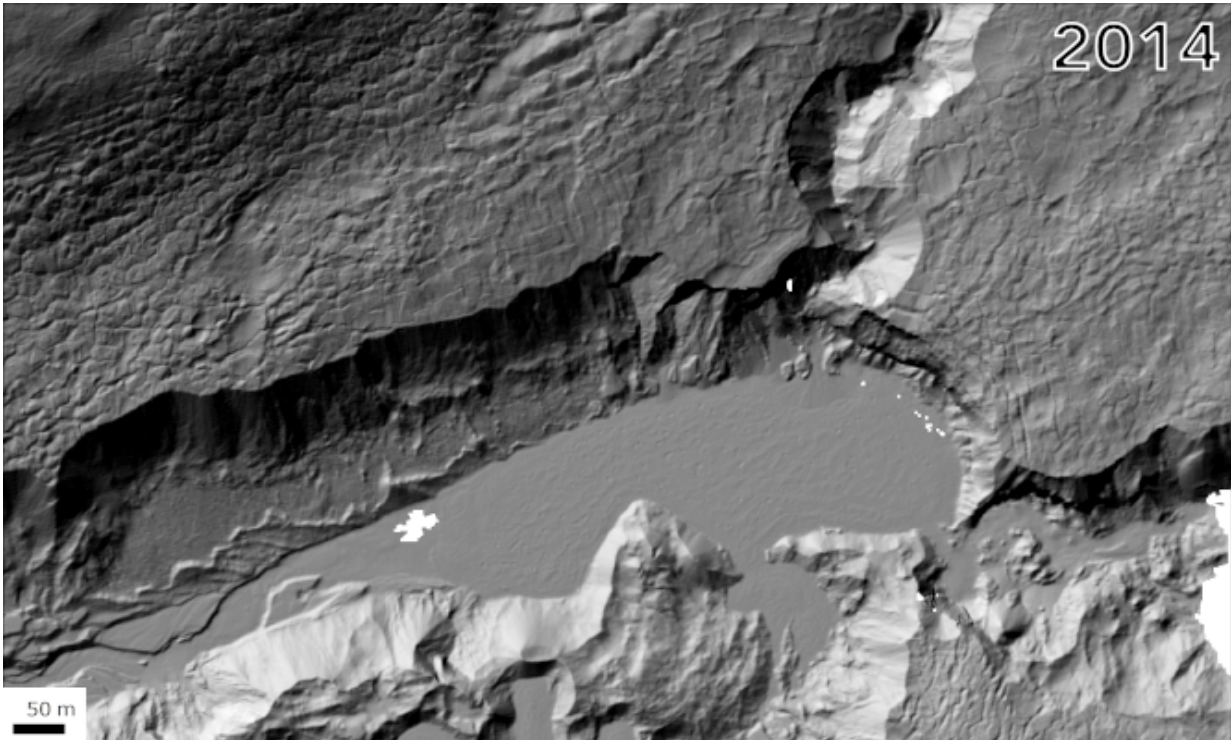
Led by Andrew Fountain, a geology professor in PSU's College of Liberal Arts and Sciences, a team of researchers used an airborne laser scanner, or lidar, to measure the surface elevations of glaciers, soils and ice-covered lakes in Antarctica's largest exposed land region. The team then compared the elevations to similar measurements made in 2001 by a different project.

The work was supported by the National Science Foundation, which manages the U.S. Antarctic Program, the nation's research endeavor on the southernmost continent.

The findings were reported Sept. 13 in the journal *Geomorphology*.

"Millions of cubic meters of buried ice have melted in the last decade," said Joseph Levy, the paper's lead author and an assistant professor of geology at Colgate University. "It's unprecedented change over the historic period of Antarctica and perhaps since the end of the last ice age. If it keeps up, it could remove the last ice deposits from some valleys in about five hundred years."

Levy said they believe the culprit is meltwater. When soils thaw and become wet from melting the buried ice below, their insulating capacity is reduced and they conduct much more heat.



An animated gif showing the banks of Alph Lake, McMurdo Dry Valleys, in 2001 and 2014. The walls of the lake are collapsing and the channel feeding it is getting much deeper and wider as warm water pours down the slopes, melting ground ice. Credit: Joseph Levy

"The valleys have been considered almost timeless, yet here we see some changes that would be considered rapid even in more temperate climates," Fountain said.

These rapid changes over the past 14 years come at a time when the Antarctic climate may be turning a corner. While the Dry Valleys region was cooling locally during the 1990s and early 2000s, warmer summers followed. A major melt episode in the Antarctic summer of 2001-2002 set the stage for widespread melting in this polar desert landscape.

"The melting mirrors the kind of melting scientists expect to see in the coming decades if climate warming catches up with the more isolated corners of Antarctica," Levy said.

Fountain added that the Dry Valleys may be on the threshold of a major reorganization.

Levy and Fountain said the melting of ground ice and thinning of glaciers threatens to disrupt delicate polar desert ecosystems and wash away clues to past climate change.

"The story of how ice sheets collapsed at the end of the last two ice ages is written in the permafrost landforms stuck to mountains and valleys in Antarctica," Levy said. "When that frozen ground thaws and turns to mud, it's like dropping your notebook in a puddle. The records are gone."

More information: J.S. Levy et al, Decadal topographic change in the McMurdo Dry Valleys of Antarctica: Thermokarst subsidence, glacier thinning, and transfer of water storage from the cryosphere to the hydrosphere, *Geomorphology* (2018). [DOI: 10.1016/j.geomorph.2018.09.012](https://doi.org/10.1016/j.geomorph.2018.09.012)

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