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**EARTHINSIGHT**  
**BYNAFEEZAHMED**  
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## Ice-free Arctic in two years heralds methane catastrophe – scientist

Professor Peter Wadhams, co-author of new Nature paper on costs of Arctic warming, explains the danger of inaction



Leading Arctic expert Prof Wadhams warns that a summer ice free Arctic in 2 years could trigger dangerous methane release. Photograph: Jenny E Ross/Corbis

A [new paper](#) in the journal Nature argues that the release of a 50 Gigatonne (Gt) methane pulse from thawing [Arctic](#) permafrost could destabilise the climate system and trigger costs as high as the value of the entire world's GDP. The East Siberian Arctic Shelf's (ESAS) reservoir of methane gas hydrates could be released slowly over 50 years or "catastrophically fast" in a matter of decades – if not even one decade – the researchers said.

Not everyone agrees that the paper's scenario of a catastrophic and imminent methane release is plausible. Nasa's Gavin Schmidt has previously argued that the danger of such a methane release is [low](#), whereas scientists like Prof Tim Lenton from Exeter University who specialises in climate tipping points, says the process would take [thousands if not tens of thousands of years](#), let alone a decade.

But do most models underestimate the problem? A [new paper in Proceedings of the National Academy of Sciences](#) (PNAS) projects that the Arctic will be ice free in September by around 2054-58. This, however, [departs significantly from empirical observations](#) of the [rapid loss of Arctic summer sea ice](#) which is heading for disappearance [within two or three years](#) according to Nature co-author and renowned Arctic expert Prof Peter Wadhams, head of the Polar ocean physics group at Cambridge University.

If Prof Wadhams is correct in his forecast that the summer sea ice could be gone by 2015, then we might be closer to the tipping point than we realise. To get to the bottom of the scientific basis for the Nature paper's scenarios, I interviewed Prof Wadhams. Here's what he had to say:

### How long do we have before the Arctic summer sea ice disappears?

Given present trends in extent and thickness, the ice in September will be gone in a very short while, perhaps by 2015. In subsequent years, the ice-free window will widen, to 2-3 months, then 4-5 months etc, and the trends suggest that within 20 years time we may have six ice-free months per year.

### Why do the climate models not match empirical observations - and why is your estimate of the

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## **Arctic sea ice disappearance so different from most model projections?**

The modellers did not pay sufficient regard to observations, especially of ice thickness. They considered certain physical processes in the model, then when the rate of retreat greatly outstripped the predictions of the model, they ignored the observations and stuck with the model. A very great physicist, Richard Feynmann, said that when a model comes up against measurements that contradict it, it is the measurements that must be preferred and the model must be abandoned or changed. Scientists who have a lot of their credibility bound up in a model are reluctant to do this. Then there are a number of key processes that can only be represented if the model has a very fine grid scale, such effects as the break-up of ice due to waves generated in the large areas of open water that we now have in summer; or the additional weakening of the ice by meltwater pools that melt their way right through the ice sheet. A modeller who represents all these fine scale processes is Wiselaw Maslowsky (Monterey) and his models agree with my empirical predictions.

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## **Our global emissions trajectory is already on track to breach 2C in coming decades. What does a 2C world imply for the Arctic melt and the potential for methane release?**

We are already in a 2C world in terms of the heating potential of carbon dioxide that we have already put into the atmosphere. The heating will reach 2C before 2050 and will then go on to 3-4C globally by the end of the century. Even a 2C world involves the probable loss of Arctic sea ice for much of the year (and 4C for most of it), which will ensure maximum methane release from the exposed shallow seas of the continental shelves.

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## **What does the loss of the Arctic summer sea ice mean for the climate? How will this impact on society and the economy?**

Our own model shows that the methane release from the ice retreat will add about 0.6C to global warming by 2040. Adding on the faster sea level rise, and trend towards greater extremes in weather (due to jet stream displacement) means increased risk of catastrophic floods in less developed countries and a decrease in food production at a time when world population is rapidly increasing.

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## **What is the link between permafrost melt, methane release and the loss of the Arctic sea ice? After 2015, if the Arctic becomes ice free in the summer, is there a heightened danger of methane release?**

The loss of sea ice leads to seabed warming, which leads to offshore permafrost melt, which leads to methane release, which leads to enhanced warming, which leads to even more rapid uncovering of seabed. If a large release has not occurred by 2016 the danger will be continuously increasing. It is thought that at 2-3C of global warming, which means 6-8C of Arctic warming, methane release from permafrost on land will be greatly increased.

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## **Some people say that a catastrophic methane release over 10 years - your worst-case scenario - is a very low probability event and we don't really need to worry about it. What's your response to that?**

Those who understand Arctic seabed geology and the oceanography of water column warming from ice retreat do not say that this is a low probability event. I think one

should trust those who know about a subject rather than those who don't. As far as I'm concerned, the experts in this area are the people who have been actively working on the seabed conditions in the East Siberian Sea in summer during the past few summers where the ice cover has disappeared and the water has warmed. The rapid disappearance of offshore permafrost through water heating is a unique phenomenon, so clearly no "expert" would have found a mechanism elsewhere to compare with this.

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## Would Arctic experts agree with you?

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I think that most Arctic specialists would agree that this scenario is plausible.

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## What about scientists like Prof Tim Lenton, a climate tipping point expert, who argues that a methane release is a long-term problem, not an immediate danger?

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His earlier conclusions are out of date. His oft-cited paper on tipping points is two years old now and was based on literature surveys rather than direct research. An ice-free summer (September) Arctic is clearly nearly upon us, and will be achieved within three years or less - this is plain from the observational data on ice extent (satellites) and thickness (submarines and altimeter satellites). I am sure that he is about to revise his views if he hasn't already done so.

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