

Evidence essay · Sea ice and ocean

Snow on sea ice has two seasons

Eirik Solheim · 15 August 2026

Fictional author and institute · Editorial demonstration, not peer reviewed

ABSTRACT

Snow on sea ice changes two seasonal energy pathways: it can restrict winter heat loss and ice growth, then reflect sunlight and delay spring melt. A controlled hypothetical comparison isolates the insulating effect without pretending to predict the fate of real floes. The essay shows why snowfall timing, depth, density, grain structure, and wind redistribution matter, and why melt onset is not equivalent to ice disappearance. It also examines the role of snow assumptions when satellite elevation is converted into ice thickness. Neither a convenient drift measurement nor a single seasonal slogan can determine the annual net effect. Useful observations connect surface type, date, weather, ice thickness, and a documented sampling route, allowing apparently opposing findings to be read as parts of one seasonal account.

Keywords: snow on sea ice · winter insulation · albedo · melt onset · snow sampling

Adapted from the Still North field journal. Original article. A source-based editorial text, not a report of original Still North research. Examples and imagery are illustrative.

More snow does not have one simple effect on sea ice. In winter, a snow cover can slow the growth of ice beneath it. In the brighter months, it can delay melt by reflecting sunlight. Those effects are not contradictory. They concern different routes by which energy moves, and different parts of the seasonal cycle.

The National Snow and Ice Data Center describes both roles: insulation restricts winter heat loss, while a bright snow surface changes the summer energy balance. Asking whether snow is 'good for ice' hides the more useful questions. When did it fall? How deep and dense is it? What lies beneath it, and is the main energy exchange coming from above or below?

The winter blanket slows the escape of heat

Ice grows at its underside when the ocean can lose enough heat through the ice and into the colder atmosphere. The ice itself resists that transfer. Snow adds another insulating layer, so the same cold air can produce less basal growth beneath a snow-covered surface than beneath a comparable bare one.

Consider two hypothetical patches that begin with the same level-ice thickness. One acquires a deep snow cover early in winter; wind keeps the other comparatively bare. Hold ocean conditions and air temperature equal for this thought experiment. The snow-covered patch has the greater resistance to heat flow and therefore the weaker opportunity for thermodynamic growth. This example isolates a mechanism, not a prediction for two real floes.

Timing changes the comparison. Snow arriving late cannot undo the growth that already occurred during a snow-free cold period. A winter total of snowfall, on its own, misses when the insulation was in place. Likewise, two snowpacks of the same depth may conduct heat differently because density, grain structure, and layering differ. 'Snow depth' is useful, but it is not the entire material description.

Spring changes the energy question

Once sunlight becomes important, a snow cover reflects more incoming solar energy than darker bare ice or open water. Energy is also required to warm and melt the snow before the underlying surface is exposed. The patch that grew less ice during winter may keep its reflective cover longer in spring. There is no requirement that the winter disadvantage determine the summer outcome.

Nor does 'less snow' automatically mean 'less ice' by September. Removing snow can increase winter growth while making the spring surface darker earlier. Ocean heat, clouds, snowfall after melt begins, and the timing of drainage all enter the seasonal balance. To decide the net effect, researchers need observations or a model representing those competing processes through time, rather than a slogan about blankets.

The NOAA 2025 sea-ice assessment defines melt onset as the first appearance of liquid water on the surface, often within the snowpack. That is earlier than the disappearance of the ice. A surface can begin changing its microwave signature and reflectivity while substantial ice remains underneath.

A smooth white view can hide a varied record

Wind moves snow into drifts and leaves scoured areas. Ridges catch accumulations; nearby level surfaces may carry much less. A depth measurement in a convenient hollow should not become the average snow cover of a whole floe. A useful survey samples the different surface types and records the rule used to choose them, not merely the number of measurements collected.

Snow also matters to remote sensing. Satellite altimeters estimate thickness from elevation and information about the floating snow-and-ice column. Snow depth and density affect that conversion, and different instruments interact with the snow differently. An apparent thickness

difference between products may partly concern their snow assumptions, not simply different ice. Our sea-ice overview explains why instrument footprints and surface conditions must remain visible.

What to retain beside a snow measurement

A defensible record would connect depth and, where measured, density with date, surface type, ice thickness, recent weather, and the sampling route. Repeated measurements help separate fresh accumulation from redistribution and melt. If an image accompanies the result, it should show that it is an illustration of surface structure, not proof of the snowpack's thermal properties.

For readers, the simplest useful habit is to finish the sentence: more snow, at which time, changes which heat transfer? Keep the answer with the evidence in the observation record. That small addition turns an apparently inconsistent pair of findings into a coherent seasonal account, without pretending that one snow measurement can forecast the fate of the pack.

References

1. National Snow and Ice Data Center describes both roles (nsidc.org)
2. NOAA 2025 sea-ice assessment (arctic.noaa.gov)