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Arctic ice thickness 'plummets'

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Arctic sea ice

The data proves that overall volume of sea ice is decreasing, say researchers

The thickness of Arctic sea ice "plummeted" last winter, thinning by as much as one-fifth in some regions, satellite data has revealed.

A study by UK researchers showed that the ice thickness had been fairly constant for the previous five winters.

The team from University College London added that the results provided the first definitive proof that the overall volume of Arctic ice was decreasing.

The findings have been published in the journal *Geophysical Research Letters*.

"The ice thickness was fairly constant for the five winters before this, but it plummeted in the winter after the 2007 minimum," lead author Katharine Giles told BBC News.

I think this is the first time that we can definitively say that the bulk overall volume of ice has decreased

Dr Seymour Laxon
University College London

Sea ice in the Arctic shrank to its smallest size on record in September 2007, when it extended across an area of just 4.13 million sq km (1.59 million sq miles), beating the previous record low of 5.32 million sq km, measured in 2005.

The team from the university's Centre for Polar Observation and Modelling - part of the UK's National Centre for Earth Observation - found that last winter the ice had thinned by an average of 10% (26cm/0.9ft) below the 2002-2008 winter average.

Dr Giles added that the data also showed the western Arctic experienced the greatest impact, where the ice thinned by up to 19% (49cm/1.6ft).

Melting point

The recent record losses of ice cover in the Arctic has led to suggestions that the region could have reached a "tipping point" but some uncertainty over the causes had remained, explained co-author Seymour Laxon.

"The extent can change because the ice can be redistributed, increasing the amount of open water," he told BBC News. "But this does not reduce the overall amount of ice."

Envisat (Image: Esa)

'Green eye' tech centre launched

"To determine whether the reduction in sea ice extent is the result of ice being piled up against the coast or whether it is the result of melting, you need to measure the thickness."

"I think this is the first time that we can definitively say that the bulk overall volume of ice has decreased," observed Dr Laxon.

"So this means melting; it doesn't mean that the ice has just been pushed up against the coastline."

Dr Giles explained that the measurements gathered by satellite provided a continuous data-set and had a number of advantages over other methods.

"Drilling, submarines or aircraft; all of these techniques can be limited by time and space," she said.

"You can only sample relatively small areas, and you cannot have a continuous time series - it's a very harsh environment, so field experiments in winter are logistically difficult."

"We have been using satellite data, which means we get coverage all across the Arctic Ocean (apart from the very centre) and we get it continuously, so we have great coverage both in terms of time and area."

The measurements were recorded via a radar altimeter onboard the European Space Agency's (Esa) Envisat satellite.

The altimeter fires pulses of electromagnetic waves down on to the ice, which reflects them back up to a receiver on the satellite.

The time taken for the waves to complete this journey is recorded, and it is a fairly straightforward calculation to work out the height of the ice above sea level.

As one tenth of the ice sits above the water, it is then possible to work out the overall volume and thickness of ice in that location.

Dr Laxon said the project's findings are being used to help climate modellers refine their projections of what is going to happen in the future.

"The time when Arctic sea ice is going to disappear is open to a lot of debate," he said.

"About five years ago, the average projection for the sea ice disappearing was about 2080.

"But the ice minimums, and this evidence of melting, suggests that we should favour the models that suggest the sea ice will disappear by 2030-2040, but there is still a lot of uncertainty."

The researchers hope to keep the data series, funded by the EU and the Natural Environmental Research Council (Nerc), running for as long as satellite-based measurements are available.