

Ocean life triggers ice formation in clouds

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Credit: Tiago Fioreze / Wikipedia

Researchers have shown for the first time that phytoplankton (plant life) in remote ocean regions can contribute to rare airborne particles that trigger ice formation in clouds. Results published this week (Wednesday 9 September) in the journal *Nature* show that the organic waste from life in the oceans, which is ejected into the atmosphere along with sea spray from breaking waves, stimulates cloud droplets to freeze into ice particles. This affects how clouds behave and influence global climate, which is important for improved projections of future climate change.

Clouds in the Earth's atmosphere are made of liquid water droplets, ice [particles](#) or a mixture of both. Ice particles affect how long a cloud exists and how much rain, hail or snow it produces. They also help control temperature of the climate by reflecting sunlight (keeping surface temperatures cool) or trapping heat close to the Earth's surface (keeping temperatures warmer). Climate in the polar regions is changing more rapidly than any other part of the planet, yet predictions for how it will change in future remain uncertain. This improved understanding of cloud formation is a step closer to helping reduce uncertainties in [global climate](#) modelling.

An international team of researchers investigated marine life from the biological ecosystem in the Arctic Ocean, Western Atlantic and North Pacific by collecting biological matter using a remote controlled boat launched from research ships, along with hand held sampling equipment. By combining these direct measurements with global computer modelling scenarios of the atmosphere, the team found that [airborne particles](#) from sea spray were most influential in polar and other remote ocean regions.

Dr Theo Wilson, lead author from University of Leeds says: "Breaking waves in the ocean generate large quantities of airborne sea spray. Some [sea spray](#) particles contain biological material linked to the ocean's ecosystem. It has been speculated in the past that some of this biological material may trigger the formation of ice in clouds - making them 'ice nucleating particles' (INPs) in the atmosphere. Now we have clear evidence that marine [biological material](#) such as matter exuded from [phytoplankton](#) is able to nucleate ice and could do so in the atmosphere. This could be particularly important in the polar regions."

Co-lead author Dr Luis Ladino, who worked on this project as a Research Fellow at the University of Toronto and is currently an NSERC Visiting Fellow at Environment Canada, says: "The team also

investigated specific marine life forms in the laboratory to learn more about the material we sampled. We found that a certain species of algae (*Thalassiosira pseudonana*, a common type of phytoplankton) release organic material that is able to nucleate ice like the INPs we found in the sea. We think that species like phytoplankton may therefore be responsible for producing the INPs we found in [aerosol particles](#) formed from the ocean water."

Co-author Dr Benjamin Murray from the University of Leeds says: "Understanding the sources, fate and global distribution of particles which trigger [ice formation](#) in clouds is needed to not only improve our weather models, but also to increase the confidence we have in climate model predictions of what will happen over the coming centuries. Understanding where ice nucleating particles come from is important for predicting future climate. For example, as the polar ice caps shrink (we are heading for another record Arctic minimum later this month) there will be more open ocean from which these particles can be emitted, and this marine source of [ice](#) nucleating particles might become more important."

More information: A marine biogenic source of atmospheric ice nucleating particles, *Nature*, [DOI: 10.1038/nature14986](https://doi.org/10.1038/nature14986)

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