

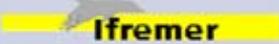


inmartech₀₈

Toulon, France

8-10 October 2008

hosted by Ifremer



Ifremer

International Marine
Technicians Symposium



<http://wwz.ifremer.fr/inmartech08>

Proceedings

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Inmartech 2008 Proceedings Introduction

The 2008 International Marine Technician (Inmartech) Symposium was hosted by Ifremer in Toulon, France on October 8-10, 2008.

The Inmartech 2008 programme agenda is included as [Appendix A](#) of these proceedings.

The symposium was attended by 82 participants representing 16 different countries and 36 organizations. An attendance list is included as [Appendix B](#).

Inmartech 2008 consisted of 9 technical sessions:

- AUVs/Gliders
- Manned Submersibles
- New Vessels
- ROV/AUV Deployment and Interoperability
- Instrumentation and Methods
- Acoustic and Seismic Tools
- Buoys-Moorings-Observatories Installation
- Data Treatment, Network and Communication
- Lessons Learned

Inmartech 2008 also included a visit of Ifremer facilities where submersibles (*Nautile*, *Victor 6000*, *Aster^x* and *Idef^x*, *SAR/SYSIF*) could be seen, posters were exposed (see Poster Session) and local companies ([Semantic-TS](#), [Sirenya](#), [Subsea-tech](#)) presented their activities. The [Pôle Mer PACA](#), which participated in the organization of the exposition, was also represented.

This Proceeding document is a compilation of all the presentations that were made during the symposium. The document is organized by session; an abstract of each presentation and a photograph of the presenter(s) are provided when available.

A satisfaction survey was distributed during the symposium: 21 participants answered. The results can be read in [Appendix C](#).

Inmartech 2008 Organization

The organizing committee was composed of:

- Gérard Riou, Ifremer
- Olivier Lefort, Ifremer
- Vincent Rigaud, Ifremer
- Laurent Brisset, Ifremer

and received the help of Thierry Terre (Ifremer).

The Ifremer team involved in the preparation and the realization of the symposium was composed of:

- Véronique Asseline
- Laurent Brisset
- Patricia Gontier
- Anny Laurantin
- Alain Massol
- Annabel Merien
- Nadine Rossignol
- Emmanuel Sargenton
- Carole Vichery
- Jacques Vichery

This Proceeding document has been edited by Laurent Brisset and Annabel Merien; all the photographs were taken by Alain Massol during the symposium.

Inmartech 2008 Symposium Introduction

• Welcome Address – Gérard Riou, Director of Ifremer Mediterranean Centre



“Dear guests and colleagues
Ladies and Gentlemen.

It is a great honour to have the opportunity to say a few words before starting this symposium. First of all, on behalf of Ifremer, I would like to express our great pleasure in welcoming all of you and in hosting the International Marine Technician Symposium, 2008 edition, in Toulon.

Inmartech gives us a unique opportunity to discuss, every two years, a wide range of topics concerning the technology for research vessels, instrumentation, marine or submarine systems for marine science. The number of presenters and attendees show your fondness to this event and your interest for innovation and marine technology.

In view of the advancing frontiers of marine science, we are required to develop ever more performing ships and systems. Increasing the observation capabilities in terms of time resolution, spatial coverage or real time processing are still challenges for marine technicians.

I feel that major changes will impact the way to deal with these challenges. Either the complexity of science requirements or the funding questions are powerful drivers for these changes. As an illustration, I would like to point out two trends:

- Marine measurement systems and ships are parts of observing systems which can be considered as a whole. Now they have to be managed in order to optimize the investment and operating costs. Efficiency is balancing performance.
- The increasing importance of wide collaboration between laboratories and with private companies. Sharing competencies and systems are balancing self developments.

As a result, our added value in producing new technology is moving. This will change the way to manage our projects but the technological challenges are still there. Innovation is still the only way to accept the challenges.

The Inmartech symposium will give us the opportunity of sharing experiences and expressing ideas. Quite fascinating topics will be discussed in the different sessions and I expect a variety of hot discussions throughout this symposium. I am confident it will stimulate innovation.

Finally I would like to thank the Regional Council of Provence Alpes Côte d'Azur for help in financial sponsorship and marine competitiveness sea cluster « Pole mer PACA » for help in organization.

I express my sincere wishes for the success of the symposium.

Thank you for your attention.”

- Ifremer Toulon Operational Base and CETSM – Vincent Rigaud (Ifremer)



Presentation: < [Introduction-Rigaud.pdf](#) >

Session 1: AUVs/Gliders**Moderator: Volker Ratmeyer (MARUM)****• First Science Missions for *Autosub6000* AUV – Stephen Mc Phail (NOC)**

Abstract: Between 8th August, and 1st September 2008, the *Autosub6000* AUV carried out 5 missions, as part of the NERC, UK, Oceans 2025 funded cruise, /RRS *James Cook*/ 027. Lead by Dr Russell Wynn of the National Oceanography Centre, Southampton, the cruise's objectives were to investigate potential threats to coastal communities along the Western European margin from giant landslides, earthquakes and tsunamis. The areas of *Autosub6000* operation ranged from just north of the Canary Islands, via the Iberian Abyssal plain to the Whittard canyon, in water depths ranging from 4200 to 4850 m. The

ship cruise track length was in excess of 2000 miles. Each of the *Autosub6000* missions lasted 24 hours. While the AUV carried out the detailed, high resolution (3 m pixel size), 3D bathymetric survey of the sea floor, of 16 to 25 km² areas, the ship was able to transit elsewhere and carry out seabed piston coring operations. Within 2 hours of the end of each mission, more seabed coring operations were underway, guided by the *Autosub6000* gathered bathymetry.

Presentation: < [Session1-McPhail.pdf](#) >

• AUVs Fleets Exploitation Feedbacks – Jan Opderbecke (Ifremer) and Volker Ratmeyer (MARUM)

Presentation: < [Session1-Opderbecke.pdf](#) >

Movie clip: < [asterx.avi](#) >



Presentation: < [Session1-Ratmeyer.pdf](#) >

- **Daurade: an AUV for Rapid Environment Assessment – Jean Meyrat (SHOM)**



Abstract: The French hydrographic and oceanographic office (SHOM) and the “Délégation générale pour l’armement” (DGA) are developing an AUV for rapid environmental assessment applications.

The vehicle, called *Daurade*, has been accepted at the end July 2008, and a program of 3 years of studies will follow, to improve the vehicle’s autonomy and develop a prototype of data fusion capability. The main assets of this AUV are its speed (up to 8 knots) and payload: it carries accurate sonars, an ADCP, a camera as well as oceanographic equipments such as a CTD and a velocimeter. It will implement new algorithms for survey optimisation and adaptative surveys, allowing to complete a survey without having to go back on the area. The aim of this paper is to present this new vehicle and to give an insight on its future capabilities for REA applications.

Presentation: < [Session1-Meyrat.pdf](#) >

Movie clip: < [m2u00100_mc.avi](#) >

- **AUV *Abyss* – Friedrich Abegg (IFM GEOMAR)**



Presentation: < [Session1-Abegg.pdf](#) >

- **Experiences with different underwater gliders - Thierry Terre (Ifremer)**



Abstract: During the last 4 years, we have been able to use different types of gliders to contribute to various projects and experiments. The talk will describe the different characteristics of 4 on-the-shelf gliders. If they all are driven by the same principle, different technical solutions have been used to develop these new instruments and fulfill all the required functions. We will present the technical solutions to achieve the requirements and we will illustrate the presentation with data acquired during experiments. At sea operations with those instruments will also be exposed.

Presentation: < [Session1-Terre.pdf](#) >

Web pages: < [Flight Across the Atlantic - RU 17.htm](#) >, < [page.do.htm](#) >

Session 2: Manned Submersibles

Moderator: Vincent Rigaud (Ifremer)

- **Multidisciplinary Design Optimization Method Applied to a HOV Design – Weicheng Cui (CSSRC)**



Abstract: In this paper, a Multidisciplinary Design Optimization (MDO) procedure is applied to a HOV design. Multidisciplinary decomposition and analyses have been developed for this complex system that includes hydrodynamics, structure, propulsion, weight & volume. The Multi-Objective Collaborative Optimization (MOCO) method is selected to conduct the preliminary conceptual design of the HOV. This approach was able to identify Pareto front designs. The results also demonstrate that MDO approaches are more suitable for design of the HOV and more flexible and advanced compared with the traditional design approach.

Presentation: < [Session2-Cui.pdf](#) >, **paper:** < [Session2-Paper-Cui.pdf](#) >

- **Introduction to Design and Construction of Deep Manned Submersible “Harmony” – Feng Liu (COMRA)**



Abstract: Deep sea exploration and exploitation are of an increasingly interest to human beings in the 21st century. Manned and unmanned deep submergence vehicles are necessary means for deep sea explorations. In order to fulfill the requirements of deep sea explorations of COMRA (China Ocean Mineral Resources R&D Association), a deep manned submersible is developed in China and it is now named “Harmony”. The purpose of this paper is to briefly introduce the development process, including design, construction and open water tank test.

Presentation: < [Session2-Liu.pdf](#) >, **paper:** < [Session2-Paper-Liu.pdf](#) >

- **Nautilé status and trends – Jean-Pierre Lévêque (Ifremer)**



Presentation: < [Session2-Leveque.pdf](#) >

Session 3: New Vessels

Moderator: André Cattrijsse (VLIZ)



- A new Norwegian Ice Going Research Vessel – Hans Petter Knudsen (Institute of Marine Research)**



Abstract: The Norwegian Government has funded a feasibility study for a new ice going research vessel to replace the only Norwegian ice going research vessel “*Lance*”, owned by the Norwegian Polar institute and the research vessel “*Jan Mayen*” which is owned by a private company and used by the University of Tromsø and the Institute of Marine Research.

The plan is to develop a vessel concept, budget for building and running the vessel, and all necessary support documents for an external audit of the complete feasibility study in the fall of 2008 in order for the Government to make an investment decision late 2008 or early 2009. A contract for the building of the vessel can be in place in mid-2009 at the earliest and the vessel could then be in operation in 2012.

The vessel is so far planned to be a truly multifunctional research vessel. It is specially designed for operations in ice covered waters in both the Arctic and the Antarctic. The preliminary concept is based on a 92 m length and 19 m wide hull with accommodation for 50 persons and 2 small helicopters. The vessel will be host of scientific equipment for oceanographic, geological, metrological and biological observations. Sampling in the air, on the surface, in the water column, on the sea floor and under the sea floor using hydro acoustics, trawl nets, plankton nets, towed bodies, ROV, AUV, seismic, coring equipment, grabs, sledges and much more, is planned.

The vessel will be used by a number of different institutions and will be a truly national asset. Several Norwegian institutions have interests in the utility of the vessel, with Norwegian Polar Institute, Institute of Marine Research, University of Tromsø and University of Bergen as primary users.

This paper gives an overview of the present status of the project with focus on the planned instrumentation and scientific equipment.

Presentation: < [Session3-Knudsen.pdf](#) >

- ***AURORA BOREALIS* - Development of a new European Research Icebreaker and Deep-Sea Drilling Vessel - Lester Lembke-Jene (AWI)**



Abstract: Future breakthroughs in scientific deep-sea drilling critically depend on our ability to perform field expeditions with state-of-the-art technologies and modern infrastructures. This will require major investments, both in terms of generating new, as well as maintaining and renovating existing infrastructure. Diverse models for science operations are presently projected, also within the context of scientific needs after the current phase of the IODP will come to an end. In spite of its critical role in global climate and tectonic evolution, the Arctic Ocean is one of most unexplored ocean basins of the world, its geologic and paleo-

environmental history remaining largely unknown. Restricted by circulating sea ice, scientific drilling has been slow to arrive in the Arctic Ocean. After ODP Leg 151 had drilled the Yermak Plateau, it was not until 2004 that the ACEX expedition retrieved several hundred meters of sediments on top of Lomonosov Ridge, thereby proving that deep-sea drilling in permanently sea ice-covered ocean basin is principally feasible. However, it has mostly not been possible to sufficiently sample and date the sedimentary record preserved in the basin beyond the length of a single core. This dominating lack of data remains and represents one of the largest gaps of information in modern Earth Science.

We here report on the planning of a new European research icebreaker and deep-sea drilling vessel, the *AURORA BOREALIS*, designed with an all-season capability of endurance in permanently ice-covered waters. The ship shall facilitate research in ice and open water conditions in the fields of geology, geophysics, oceanography, biology, glaciology, bathymetry, meteorology, and atmosphere physics.

The icebreaker will be able to carry out deep-sea drilling in ice-covered deep-sea basins during the more favorable summer seasons in order to fulfill the needs of the IODP or its eventual successor as a Mission-Specific Platform. *AURORA BOREALIS* will be the most advanced polar research vessel in the world with a multi-functional role of drilling in deep ocean basins and supporting climate and environmental research and decision support for stakeholder governments within the next 35-40 years. The vessel will be a powerful research icebreaker with more than 50,000 tons displacement and an estimated length of 200 m, with about 55 Megawatt propulsion power. *AURORA BOREALIS* is projected as a major strategic European science infrastructure for the next generations of polar researchers in the upcoming decades. It will feature the highest attainable icebreaker classification, considerably surpassing in performance all currently operating icebreakers. Yet machinery onboard *AURORA BOREALIS* shall be highly energy-efficient, environmentally friendly, fully redundant, and thus allow reliable and safe operations in the most remote and hostile oceanic polar regions.

New technological features to be implemented include a novel hull design and specialized dynamic positioning systems for operations under closed sea-ice cover conditions with up to 2.5 m ice thickness, combined with advanced satellite navigation and ice-forecasting support. The vessel is planned to operate routinely without ice management support by additional icebreakers, thus reducing operational costs for scientific drilling in polar regions considerably. Two moon-pools (7x7 m each) will allow routine deployment of Remotely Operated Vehicles (ROV) and Autonomous Underwater Vehicles (AUV) in ice conditions. A dedicated deep-sea drilling rig with full weather protection will enable sampling of the ocean floor in water depths down to 5000 m with 1000 m penetration under polar conditions.

Following a European-wide public invitation to tender, an internationally operating naval architect and marine engineering company was contracted by the Alfred Wegner Institute for Polar and Marine Research, Bremerhaven with funds from the German Federal Ministry for Education and Research and tasked with the general arrangement planning, preparation of the initial design concept, and provision of a full tender documentation for the vessel. The general contractor's main challenge is to provide a novel, yet technically sound and convincing ship design concept that optimally combines the wide range of tasks that *AURORA BOREALIS* is envisioned for by the international scientific community.

The modular arrangement of science space with hangars, the possibility to flexibly equip the ship with laboratory or supply containers and with helicopters, addresses the needs of diverse disciplines in marine research. This icebreaker will allow to stage long international, interdisciplinary drilling expeditions in the central Arctic. In a long-term perspective, *AURORA BOREALIS* will also be used to address Antarctic research targets, both in its mode as a regular research and a scientific drilling vessel.

Presentation: < [Session3-Lembke-Jene.pdf](#) >

- **R/V *L'Atalante* Modernization - Sébastien Dupont (Ifremer)**



Abstract: R/V *L'Atalante* was built by Ateliers et Chantiers du Havre (ACH) and commissioned in October 1990 as a multi-purpose research vessel. *L'Atalante* is dedicated for research in marine geosciences, physical oceanography and marine biology. The vessel is able to operate a manned submarine system as *Nautile*, towed system as *SAR* or *Rov Victor 6000*, and heavy systems as *Penfeld*.

L'Atalante is 84 meters long, 15 meters wide for a load displacement of 3550 tons.

The vessel is designed to perform oceanographic missions involving deep sea submarine operations as bathymetry up to 12,000m, remote controlled submarine operations, submarine operations, heavy seismic operations, deployment of heavy systems, coring operations up to 20m, sampling operations using hydrology/CTD profiler, dredging and trawling operations. This modernization should not modify the current missions of the vessel, at most, it will adapt them to the new context of the French research fleet.

The main objectives of the modernization are to replace all obsolete scientific equipment by up-to-date scientific equipment, to assure the remedial and curative maintenance at mid-life of the vessel and to provide a reliable and efficient platform appropriate to the coming 15 years of marine science.

New shallow water and deep sea multibeam echo-sounders will be installed. This equipment will be integrated in a gondola instead of present fairings. All scientific spaces as laboratories and scientific centre will be re-accommodated in way to be adapted to the new scientific equipment.

Presentation: < [Session3-Dupont.pdf](#) >

- **New Research Vessel in China - Song Sun (Institute of Oceanology)**



Abstract: Institute of Oceanology, Chinese Academy of Sciences had permission from the National Development and Reform Commission of China to build a new research vessel in Dec 20, 2007, which will be a replacement for *KE XUE YI HAO*, an old research vessel. The new research vessel named *KE XUE* is planned to be delivered on June 2012.

The R/V *KE XUE* will operate worldwide from the tropics to the edge of floating ice, concentrating on multidisciplinary integrated research, and undertake both continental margin and deep ocean projects. It will be able to manage remotely operated vehicle (ROV) on board.

The vessel will be used in marine research from a number of different disciplines including: marine resource research, deep sea research, climate research, sea floor research, marine chemical and physical oceanography research. The ship's design enables it to work in higher sea states. It will be more manoeuvrable, with more scientific berths and advanced technical facilities.

General specifications for the vessel *KE XUE* are:

- Length overall: 108.00m
- Breadth: 16.6/17.2m
- Draft: 5.5-5.8m
- Displacement: ~4600 tonnes
- Cruising speed: 12 knots
- Maximum speed: 17 knots
- Maximum endurance: 60 days
- Range: abt. 1500(12)n, miles

Accommodation:

- Scientific berths: 48
- Crew & technicians: 30

Additionally, the R/V *KE XUE* will be equipped with advanced winch and wire system, Cranes and overside handling device, precision navigation, bottom mapping (e.g. multibeam) and sampling facilities, the remotely operated vehicle (ROV) and its control system, etc. The new research vessel will do boost the marine research particularly in deep ocean in China.

Presentation: < [Session3-Sun.pdf](#) >

- ***Haliotis*: An Easy-to-use Survey Launch for Very Shallow Waters – Hervé Bisquay (Ifremer)**



Abstract: This paper describes the new Ifremer road transportable survey launch: *Haliotis*.

RV Haliotis is a 33 feet long motor boat, which has been specially designed for use in very shallow water (typically 1 to 15 meters) for near-shore habitat mapping and marine geological applications. She is associated with a semi-trailer truck fitted with a foldable crane. The truck is able to transport *Haliotis* anywhere on the coastal areas.

Haliotis is equipped permanently with:

- an interferometric sidescan sonar,
- a sub bottom profiler,
- a single beam echosounder associated with a bottom classification software,
- inertial motion sensor and real time kinematic GPS.

A light underwater video system can be towed.

The crew includes 2 operators (1 helmsman – 1 sonar technician). One or exceptionally 2 scientists can also go on board.

The system (Survey launch + truck and crane) has been tested and accepted during the first six-months 2008.

Haliotis is now integrated into Ifremer fleet and is available for the French scientific community and chartering.

Presentation: < [Session3-Bisquay.pdf](#) >

Session 4: ROV/AUV Deployment and Interoperability



Moderator: Stephen Mc Phail (NOC)

- **ROV *Kiel 6000* on R/V *L'Atalante* : Experiences and Results - Friedrich Abegg (IFM GEOMAR)**



Abstract: Due to technical problems with the German research vessel “*Maria S. Merian*” in late 2007 the German Science Foundation (DFG) and its associates chartered the N.O. “*L'Atalante*” for four legs during the period November 2007 - March 2008. The first two legs saw the first scientific deployments of the new German 6000m ROV “*Kiel6000*” for hydrothermal research. The system is transported in 5 containers, of which at least three (control, winch, workshop/power) needed to be installed on deck. Four days mobilisation in Toulon enabled us to complete this installation and prepare the A-frame to take the Kiel

deployment cradle. The ROV operates in free-flying mode without a tether management system.

Most dives were carried out to around 3000m water depth. During the first leg 8 dives were successfully completed, with deployment being possible even in relatively high sea-state. The combination of the deployment cradle and the *Atalante* vehicle recovery winch was particularly effective - plans are being made to implement a similar system on German research vessel, one of the many positive outcomes of this international cooperation. The ROV was navigated underwater using the Posidonia system installed on “*L'Atalante*” - during Leg 1 this system behaved less than optimally, intensive work by the ship's technicians meant that during leg 2 the system worked perfectly for 10 out of the 11 dives completed.

Scientifically, Leg 1 yielded much information about the Logatchev hydrothermal field located 14°45' N on the Mid-Atlantic Ridge (MAR). The main focusses of the ROV dives were recovering and re-deploying seafloor geophysical stations (tilt-meters, long-term temperature measurement devices) and biological and fluid sampling.

The second leg studied the hydrothermal systems and deeper crustal exposures on the southern MAR at approximately 5° S. In addition to the tools used on Leg 1, the second leg saw the installation of a slurp gun and an isobaric sampler including trigger mechanism. This leg also saw the ROV attain its greatest depth to date: -4890m. Indeed this is a depth record for the ROV manufacturer Schilling and accordingly brought some of the system components into operating conditions which they had not previously experienced, leading to technical insights.

In the talk we will briefly summarise the technical equipment and our experiences with the new ROV Kiel 6000.

Presentation: < [Session4-Abegg-ROV-Kiel.pdf](#) >

Movie clip: < [komplett.mpg](#) >

- **Using *Victor 6000* on board R/V *Sarmiento de Gamboa* - Arturo Castellon (UTM/CSIC)**



Abstract: The R/V *Sarmiento de Gamboa* was designed with the capacity to operate the deep-ocean ROV from Ifremer *Victor 6000*. Design of several devices and gears, together with ship's design requirements, were applied for load and operation of Victor 6000: as maximum deck load of 120 Tons for ROV equipment. Adaptation of the deck for ROV installation and operation, as well as the design of the stern "A" frame, were necessary. Also, specification of power lines and navigation aids (USBL, DP) were done following the recommendations and guidelines of Ifremer. The shipyard (C.N.P. Freire) and other companies participated on these design and development.

The vessel was finished on July 2007. In January 2008, a test cruise was carried on in French waters, close to Toulon Ifremer base at 2000 m depth. Three test dives were done: fixed point survey, line survey and a recovery operation. The cruise was a complete success and today, with the exception of some minor modifications and accessories, R/V *Sarmiento de Gamboa* and its crew is prepared for using this ROV in scientific cruises.

Presentation: < [Session4-Castellon.pdf](#) >

- ***QUEST 5 and 7* LARS system - Friedrich Abegg (IFM GEOMAR) and Volker Ratmeyer (MARUM)**



Presentation: < [Session4-Abegg-QUEST-LARS.pdf](#) >



Presentation: < [Session4-Ratmeyer-Quest.pdf](#) >

Movie clip: < [floats.avi](#) >

Movie clip: < [recovery_nights.avi](#) >

- **Underwater System Deployment from R/V *Pourquoi Pas?* – Olivier Lefort (Ifremer)**



Presentation: < [Session4-Lefort.pdf](#) >

Movie clip: < [deploiement_Pp.avi](#) >

- **MeBo Drill Rig: Mobilization on Celtic Explorer, Status and Lessons Learned - Bill Dwyer (P&O Maritime Services Ireland Ltd) and Volker Ratmeyer (MARUM)**



Presentation: < [Session4-Dwyer.pdf](#) >

Movie clips: < [Chain Capstan.avi](#) > < [LARS1.avi](#) > < [LARS2.avi](#) >
< [In the water.avi](#) > < [Robotic arm.avi](#) > < [Fit tool.avi](#) > < [Drilling.avi](#) >



Presentation: < [Session4-Ratmeyer-MeBo.pdf](#) >

- **CALMARS: a Solution to Facilitate the Interoperability and to Increase the Operational Capacities of Autonomous Unmanned Vehicles - Marc Luccioni (Ifremer)**



Abstract: The paper describes CALMARS concept, its presents applications and prospects offered by this system to optimize the AUVs operations.

i) Problem statement: Ifremer AUVs *Aster^X* and *Idef^X* are tools that can be operated from European research vessels including small opportunity ships. The requirement is to realise a quick and safe launch and recovery at surface level without swimmers, divers or small boats involved; it must be used with no specific support.

ii) *CALMARS concept* : the CALMARS concept optimises the sea deployment with a simple, low cost and easily transportable system. It is an answer for the interoperability problem. This system is very flexible. It can be used with any of the sea equipment lifts: A frame, classical LARS, crane and gantry equipped or not with docking system. It can be used whatever the height between the main deck and the sea level.

iii) *Applications*: based on the CALMARS concept, we developed the CALISTE project. The CALISTE cage is designed as an autonomous floating “swinglebar” to protect AUV by separating it from the ship’s heaving during the AUV capture or launch. In the first phase of recovery, we use an active or passive system to catch a tow line integrated in the nose of the AUV at a secure distance from the ship. Then, we use a capture mechanism floating as the vehicle and decoupled from the vessel movements. A light integrated winch pulls the AUV towards the cage and a funnel-shaped device leads the AUV and lines it up with the cage. Then, the AUV is docked and locked into the cage. After this operation, the CALISTE cage and the AUV are lifted on board. The links with the platform are very simple, only ropes. The capture mechanism is a high-reliability system no longer than AUV. This system does not use complicated device on the AUV. The technology is installed on the cage CALISTE for the benefit of the AUV payload. This device is patented. It benefits for civil and military operations using AUV with torpedo architecture, equipped or not with external appendices as fins or mast. The system can be used from small ship as RV EUROPE or like the RV POURQUOI PAS? A prototype was built at the end of 2007 and tested successfully with an AUV like *Aster^X*. Today, this tool is employed for launching and recovery operations but also to realize the maintenance on the deck.

iv) *Development and potentialities*: the achievements issues of the CALMARS concept and the device CALISTE are able to be used to ample applications. Originally developed for L&R operations, we propose to use this development to design rallying points for unmanned autonomous vehicles, on the sea surface or on the bottom of the ocean. These bases could make a submarine network. They will be used to recharge accumulators and for data transmission and how, extend the operational capabilities of AUVs in particular for very large inspection fields.

Presentation: < [Session4-Luccioni.pdf](#) >

Session 5: Instrumentation and Methods



Moderator: Mark Smit (NIOZ)

• Hydrostatic Pressure Actuated Cable Cutter - Christopher Griner (WHOI)



Abstract: Fouling or an emergency situation during haul back of mooring or instrument recoveries may require the cable to be cut for safety reasons. The device to achieve this should be safe to handle on deck, simple to rig for deployment, and minimize the amount of cable lost. By researching previous designs, researching components and doing fairly extensive tests on shear pins, this implementation was reached. Using the hydrostatic pressure of water to activate the wire cutter and utilize a single size of shear pin, with a variable cross sectional area, it is possible to cut a wire below the water surface. By using a wire cutter as

close to the fouling as possible, wire loss is brought to a minimum and a significant cost is saved.

Presentation: < [Session5-Griner.pdf](#) >

Animation: < [Cutter-video-2.avi](#) >

• SUGAR – Submarine Gas Hydrate Deposits as Sites for CO₂ Sequestration: Prospection, Exploitation and Transport - Joerg Bialas (IFM GEOMAR)



Abstract: In the current discussion about climate change it has become obvious that it is insufficient to neutralise the anthropogenic effect by reduction of CO₂ emissions only. Efforts to collect existing gases and store them elsewhere are necessary to decrease the input of CO₂ into the atmosphere. Land deposits for CO₂ are, on first sight, easy to find and offer easiest access for storing CO₂. However storage safety, influence of other pore fluids and in particular possible interaction of economic activity within the storage area may not be easily assessed. Hazards for the population and groundwater reservoirs are not given in the marine

environment. Since the disposal of CO₂ in large water depths further enhances ocean acidification and therefore is prohibited by international laws (London Dumping Convention, OSPAR treaty), within the proposed project SUGAR we are focussing on the deposition of CO₂ in deep sub-marine sediments.

A sequestration in former or still active oil fields bears a high risk of CO₂ escape due to shallow water depths, possible leakages through fracture zones or insufficiently sealed inactive boreholes. For an effective climate protection a diffusion of CO₂ from the sequestration site of 0.01 % and less must be guaranteed. Therefore the entire SUGAR project has committed itself to the sequestration of CO₂ in connection with hydrate deposits to avoid

possible environmental hazards and associated liabilities due unforeseen leakages when using former oil- and gas reservoirs. Here CO₂ will not be stored as mobile gas or supercritical fluid, but as solid substance due to the transformation of methane hydrate. Liquid CO₂ will be injected into methane hydrate deposits where it decomposes the methane hydrates and where it will form CO₂ hydrates in the pore space. Due to higher temperature stability of CO₂ hydrates, diffusion of CO₂ by leakage and/or dissolution may be prevented. Through the release of methane in the associated process, this kind of sequestration can be combined with methane exploitation, which improves the economic balance of the procedure.

The network project develops, in an integrated approach, new technologies for the entire potential hydrate exploitation chain extending from the exploration of new CO₂ deposits to the CO₂ and methane transport in suitable ships. This allows to establish a close collaboration between participating research institutes and industry. The network project is divided into two topical themes: *A – Exploration of submarine gas hydrate deposits* and *B – Exploitation of submarine gas hydrate deposits and transport of natural gas*. Based on the excellent knowledge of each institute and the comprehensive technical know-how of the industry companies, new technologies will be developed in this project covering the entire chain of economic value. This includes prospecting of hydrate resources, determining the spatial distribution of hydrate layers within the deposit, quantification of hydrate amount, development of new and CO₂-neutral exploitation as well as new transport strategies of the gas from the deposit to the customer.

SUGAR has been launched as a “lighthouse project” that covers all relevant aspects with respect to CO₂ sequestration and methane hydrate exploitation through grants of the German BMBF and BMWi.

Presentation: < [Session5-Bialas.pdf](#) >

- **The TVHD on *Victor 6000* - Pierre Léon (Ifremer)**



Abstract: This paper introduces the 6000 m underwater TVHD camera developed by Ifremer for being installed on *Victor 6000* (6000m Depth Class ROV). The presentation includes the technical improvements and developments induced, the effective use for the operator and some pictures taken during sea trials.

Presentation: < [Session5-Leon.pdf](#) >

Session 6: Acoustic and Seismic Tools**Moderator: Joerg Bialas (IFM GEOMAR)****• Ultra Deep Low Frequency Sub-Bottom Profiler for AUV and ROV - Yves Le Gall (Ifremer)**

Abstract: Acoustical techniques for ultra-deep sub-bottom exploration are still little investigated. IXSEA and Ifremer have launched in 2006 the development of a new deep-sea low-frequency sub-bottom profiler, working up to 6000 meters depth. Based on the Janus-Helmholtz broadband technology, two acoustic sources have been modelled, built and characterized in-tank and at-sea : a single transducer working in the [1.8, 6.2 kHz] frequency band, and a three-transducer array operating in the [2, 8 kHz] frequency band. In both cases, vertical resolution is better than 20 cm. Comparison between finite element modelling and in-tank

measurements is presented, together with the specific constraints linked to very-deep water and AUV mounting. Power electronics and impedance matching unit have been specifically optimised to deliver a sound level of 190 dB (ref. 1 μ Pa @ 1 m), with 48 VDC supply voltage and 250 W available electric power, compatible with a 50 m penetration. The receiving part is made up of a three-hydrophone array with a loss of sensitivity lower than 1 dB between 0 and 600 bar. Due to the vicinity of several low-frequency noise sources (motor, fins), a careful analysis of radiated noises has been conducted. This ultra-deep light system has been mounted on an Ifremer's AUV and the first results at sea are presented and discussed.

Presentation: < [Session6-LeGall.pdf](#) >

Animations: < [anim1.avi](#) > < [anim2.avi](#) >

• SYSIF: A New Tool for Near-Bottom Very High-Resolution Profiling in Deep Water - Pierre Léon (Ifremer)

Abstract: Detailed sea-bed geology of deep waters areas is nowadays explored, both for scientific purposes such as a better insight into marine sedimentary processes and tectonics and for the offshore industry developments. Ifremer has developed a new tool for the near-bottom profiling in deep water, down to 6000m, called SYSIF (bottom seismic system). The system is based on a towed tray, supporting at the same time a High resolution seismic source and the deep towed streamer. This paper describes this original system, its main characteristics and performances and first results.

Presentation: < [Session6-Leon.pdf](#) >

Session 7: Buoys-Moorings-Observatories Installation



Moderator: Colin Day (NOC)

- GITEWS Deep Mooring Deployment In Med Sea - Swen Roemer (GeoForschungsZentrum Potsdam)



Presentation: < [Session7-Roemer.pdf](#) >

- ANTARES Installation - Marine Means and Methods - Jean Roux, Vincent Bertin, Stephan Beurthey (CNRS/CPPM)



Presentation: < [Session7-Roux.pdf](#) >

Movie clip : < [deployment.wmv](#) >



Presentation: < [Session7-Bertin.pdf](#) >



Presentation: < [Session7-Beurthey.pdf](#) >

Session 8: Data treatment, Network and Communication



Moderator: Colin Day (NOC)

• HiSeasNet in 2008 - Steven Foley (SCRIPPS)



Abstract: HiSeasNet is a satellite communications network providing continuous Internet connectivity for oceanographic research ships and platforms throughout the Pacific, Atlantic, and sometimes Indian oceans. With the addition of new vessels and satellites in the network, HiSeasNet now uses four satellite beams to extend campus networks out to 15 ships in the US research fleet as well as a seismic observatory on South Georgia Island in the Southern Ocean. Last year (2007), HiSeasNet also supported ship operations in the Indian Ocean using a commercial ground station in Germany. Employing a variety of networking technologies,

HiSeasNet has allowed scientists to conduct videoconference outreach programs, maintain limited long-term real-time data collection, connect campus phones to shipboard phones through the ship's PBX using Voice over IP (VoIP) protocols, and direct multi-ship research from shore and other ships. Standard Internet protocols available include FTP, HTTPS, and SSH. With still more bandwidth available for data, this system can provide new opportunities for enhancing ship-based ocean exploration as well as supporting the long-term data collection projects such as those proposed in the NSF's Ocean Observatories Initiative program.

As much of the UNOLS fleet has been equipped with HiSeasNet capabilities, efforts in 2008 focus on operations and maintenance. A successful 4-day training class was offered at WHOI this year to support additional on-ship maintenance and operations capabilities. Operations information continues to be added to www.hiseasnet.net and the HiSeasNet Wiki, and shipboard systems are being gradually upgraded to provide better tracking, reliability, and performance. HiSeasNet is operated by Scripps Institution of Oceanography and funded by the National Science Foundation.

Presentation: < [Session8-Foley.pdf](#) >

• Facilitating the Access to Marine Research Infrastructures in Europe through Dedicated Information e-Tools - Laurent d'Ozouville (EurOcean)



Abstract: The European Centre for Information on Marine Science and Technology – EurOcean- manages an Internet portal working as an electronic platform of information and communication for all actors with interest in marine science and technology in Europe. It gathers information, which is scattered, fragmented and uneasy to access, in a single Portal, maximising and enhancing Europe's marine and maritime

dedicated efforts in research and technology development.

Three info-bases developed by EurOcean are related to marine research infrastructures in Europe. Each info-base has been developed in cooperation with the interested end users adopting the specific descriptors employed by the users in their daily work, and applying those to the development of user-friendly search tools.

EurOcean_RV info-base gathers information for 264 research vessels: operating (231), planned and/or under construction (5) and out of service RV's (28). 87 descriptors have been developed concerning available onboard equipment, vessel technical specifications and contact details. Several search criteria are available such as RV's operating areas, main activity and vessel category. The update is done in cooperation with the operators of the research vessels at least twice a year.

EurOcean_UV, is an *on line* info-base on the underwater vehicles (UV) used in Europe for scientific research. The EurOcean_UV provides access to technical information on four categories of UVs as following: Remotely Operated Vehicles (ROV); Autonomous Underwater Vehicles (AUVs); Manned Submersibles; and others. Presently, EurOcean_UV has listed 67 UVs. A friendly-user interface allows the end-user to select the UVs according to: the name of vehicle, the country, the type of vehicle and the depth range. Fifteen descriptors have been associated to each underwater vehicle and this information is collected and put *on line* by the EurOcean Office after validation by the vehicle's operators, at least, twice a year.

Recently, and in close cooperation with the Institute of Marine Research (IMR) of Norway, a EurOcean Member, the Centre has developed the Large Exchangeable Instruments Info-base, **EurOcean_LExI**. This info-base assembles information on 24 categories of marine research instruments. EurOcean_LExI has a different updating scheme than the previous ones. The upload and update of the Instruments on the info-base is of the responsibility of the operators, via authorization provided by the info-base administrators, to the info-base administration pages. So far, 74 instruments have been uploaded.

EurOcean has recently moved a step forward in the management of the information collected. Added value is given to information on the research vessels by the production and dissemination of statistical analysis of the contents of the info-base EurOcean_RV, providing *on line* and real time indicators, and preparing reports, available *on line* and in printable formats.

The easy and friendly tools to access information, the well-thought architecture design and functionalities of these info-bases lead to the recognition of the EurOcean info-bases as standards and models being used by other groups of interest. For instance, the international Ocean Going Research Vessels Database of POGO was built using as template the EurOcean_RV.

Presentation: < [Session8-DOzouville.pdf](#) >

Session 9: Lessons learned

Moderator: Thierry Terre (Ifremer)

- A Revised Rosette and CTD System Built around a SBE 9Plus Underwater Unit - Michel Hamon (Ifremer)**



Abstract: Used during many years, the old CTD system based on a Neil Brown probe has been replaced by a more recent instrument, a SBE 9Plus probe. But the carousel water sampler designed by LPO was still required as it deserves perfectly the needs and requirements of the laboratory hydrographic cruises. Based on 28 bottles of 8 liters each, it allows to trap a large number of water samples with a volume enough for chemical analysis compatible with needs of physical oceanographers. A new electronic design was required to interface the rosette to the SBE system. The presentation will give a description of the overall system.

Presentation: < [Session9-Hamon.pdf](#) >

- A Dropping Box for ARGO Profiler Launches - Stéphane Leizour (Ifremer)**



Abstract: A dropping box for ARGO profiler launches has been designed at LPO. Made of paperboard easily dissolved in water, the packing box is strong enough to protect the float or profiler when entering into water while dropped from high and speedy vessels. Once into water a fast soluble releaser insures that the profiler can freely float, dive and climb in respect to the programmed mission. A video from trials made from a ferry between Brittany and England will illustrate the presentation.

Presentation: < [Session9-Leizour.pdf](#) >

Movie clips: < [essai bassin.wmv](#) > < [essai roscoff.wmv](#) >

- **Water and Bottom Sampling Combined in One Cast - Jack Schilling (NIOZ)**



Abstract: During a North Atlantic LOCO cruise a vast track of water column measurements was planned. Lowering a rosette water sampler to 5.000 m and bringing it back takes quite some time: approximately four hours. When a bottom sample is needed afterwards the same time span is required again. In close cooperation with the scientist a system was developed to combine the CTD water sampling with a small bottom sampler, in a way that both could be used within the same cast. The new “mono-corer” that was developed experienced a successful maiden trip.

Presentation: < [Session9-Schilling.pdf](#) >

Animation: < [Test Monster 2.avi](#) >

- **ISIS Deployment - TMS and “live boating” - Dave Turner (NOC)**



Presentation: < [Session9-Turner.pdf](#) >

- **Air Bubbles and Hydroacoustic Equipment - Olivier Lefort (Ifremer)**



Presentation: < [Session9-Lefort.pdf](#) >

Poster session

• **Glider Operation : A Technical Facility - Laurent Beguery (DT INSU)**

Abstract: Gliders will be more and more used by scientists to collect data. In between “propellered AUVs” and profiler floats, they allow collection of data during 6 months with a good manoeuvrability.

As part of CETSM (European Center for underwater technologies), in collaboration with Ifremer and IRD, INSU (Technical Division) created at La Seyne-sur-Mer a Technical Glider facility for French scientific teams.

This team has in charge:

1. Preparation of gliders (batteries, calibration, weight...)
2. Support for deployments and recovery
3. Communication infrastructure and piloting
4. Research, development, and integration of new vectors and sensors
5. Maintenance

This facility will help the French scientific community to operate Gliders.

Poster: < [Poster-Glider operation center.pdf](#) >

• **Discovery Replacement Project - Edward Cooper (NOC)**

Abstract: The RRS *Discovery* built in 1962 is approaching the end of her useful scientific life with operational issues starting to affect the reliability of the vessel. For this reason to ensure that the UK maintains its strong international leadership and production of high quality sea-going science, a NERC project to replace her has been active since June 2007. During the elapsed year the following key tasks have been completed:

The Science and Business Cases for the *Discovery* Replacement have been developed and accepted by Research Council UK.

Science Users and Operators (NMF-Sea Systems) have been consulted on the detailed requirements within the description initially set by NERC Council in September 2005.

The consultation process has concluded in a Concept General Arrangement, and a Statement of Requirements. These documents, combined with “Management & Commercial” documentation, have been issued as an Invitation to Tender for a design and build package to a number of potential shipbuilders.

The project target for delivery of the vessel to NERC is the end of 2011.

Further information

http://www.noc.soton.ac.uk/nmf/discovery_replacement_project/d4rpintrroduction.html

Poster: < [Poster-RRS Discovery Replacement Project.pdf](#) >

Closing remarks

Olivier Lefort (Ifremer) thanked the Inmartech 2008 presenters for their contributions, as well as the attendees for their participation. The next Inmartech symposium in 2010 will possibly be held in China.



Appendices

Click on links below to view Appendix:

- A: [Inmartech 2008 Programme](#)
- B: [Symposium participants list](#)
- C: [Results of satisfaction survey](#)