**Antragsskizze für BMBF Verbundprojekt**

BIOACID

Biological Impacts of Ocean ACIDification

German initiative

# BIOLOGICAL IMPACT OF OCEAN ACIDIFICATION

(in times of ocean warming)

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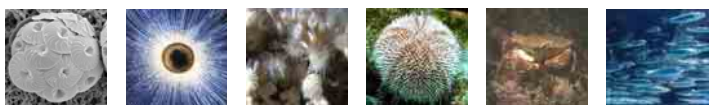

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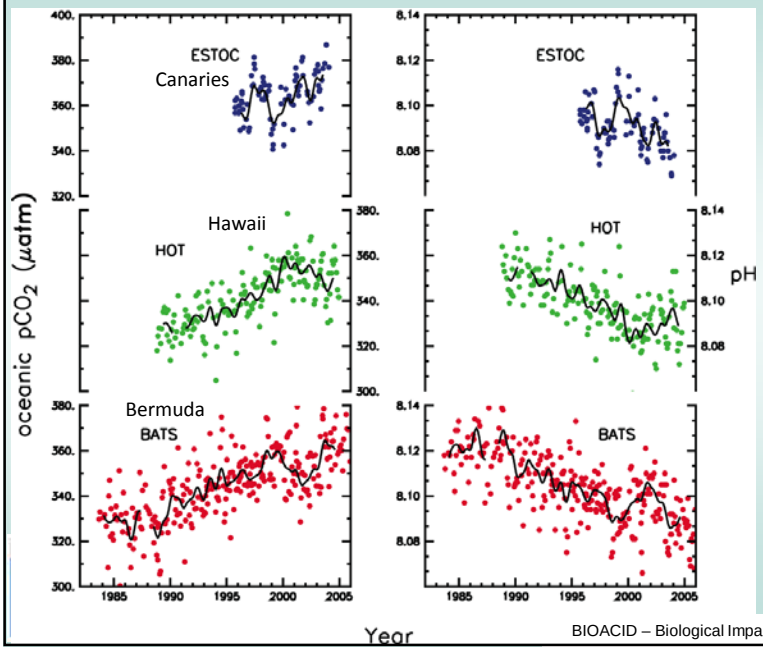
## Trends of Ocean Acidification (through $CO_2$ enrichment)…

*…associated with a pH-decrement in surface water by 0.02 units per decade since 1980*

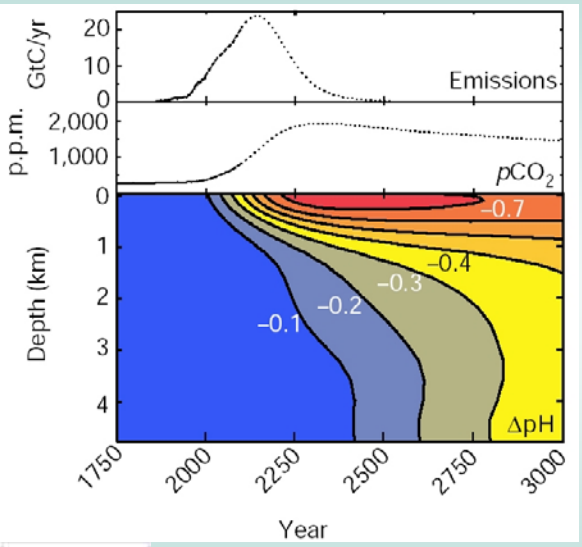



Biological Impact?

IPCC 2007



## What do we expect?




Modified water chemistry (surface)

Pre-industrial → Today

ΔpH = 0.12

Today → 2100

ΔpH = 0.45

Caldeira & Wickett 2003

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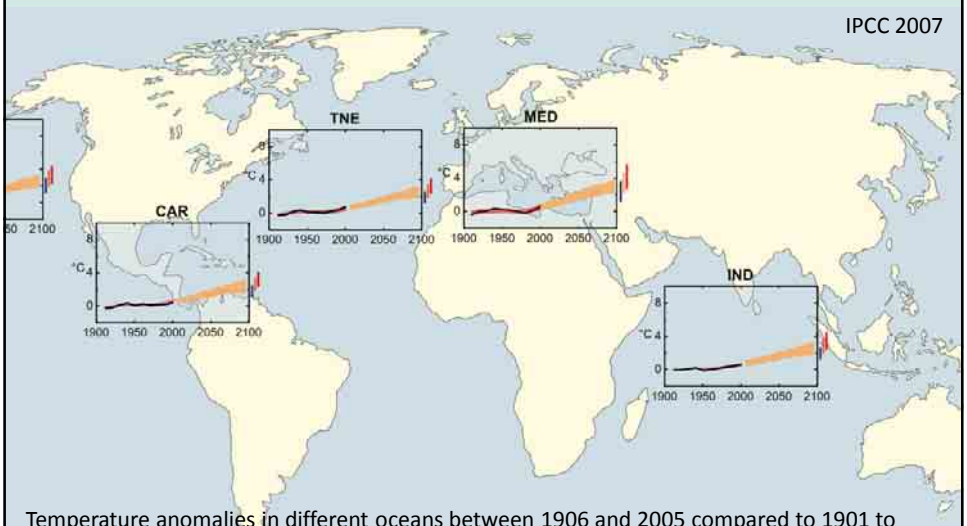
## ….in times of ocean warming:

Warming of the North Sea (SST compared to 40 years ago):

+ ~1.1°C today → + 2.7 bis 5°C at 2100

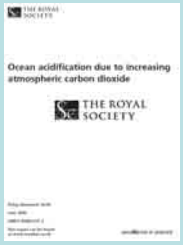



Temperature anomalies in different oceans between 1906 and 2005 compared to 1901 to 1950. Projections until 2100 according toemission scenarios B1, A1B, A2.

## Timeliness

International Council for Science
Scientific Committee on Oceanic Research

The Ocean in a High $CO_2$ World
An International Science Symposium
May 10 - 12, 2004
UNESCO, Paris, France




2005


2006


2006

solas

IMBER

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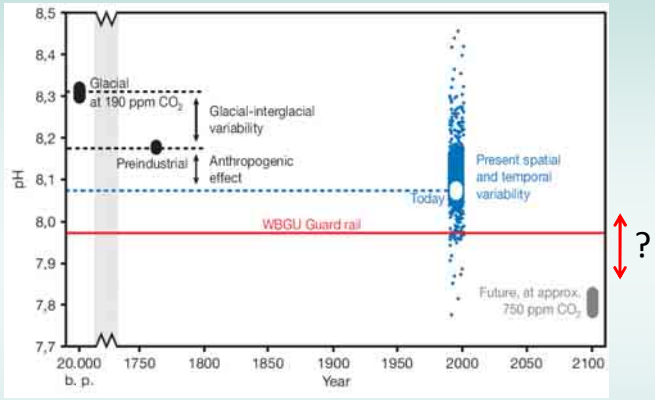
## Timeliness


2006




→ There is a need for knowledge based risk assessment



## Risks of ocean acidification in times of ocean warming

General questions:

- $CO_2$ dependence of biological effects (when do they set in)?
- Sensitivities of species in diverse ecosystems and climate regimes?
- Effects and mechanisms?
- Adaptability of organisms (population genetics and functional genomics)?

- Which degree of acidification is dangerous in the long run?
- How do ocean warming and acidification interact?
- Are there feedbacks on the climate system?

## Themes addressed by „BIOACID“

1. Primary production and microbial processes
2. Animal performance: reproduction, growth and behaviours
3. Calcification in organisms and ecosystems
4. Dynamics of food webs:
   Contributions to “regime shifts”
5. Biogeochemical cycles: feedback on climate
6. Integrated Analyses:
   “Dangerous” impact as a basis for “Guard rails”

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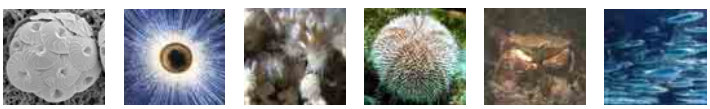
## Structure and integration, time line

- Outline and presentation to the BMBF in December 07:
- Planning committee:
  - Call for proposals in January 2008
  - Selection of partners in February 08
- Consortium formation ín April 2008
- Full application to the BMBF in May 08
- Start in early 2009



Antragsskizze für BMBF Verbundprojekt BIOACID – Biological Implications

BIOACID – Biological Impact of Ocean ACIDification

## Potential national partner institutions

- Leibniz-Institut für Meereswissenschaften (IFM-GEOMAR), Kiel
- Christian-Albrechts-Universität, Kiel
- Alfred-Wegener-Institut für Polar- und Meeresforschung (AWI), Bremerhaven
- Universität Bremen, inklusive Forschungszentrum Ozeanränder (MARUM)
- Jacobs Universität Bremen
- Zentrum für Marine Tropenökologie (ZMT), Bremen
- Max-Planck-Institut für Marine Mikrobiologie (MPI), Bremen
- Universität Rostock
- Leibniz-Institut für Ostseeforschung (IOW), Warnemünde
- Westfälische Wilhelms Universität, Münster, Institut für Evolution und Biodiversität
- GKSS Forschungszentrum, Geesthacht
- Universität Hamburg
- Carl von Ossietzky Universität, Oldenburg, inkl. ICBM
- Universität Düsseldorf, Institut für Tierphysiologie
- Leibniz-Institut für Gewässerökologie und Binnenfischerei (IGB), Berlin

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up to 5 PIs per partner institute



## Infrastructure

*Infrastructure available for BIOACID*

| | |
|---|---|
| • NMR (AWI) | € 2.000.000 |
| • NanoSIMS (MPI Bremen) | € 1.500.000 |
| • Pelagic off-shore mesocosms (IFM-GEOMAR) | € 750.000 |
| • 6 culture rooms with $CO_2$ system (IFM-GEOMAR) (5 $CO_2$ Levels) | € 85.000 |

*Required infrastructure*

(accessible for all BIOACID Partners)

| | |
|---|---|
| • Benthic mesocosms (pH-stat) | € 200.000 |
| • Larval culture system | € 200.000 |
| • Microsensors for continuous in situ measurements of $pCO_2$, pH, $[CO_3^{2-}]$, $[Ca^{2+}]$, pH | € 100.000 |

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## International cooperation

- EU – EPOCA EU FP 7
  European Project on OCean Acidification
- UK – NERC (launching new 5-year strategy)
  Challenges in Earth Systems Science
  *Changes in ocean ecosystems in response to OA*
- USA – Bill to the U.S. Senate (FORAM Act)
  *Federal Ocean Acidification Research & Monitoring*
  2008-2012: 30 Mio.$ jährlich
  NSF/NOAA → OCB

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