

A Climate Change Tour for a K-12 Audience

Note: This tour was first published in 2009 at the National Snow and Ice Data Center (NSIDC). In June 2022, it was reviewed and found to still be very relevant to current climate conditions. The permafrost map is somewhat outdated but the September sea ice animation movie was updated to show data through September 2021, however, the audio that plays over the animation was not updated. We leave it to the interested student to find the most recent data or maps and see how things have changed since 2009.

This project was presented as a talk at the Geological Society of America 2009 Fall Meeting in Portland, Oregon. The co-authors were L. Ballagh (NSIDC) and V. Otero (CU's School of Education). An abridged version of the project is summarized below.

With a focus on snow and ice, this tour explains how snow and ice play critical roles in the changing climate. Scientists publish their results in refereed journals, the media interviews scientists on engaging topics, and citizens learn about climate change through multiple channels. But what do students understand about climate change and what questions do they have? In a classroom setting in Denver, Colorado, middle-school science students connect with National Snow and Ice Data Center scientists through interactive question and answer sessions. Students ask their questions and scientists respond. With down-to-earth examples and terms that are simple to understand, students and scientists share their thoughts and knowledge about climate change. The scientists are videotaped by a CU undergraduate student funded by the National Science Foundation's Robert Noyce Scholarship Program as a part of her science education research. In this tour, viewers observe data overlays and videos of scientists answering children's questions about climate change. The tour is 12 and half minutes long.

1 DATA SOURCES

Fetterer, F., K. Knowles, W. Meier, and M. Savoie. 2002, updated 2009. Sea Ice Index. Boulder, CO: National Snow and Ice Data Center. Digital media.

NSIDC/WDC for Glaciology, Boulder, compiler. 2002, updated 2009. Glacier photograph collection. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.

Scambos, T., B. Raup, and J. Bohlander, compilers. 2001, updated 2004. Images of Antarctic ice shelves, March 2004. Boulder, CO: National Snow and Ice Data Center. Digital media.

2 FIGURES FROM TOUR

Figure 1 from tour: Photograph of Ted Scambos in front of classroom.



Figure 2 from tour: Photograph of Julienne Stroeve in the Arctic.



Figure 3 from tour: The village of Qannaq, Greenland, in the Arctic, is built on permafrost. Credit: Andy Mahoney/NSIDC.



Figure 4 from tour: This damaged building in Dawson City, Canada, shows what can happen when the warm interior of a building causes the permafrost underneath to thaw. Credit: Andrew Slater.



Figure 5 from tour: The leaning trees in this Alaskan forest tilt because the ground used to be permanently frozen, but it thawed. Forests like this are named drunken forests. Credit: Tingjun Zhang.



Figure 6 from tour: A large portion of the Arctic has permafrost. On this map, darker shades of purple indicate larger percentages of permanently frozen ground. Lighter purples, and the terms isolated and sporadic, refer to lower percentages of frozen ground. Credit: Map by Philippe Rekacewicz, UNEP/GRID-Arendal; data from International Permafrost Association, 1998. Circumpolar Active-Layer Permafrost System (CAPS), version 1.0.



Figure 7 from tour: This lake in Alaska formed when the active layer thawed. Lakes like this one provide water for plants and animals in frozen ground areas. Credit: Tingjun Zhang.



Figure 8 from tour: These tracks in the Tibetan tundra formed when a truck drove over the ground a few years ago. The gullies can get bigger and deeper over time, changing the landscape forever. Credit: Tingjun Zhang.



Figure 9 from tour: Post, Austin. 1966. South Cascade Glacier: From the Glacier Photograph Collection. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.

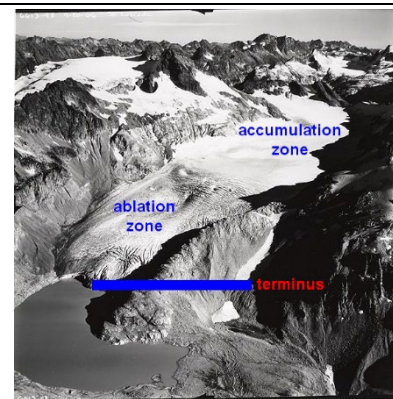
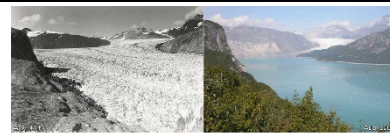


Figure 10 from tour: Photographs by William O. Field on 13 August 1941 (left) and by Bruce F. Molnia on 31 August 2004 (right). Muir Glacier: From the Glacier Photograph Collection. Boulder, Colorado USA: National Snow and Ice Data Center. Digital media.



Muir Glacier (foreground) and Riggs Glacier (background right), photographed by William O. Field on 13 August 1941 (left) and by Bruce Molnia on 31 August 2004 (right). Note that in the 2004 photo, Muir glacier has completely retreated out of the frame of the photo

Figure 11 from tour: Photograph of the Chukchi Sea.
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3 YOUTUBE VIDEOS

Video 1 from tour: [Why is Greenland called Greenland?](#)

Video 2 from tour: [How long has Antarctica been a continent?](#)

Video 3 from tour: [How was Antarctica found?](#)

Video 4 from tour: [September Arctic Sea Ice Animation](#)

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