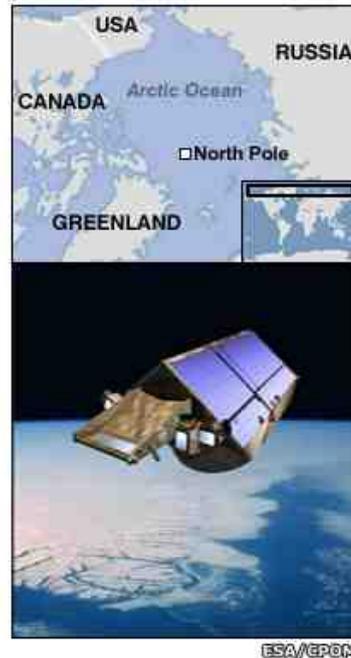
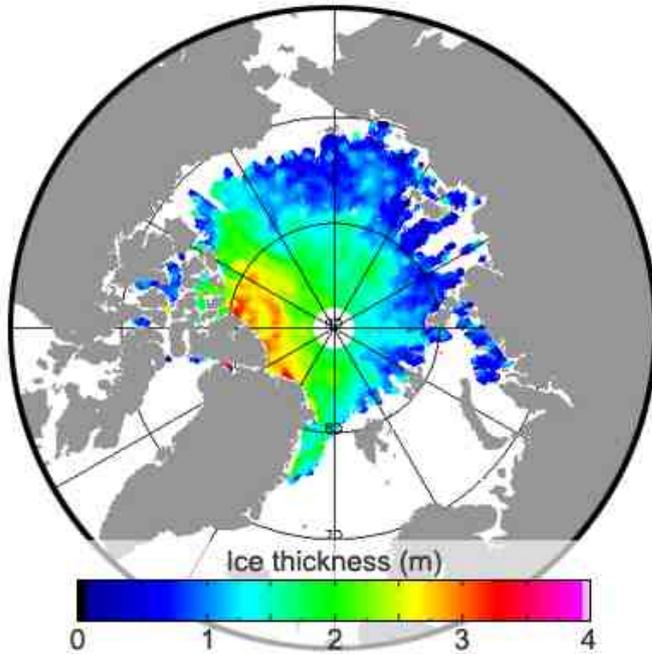


16 December 2013 Last updated at 08:48 GMT

## Esa's Cryosat sees Arctic sea-ice volume bounce back

By Jonathan Amos Science correspondent, BBC News, San Francisco

Arctic Sea Ice Thickness - Late October 2013



The bounce back in the extent of sea ice in the Arctic this summer was reflected also in the volume of ice.

Data from [Europe's Cryosat spacecraft](#) suggests there were almost 9,000 cu km of ice at the end of this year's melt season.

This is close to 50% more than in the corresponding period in 2012.

It is a rare piece of good news for a region that has witnessed a rapid decline in both area cover and thickness in recent years.

But scientists caution against reading too much into one year's "recovery".

"Although the recovery of Arctic sea ice is certainly welcome news, it has to be considered against the backdrop of changes that have occurred over the last few decades," said Prof Andy Shepherd of University College London, UK.

"It's estimated that there were around 20,000 cu km of Arctic sea ice each October in the early 1980s, and so today's minimum still ranks among the lowest of the past 30 years," he told BBC News.

CryoSat is the European Space Agency's (Esa) dedicated polar monitoring platform.

It has a sophisticated radar system that allows scientists to work out the thickness of the ice floes covering the Arctic Ocean.

In the three years following its launch, the spacecraft saw a steady decline in autumn ice volume, with a record low of 6,000 cubic km being recorded in late October 2012.

But after a sharply colder summer this year, the autumn volume number has gone up.

Measurements taken in the same three weeks in October found the floes to contain just shy of 9,000 cu km.



Thicker ice has been retained in the Arctic. Part of this stronger performance can be put down to the greater retention of older ice.

This is evident particularly around the Canadian archipelago and North Greenland, where there is much more two-year-old and three-year-old ice

than in previous years.

"One of the things we'd noticed in our data was that the volume of ice year-to-year was not varying anything like as much as the ice extent - at least for the years 2010, 2011 and 2012," explained Rachel Tilling from the UK's Nerc Centre for Polar Observation and Modelling (CPOM).

"This is why we're really quite surprised by what we've seen in 2013.

"We didn't expect the greater ice extent left at the end of the summer melt to be reflected in the volume.

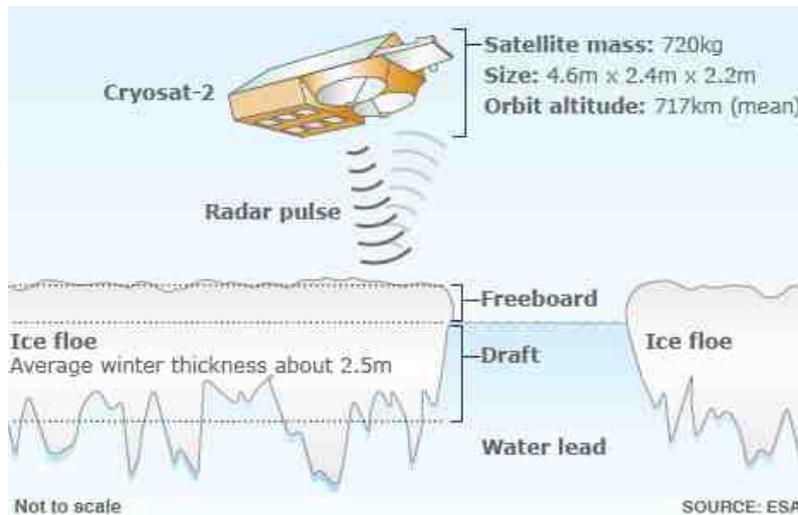
"But it has been. And the reason is related to the amount of multi-year ice in the Arctic."

Dr Don Perovich is a sea-ice expert at Dartmouth College, US.

He said Cryosat's data tallied with observations made by other spacecraft.

"In previous summers, some of the [multi-year ice] migrated over to the Alaska and Siberia areas where it melted. But this past summer, it stayed in place because of a change in wind patterns. And so there'll likely be more multi-year ice next year than there was this year," he told BBC News.

## Satellite altimetry: How to measure sea-ice volume



- Cryosat's radar has the resolution to see the Arctic's floes and leads
- Some 7/8 of the ice tends to sit below the waterline - the draft
- The aim is to measure the freeboard - the ice part above the waterline
- Knowing this 1/8th figure allows Cryosat to work out sea-ice thickness
- The thickness multiplied by the area of ice cover produces a volume

The minimum ice extent in the Arctic this summer was recorded as 5.10 million sq km. Again, this was a figure almost 50% larger than the all-time satellite-low mark achieved 12 months previously - when floes were reduced to just 3.41 million sq km by mid-September.

Area/extent is easier to measure, but scientists regard thickness/volume to be the best metric with which to judge the health of the ice pack, which is why Cryosat's unique data-set is so important.

For a while, it was uncertain whether the European satellite would get any autumn measurements this year.

The spacecraft suffered a major fault in its onboard power system at the beginning of October, and all science activity was halted.

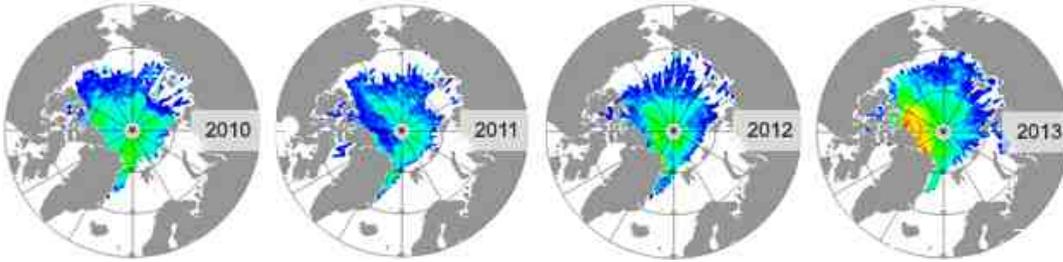
But engineers managed to switch the satellite over to a back-up system and normal operations were resumed on 11 October.

"We lost the side 'A' of the power subsystem we believe for good, although we still have hope to be able to use part of it in the future in case we experience another issue," said Esa Cryosat mission manager Dr Tommaso Parrinello.

"Since 2 October, we have been operating on the redundant chain, but all other subsystems are still being operated on their prime chain 'A'. Therefore, the science instruments and the quality of data have not been affected."

The new Cryosat study was presented here in San Francisco to the [American Geophysical Union \(AGU\) Fall Meeting](#), where the [annual Arctic Report Card](#) was released.

Arctic Sea Ice Thickness Comparison - Late October



observations show clearly that more thick ice (red/yellow) has been retained this year

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