

Ice Sheet Albedo - Instructor Guide

Source: Aakriti Srivastava, Barkatullah University

Activity Summary

In this lesson, students observe spatio-temporal albedo trends in the Greenland ice sheet. Students will understand regional-scale processes and atmospheric-oceanic forcings play a significant role in the ice sheet albedo variation.

Learning Goals and Outcomes

Students will...

- Analyze the spatio-temporal variations in the Greenland ice sheet albedo and mass balance
- Understand regional-scale processes' and atmospheric-oceanic forcings' significant role in the ice sheet albedo variation

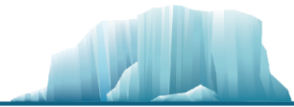
Context for Use

Topic	Glaciology
Course Type	Curriculum
Audience	Advanced Undergraduate or Graduate
Instructional Time	120 minutes
Context	This learning activity could be used in remote sensing or courses on the cryosphere. Students require background knowledge in glaciology and ice sheet dynamics.
Materials	Computers that have QGIS and QGreenland installed. See requirements at www.qgis.org .
Materials Prep	Instructor should be familiar with how to complete the QGIS exercises in the lab

Description and Materials

Before this exercise, students must be familiar with QGIS and QGreenland. The instructor can provide an overview by assigning the [QGreenland Beginner Tutorial Series](#) to students to watch and complete the exercises.

Students should be familiar with the ice sheet, sea ice, glaciers, and dynamics in Greenland before this activity. Show this video entitled '[Ice Dynamics with Twila Moon](#)' as a quick refresher at the start of this activity.



Part 1: Exploring Greenland with QGreenland

Demonstrate for students how to navigate around the QGreenland GIS package and turn on various data layers, give students time to explore. Lead a discussion of how data varies spatially in Greenland. What trends do they notice? What might cause that trend?

Part 2: What are the albedo variations around Greenland?

Have students explore albedo by expanding the Geophysics group (click on the arrow ▶) and toggling on/off July 2018 albedo and then July 2019 albedo by clicking the box (□/☑) next to the layer name. Students should examine albedo around Greenland and answer the following questions:

1. What are the changes observed between the two years of data?
2. Which portion shows higher albedo and why?
3. What does the range 0 to 0.87 indicate?

Teaching Notes and Tips

Part 1 of this activity works well when students are able to discuss amongst each other about the data, and how to navigate around QGreenland. The second part of this lesson allows students to explore more of QGreenland to answer questions about albedo variations.

This lesson aligns with the standards below:

- [Polar Literacy Principle 2B](#): Ice shapes the polar landscape.

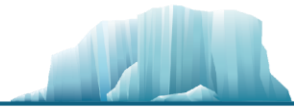
Assessment

While no tailored assessments are designed for this lesson, consider using an exit ticket. See below for some resources on exit tickets:

- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. Available at: <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).

References and Resources

- Center for Professional Education for Teachers (n. d.) *Exit Tickets as Formative Assessments*. Available at: <https://cpet.tc.columbia.edu/news-press/exit-tickets-as-formative-assessments> (Accessed: 3 September 2026).
- Center for Teaching Excellence (15 March 2024) *Exit Tickets*. Available at: <https://cteresources.bc.edu/documentation/exit-tickets/> (Accessed: 3 September 2026).
- CIRESvideos (2021) *Ice Dynamics with Twila Moon*. Available at: <https://www.youtube.com/watch?v=FISQlvRDctg> (Accessed: 3 September 2026).



- QGIS (n.d.) *Spatial without Compromise*. Available at: <https://www.qgis.org/> (Accessed: 3 September 2026).
- QGreenland (2022) *QGreenland Beginner's Tutorial Series*. Available at: <https://www.youtube.com/playlist?list=PLSRiyMridUCwyu-vqpAFtm8bVERgTvs7q> (Accessed: 3 September 2026).