

ARGOS FORUM # 78

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NEWS FROM THE OCEAN

ENVIRONMENTAL MONITORING

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China's National Marine Data and Information Service (NMDIS)

China is a major coastal country and the Chinese government attaches great importance to the development of its marine activities. The National Marine Data and Information Service (NMDIS) is a government institution subordinate to State Oceanic Administration (SOA) of China, and is responsible for the management of national marine data and information resources, providing guidance and coordination for archiving national marine data and information and providing information and technical support for the development of the marine economy, marine management, public service and maritime security. Since its establishment in the 1950s, NMDIS has participated in international marine data and information cooperation on behalf of China, and undertakes the related international responsibilities.

NMDIS has a long history serving as a national coordinator of IOC/ IODE (Intergovernmental Oceanographic Commission/International Oceanographic Data Exchange), fulfilling the international obligations for participating in global operational oceanography projects and marine data exchange activities. In addition, NMDIS also has responsibility for the WDC (World Data Center)-Oceanography, Tianjin, ASFIS (The United Nations Aquatic Sciences and Fisheries Information System) national input centre of China, and International Ocean Institute (IOI) China Regional Center for the Western Pacific Region.

Since the 1990s, the Argos satellite data collection and location system has been an essential component of China's ocean observing systems. NMDIS actively participates in the global and regional cooperation projects, such as GOOS, JCOMM, GLOSS, GTSP, Argo, NEAR-GOOS, ODINWESTPAC etc. Under its supervision, the China Argo Data Centre, the China GTSP Data Centre, and the former JCOMM/ODAS Metadata Service (terminated in May 2012) were established to perform regular operational work.

With support from SOA, the 30th Session of DBCP and 34th meeting of JTA will be held in Weihei, China, in October, 2014.

All ARGOS publications are available at:
www.argos-system.org

RUSSIA STUDIES OF CURRENTS IN THE SEA OF OKHOTSK AND ADJOINING AREAS

By Gennady Kantakov / Far-Eastern Ecological Center

Since the beginning of 2011, the industrial science company FEEC (Far-Eastern Ecological Center), in collaboration with scientific institutes in the Far East of Russia has been studying surface currents and taking surface temperature measurements in the Sea of Okhotsk and adjoining areas.

The data collected are useful not only to Russian scientists, who are mainly concerned about currents in the sea of Okhotsk, but also to the international scientific community, as Gennady Kantakov, General Director of the Far-Eastern Ecological Center, Ltd., explains.

After all, the buoys deployed in the Sea of Okhotsk continue to collect interesting data as they float across the Pacific, and some of the buoys are still sending data when they reach Hawaii.

The studies use Argos/GPS buoys made by the Ukrainian company, Marlin-Yug. The manufacturer's products are well-known in Russia for being extremely reliable and efficient, and particularly because they have a very long lifetime. Many Russian science teams use Marlin-Yug buoys to study currents and monitor sea ice.

The main research goals are to compare the distribution of surface currents between seasons and from year to year and to study exchanges of water masses between the Sea of Okhotsk and the Pacific Ocean, particularly during winter when most of the Sea of Okhotsk is covered with ice. The data collected by the Argos/GPS buoys, when complemented with in-situ measurements of coastal currents, are used to adjust models of water exchanges between the Sea of Okhotsk and the Pacific Ocean and to study the transfer of biological and anthropogenic pollution. In addition the data



Deployment of an SVP-Tristar buoy from the Regional Hydrometeorological Scientific Institute of the Far East's research vessel, Professor Multanovsky. The deployment took place in July 2013, to the North east of Sakhalin Island.

can be used for studies of the migration and distribution of pelagic fish.

Data beyond borders

The results of the FEEC projects could be useful not only to Russian scientists, who are mainly concerned about currents in the Sea of Okhotsk or near the island of Sakhalin and the Kuril islands, but also to the international scientific community as some of the buoys deployed in the Sea of Okhotsk drift towards the Pacific.

For example, a Surface Velocity Program (SVP) Tristar drifter buoy released on 1 March 2011 from the «Professor Probatov» ship belonging to the Sakhalin Research Institute for Fisheries and Oceanography, provided data for 817 days up to 26 May 2013 while drifting from the area north of the Kuril Islands to Hawaii. Extremely valuable data was collected from these buoys in March 2011 during the earthquake which affected the Tohoku region to the north-east of the island of Honshu.

Tracking analyses

The trajectory of this buoy should help validate models of currents in the northern Pacific Ocean. The buoy drifted under the influence of the Eastern Kamchatka, Oyashio, Kuroshio, Alaska and California currents. The data obtained in the framework of

cooperation of the FEEC with the Institute of Geophysics and Marine Geology and with the Sakhalin Research Institute for Fisheries and Oceanography may be used by teams from the Russian Hydro-Meteorological Service, the Federal Fisheries Agency, the Russian Academy of Science and oil companies.

In July-August 2013, the FEEC and the Regional Hydro-meteorological Science Institute for the Far East deployed 20 Argos/GPS SVP-Tristar buoys manufactured by Marlin-Yug to the north-east of Sakhalin Island. These buoys drifted for six months in the Sea of Okhotsk and began reaching the Kuril Islands at the beginning of 2014.

Crossing the Pacific

Most of the buoys ended their travels on the coasts of the islands. Seven buoys managed to cross between the islands and reach the Pacific Ocean. They are now drifting towards the East and are still providing scientists with significant information on surface currents and temperature in the Northern Pacific ocean.

The Far-Eastern Ecological Center is willing to cooperate with other international teams to deploy more buoys in this area, for which few data are currently available at the moment.



Gennady KANTAKOV

Dr. Gennady Kantakov, MBA HR, is General Director of the Far-Eastern Ecological Center Ltd., which develops environmental applications in Russia from Moscow to Far East and CIS countries. The slogan of the company - to strive, to seek, to find, to keep and to develop is mirrored everyday conditions for ongoing projects and a future for the years ahead.

See news at www.decoltd.ru (site in Russian).



The Argos Tristar buoys are launched from a research vessel by a team of scientists/engineers. The buoys are tethered to the research vessel until the drogue completely submerges.



Buoys are connected to the ship as the drogue was not completely submerged.



Once the drogue is under water, the tether is removed and the buoy begins its voyage.

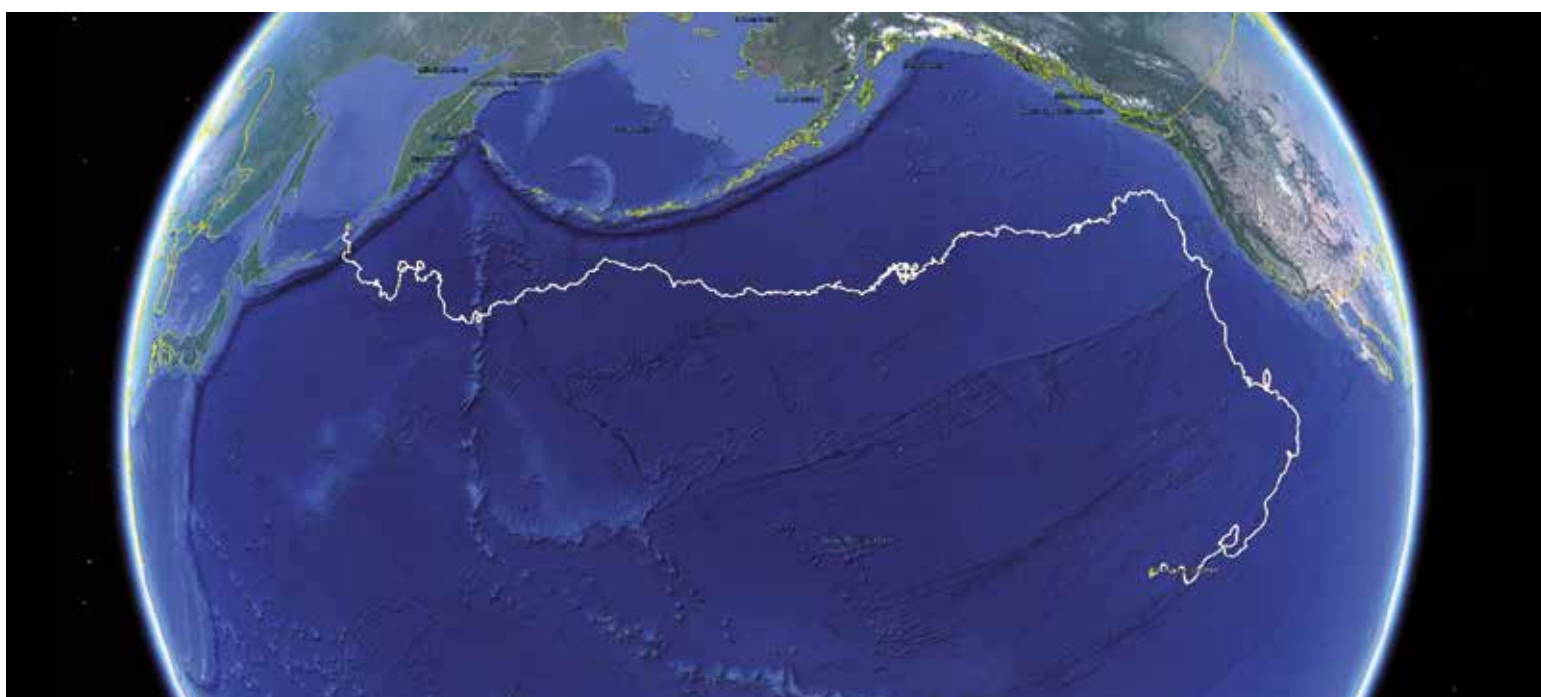


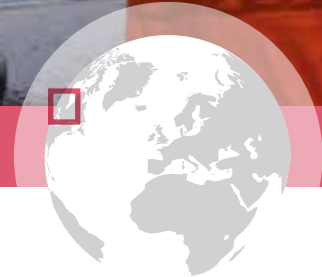
Figure 1: The buoys continue to send data, even once they have left the geographical area of interest of the Russian scientists who deployed them. The above trajectory represents data collected from March 2011 to May 2013. Data courtesy of FEEC.

CHINA COMPARISON OF TMI AND AMSR-E SEA SURFACE TEMPERATURE WITH RECENT ARGO NEAR-SURFACE TEMPERATURE OVER THE GLOBAL OCEANS



Deployment of an Argo float equipped to gather near surface temperature by a Chinese research team. © SOA

By Zenghong Liu and Jianping Xu
Second Institute of Oceanography (SIO), Chinese State Oceanic Administration (SOA)



Sea surface temperature measurements are crucial for ocean and climate studies. In situ data collected by Argo floats provide important insight into satellite measurements, as Zenghong Liu and Jianping Xu of the Second Institute of Oceanography, SOA, explain.

Measuring sea-surface temperature

Sea surface temperature (SST) is an important parameter for both ocean and climate studies. SST is a key indicator for climate change and has been widely used in El Niño–Southern Oscillation (ENSO) related studies. For validation of the satellite retrieved SSTs, many studies have been taken up using buoy-measured SST and expendable bathythermograph (XBT) which is the subsurface “bulk” SST, from depths of 1 to 5 m. In situ sensors are typically located at a depth of 1 m. Skin temperatures are not easily measured in situ, and few skin observations are available only from dedicated radiometers.

In the past few years, many floats have been deployed in the global oceans (Figure 1) which are able to sample pumped/un-pumped near-surface temperature (NST). This NST data,

relayed by the Argos data collection and location system, may become a potential data source for verifying satellite retrieved SST.

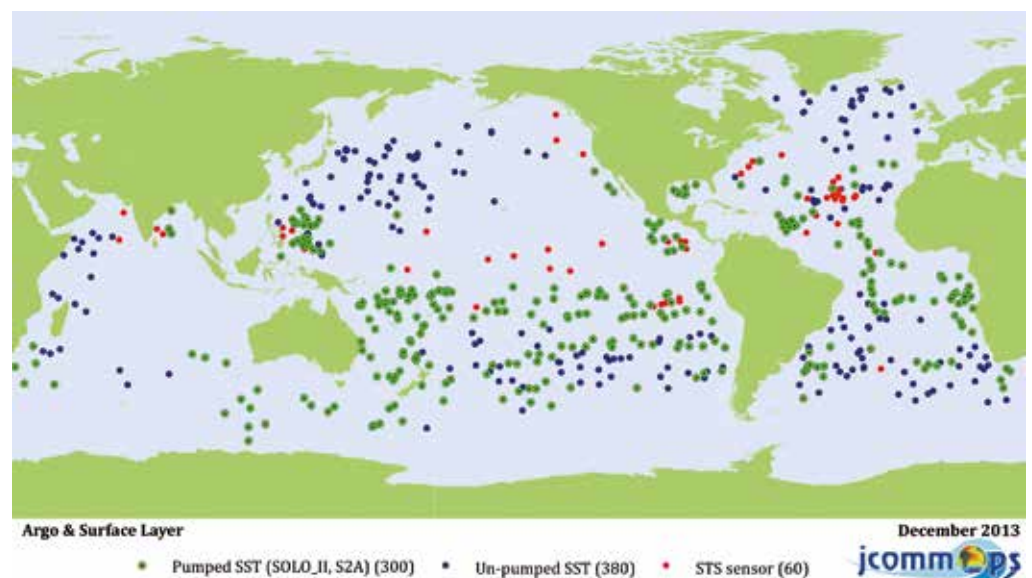


Figure 1. Distribution of Argo floats with the capacity of sampling near-surface temperature.

Diurnal variability from Argo NST

The Argo NST data used in this study is assembled and made available by the National Oceanography Centre (NOC), UK (<ftp://ftp.pol.ac.uk/pub/bodc/argo/NST/>). About 3,191 data pairs for TMI (TRMM Microwave Imager) and 3,379 for AMSR-E (Advanced Microwave Scanning Radiometer-EOS) from October 2008 to March 2012 are selected for this analysis.

Figure 2 shows the temperature difference between Argo near-surface and 5-m temperatures bin-averaged on the basis of local time. A pronounced diurnal warming is observed between 10h00 and 19h00 local time, with the maximum warming of about 0.1°C occurring between 14h00-15h00 local time.

Seasonal dependence of temperature difference exists both in the northern and southern hemispheres (Figure 3). The warm bias is most pronounced in summer months, which is probably a result of increasing stratification in the upper ocean. This warm bias is more significant in the southern hemisphere (about 0.05°C on average) than in the northern hemisphere.

Comparison of SST with Argo NST

TMI/AMSR-E SSTs and Argo temperatures show good agreement over the global oceans. The regression fits between TMI/AMSR-E SSTs and Argo near-surface temperatures indicate the correlation coefficient of 0.986 and 0.995, respectively (Figure 4).

When the winds are less than 5 m/s, both TMI and AMSR-E SSTs have a warm bias relative to the Argo near-surface temperatures, which reflects the subskin-bulk temperature difference. The statistics of comparison suggest that TMI performs slightly better than AMSR-E under weak wind conditions, whereas TMI SSTs may not be well calibrated at higher wind speeds.

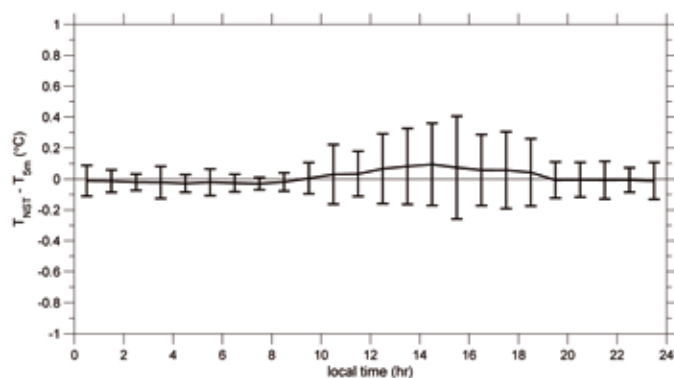


Figure 2. Argo near-surface temperatures minus Argo 5-m temperatures bin-averaged on the basis of local time. Error bars are twice the standard error for each bin.

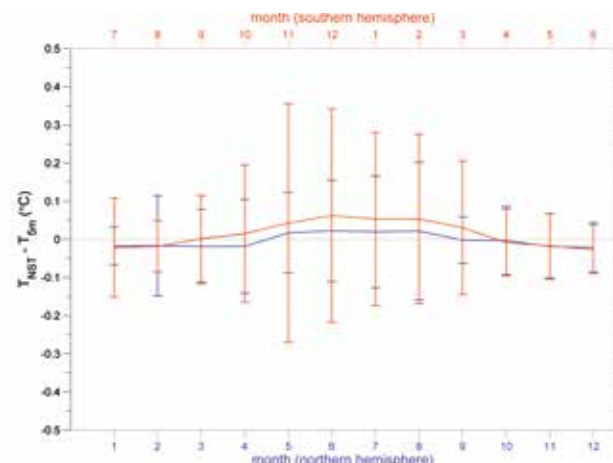


Figure 3. Argo near-surface temperatures minus Argo 5-m temperatures bin-averaged on the basis of month for the northern hemisphere (in blue) and southern hemisphere (in red). Error bars are twice the standard error for each bin. (Here we adjusted the month so that month 1 is January for the Northern Hemisphere and July for the Southern Hemisphere).

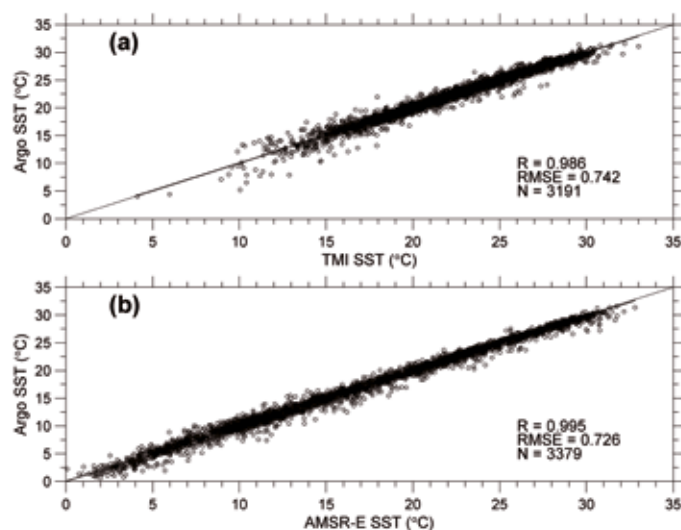


Figure 4. Scatter plot of Argo near-surface temperatures against TMI and AMSR-E SSTs. Dashed line is the linear regression line.



Zenghong LIU

Author is an associated research scientist at the Second Institute of Oceanography (SIO), SOA, China. He has been working for China Argo project since 2002.

At SIO, he is in charge of Argo data processing and distribution of all floats deployed by China Argo.



Jianping XU

Jianping Xu is a professor at the Second Institute of Oceanography, SOA, China. He is a chief scientist of China Argo project, and also a member of the international Argo Steering Team.

USA THE GLOBAL DRIFTER PROGRAM AND THE IMPLEMENTATION OF THE ARGOS-3 TECHNOLOGY



An Argos-3 drifter outside the Scripps workshop.

By Lancelot Braasch and Luca Centurioni / Scripps Institution of Oceanography

The Scripps Institution of Oceanography has been the driving force behind the Global Drifter Program (GDP) component of the NOAA's Climate Observing System and a scientific project of the Data Buoy Cooperation Panel (DBCP), since its beginnings.

Scripps continues to provide scientific and technological expertise to the GDP aimed at increasing buoy performance and lifetimes. This includes integrating Argos-3 technology into SVP drifters and evaluating its impact on buoy performance. Lance Braasch and Luca Centurioni, of Scripps, share their results.

Introduction

The Global Drifter Program (GDP) aims at maintaining a global 5x5 degree array of 1250 satellite tracked surface drifting buoys to meet the need for an accurate and global set of in-situ observations of mixed layer currents, sea surface temperature, atmospheric pressure, wind and salinity. Data users include oceanographers, climate scientists, the Numerical Weather Prediction (NWP) community and international partners of the Data Buoy Cooperation Panel, of which the GDP is a scientific project.

Description of Technology

Polar to Polar Coverage

In order to satisfy the goals of the GDP, including data timeliness requirements, a true Polar-to-Polar satellite telemetry solution is required. Few satellite telemetry systems offer

complete global coverage similar to the Argos constellation. Since 1985, drifting buoy manufacturers have been utilizing the Argos system for both data telemetry and localization. The GDP currently maintains an array of approximately 800 drifters fitted with an Argos transmitter. Currently less than half of the Argos drifters utilize Argos 3 (Figure 1), the remainder are older Argos-2 systems. As Argos-2 systems expire, they will be replaced with Argos-3.

Hardware Constraints

Developing hardware for a globally distributed array presents a number of unique challenges. Environmental conditions in the tropics have little resemblance to those at the Poles. Further, deployment opportunities by way of Vessels of Opportunity (VOS) mandate that the drifter is of robust construction and capable of withstanding deployment impact from a height of up to 15-meters and a speed of 15 knots.

Power Budget

GDP instruments are required to report hourly environmental observations for at least two years. Additionally, data timeliness requirements for NWP applications mandate a maximum of one hour latency for distribution onto the Global Telecommunications System (GTS).

Through the years Argos has developed a network of receiving ground stations to satisfy the timeliness requirement over a large portion of the Earth. These strict requirements limit the viable options for implementation and require careful budgeting of the available power for the various sub-systems.

Implementation of Use

Argos-3: Bi-directional communication

Faced with many challenging design constraints, implementers have gravitated toward the emerging Argos III technology. Utilizing a separate downlink band, the bi-directionality of Argos-3 offers many power-saving features not available on previous Argos implementations.

Pass-Prediction

Surface Velocity Program (SVP) drifters configured for Argos-3 telemetry utilize the Kenwood YTR-3000 PMT-RFM (PMT). The modem's software configuration was specially developed in collaboration with the GDP and Scripps Institution of Oceanography with focus on data throughput and strict power budget requirements. Argos-3 satellites broadcast orbital ephemeris data. The PMT is able to generate pass-prediction scheduling using the ephemeris dataset. When configured to do so, the PMT will automatically limit Argos up-link transmissions to instances with an Argos satellite overhead. Our tests have shown that when pass-prediction control features are not exploited, for

example when the PMT is used in an Argos-2 mode, the lifetime of the drifters is reduced due to excessive power consumption.

Dataset handling

Pass-prediction technology allows the end-user to collect environmental conditions at any desired interval by loading datasets onto the PMT's data queue. Datasets remain loaded on the PMT until pass-prediction deems a satellite is overhead. Without intervention from the end-user, the transmitter is enabled and passes the dataset to an Argos satellite. Data is then distributed to any one of the Argos ground stations. Data assembly and validation is conducted by CLS and then distributed onto GTS.

Additional Applications

In addition to global circulation studies, real-time hurricane research is realized through the capabilities of the Argos constellation. Air-deployed hurricane instruments have allowed forecasters to tune their models using up to the hour data streams transmitted from within the eye of the storm. Instruments can measure physical properties of the upper 150 meters of ocean while also collecting vital meteorological parameters such as wind speed, direction and barometric pressure.

Concluding Remarks

Argos has been used by Oceanographers to relay observations from remote observing stations deployed around the globe for nearly 30 years. The Global Drifter Program is currently evaluating the long-term power budget implications of the Argos-3 technology. Several hundred drifters are currently operating on Argos-3 technology with encouraging preliminary results, especially in terms of low power consumption.



Figure 1. 293 Argos-3 platforms in the GDP Array as of March 20, 2014.



Lancelot BRAASCH

Lancelot Braasch has been a development engineer for Scripps Institution of Oceanography since 2009, where he has been strongly implicated in integrating Argos-3 technology in drifting buoys.

In addition, he specializes in electro-mechanical design, fabrication and testing of drifting buoys and restrained mooring systems, as well as data architecture and development of HTML5 web applications for real-time data visualization.

He is also involved in field operations management and logistics planning. He earned his B.S. in Mechanical Engineering from the University of California at San Diego.



Luca CENTURIONI

Luca Centurioni is an Associate Researcher at Scripps Institution of Oceanography (SIO). He is the Principal Investigator of the SIO component of the Global Drifter Program.

From 2008-2011, he served as the DBCP (WMO-IOC) Chairman for the Argos-3 Pilot Project. He earned his PhD in Physical Oceanography from University of Southampton, Southampton, UK, and integrated SIO in 2002.

He has organized and run several Oceanographic cruises that included the deployment of experimental drifters he has designed.

GERMANY MESSAGES IN A BOTTLE WITH A MODERN TWIST



© Jan Seifert, GEOMAR

By Andreas Pinck and Christian Soinski, GEOMAR

In April 2014, the “Color Fantasy”, a Norwegian cruise ship, took 50 children, aged 6 to 14, from Kiel, Germany to Oslo, Norway. This three-day cruise was a special event, for the winners of the “Bottle-Action” competition launched by the cruise line company and the cruise line company and the daily newspaper Kieler Nachrichten.

The winning children were given the opportunity to launch a “message in a bottle” complete with drawings and cultural messages. In addition, a 51st bottle, equipped with an Argos transmitter, was developed by GEOMAR to track the bottles’ possible path off the Norwegian coast.

Modernizing the message in a bottle

The 51st bottle was built by a team at the GEOMAR Helmholtz Centre for Ocean Research in Kiel. Christian Soinski, a 22-year-old master mechanic, specially designed a cylinder made of durable acrylic for hosting the Argos transmitter. Andreas Pinck, in charge of electronics, integrated the HAL2 Argos transmitter into the bottle, using



© Jan Seifert, GEOMAR

The cruise ship Color Fantasy, leaving the port of Kiel.

the neck to support the antenna. The bottle was designed to float upright, to best transmit its position as it floats on ocean currents. The bottle falls into a whole range of products built by the precision engineers at GEOMAR for scientists.

The bottle was launched off the side of the cruise ship on April 29th. Its positions were picked up by the Argos satellites and processed and stored by CLS. It was tracked until May 6th, when it reached the Norwegian coast between Arendal and Grimstad.

Scientific and cultural project

Where did the other bottles end up? The children hope the bottles will land in Denmark. Perhaps some will float into the North Sea. At any rate, the campaign links both cultural and scientific curiosity. And each bottle is clearly labeled, so for those that were not equipped with an Argos transmitter, we can only hope the finders will send the bottles back when they find them, in exchange for a reward.

For further reading

The Kieler Nachrichten provided excellent coverage of this story in their newspaper. Visit their website to read more and view maps of the bottle trajectory as well as a gallery of the children’s messages.

<http://www.kn-online.de/Schleswig-Holstein/Flaschenpost/Leser-koennen-die-Route-einer-ganz-speziellen-Flaschenpost-online-verfolgen>

And to read more:

<http://www.oceanblogs.org/oceannavigator/2014/04/29/die-reise-von-flaschenpost-51/>

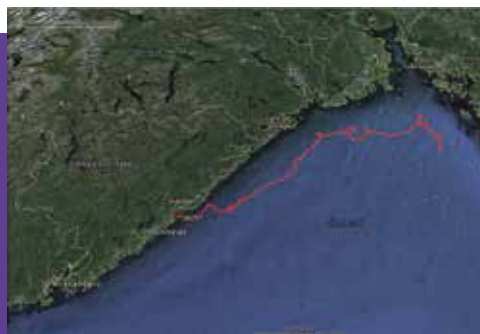


Figure 1. The modern-day message in a bottle, was tracked by Argos from April 29th when it was launched from the cruise ship Color Fantasy to May 6th, when it came ashore between Arendal and Grimstad, Norway.



© Jan Seifert, GEOMAR

Figure 2. The modern-day message in a bottle, designed by GEOMAR, complete with an Argos transmitter to track the bottle’s path.

SPAIN FINDING A LOST TRANSMITTER IN SPAIN'S SIERRA DE FILABRES



© Image courtesy of Juan Diego Ibáñez-Álamo

By Juan Diego Ibáñez-Álamo, Tomás Pérez-Contreras and Manuel Soler / Department of Zoology / University of Granada

The Hoya de Guadix is a high-altitude plateau located in the southeast of Spain.

A number of birds species breed in the area, including the Great Spotted Cuckoo (*Clamator glandarius*), studied by our research group from the University of Granada.

It is also an attractive stop for birds migrating from Europe to Africa.

Tracking great spotted cuckoos

In May of 2013, we began tracking several Great Spotted Cuckoos with Argos 5g solar PTTs. In July of 2013, the position of one of them stabilized in a location 50 kms away from its capture area and we believed it had died. The PTT still transmitted from time to time but it was impossible for us to find it with the information provided by these transmissions.

Finding the transmitter

In February of 2014, we bought a goniometer from CLS in order to find that PTT and any other that could be lost in the future. We drove to Sierra de Filabres, to a location about two kilometers away from our last received position, an arid hilly area with a very difficult terrain and sub-arid vegetation (mainly brushes and esparto grasses, with some small pines too). Then we walked with the goniometer in our hands, getting closer to the position. When we were at 300 meters more or less, the gonio started to give us some contrary directions, probably by the shadow cast by a cliff.

A few hours later, the transmitter was found partially hidden between esparto grasses just at the edge of a small cliff. The whole operation took half a day. We were very pleased with the performance of the goniometer. It allowed us to find our lost transmitter, and even though the antenna was partially damaged it can be used again. Two other PTTs were lost in different locations of the south of Spain, but they stopped transmitting entirely in October of 2013, probably because they were buried or damaged somehow once on the ground. If we had the goniometer before, we would have tried to recover them too. It is a pity. Considering the investment that is made in our PTTs, the goniometer seems to be a good tool to ensure we get as much use out of them as possible.



© Image courtesy of Juan Diego Ibáñez-Álamo

A great spotted cuckoo equipped with a 5 g Argos solar powered transmitter, in May of 2013, as the bird set out on his great voyage.



© Image courtesy of Juan Diego Ibáñez-Álamo

The slightly damaged 5g transmitter that was found with CLS's goniometer. It has since been redeployed and works very well.

ABOUT THE CLS GONIOMETER...

The CLS goniometer helps users find nearby Argos platforms.

Depending on the altitude and the reception conditions, the goniometer can detect all transmitting platforms within a radius of 100 km or more.

The user selects the ID number of the desired platform on the screen, then follows the signal power and direction information provided by the device until the platform in question has been found.

Please contact info-argos@cls.fr or your nearest CLS office for additional information.



WE WELCOME YOUR CONTRIBUTIONS!

We know your work is interesting.
Let us publish it!
We are currently accepting contributions.
Articles (maximum 700 words) should
be submitted in French or English.

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