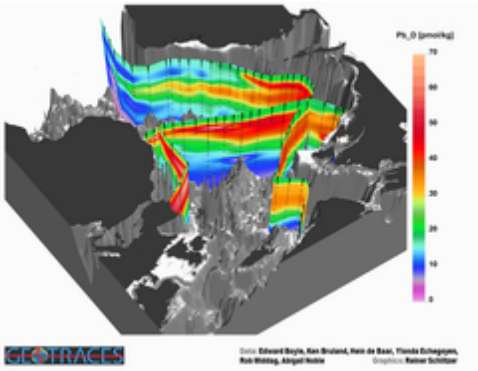
ALFRED-WEGENER-INSTITUT
HELMHOLTZ-ZENTRUM FÜR POLAR- UND MEERESFORSCHUNG

HELMHOLTZ GEMEINSCHAFT

19. March 2014: **Iron, cadmium, lead, etc. – new 3D atlas makes trace metals in the ocean visible**

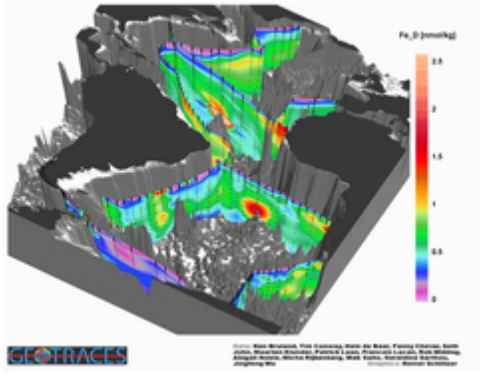
Bremerhaven, 19 March 2014. **A new digital 3D atlas reveals on first glance that the ocean has a long memory. At a depth of about 500 to 2,000 metres a red band runs across the Atlantic Ocean, indicating that presumably a large portion of the lead that used to pour out of the exhaust pipes of our cars prior to the introduction of unleaded petrol in North America and Europe floats around down there. However, lead is only one of many trace substances whose distribution in the oceans becomes visible in such detail for the first time. In a great global effort over 30 institutes from ten countries are currently working on an international project entitled "Geotraces" in order to track down and visualise sources, sinks and distribution pathways of iron, cadmium, lead, etc. in the ocean. The new 3D atlas shows initial intermediate results for the Atlantic, the Arctic and the Indian Ocean.**



"But we not only find traces of past pollution in the case of lead, we can also see that environmental policy countermeasures are having an effect," says Dr. Reiner Schlitzer from the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research in Bremerhaven, who developed the three-dimensional atlas. For the same image of the Atlantic reveals that water layers above 500 metres contain substantially lower lead concentrations. They first appeared on the surface of the ocean after the ban on leaded petrol and have not yet mixed with the deeper water layers.

"In total, we are talking here about very low concentrations on the order of approximately one part of lead to a thousand billion parts of water," Reiner Schlitzer explains why the lead concentrations measured in the Atlantic do not represent a direct threat to the environment. However, the low amounts detected illustrate the enormous analytical effort required for such a project that is only possible in a large research network.

"There are only a few highly specialised laboratories worldwide that are able to reliably measure specific trace substances in such low concentrations," states Schlitzer. And adds: "Not only very sophisticated analyses, but also very many of them are necessary to be able to prepare such an atlas of the oceans." Thus far more than twenty-five thousand water samples from varying depths taken at around eight hundred measuring stations have been examined for over 200 substances. Fifteen ship expeditions were necessary to collect the data incorporated to date. Others will follow. Apart from the Alfred Wegener Institute, the facilities involved in the project in Germany include the Geomar Helmholtz Centre for Ocean Research in Kiel, the Max Planck Institute for Chemistry in Mainz, the Institute for Chemistry and Biology of the Marine Environment at the University of Oldenburg and the Max Planck Institute for Marine Microbiology.



"Iron" is another example that shows what a scientific treasure researchers have brought to the screen and made visible using vivid visualisations from the depths of the ocean. Iron is frequently a deficient element in the ocean. Up to now dust deposition from the land has been considered the dominant source of the important micro-nutrient for algae, thus underlining iron's great significance in the ocean ecosystem. A look at the digital atlas, however, shows that there is also a large input of iron into the ocean in the area surrounding seamounts on the Mid-Atlantic Ridge or at the continental shelf of West Africa. The relatively high cadmium concentrations, in turn, which run in a conspicuous band along the South American Atlantic coast, are not an indication, for example, of a great environmental outrage on the part of the bordering countries. Rather, the heavy metal reflects the dispersal patterns of different oceanic currents.

Making such interrelationships perceptible for all oceans at one glance is the objective of the new electronic atlas, which has been available to the general public on the Internet since recently. And not only that. "By means of regular comparisons, we will be able to determine in a simple manner how climate change or also anthropogenic emissions alter the distribution of nutrients, pollutants and other trace substances in the ocean in future," sums up Reiner Schlitzer and looks at slowly rotating 3D animations of iron, lead and manganese concentrations in the Arctic Ocean. Assuming, of course, that hundreds of researcher

colleagues all over the world continue to steadily feed the new atlas with data.

Notes for Editors:
A selection of 3D animations is available to the public on our YouTube channel “AWIresearch”:
http://www.youtube.com/user/AWIresearch
You will find further information on the electronic trace substance atlas at http://www.egeotraces.org.
Your contact persons at the Alfred Wegener Institute are Dr. Reiner Schlitzer, phone +49 471 4831-1559 (e-mail: Reiner.Schlitzer(at)awi.de) and Ralf Röchert, Dept. Of Communications and Media Relations, phone +49 471 4831-1680 (e-mail: medien(at)awi.de).

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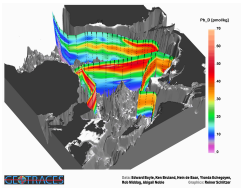
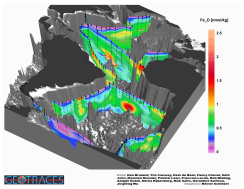
The Alfred Wegener Institute researches in the Arctic, the Antarctic and oceans in the central and high latitudes. It coordinates polar research in Germany and provides important infrastructure such as the research icebreaker Polarstern and stations in the Arctic and Antarctic for the international science community. The Alfred Wegener Institute is one of the 18 research centres belonging to the Helmholtz Association, which is Germany's largest scientific organisation.

Printable Images



Lead concentrations in the Atlantic
At a depth of about 500 to 2,000 metres a red band runs across the Atlantic Ocean. It indicates relatively high lead concentrations. The increased concentrations are due to emissions of car exhaust gases in Europe and North America that found their way into the environment prior to the introduction of unleaded petrol. In the same section water layers above a depth of 500 metres contain considerably less lead (green colour). These concentrations did not appear on the surface of the ocean until after the ban on leaded petrol and have not yet mixed with the deeper water layers. In the image Europe and Africa are on the left while the east coast of North and South America is on the right; the viewing direction is from northeast to southwest. Graphics: Reiner Schlitzer, Alfred Wegener Institute
web print



Iron concentrations in the Atlantic
The image shows conspicuous red areas around seamounts on the Mid-Atlantic Ridge and at the continental shelf of West Africa. A relatively large amount of iron is deposited in the ocean there. At the same time the image illustrates why the important micro-nutrient for algae in the ocean is considered to be a deficient element. There is only very little or no iron at all in large sections of the translucent surface water and in the entire South Atlantic (blue and violet colour spectrum). In the image South America is on the left while Africa is on the right; the viewing direction is from southeast to northwest. Graphics: Reiner Schlitzer, Alfred Wegener Institute
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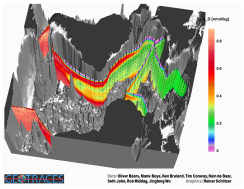

Cadmium concentrations in the Atlantic
The relatively high cadmium concentrations, which run in a conspicuous band along the South American Atlantic coast or from South Africa towards Antarctica, are not an indication, for example, of a great environmental outrage on the part of the bordering countries. Rather, the heavy metal reflects the dispersal patterns of different oceanic currents. The cadmium distribution resembles that of the nutrient phosphate, pointing to cadmium absorption on the part of algae during phytoplankton bloom. In the image South America is at the top, the West African coast on the bottom; the viewing direction is from east to west. Graphics: Reiner Schlitzer, Alfred Wegener Institute
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back to list