A switch in ocean circulation that helped end the Ice Age

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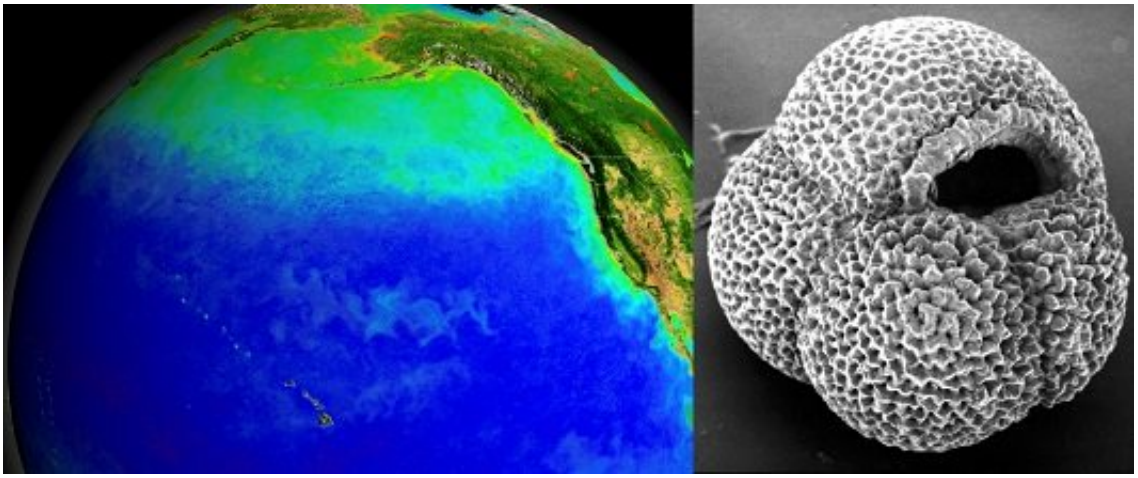

Credit: University of St Andrews

Changes in the circulation of the North Pacific Ocean about 15,000 years ago released large amounts of CO2 to the atmosphere, helping warm the planet and end the last Ice Age, according to research by scientists at the University of St Andrews.

The new study, published today (23 April) in *Nature Geoscience*, also found that the changes in circulation resulted in a reduction of the amount of oxygen in the deep ocean. The findings will help scientists understand the processes controlling the exchange of CO2 and oxygen between the ocean and atmosphere.

The researchers measured the chemical composition of the shells of tiny fossil plankton, called foraminifera, which they used to reconstruct the exchange of CO2 between the North Pacific Ocean and atmosphere at the end of the last Ice Age, a time when carbon dioxide levels in the atmosphere increased. They found the North Pacific released large amounts of CO2 to the atmosphere about 15,000 years ago, a time when ocean currents in the Atlantic were also changing rapidly. Findings showed that the release of CO2 by the North Pacific was caused by a change in its circulation and could explain a drop in oxygen levels in the Pacific Ocean seen at the same time, first discovered over 20 years ago. Scientists are observing a similar loss of oxygen from the ocean as the climate changes today.

Lead author, Dr. Will Gray from the School of Earth and Environmental Sciences at the University of St Andrews, formerly of University College London, said: "Last week we saw worrying new studies showing us the ocean currents in the North Atlantic are slowing down. In our study we see very rapid changes in the climate of the North Pacific that we think are linked to past changes in ocean currents in the Atlantic. This gives us an example of the way that different parts of the climate system are connected, so that changes in circulation in one region can drive changes in CO2 and oxygen all the way over on the other side of the planet."

Dr. Gray added: "The North Pacific Ocean is very big and just below the surface the waters are brimming with CO2; because of this, we really need to understand how this region can change in the future, and looking into the past is a good way to do that."

Co-author Dr. James Rae, also from the University of St Andrews, added: "Although the CO2 rise caused by this process was dramatic in geological terms, it happened very slowly compared to modern man-made CO2 rise. Humans have driven CO2 rise in the atmosphere as large

as the CO2 rise that helped end the last Ice Age, but the man-made CO2 rise has happened 100 times faster. This will have a huge effect on the climate system, and one that we are only just beginning to see."

More information: William R. Gray et al. Deglacial upwelling, productivity and CO2 outgassing in the North Pacific Ocean, *Nature Geoscience* (2018). DOI: 10.1038/s41561-018-0108-6

Provided by University of St Andrews