

## Oxygen optodes on Canadian Argo floats: Air measurements and more than 4 years of sensor stability

Oxygen optodes from AADI have become frequently used sensors on profiling Argo floats (for information on the operation see Fig. 1 and <http://www.argo.ucsd.edu/>).

The rationale of measuring dissolved oxygen with Argo floats was presented in detail by Gruber et al (2007) and includes that dissolved oxygen concentration is a key quantity for ocean ecology and biogeochemistry.

It is affected by global warming, it can be used as tracer in ocean circulation studies, and a better understanding of dissolved oxygen dynamics will improve estimates of the oceanic uptake of anthropogenic CO<sub>2</sub>.

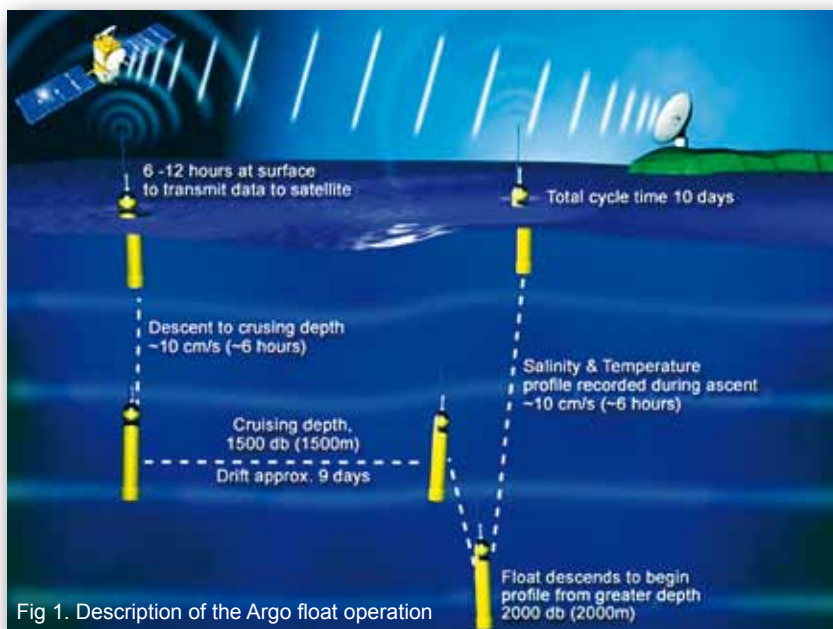


Fig 1. Description of the Argo float operation

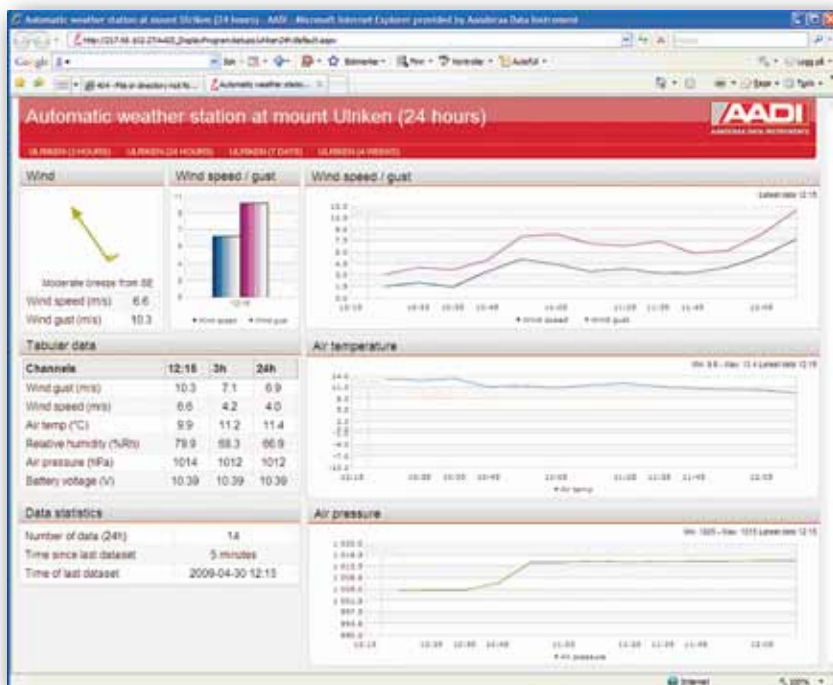
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## AADI GeoView – new display software

AADI GeoView is a web based display solution for environmental data display. It uses Flash graphics to display real-time data collected with various types of instrumentation.

AADI GeoView is part of the AADI Real-Time Solution. This gives the user vast opportunities for interfacing meteorological, oceanographic, or other environmental research equipment in a networked solution giving access to data in real-time.

The AADI GeoView relies on an underlying SQL database which contains the collected environmental data and is included in the installation. The display of data is in a standard browser, and if the PC running the AADI GeoView program is networked, the display of data can be viewed from anywhere on the network.



Bård Birkeland, the developer of GeoView says the new program represents a great improvement over existing display solutions. It is designed to display data from both AADI and other equipment, from one or multiple instruments displayed on one or more computers in a network.

## Oxygen optodes on Canadian Argo floats: over 4 years of sensor stability

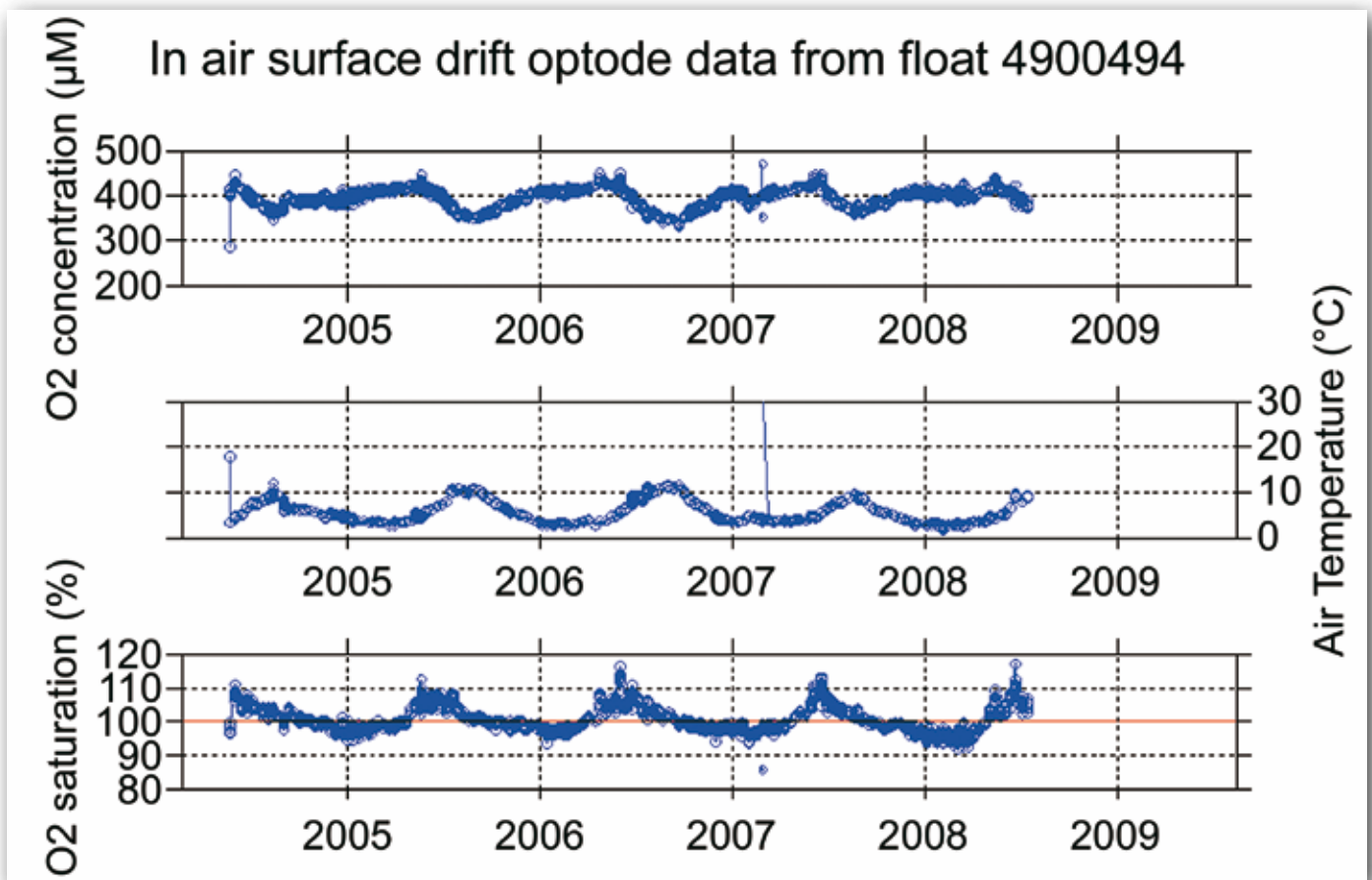


Fig. 2: Oxygen and temperature variations in the air just above the sea surface measured with Argo floats

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During the latest Argo float workshop in Hangzhou, China (March 2009) Dr. Denis Gilbert (Institut Maurice-Lamontagne, Mont-Joli, Québec, Canada) presented results from oxygen measurements carried out with 16 Canadian Argo floats.

Oxygen is measured both in the water column during float ascent as well as in the air when the floats were at the surface to transmit data by satellite to land receiving stations (Fig. 1).

One conclusion from the measurements was that all oxygen optodes appeared to be stable, the longest deployments have lasted more than four years and are still on-going.

In addition to high quality information about oxygen conditions in the water column these floats have produced a unique set of data on seasonal and annual variations of oxygen in the air just above the sea surface (see Fig. 2).

Most likely there are several factors affecting the oxygen changes seen in the figure including: oxygen uptake of the water during autumn cooling leading to lower oxygen saturation, spring warming causing supersaturation and degassing, and a short-lived oxygen saturation peak in the spring which is most likely caused by the spring bloom of algae.

The oxygen saturation values at the surface were calculated assuming a pressure of 1 atmosphere, 100% relative humidity and zero salinity. Any departure from these assumptions may contribute to the oxygen saturation signal.

More reading:

Gruber N., S.C. Doney, S.R. Emerson, D. Gilbert, T. Kobayashi, A. Körtzinger, G.C. Johnson, K.S. Johnson, S.C. Riser and O. Ulloa (2007) A white paper to promote the addition of oxygen sensors to the international Argo float program.

## New products and technology

Our R&D Department has been busy launching new products this spring. We are expanding our range of sensors based on the low-cost Wave and Tide sensor with a new temperature sensor, and we have released our first version of the SEAGUARD® String Logger.

### New Temperature Sensor 4880

New high accuracy, fast response Temperature Sensor 4880 for shallow water applications. They are rated for 300 meters depth and achieve or surpass the same performance specifications as the 4060, except for depth rating.



Temperature Sensor 4880

It is available in two versions: 4880 which has a Smart Sensor, AiCaP (for SEAGUARD® use) interface or an RS-232 interface for general stand-alone use. The 4880R has an RS-422 interface enabling it for general applications utilizing longer cables.

Both units have XML based protocols, embedded calibration coefficients and outputs in engineering format. There is no need for external processing or A-to-D conversion. Everything is embedded in the new small device.

Both units are priced at NOK 8900.-

### New SEAGUARD® Sensor String

The SEAGUARD® Sensor String is designed to be connected to the SEAGUARD® String Logger (new



SEAGUARD® Sensor String product with enhanced power handling capacity and extended memory.

The string can hold up to 20 AiCaP sensors. The design of the cable ends enables easy extension of the cable or creation of suitable cable subsections; the maximum cable length is 300m. The positions of the string outlets are customer specified.

The SEAGUARD® Sensor String offers a highly flexible configuration making the system a perfect tool for measurements of e.g. dissolved oxygen, conductivity, temperature, pressure and tide etc. A typical application is monitoring of a water column. The fly lead option is suitable for measurements in biological sensitive areas, e.g. coral reefs.

The output parameters are readable in engineering units; the parameters are easily presented in the post processing software, SEAGUARD® Studio. Each sensor connected to the string can be tagged with e.g. the depth position for easy recognition of correct parameter.

The SEAGUARD® Sensor String and the AADI smart sensors are interfaced by means of a reliable CANbus protocol (AiCaP) using XML for plug-and-play capabilities. The smart sensors are automatically detected and recognized after instrument power up.

The SEAGUARD® Sensor String can be used with AADI Real-Time Collector for real-time data storage, access and visualization in GeoView and real-time communication with the datalogger.

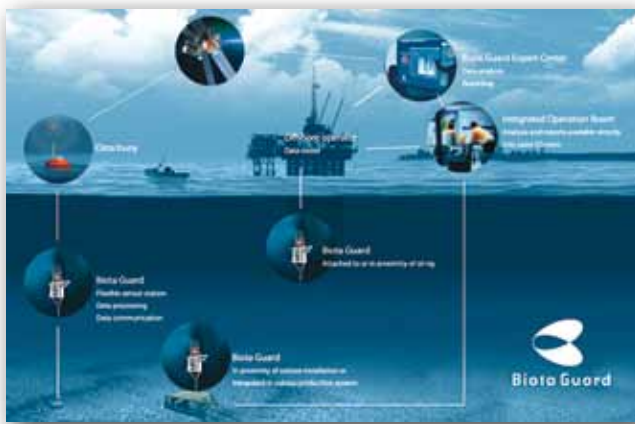
*New  
Temperature  
Sensor 4880*

*Costs 30%  
less than the  
4060*

## AADI and Biota Guard protect the Marine Environment from pollution

The Biota Guard system is the result of 15 years of research within marine eco-toxicology at the International Research Institute of Stavanger combined with reliable AADI high technology.

The objective is to monitor oil and gas activities in the sea by observing behavior of organisms in their natural habitat in combination with monitoring of physical and chemical parameters.



This represents an innovation and a step forward in terms of using live organisms in the ocean pollution fight.

The system is the result of a combination of physical and chemical sensors based on the use of AADI instruments to measure currents, temperature, salinity, turbidity, oxygen, pressure, chlorophyll and natural bio-sensors like mussels in order to give information about the health of the organism (i.e. if it feels threatened or is exposed to pollution). For that, the behavior of the animal is observed by registering the degree and frequency of the opening and closing of the mussel together with infrared sensors measuring the heart rhythm.

The collecting system is then placed in areas around oil rigs, sub sea installations and ports. Data are transmitted on shore in real time using radio, acoustic telemetry and/or cable. Once data received, they are analyzed by use of algorithms and graphical representations in Biota Guard



Expert Center. Users and experts can monitor the environment 24 hours a day and thanks to all collected information, they will be notified of any pollution in the area.

Next part of the project is to develop, test and demonstrate to the offshore oil industry this system suitability for the Arctic region. For more information, visit : [www.biotaguard.no](http://www.biotaguard.no)



## Impacts of seafloor respiration on threatened coral reef ecosystems —



Figure 1. The giant barrel sponge *Xestospongia muta*, and stinker sponge, *Ircinia strobilina*, common to coral reef ecosystems in the Caribbean (Photo by Chris Martens, UNC-Chapel Hill).

The University of North Carolina at Chapel Hill and Aanderaa Data Instruments partner in a new research project to discover the impacts of seafloor respiration on threatened coral reef ecosystems

Researchers and engineers in the Department of Marine Sciences at the University of North Carolina at Chapel Hill, NC, and at Aanderaa Data Instruments, Inc. (AADI), Bergen, Norway and Attleboro, MA, have announced a new partnership designed to enhance efforts to investigate the role of sea floor respiration on the health of coral reef and other threatened coastal ecosystems. The collaborative research effort will initially focus on the role of large sponges that increasingly dominate the benthic biomass of declining coral reefs along the Florida Keys tropical island chain.

The giant barrel sponge, *Xestospongia muta*, along with several other sponge species are believed to dominate the supply and removal of nutrient elements such as nitrogen to the reef, however, the data needed to quantify the role of sponges cannot be obtained using shore-based experiments because of their fragility when removed from the reef environment.

Experiments funded by the National Undersea Research Center (NURC) operated for NOAA by UNC-Wilmington and by the Chemical Oceanography Program of the National Science Foundation, will benefit from direct ocean access provided by the world's only underwater laboratory, Aquarius Reef Base (ARB), where divers can live and work below 50 ft for periods of weeks with

virtually unlimited dive time on the surrounding coral reef environment.

Aquarius is located at a depth of 62 ft on Conch Reef on the edge of the Florida outer reef tract, 3.5 miles off the coast of Key Largo, Florida. The researchers and engineers working from Aquarius and from surface boats will install several new types of instrumentation on the seafloor beginning in September, 2009, including a revolutionary "string" of multiple dissolved oxygen sensors custom-built by AADI engineers to mate with their SEAGUARD® sensor support and data logging units (*Figure 3c overleaf*).

The SEAGUARD® String system (*Figure 3a overleaf*) features major design breakthroughs that will allow the Aquarius researchers to directly monitor sponge respiration simultaneously by up to five individual sponges. Pairs of sensitive optode oxygen sensors, spaced at 30 meter intervals along the main trunk cable or "string", will be placed at sponge water intake and outflow (excurrent) locations to directly determine dissolved oxygen consumption by concentration difference. This unique sensor configuration is made possible through mounting each sensor independently on a three meter fly cable (*Figure 3b overleaf*). Individual sensors can be removed or replaced underwater for cleaning or other maintenance (*continued overleaf*).

*Cont...* Impacts of seafloor respiration on threatened coral reef ecosystems



Figure 2. Aquarius underwater habitat located on Conch Reef along the Florida Keys outer reef tract (Photo by Chris Martens, UNC-Chapel Hill).



**AADI SEAGUARD® Sensor String System**



Figure 3. Aanderaa Data Instruments Seaguard sensor system designed for UNC-Chapel Hill's coral reef project. A, Seaguard base unit with current meter, optode O<sub>2</sub> sensor, CTD and turbidity sensors. B, wet mateable Optode sensors on 3 meter length fly leads. C, 170 meter optode sensor string with Seaguard base unit, .

## New Russian Loadtronic distributor



AADI is pleased to announce the appointment of LogMax North-West as our new distributor in Russia. The brand LogMax will be representing our Loadtronic scales for front wheel loaders. This agreement represents a major boost in order to increase our market share in the important Russian market.

In cooperation with LogMax we are now able to offer competitive sales and support to all important OEM dealers in Russia. "LogMax Russia is located in St. Petersburg and will initially focus on sales in the western territory of Russia", says Kornei Erofeev, Managing Director of LogMax. <http://www.logmaxnw.ru/>.

Ronny Karlsen, Sales Manager at AADI, stressed the importance of the Russian market to AADI. "We chose LogMax for their expertise and comprehensive network within the construction business and for their ability to provide sales results as well as professional technical and application support to all customers". Like AADI, LogMax will provide the high level of service that our customers have come to expect.

## Oil Spill Response product news

The AADI Doppler Log System to measure speed through water of towed oil booms was in use during the yearly "Oil on Water" exercise that was held around the Frigg Oil Field in the North Sea from 8 to 12 June this year.

The system was clearly useful because, as explained by the command and towing vessel Captain; "I now have full control over the oil boom recovery system speed through the water. We can see the true system speed displayed on the control panel allowing us to operate at the maximum oil recovery speed and not exceed the 0.7 to 0.9 knot system limit." The true speed through water from the Doppler Log and speed over ground from the GPS was a difference of up to 0.6 knots.

## AIS Drifter buoy news

Oil spill response AIS Oil Drifter buoys were also used during the yearly "Oil on Water" exercise that was held around the Frigg Oil Field in the North Sea from June 8 to 12 this year.

The buoys was deployed to provide detailed information about the drift of the sea surface and where the oil spill would drift when oil was released into the sea. When the oil slick was recovered and pumped back on board the ships, a small oil slick was left on the sea.

The AIS Oil Drifter buoy marked and followed the small oil slick for two days. When a reconnaissance air plane surveyed the exercise area it got the AIS up on the screen and was able to focus the search. A small oil slick of crude oil was discovered around the buoy proving that the buoy actually follows the oil in reality and over days.

## Agreement for Oil Spill Market



We have the pleasure to inform about AADI's new sales agreement with AllMaritim AS — <http://www.allmaritim.com/>.

AllMaritim who is a leader in Norway in the oil spill response sector as well as one of the leading international suppliers – will include AADI's AIS Drifter/response buoys and Doppler Log to their line of oil boom products.



It is also the aim of both parties to develop the search and rescue segment MOB (man-over-board) for the AIS Buoy. Three sales persons from AllMaritim will be trained in AIS Drifter/response buoys and Doppler Log system. Our aim is to establish an excellent sales channel in the oil spill market.

## IRIMO, Iranian Met Office



Our close cooperation with the Iranian Meteorological Office has grown stronger over the last years.

IRIMO is a modern meteorological organization with highly qualified staff offering weather services to the public and to the industrial community.

IRIMO has, through our distributor Padyab, ordered two new buoys. One will be located in the Persian Gulf and the other one in the Caspian Sea. In addition, they have ordered several coastal weather stations from AADI this year for integration into their online network.

## Upcoming events

### **AQA2009 Aqua Farming International 2009**

16 - 19 Sep. Vigo 2009, SPAIN – Stand K98

<http://www.aquafarminginternational.com/index.php>

### **OCEANS 2009 MTS/IEEE**

Biloxi, Mississippi, USA - October 26-29, 2009

<http://www.oceans09mtsieeebiloxi.org/>

### **AGU Fall Meeting 2009**

14 – 18 December 2009, San Francisco, California, USA

<http://www.agu.org/meetings/fm08/>

### **Martech 2009**

Third International Workshop on marine Technology,

19 to 20th Nov., Vilanova I La Geltru, Barcelona, Spain

<http://www.cdsarti.org/martech09/eng/programa.asp>

### **Current methods and means of Oceanographic research**

25 to 27 November, Moscow, Russia.

## Spare parts for RCM 9 and 11

Due to the discontinuing of RCM 9 and RCM 11 as per our letter of 21 November, 2008, maintenance parts and spare parts related to these products will be affected by a price increase of 15% as of 1 October, 2009.

As our next generation of instruments, the SEAGUARD® RCM, replaces the RCM 9 and RCM 11 the production of RCM 9/11 will come to an end.

Due to the lower part turnover we see no other option than increasing our spare parts prices.

Please note that the price increase only applies to RCM 9 and RCM 11 parts and that our maintenance, service and calibration rates will not be affected as we expect a high service volume for many years to come.

## Quality Management System

AADI has implemented and maintains a Quality Management System. As of 24th June 2008 we were ISO Certified and now we meet the requirements of the new ISO 9001:2008 standard.

Customer satisfaction is fundamental to our business. AADI's products meet the highest quality standards and we strive to implement these same quality and reliability standards in every product and system we deliver. In addition we seek to continuously improve and simplify all of our business processes.

We have currently over 100 highly skilled employees working in our facilities, including engineering, manufacturing, calibration and test areas.

In-house expertise include instrument technicians, scientists, engineers, sales, marketing and support personnel.

We also have operational and administrative offices strategically located in the US and Spain, as well as representation via agents in 40 different countries.

Hence, we are ideally positioned to meet the needs of our clients and provide world-class product and services with the highest levels of quality and safety.