

Hot at the South Pole?

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Abstract

Earth management based on scientific understanding can only be carried out effectively if the research community succeeds in improving our understanding of the global environmental changes induced by natural causes and human interference. In communicating the results of environmental and climate research, the interdisciplinary and international aspects must also be conveyed, since they are necessary for an understanding of the subject as a whole.

The German Federal Ministry of Education and Research launched a Science Dialogue Campaign in 1999. As part of this campaign, special fields of science are spotlighted each year. 2002 is the Year of Geoscience. A number of important events and a wealth of regional activities were sponsored by research organisations, universities, museums, associations and other institutions. They dealt with the entire spectrum of modern geoscientific research.

'Ice and the ocean' was one of the contributions of the Alfred Wegener Institute to the Year of Geosciences 2002. In terms of stimulating interest the most successful themes and exhibitions were those which addressed the adventurous aspects of polar and marine research, those which involved hands on experiments through which discoveries could be understood, and those which conveyed fascination through images and sounds. A mixture of different types of event proved successful. Many scientists acknowledged the necessity of dialog with the general public. Comprehensible representation and didactic preparation of research themes was found to be a useful process.

Paper

Hot at the South Pole?

Discover the adventure of polar and marine research

To set the mood, I shall begin by showing the short film 'Ice Worlds'. The film comprises scenes from the Antarctic and Arctic, and communicates the fascination of the ice, which is felt by many of our visitors, and will perhaps draw you in to the world of polar and marine research.

Polar and marine research are key areas of Earth System and global change research. The Alfred Wegener Institute in Bremerhaven (Germany) promotes polar and marine research with its own research work in the Arctic, Antarctic and mid-latitudes. The mission of the Alfred Wegener Institute is to improve our understanding of the complex relations between the oceans, ice, atmosphere, the ocean floor and the plant and animal kingdoms. Earth management based on scientific understanding can only be carried out effectively if the research community succeeds in improving our understanding of the global environmental changes induced by natural causes and human interference. The Alfred Wegener Institute for Polar and Marine Research (<http://www.awi-bremerhaven.de/index-e.html>) includes the Institute in Bremerhaven, the Potsdam Research Unit, the Biologische Anstalt Helgoland and the Wadden Sea Station Sylt. In 2002, it has a staff of 768 and a total budget of about Euro 100 million. It is a member of the Helmholtz Association of German Research Centres and is 90% financed by the German Federal Ministry for Education and Research.

The Institute operates the largest German research vessel, the 'Polarstern' – an icebreaker which was especially designed for research in the pack ice zones of the Earth. The Institute also has stations in the Arctic and Antarctic, along with two polar research aeroplanes. (<http://www.awi-bremerhaven.de/Polar/index.html>).

I am the press officer and public relations manager. In carrying out public relations work at the Alfred Wegener Institute for Polar and Marine Research (<http://www.awi-bremerhaven.de/AWI/Presse/index-d.html>) I appreciate the great interest of the media and of the general public in the topics of our research. This interest arises both from fascination with the landscapes and adventure and out of concern for climate and environmental protection on global scales – themes such as global warming and global change.

Particularly on account of the latter political interest of the general public, we find ourselves responsible for explaining, in simple terms, the results of fundamental research into world climate and our environment to a broad audience. How do we go about this?

Firstly, let me establish how I interpret the term 'environmental communication': For me, environmental research is research which aims to further our understanding of the Earth System in a global sense, including issues such as global warming and climate change which have already been mentioned in Session 5 of this conference. I report from the perspective of fundamental research, and my task is to communicate the topics and results of such research to the general public.

The working area of the Alfred Wegener Institute – marine and polar research – are crucial for the understanding of our environment on global scales: The oceans define ours as the 'blue' planet. They cover 78% of its surface. They play a deciding role in the global climate. The polar oceans are of particular importance, representing a high proportion of the total ocean surface, and more importantly providing the driving forces for the global thermohaline circulation: They are therefore key regions for the development of climate for the entire planet. This is the domain of the scientific work of the Alfred Wegener Institute.

We can only comprehend the earth system, with all its interactions, if the natural sciences work together in an interdisciplinary fashion, each contributing its piece of the puzzle. This necessity has been recognised in marine and polar research, and collaboration between biologists, oceanographers, chemists, geologists and so on has a long tradition.

The same applies to international co-operation. Worldwide studies can only be carried out by many countries working together. This has also been accepted by scientists for many years. The first Geophysical Year was declared in 1882/83. In the twentieth century, many internationally co-ordinated research programs have been pursued under the auspices of the UNO, for example the World Climate Research Program (<http://www.wmo.ch/web/wcrp/wcrp-home.html>).

In communicating the results of environmental and climate research, these interdisciplinary and international aspects must also be conveyed, since they are necessary for an understanding of the subject as a whole. In my opinion, this is an essential element of environmental communication.

I would like to mention one further subject: many people see in the current discussion about climate change a means of understanding the state of the science itself, since the controversy amongst scientists highlights the limits of our understanding. Science does not speak ex Cathedra, but is rather itself a simple work of man, subject to errors, misunderstandings and difference of opinion.

I would like to draw your attention to a particular program of the World Climate Research Program, one which, after 12 years of intensive work, was closed two weeks ago at a conference in San Antonio, Texas (USA) in November 2002 (<http://www.WOCE2002.tamu.edu>): the World Circulation Experiment WOCE. (<http://www.woce.org/>)

The World Ocean Circulation Experiment (WOCE) is a component of the World Climate Research Program (WCRP) and is the most ambitious oceanographic experiment undertaken to-date.

WOCE is the largest internationally co-ordinated oceanographic program ever conducted. It provides global ocean observations of unprecedented extent and quality for the decade from 1988 until 1998. In addition to global observations furnished by satellites, conventional in-situ physical and chemical observations have been made by nearly 30 nations in four of the world's oceans. At the same time global numerical ocean models are being developed to assimilate these measurements. The field phase of the project lasted from 1988 until 1998. It was followed by analysis, interpretation, modelling and synthesis activities. This phase of WOCE continued to the year 2002. The success of WOCE will have considerable impact on follow-on programmes - CLIVAR, a global study of ocean climate variability and predictability, GODAE, the Global Ocean Data Assimilation Experiment, ARGO, a global array of temperature/salinity profiling floats.

The question here is, how to communicate the scientific results of the program in a comprehensible manner. The unique results of WOCE have been made accessible to the general public, for example, over the internet: I shall show one of the web pages from eWOCE, the Electronic Atlas of WOCE.

(<http://www.awi-bremerhaven.de/GEO/eWOCE/index.html>)

To facilitate their use, profile and sequence data from most WOCE data streams have been compiled in global or basin-wide datasets. When used with the Ocean Data View (ODV) visualisation software, which was developed by Dr. Reiner Schlitzer of the Alfred Wegener Institute, this compilation constitutes an Electronic Atlas of WOCE Data that permits graphical display and interactive analysis of the data in many different ways. With extensive interactive controls and the capability to add a wide variety of derived quantities, this electronic atlas complements the printed WOCE atlases.

The eWOCE Gallery shows more than 350 tracer distributions along sections from the WOCE Hydrographic Program (WHP). The gallery figures are accessed through interactive maps using your web browser. No additional software installation is required for viewing the gallery plots.

The crux of the eWOCE site was to take data which were gathered worldwide by many participants and make them available, in a consistent format, to anyone with an interest in them. The data can now be used also in school lessons and university lectures.

This is an example only for communicating results and people can discover the role that modern marine research plays within current environmental research. The natural and anthropogenic characteristics of the environment influence the living conditions of all humankind. The work of research establishments such as AWI is an important contribution towards the scientific assessment of potential changes to the future environment.

The findings of our scientists are important for insuring the sustainable use of our finite resources. "An intensive dialogue is needed to make these exciting findings available to a broad public and put people in a position to discuss them at the same table with the scientific community." writes the German Federal Minister of Education and Research to describe the aim of the Year of Geoscience (<http://www.planeterde.de>).

2002 – the Year of Geoscience in Germany

The German Federal Ministry of Education and Research launched the Science Dialogue Campaign in 1999, working together with the Donor's Association for the Promotion of Science and Humanities and major research organisations such as the Helmholtz Association to which the Alfred Wegener Institute belongs. As part of this campaign, special fields of science are spotlighted each year. The year 2000 was the Year of Physics, 2001 was the Year of Life Sciences, 2002 is the Year of Geoscience and 2003 will be the Year of Chemistry.

"As part of our efforts to bring to life the complex topics covered by geoscientific research, we are offering a platform for intensive dialogue." Four major events were held under the motto Planet

Earth. They dealt with the entire spectrum of modern geoscientific research, broken down into the categories Earth, Fire, Air and Water. A number of other important events and a wealth of regional activities were sponsored by research organisations, universities, museums, associations and other institutions.

The Alfred Wegener Institute for Polar and Marine Research participated in these events and organised its own in Bremerhaven: 'Ice and the ocean - polar research concerns all'

'Ice and the ocean'

'Ice and the ocean' was the AWI highlight of the Year of Geosciences 2002, and took place between 5-9 June in Bremerhaven. At the height of the festival were interactive experiments and demonstrations in the AWI laboratories. There was also a science show about ice, and a piece of the Antarctic was presented in Bremerhaven: a large ice block especially brought home by our research vessel Polarstern. Thousands of people came to visit the festival.

Program:

Wednesday

Opening party, science show 'Ice worlds'

Thursday – Schools Day:

Activities for pre-registered school classes in the laboratories of geology and glaciology and on board the research vessels Heincke and Uthoern, an evening lecture on popular science

Friday – Young Scientists Day/Postgraduates Day

Activities for pre-registered school classes in the laboratories of geology and glaciology and on board the research vessels Heincke and Uthoern, an evening lecture on popular science

Saturday

Science Market, open-door laboratories, exhibitions in marquees

Sunday

Open Ship on the research ships

In the schools program classes could perform scientific experiments and measurements in the laboratories of geology and glaciology. They could produce and microscopically examine very thin sections of rock, make x-ray examinations of rock and ice, look at fossils under the microscope, draw maps and much more. On board the research vessels Heincke and Uthoern they experienced modern marine research with an excursion into the North Sea. Evening lectures for the public took place in the lecture room of the AWI. New climate research results were presented from both the geological and oceanographic viewpoint.

On Saturday, AWI presented the most exciting aspects of its work in five marquees. The visitors were invited to come and discuss with the scientists.

Of the many themes, which were presented, I would like to pick one example, which is connected to the World Ocean Experiment that I described earlier. Although WOCE improved our knowledge of the seas dramatically, the data collected were 'a drop in the ocean'. The follow-up project, ARGO, will deploy a global array of profiling temperature/salinity floats. These floats represent an automated measurement network, which will deliver continual data streams, for years to come, at higher spatial resolution than has ever been achieved. The ARGO floats were on display at the festival, and our oceanographers were on hand to explain them to visitors.

Other themes included, for example, ice coring in the Antarctic, climate research in Siberia, the Neumayer Station in the Antarctic and research into seals and life on the sea floor.

In addition there was a theatre for children, a film program, video conferences to the arctic Koldewey-Station and the geology laboratory was open to the public and they could perform scientific experiments and measurements themselves.

On the last day, the research vessels Heincke, Uthoern and Polarstern were open for the public. The giant icebreaker was between expeditions. This time is generally used for repairs and maintenance. Amongst other things the stern of the ship had to be cut open in order to replace the rudder equipment. So the enormous Polarstern could be seen by the public for the first time in dry dock. The AWI and collaborators presented their research, highlighting the central role of national and international co-operation in polar and marine research.

Under the auspices of the 'Ice and the ocean' festival, a group of artists and scientists illustrated the theme of ice on huge canvases. These works of art remained in place all summer long until September, and the Polarstern was directly docked outside the main AWI building. At the German navigation museum there was an iceberg to be crossed and the Weser became an ice landscape.

I was particularly pleased that, through this project, two glaciologists from the AWI, who are frequently at large in Greenland and in the Antarctic, working under difficult conditions, wanted to convey what they find extraordinary and beautiful in their work: the fascination of the ice, to the general public. They were rewarded with a massive response and much appreciation.

Number of Visitors

In all, over 8000 interested visitors attended the 'Ice and the ocean' festival. These were divided amongst the individual events as follows:

| Day/ Duration | Format | Audience | Number of visitors |
|---------------------------|--|--|--------------------|
| Wednesday | Opening party, science show 'Ice worlds' | General public (by invitation) | 450 |
| Thursday and Friday | Activities for Schools: laboratories of geology and glaciology and on board the research vessels Heincke and Uthoern | Pre-registered school classes and groups | 53 (24+29) |
| | | | 33 (22+8+13) |
| | | | 63 (25+24+14) |
| Thursday and Friday | Evening Lectures | General public | 105 (45+50) |
| Saturday | Science Market | General public | Ca. 3500 |
| Sunday | Open Ship | General public | Ca. 4000 |
| 8th June to 8th September | Art installation / long term exhibition | General public | Estimated 250000 |

We were very pleased with the number of visitors, since it is difficult to mobilise the public in Bremerhaven. The visitors came specifically for the events and were very interested. Both the visitors and the scientists involved expressed satisfaction with the exhibitions and with the interaction, and reported having interesting discussions, partly at a very high scientific level.

In terms of stimulating interest, motivating and mobilising people, the most successful themes and exhibitions were, as might be expected, those which addressed the adventurous aspects of polar and marine research, those which involved hands on experiments through which discoveries could be understood, and those which conveyed fascination through images and sounds.

For example

Adventurous aspects of polar and marine research: Trying on polar clothing, such as the thick boots, mosquito nets etc. Active participation: Performing scientific experiments and measurements in the geology laboratories. Discussion via video-link with researchers in the Arctic station Fascination conveyed by images and sound: The science show 'Ice World', art installations

The mixture of different types of event proved successful. However, diversity requires the investment of a great deal of time and money. Only a small number of participants could be catered for in the schools program. We considered this carefully, and decided beforehand that good supervision and a high degree of participation was more important than increasing the number of participants. This was not the case for the lectures, Science Market or Open Ship events.

Important internal goals were also achieved through the festival: Many scientists acknowledged the necessity of dialog with the general public. They were often surprised by the degree of general knowledge and interest in their work shown by the visitors. Comprehensible representation and didactic preparation of research themes was found to be a useful process. In general, the openness of the scientists to the wishes and requirements of public relations and scientific communication was increased.

The Scientific Committee of this conference asked me to emphasise the practical aspects for others. This paper should be much more than a presentation of another science awareness program and its activities.

I have considered this request at length and find it difficult to pass on more concrete practical advice about activities such as those I have described. I have mentioned aspects of environmental communication which cover global scales and of which everyone in his landscape and local environment will feel the consequences. I believe that communication of scientific results to a broad audience will take diverse forms, depending on continent and country. It is dictated by a country's culture. I don't know what form it would take in Australia, South Africa or Sweden. In Germany it is often said that the USA, UK, France and the Scandinavian countries are considerably far advanced in matters of dialog between science and society and public understanding of science. I am very interested to learn more from you at this conference.

Scientific work without international co-operation, without discussion and exchange is, today, inconceivable. Up until now, there has been little exchange internationally regarding different means of communicating scientific results to a broad audience on a global scale. I look forward to meeting networks and organisations at this conference, with whose help international exchange might be intensified in the area of science communication.

To finish, allow me briefly to comment on the title of my talk: 'Hot at the South Pole' has a double meaning, but one which will only be appreciated by a German-speaking audience. A book entitled 'Am Sudpol denkt man ist es heiß', or 'They think it's hot at the South Pole', written by Elke Heidenreich, was very successful in Germany, describing in an amusing fashion a concert of the Three Tenors given for the penguins in the Antarctic. This bestseller is well known in Germany, and brought the Antarctic a little closer for many readers. We know from the work of geologists that there were periods in the history of our planet when the South Pole really was warm. Geologists have found ways of opening up natural archives, and of interpreting information to decrypt the past. This view of the Earth's history helps us to understand natural climatic changes, and with this knowledge we may be able to manage our planet and its resources better.