

More summer sunshine increases Greenland ice melt

Plain language summary

The mass of the Greenland Ice Sheet has been reducing at a faster rate since the mid-1990s. This has been mainly due to increased melting of the ice surface, caused by both higher air temperatures and a darker/dirtier ice surface that allows more solar energy to be absorbed.

A team of glaciologists and climate scientists from the University of Bristol in the UK and the University of Liège in Belgium have investigated the reasons behind the increased melt rate. They used satellite data and numerical models of the climate system to show that the increased melt is closely linked to reduced summer cloud cover.

Satellite observations show that summer cloud cover decreased by, on average, nearly 1% per year between 1995 and 2009. Results from climate models suggest that the amount of summer melt increases by ~27 gigatons per percentage reduction in summer cloud cover, mainly because the presence of fewer clouds allows more incoming solar energy to reach the ice surface. This is particularly important in lower-altitude areas (e.g. around the edges) of Greenland, where the ice surface tends to be dirtier and darker, allowing more solar energy to be absorbed and used for melting (i.e. less is reflected away).

The reduction in summer cloud cover over Greenland was found to be strongly linked with a simultaneous shift in a natural phenomenon called the North Atlantic Oscillation (NAO). The NAO describes the difference in pressure between the Azores islands (typically high pressure) and Iceland (typically low pressure). Changes in pressure in these two regions dictate the intensity and location of the jet stream, and have a large impact on weather and climate patterns in the surrounding continents.

Since the mid-1990s, the difference in pressure has been weaker than usual, promoting high-pressure conditions over Greenland in summer, which are typically associated with reduced cloud cover. This suggests that the recently increased surface melt of the Greenland Ice Sheet has been driven by large-scale changes in atmospheric circulation.

Full paper (open access): Hofer, S, Tedstone, A.J., Bamber, J.L. and Fettweis, X. (2017), 'Decreasing cloud cover drives the recent mass loss on the Greenland ice sheet', Science Advances e1700584 (DOI: [10.1126/sciadv.1700584](https://doi.org/10.1126/sciadv.1700584)).