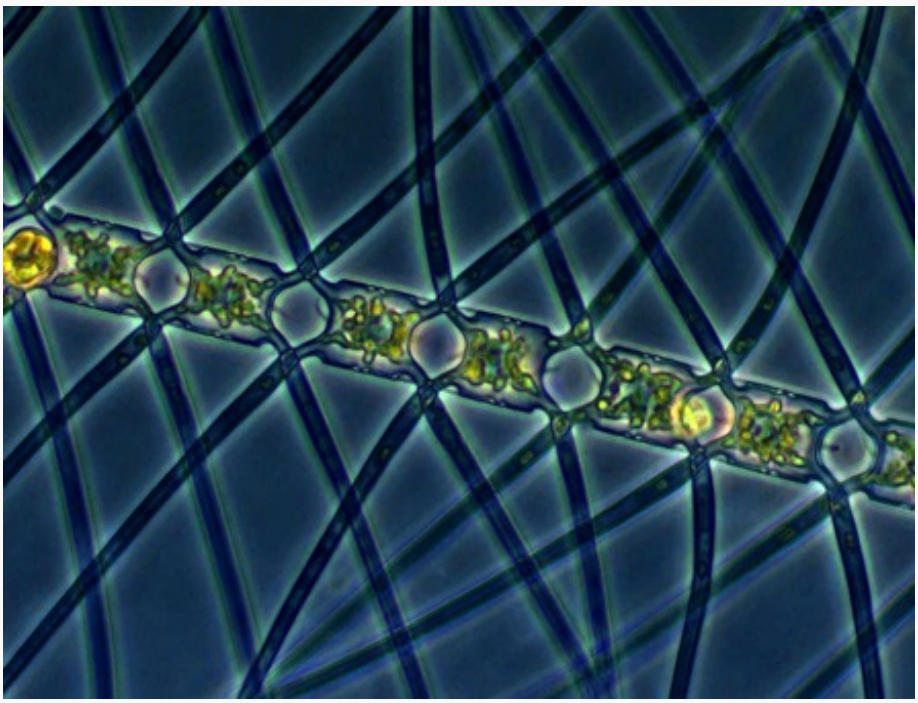
Iron versus climate change

By Roberta Kwok / August 9, 2012

In 2004, a team of scientists traveled by ship to an enormous whirlpool in the ocean near Antarctica. Their goal was to find out if a risky strategy for fighting climate change might work. The plan: Dump iron in the water to trigger the growth of organisms called algae. Then let the algae soak up carbon dioxide, a gas that contributes to global warming. Finally, watch to see if the organisms drift to the seafloor.

This iron fertilization of algae appears to have been successful, an international team of researchers reports in the July 19 issue of *Nature*. Algae indeed removed carbon dioxide from the atmosphere, then sank deep into the ocean. Some scientists still aren't sure if iron fertilization is a good idea, but this study is one step toward showing that the tactic for fighting global warming holds promise.



A tiny organism called a diatom can absorb carbon dioxide from the atmosphere and carry the carbon to the bottom of the ocean. Credit: Marina Montresor, SZN / Alfred Wegener Institute.

Climate change is a major problem facing the planet. As cars and factories release gases such as carbon dioxide that trap heat, Earth slowly warms. Rising temperatures can melt glaciers and ice sheets, causing sea level to rise. Some plants and animals may go extinct if they can't adapt to a warmer world.

One way to solve this problem is to cut the amount of carbon dioxide released through human activities. But it would also help to suck some of the extra carbon dioxide out of the atmosphere.

Iron fertilization is one method that scientists have proposed to do so.

Fertilizers function like dietary supplements. They make sure an organism has enough minerals to effectively use food to fuel essential processes like growing and reproducing. Most algae are photosynthetic, meaning that they grow by absorbing light and carbon dioxide and using those raw materials to make sugar and oxygen.

To absorb the light, these organisms need a pigment called chlorophyll. And to make chlorophyll, they need iron. If iron is in somewhat short supply, this can reduce the ability of these algae to maximally harvest carbon.

If people add iron to the ocean, the thinking goes, more algae will grow. After sucking carbon dioxide out of the atmosphere, these algae may eventually sink and carry that carbon to the ocean floor. Once the carbon is at

the bottom of the ocean, it could remain buried there for centuries.

Other experiments have shown that the first part of the process works — that adding iron promotes the growth of algae, which then remove some carbon from the atmosphere. But scientists have had a hard time proving that this carbon later sinks, rather than just reentering the atmosphere again.

To test the second part of the process, the research team dumped iron powder into a whirlpool in the Southern Ocean. Because the whirlpool traps material instead of letting it drift to other parts of the ocean, the scientists could more easily track the carbon.

Sure enough, a giant bloom of algae called diatoms grew. Diatoms are tiny organisms with a shell of hard material called silica. After a few weeks, many of the diatoms died.

The researchers collected water samples at various depths to monitor the organisms. Much of the dead diatom mass sank 1,000 or more meters, and a lot of it probably reached the bottom of the ocean. The team calculated that more than half of the carbon absorbed by the diatoms probably also sank to the seafloor.

Iron fertilization is not a perfect solution. The researchers' experiment removed only a tiny fraction of the carbon dioxide released through human activities each year. And iron fertilization might put other organisms in danger by increasing levels of algal poisons in the ocean.

Power Words

algae A large group of organisms ranging from meters-long seaweeds to single-celled microorganisms. Most algae are photosynthetic, meaning that they use light and carbon dioxide to make sugar and oxygen.

diatom A microscopic type of algae with a shell of hard material called silica.

carbon dioxide A gas made of one carbon atom and two oxygen atoms.

fertilization The addition of chemicals that encourage growth.

photosynthesis The process of converting light and carbon dioxide to sugar and oxygen.

chlorophyll A pigment that photosynthetic organisms need to absorb light.