

## Oceans acidify much faster than ever before in Earth's history

### Conference: More than 200 scientists from all over Europe discuss increasing ocean acidification

Bremerhaven, 27. September 2010.

For four days the topic of ocean acidification will be the focus of marine and polar research. The Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association is hosting the conference and expects more than 200 scientists from all over Europe at the Conference Center Bremerhaven.

The greenhouse gas carbon dioxide not only leads to global climate warming, but also to increasing acidification of the oceans. Next week scientists will discuss the most recent results on ocean acidification at the first joint meeting of the three large coordinated projects, EPOCA (**E**uropean **P**roject on **O**cean **A**cidification), the German project BIOACID (**B**iological **I**mpacts of **O**cean **A**cidification) and UK project UKOARP (**U**K **O**cean **A**cidification **R**esearch **P**rogram).

The oceans take up about a third of the carbon dioxide (CO<sub>2</sub>) produced by the combustion of fossil fuel every year. When carbon dioxide dissolves in seawater, carbonic acid forms and the acidity (pH value) of the water decreases. Since the beginning of industrialisation the CO<sub>2</sub> absorbed by the sea has led to an increase in surface ocean acidity by 30 percent. As a consequence, the concentration of carbonate ions in seawater is declining. Many marine organisms such as calcareous algae, mussels and snails have difficulties in forming their shells or skeletons. As a result of this, entire ecosystems such as coral reefs may be affected.

In conjunction with the three large-scale research projects, at national and international level the Alfred Wegener Institute is examining the impacts of ocean acidification, particularly on the biotic communities in the Arctic Ocean.

The polar regions are especially sensitive to ocean acidification. "The solubility of CO<sub>2</sub> is exceptionally high due to the low sea water temperatures in the polar regions, so that carbonate ion concentrations, in turn, is also lower there and this shortage may be especially hard on the organisms living there. As many metabolic processes proceed more slowly at cold temperatures, the ability of polar organisms to compensate for an increased CO<sub>2</sub> concentration may be restricted further," says Prof. Hans-Otto Pörtner, animal physiologist at the Alfred Wegener Institute and co-coordinator of the BIOACID large-scale research project.

The specific processes in marine bacteria were examined by researchers of the Alfred Wegener Institute during a voyage of the research vessel "Polarstern" to the Arctic. Their latest results substantiated their current assumptions. "Acidified water stimulated bacterial production considerably and led to increased consumption of organic carbon compounds, which may reinforce release of CO<sub>2</sub>," explained Dr. Anja Engel. Hardly any research has been conducted to date on the impact of climate change on the complex interrelationships of the marine carbon cycle and on the role microorganisms will play for the future CO<sub>2</sub> balance in the Arctic Ocean, she adds. "The meeting of the three large-scale research projects offers a good forum for

exchanging data and discussing joint approaches for solutions,” stated Dr. Anja Engel.

To completely understand the (longer-term) impacts of increasing ocean acidification, it is of crucial importance for researchers to take a look back at past events. After all, sediments in the ocean form a significant archive of the Earth’s history, comparable to books in a library. “Those who understand the language of sediments will be able to examine the evolution of the environment and climate conditions in the Earth’s history there,” says Prof. Jelle Bijma, marine biogeoscientist at the Alfred Wegener Institute. Ocean acidification events have left their “fingerprints” in the sediment at different places in the Earth’s history, such as during the transition from the Permian to the Triassic period 251 million years and during the Palaeocene/Eocene transition 55 million years ago. However, acidification in the past was always triggered by natural events. “Nowadays it is caused by the immense release of carbon dioxide due to human activity and the sea is less and less able to buffer these disruptions,” states Bijma. Furthermore, he adds, we have to realise that acidification events are almost always accompanied by global warming, increased stratification of the oceans and a reduction in the oxygen concentration of the deep sea.

“It is not the first time in the history of the Earth that the oceans have acidified, but a disturbing aspect now is that it is occurring much faster than ever before. As a consequence, not only the pH value drops, but the saturation state of the oceans with respect to carbonate falls as well. Times are tough, especially for calcifying organisms,” Bijma claims. Scientists will continue to investigate how various calciumcarbonate-producing marine organisms react to acidification and why their reactions vary and discuss their thoughts on this topic at the conference in Bremerhaven.

### The three projects

BIOACID (**B**iological **I**mpacts of **O**cean **ACID**ification) is a coordinated project that investigates the impacts of ocean acidification on marine biotic communities since its launch in 2009. A total of 14 research institutes and universities from all over Germany are involved in the project funded by the Federal Ministry for Education and Research (BMBF) for three years to an amount of 8.5 million euros. The Leibniz Institute for Marine Sciences (IFM-GEOMAR) in Kiel is responsible for project coordination and management. The Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association is the co-coordinator.

The integrated project EPOCA (European Project on Ocean Acidification) was launched in May 2008 with the overall goal to fill the numerous gaps in our understanding of ocean acidification and its consequences. The EPOCA consortium brings together more than 100 researchers from 32 institutes and 10 European countries. The research of this four-year long project is partly funded by the European Commission.

UKOARP (**UK** Ocean **A**cidification **R**esearch **P**rogram) is UK’s first research programme to investigate the impacts of ocean acidification. Launched in 2010 it involves 101 scientists from 21 of the UK’s top scientific institutions. The UK Ocean Acidification Research Programme consists of several projects working together to

investigate different aspects of this global issue.

Contacts and more information on EPOCA, BIOACID and UKOARP please see project web sites:

<http://epoca-project.eu>

<http://www.bioacid.de>

<http://www.oceanacidification.org.uk/>

### Notes for editorial offices

The conference on ocean acidification takes place from September 27 to 30, 2010. The various committees meet on Monday and Prof. Ulrich Bathmann will officially open the conference on Tuesday.

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The Alfred Wegener Institute conducts research in the Arctic, Antarctic and oceans of the high and mid latitudes. It coordinates polar research in Germany and provides major infrastructure to the international scientific community, such as the research icebreaker Polarstern and stations in the Arctic and Antarctic. The Alfred Wegener Institute is one of the sixteen research centres of the Helmholtz Association, the largest scientific organisation in Germany.