

5TH INTERNATIONAL WORKSHOP ON MARINE TECHNOLOGY

GIRONA
9-11th
october
2013

MARTECH

www.martech-workshop.org

CONFERENCE INFORMATION

Hosted by:



In collaboration with:



With the support of:



WELCOME

Welcome to the 5th International Workshop on Marine Technology – Martech Workshop 2013.

The main goal of the workshop is to show the latest investigations and exchange of information and points of view on current research in MARine TECHNOlogy. Martech Workshop brings together a diverse set of researchers who are jointly committed to developing technology, not just for its own sake, but to generate innovation in the field of maritime technologies. The conference series was initiated in 2005 and has taken place, until the moment, in Vilanova i la Geltrú, Cadiz and now in Girona. The present edition is co-organized by the Universitat de Girona and the Universitat Politècnica de Catalunya, and is taking place on October 9th-11th 2013. Girona offers a great combination of cultural, gastronomical and landscape attractions that make it one of the most visited regions in Spain.

Martech Workshop 2013 will bring together 55 contributions, which will be presented orally in two parallel sessions, and can be categorized in 10 different topics: Operational Oceanography; Instrumentation, Metrology, Signal processing; Marine sensors, sensor networks; Observatories, remote sensing; Marine Robotics: ROVs, AUVs, ASVs, Gliders; Underwater imaging and communication; Sea floor characterization; Structures and materials; Marine Biology and Aquaculture; and Renewable energies. It will also have an invited tutorial session given by Christian Ferreira (Marum, Germany) entitled “Mapping the Seafloor with MB-System, overview and practice”. And, finally, two invited plenary sessions will be given by: 1) Steve McPhail (National Oceanography Centre, U.K.) entitled “The Autosub AUVs - Multisensory, Multi-scale mapping from the Polar Seas to the Tropics”; and 2) Tim Owen (Carrack Measurement Technology, U.K.) entitled “Marine Seismics at Sea, Past and Present”.

Besides the technical sessions, there will be an exhibitor area where 11 companies and institutions will show their products, services and projects to the assistants during break times.

The technical program is completed with 2 visits to the Underwater Robotics Research Centre of the Universitat de Girona (CIRS) and the meeting of the GITECMAR group.

I would like to thank all authors and people attending at Martech Workshop 2013 for their interest and collaboration. I hope you enjoy and find fruitful the meeting and you have a pleasant time in Girona. I would like also to thank the organizing committee from VICOROB group (Universitat de Girona) and SARTI group (Universitat Politècnica de Catalunya) for their support and effort in the organization of this successful event.

Yours sincerely

Marc Carreras

Martech Workshop 2013 Chair

TECHNICAL PROGRAM

GENERAL PROGRAM

| Wednesday 09/10/2013 | Thursday 10/10/2013 | | Friday 11/10/2013 | |
|---|--|--|---|-------------------------------------|
| | Registration opens at 8:00 | | Registration opens at 9:00 | |
| | 9:00-9:15, Welcome (room A) | | 9:15-10:15 S5A: Observatories | |
| | 9:15-10:15 Plenary 1: Stephen D. McPhail (room A) | | 9:15-10:15 S5B: Renewable energies and materials | |
| Registration opens at 10:00 | 10:15-11:15 S1A: Marine Robotics | 10:15-11:15 S1B: Instrumentation, signal processing and sensors | 10:15-11:15 Plenary 2: Tim Owen (room A) | |
| 11:00-14:00 Tutorial: Mapping the Seafloor with MB-System, overview and practice Christian Ferreira (room B) | 11:15-12:00 Coffee Break at exhibitor area | | 11:15-12:00 Coffee Break at exhibitor area | |
| | 12:00-13:30 S2A: Marine Robotics | 12:00-13:30 S2B: Instrumentation, signal processing and sensors | 12:00-13:30 S6A: Instrumentation, signal processing and sensors | 12:00-13:30 S6B: Marine Robotics |
| 14:00-15:00 Lunch at tutorial room | 13:30-15:00 Lunch at exhibitor area | | 13:30-15:00 Lunch at exhibitor area + GITECMAR Meeting in Meeting Room B | |
| 15:00-18:00 Tutorial: Mapping the Seafloor with MB-System, overview and practice Christian Ferreira (room B) | 15:00-16:00 S3A: Operational oceanography and submersibles | 15:00-16:00 S3B: Underwater imaging | | |
| | 16:00-16:30 Coffee Break at exhibitor area | | | |
| | 16:30-17:30 S4A: Sea floor and surface characterization / Biology | 16:30-17:30 S4B: Underwater imaging | | |
| | 17:30-18:30 CIRS guided tour - demos | | | |
| | 18:30-20:30 Girona guided tour | | | |
| | 20:30h Conference Dinner | | | |

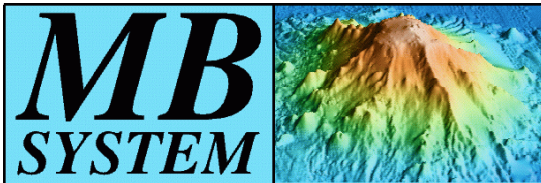
TUTORIAL

WEDNESDAY, 11:00-14:00 AND 15:00-18:00, ROOM 8

Tutorial title: Mapping the Seafloor with MB-System, overview and practice.

Speaker: Christian Ferreira

Institution: Marum, Germany



Abstract: MB-System (<http://www.mbari.org/data/mbsystem/>) is an open source software package consisting of programs which manipulate, process, list, or display swath sonar bathymetry, amplitude, and sidescan data. The swath mapping sonar data may derive from multibeam sonars, interferometry sonars, or sidescan sonars. This software is distributed freely (and for free) in the form of source code for Unix-based platforms using the GNU Public License (GPL) version 3. To give an overview about it, during the next 6 hours we'll explore the tools build-in MB-System and their capabilities for: data querying, 2D and 3D data editing, survey planing, grid ding, map making, calibration. These topics will be seen inside already existing workflows used by MBARI (US) and MARUM (Germany) for processing multibeam data (bathymetry and sidescan) from ship-mounted and AUV-mounted echosounders mainly from Kongsberg and Reson. And we'll finish talking about the on-going and future projects for MB-System's development. The tutorial will start with a short theoretical session and the rest will be practice. All the activities will be done in a room with computers for the participants. Participants following the practical exercises should have some knowledge about Linux/Mac terminal or GMT. Participants without this knowledge can participate also working in groups.

CV: Christian dos Santos Ferreira is an acoustic specialist working with echosounders and bathymetric mapping since 2001 and with AUV mapping since 2009. He has participated in over nearly 20 expeditions logging almost two full years at Sea. His maps have been published in various scientific journals and popular publications such as National Geographic Atlas. In 2004, he developed a Linux distribution called Poseidon Linux (derived from Debian/Ubuntu) aiming to help other specialists on the topic of mapping/bathymetry, and other applications. Christian currently also serves as the main scientific inspector for the governmental agency called "Leitstelle Deutsche Forschungsschiffe" that oversees the German research fleet (R/V Meteor, R/V Merian and R/V Sonne) in controlling the data quality of the installed multibeam systems in addition to providing recommendations and suggestions for system upgrades. Christian is also one of the maintainers of the open source software package MB-System used by scientist and companies around the world for multibeam data processing. This latest effort earned him an invitation to join one of the IHO/GEBCO committees for the publication called "IHO-IOC GEBCO Cook Book" (referenced as: IHO Publication B-11). He is currently co-authoring a chapter for the Cookbook with Dave Caress of MBARI on the processing of multibeam data using the MB-System.

Contents:

- 1) Intro about what is MB-System
- 2) MB-System structure and auxiliary files
- 3) Basic plots
- 4) Extracting information and metadata
- 5) Corrections (backscatter, sound velocity, tide and lever arms)
- 6) Cleaning multibeam data (automatic and manual)
- 7) Cleaning navigation (manual)
- 8) Creating processed files
- 9) Gridding and producing final maps

Extras:

- a) Survey planning (ship and AUV)
- b) Navigation adjustment/correction for AUVs

PARALLEL SESSIONS

SESSION 1 - THURSDAY, 10:15-11:15

S1A: Marine Robotics (**ROOM A**)

Chair: Pere Ridao

- **AUV Risk Management in Coastal Water surveys**
Pablo Rodriguez Fornes, Nuria Pujol Vilanova and David Roque Atienza
- **On the setup of an operational autonomous underwater glider facility**
Simó Cusí, Marc Torner, Miguel Martínez-Ledesma, David Roque, Joan Pau Beltran, Simón Ruiz, Benjamín Casas, Carlos Castilla, Irene Lizarán, Sebastián Lora, Emma Heslop and Joaquín Tintoré
- **Operational Validation of GIRONA500 AUV**
Pere Ridao, David Ribas, Narcís Palomeras, Marc Carreras, Angelos Mallios, Natàlia Hurtós, Nuno Gracias, Lluís Magí, Rafael Garcia, Ricard Campos, Ricard Prados and Javier Escartin

S1B: Instrumentation, signal processing and sensors (**ROOM B**)

Chair: Anders Tengberg

- **Challenges and opportunities associated with monitoring marine anoxic zones with autonomous sensors – an Irish perspective**
Timothy Sullivan and Fiona Regan
- **Multi-parameter observations from coastal waters to the deep sea: focus on quality control and sensor stability**
Anders Tengberg, Mikhail Kononets, Daria Atamanchuk, Per Hall and Christoph Waldmann
- **Interoperability developments for next generation multifunctional ocean sensor systems in NeXOS**
Daniel Mihai Toma, Joaquin del Rio, Antoni Manuel, Manel Moreno, Arne Bröring, Jay Pearlman and Eric Delory
- **Representing SensorML and O&M files in Android clients**
Joan Olivé, Jaume Piera, Jordi Sorribas and Raul Bardají

SESSION 2 - THURSDAY, 12:00-13:30

S2A: Marine Robotics (**ROOM A**)

Chair: David Ribas

- **euRathlon - European Robo-Athlon Competition: Marine Robotics approach**
Dario Sosa-Cabrera, Vladimir Djapic and Alan Winfield
- **Latest contributions to Guanay II**
Ivan Masmitjà Rusinyol, Julián Gonzalez Agudelo and Spartacus Gomáriz Castro
- **An Approach to Multiple Cooperative AUV-ASV in Twinned Guided Schema for Coordinated Navigation**
Javier Busquets, Jose-Vicente Busquets, Federico Zilic, Francisco-Javier Martin, Javier Gilabert and Gonzalo Tampier
- **AUV Underwater Robotics Experiment in The Mar Menor Coastal Lagoon and beyond. The Submarine Vehicles Lab – UPCT**
Javier Gilabert, Francisco López-Castejón and Antonio Guerrero
- **SPARUS II, design of a lightweight hovering AUV**
Marc Carreras, Carles Candela, David Ribas, Angelos Mallios, Lluís Magí, Eduard Vidal, Narcís Palomeras and Pere Ridao
- **MANATI. Modular underwater vehicle for continuous operation**
Ignacio Gonzalez Liaño, Pablo Alvarez Chaver and Silvia Torres Lopez

S2B: Instrumentation, signal processing and sensors (**ROOM B**)

Chair: Daniel Roig

- **Ponyo. Cost-effective wave sensor**
Nicolas Romero Gonzalez, Ignacio Gonzalez Liaño and Silvia Torres Lopez
- **Advances in instrumented Lagrangian Buoys**
Pedro Fernández Gallego, Joaquin Salvador Castiella, Jordi Font Ferré, Josep Lluís Pelegrí Llopart and Emili García-Ladona
- **Coastal lagrangian drifter: cost effective, robust, precise and user friendly**
Gabriel Navarro, Raúl García, Dana DeShetler, Jose Alberto Ortega and Javier Ruiz
- **New designs of sea current tracking buoys**
Daniel Roig and Gabriel Donaire
- **HidroboyaTM: Capabilities and Limitations**
Xulio Fernández Hermida, Carlos Durán Neira, Manuel Domingo Lago Reguera, Iago Posse García and Fernando Martín Rodríguez
- **HidroboyaTM Sampling Platform: Development of a Physical and Operational Capabilities Simulator**
Xulio Fernández Hermida, Manuel Vazquez Enriquez and Fernando Martín Rodríguez

SESSION 3 - THURSDAY, 15:00-16:00

S3A: Operational oceanography and submersibles (ROOM A)

Chair: Xulio Fernández Hermida

- **MAR2: “Crisis Management System for Marine Pollution caused by Oil Spills”**
Carlos de la Cuesta de Bedoya, Irene Carlos Lorenzo, Jaime López Marco, Manuel Espino Fernández, David Cobo, Blas Galván González, Raquel Díez Arenas and Samuel Otero Paz
- **Ocean Data Management: High Performance Data Management System with Flexible Structure to Support International Standards on Quality Assurance**
Xulio Fernández Hermida, Sonia Lamas Pose, Manuel Domingo Lago Reguera and Darío Lodeiros Vázquez
- **Breeze influence on waves and vertical current profile in the coastal area based on EOF analysis (Vilanova i la Geltrú, Barcelona)**
Josefina Antonijuan, Gonzalo Simarro and Jorge Guillén
- **Development of Research Submersible ICTINEU 3**
Carne Parareda and Pere Forès

S3B: Underwater imaging (ROOM B)

Chair: Rafael Garcia

- **Optimal pattern design for automatic estimation of water transparency through photograph using crowdsourcing data**
Carine Simon and Jaume Piera
- **Merging bathymetric and optical cues for in-detail inspection of an underwater shipwreck**
Ricard Campos, Nuno Gracias, Ricard Prados and Rafael Garcia
- **Incremental underwater mapping in 6DOF with stereo tracking**
Francesco De Filippo, Nuno Gracias, Rafael Garcia, Jordi Ferrer and Fabio Bruno
- **Evaluation of a Laser Based Structured Light System for 3D Reconstruction of Underwater Environments**
Miquel Massot-Campos and Gabriel Oliver-Codina

SESSION 4 - THURSDAY, 16:30-17:30

S4A: Sea floor and surface characterization / Biology (ROOM A)

Chair: Francisco Sánchez

- **Politolana, a new low cost towed vehicle designed for the characterization of the deep-sea floor**
Francisco Sánchez and Juan Manuel Rodríguez
- **Near surface oceanographic measurements using the SailBuoy**
Ilker Fer and David Peddie
- **New SNP markers in European anchovy and albacore: useful genetic tools for stock delimitation**
Urtzi Laconcha, Iratxe Montes, Haritz Arrizabalaga and Andone Estomba
- **Molecular stratigraphic analysis with Raman spectroscopy of the shell of a mussel**
Perla Ferrer, Sergio Ruiz-Moreno, Antonio Ramos de Torres and Alejandro López-Gil

S4B: Underwater imaging (ROOM B)

Chair: Gabriel Oliver

- **Visual Odometry Parameters Optimization for Autonomous Underwater Vehicles**
Pep Lluís Negre and Gabriel Oliver-Codina
- **XeoTV: 1080p Underwater Geotagged Video with Deferred Filtering**
Manuel Domingo Lago Reguera, Manuel Martínez Torres and Xulio Fernández Hermida
- **Preliminary results of the obsea citizen science project**
Ikram Bghiel, Joaquin del Rio, Alberto Hidalgo, Daniel Toma and Antoni Manuel

SESSION 5 - FRIDAY, 9:15-10:15

S5A: Observatories (**ROOM A**)

Chair: Joaquin del Rio

- **OBSEA's seismic station joins the IGC network**
Joaquin del Rio, Daniel Mihai Toma, Javier Cadena, Jordi Segalas, Joana d'Arc Prat, Jose Antonio Jara, Tànit Frontera, Carme Olivera and Xavier Goula
- **Long term monitoring of day-night fish assemblage at OBSEA**
Guillem Santamaria, Jacopo Aguzzi, Valerio Sbragaglia, Joaquin del Río del Río, Marc Nogueras, Antoni Mànuel and Francesc Sardà
- **OBS application inALERTES project**
Antonio Pazos García, Jose Martín Davila and Elisa Bufon Peiro

S5B: Renewable energies and materials (**ROOM 8**)

Chair: Amable López

- **A synergetic combination of measurements and models to assess renewable wind energy in semi enclosed domains**
Agustin Sanchez-Arcilla, Daniel Gonzalez Marco, Joaquin Sospedra, Joan Pau Sierra, Manuel Espino, Manel Grifoll and Elena Pallares
- **An impacting energy harvester through piezoelectric device for velocity water flow**
Daniel Toma, Montserrat Carbonell-Ventura, David Pujol-Bresco, Antoni Manuel Lazaro and Jaume Miquel
- **Inertial behavior of offshore devices**
Amable López, José Andrés Somolinos, Luis Ramón Núñez, Fernando Robledo and M^a Ángeles Muñoz
- **Does modification of surface topography represent a viable method of biofouling control in marine environments?**
Timothy Sullivan and Fiona Regan

SESSION 6 - FRIDAY, 12:00-13:30

S6A: Instrumentation, signal processing and sensors (**ROOM A**)

Chair: Jaume Piera

- **ANERIS: Development of an oceanographic vertical profiler with high resolution autonomous sampling capabilities**
Núria Pujol and Jaume Piera
- **Design and development of a cost-effective geo-camera**
Pablo Alvarez, Ignacio Gonzalez, Pedro Montero and Silvia Torres
- **Estimating underwater light diffuse attenuation with low-cost devices: Optimal sensor configuration analysis using radiative transfer models**
Raul Bardají, Eloy Zafra and Jaume Piera
- **Good practice guide for C calculation**
Albert Garcia Benadí, Javier Cadena Muñoz, David Sarrià gandul and Joaquin del Rio Fernandez
- **Size discrimination of inorganic suspended particles based on the analysis of hyperspectral attenuation measurements**
Marta Ramírez Pérez, Elena Torrecilla Ribalta and Jaime Piera Fernández
- **On the Optimization of State Observers for Application in Navigation of Low Cost Autonomous Vehicles**
Javier Busquets, Jose Vicente Busquets, Francisco Perez, Gonzalo Tampier, Christian Lazo, Jesus Busquets-Carbonell, Federico Zilic, Dionisio Tudela and Javier Gilabert

S6B: Marine Robotics (**ROOM 8**)

Chair: Javier Gilabert

- **Linear control of the yaw and rudder limitations for Cormoran AUV**
Julián González, Ivan Masmitjà and Spartacus Gomariz
- **Primitive shape fitting in point clouds for enabling autonomous underwater grasping**
David Fornas, Antonio Peñalver, Mario Prats, J. Javier Fernández and Jorge Sales
- **Semi-autonomous grasping approach of unknown objects in underwater environments combining structured light and a virtual simulation environment**
Antonio Peñalver, Mario Prats, J. Javier Fernández and Jorge Sales
- **Automating Seafloor Inspection Using Autonomous Underwater Vehicles**
Enric Galceran and Marc Carreras
- **Towards Realtime AUV SLAM with Occupancy Grids**
Guillem Vallicrosa, Albert Palomer, David Ribas and Pere Ridao
- **SIRENA: Autonomous Integrated System for Naval Recognition and Exploration**
Juan Herrero, Francisco José Pérez, Francisco Miguel Moreno, José Manuel Pastor, Alberto Bonillo, Joaquín Macanás and José Miguel Liarte

CIRS GUIDED TOUR

THURSDAY, 17:30-18:30

Visit to the Underwater Robotics Research Centre (CIRS) located next to the conference venue. 1 visit has been organized, on Thursday afternoon. The AUVs of the laboratory will be shown moving in the water tank of the lab. <http://cirs.udg.edu>



GITECMAR MEETING

FRIDAY, LUNCH TIME AT MEETING ROOM 8

Meeting of the Spanish Marine Technology Interest Group (GITECMAR) <https://sites.google.com/site/gitecmar/>

GENERAL INFORMATION

WHERE WILL THE CONFERENCE TAKE PLACE?

MARTECH 2013 will take place at Scientific and Technological Park at the University of Girona. The venue is located in the southeast side of the city.

The conferences will take place in two different buildings:

Edifici Jaume Casademont – Auditorium - floor 0 (**ROOM A** & registration desk)

Edificis

- Jaume Casademont
- Centre d'Empreses - Giroemprèn
- Narcís Monturiol
- ICRA
- Centre d'Alimentació i Salut
- Robòtica Submarina(CIRS)



C/ Pic de Peguera, 15 - 17003 Girona

| Descripció | Imatges |
|---|---|
| <ul style="list-style-type: none"> • Edifici • Façana • Hall • Laboratori |  |

Edifici Giroemprèn – Auditoriums – floor -1 (**ROOM B**, commercial exhibition, coffee break / lunch area & information point) & floor 0 (commercial presentations)

Edificis

- Jaume Casademont
- Centre d'Empreses - Giroemprèn
- Narcís Monturiol
- ICRA
- Centre d'Alimentació i Salut
- Robòtica Submarina(CIRS)



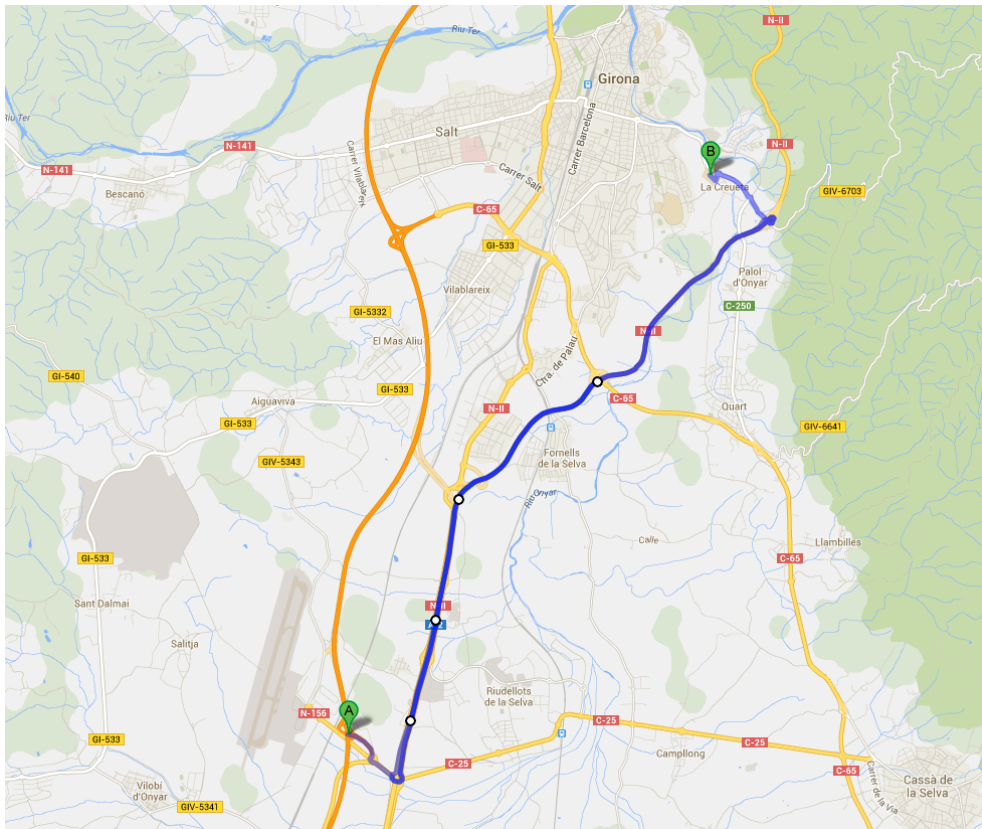
C/ Pic de Peguera, 11 - 17003 Girona

| Descripció | Imatges |
|--|--|
| <ul style="list-style-type: none"> • Edifici • Façana • Hall • Interior • Interior • Laboratori Biotech • Mòdul • Mòdul • Mòdul |  |

HOW TO ARRIVE TO THE VENUE?

Access to the Scientific and Technological Park of Girona from the center of the city is easy. You can go by taxi or bus or, considering the size of the city, on foot (30'). There is a taxi stating right in front of the train station. If you wished to come by bus, your best option would be to take Line 8 of Girona buses line that leaves also from the train station.

In case of coming by car from the AP7 road, you should take exit 8 "Aeroporto" and then take road A2 / NII in direction north "Figueres" until exit km 715 "Girona", then take GIV 6703 in direction "Girona" and you will find the Scientific and Tecnological Park on the second roundabout where you will already see MARTECH 2013 signs. It might not be the shortest way but it is the fastest in high congestion hours.



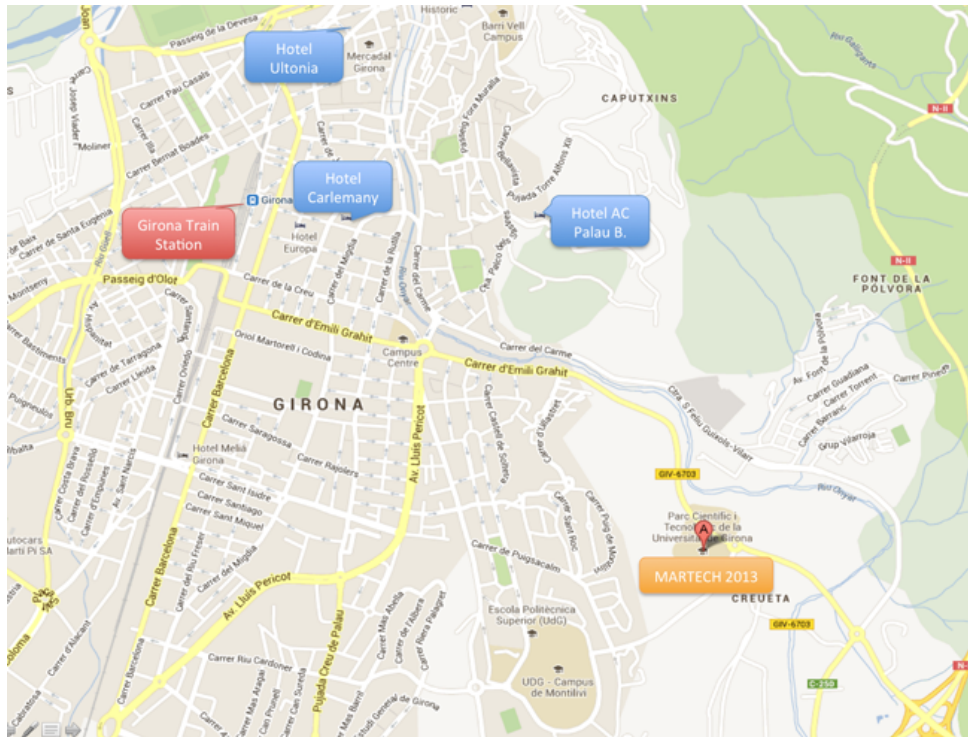
REGISTRATION DESK

The registration desk will open along the conference, and will be seated on the Edifici Jaume Casademont.

An additional information point will be placed in the Edifici Giroemprèn -1 floor corridor; in any case, your accreditation (badge, tickets and materials) should be collected in Edifici Jaume Casademont main entrance.

CONFERENCE DINNER

The conference dinner will take place at AC PALAU DE BELLAVISTA restaurant in Girona's city centre.



The meeting point is at the restaurant at 20:30h, but, there will be a **previous guided tour around the city for which you will have to register when you collect your badge**, as there are a limited number of spaces for it. The tour will start from the Scientific and Technological Park at 18:30h (after meetings) and will finish at 20:30h in the restaurant.



INFORMATION POINT

There will be a permanent information desk at Edifici Giroemprèn floor -1 corridor where you will find someone of the organization. Martech 2013 staff will be easy to recognize, as they will be dressed in orange t-shirt with the workshop logo.

For urgent matters, you can contact the local organizers at the email martech2013@eia.udg.edu or telephone **+34 609 358 428**

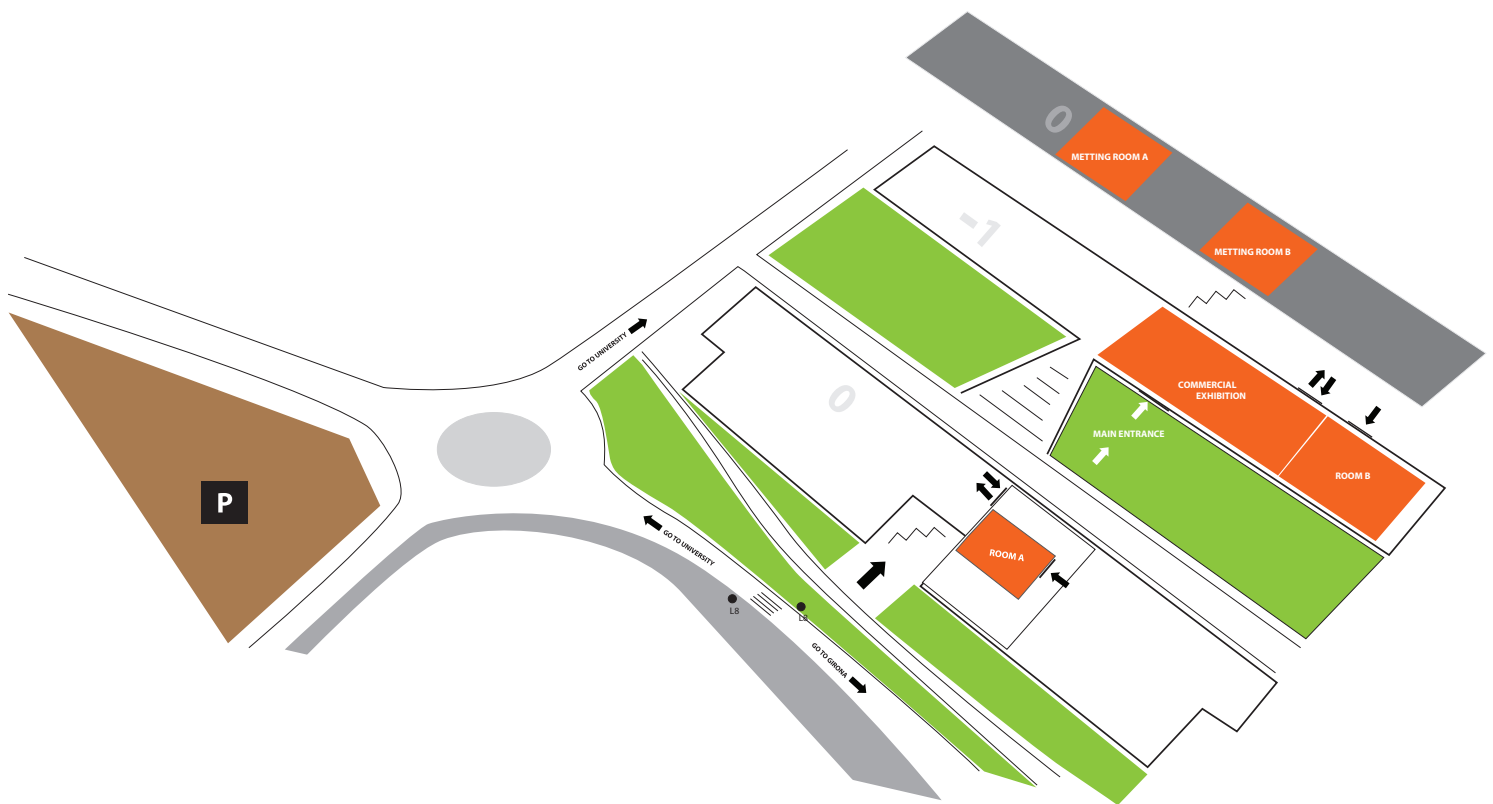
WIFI CONNECTION

WIFI connection is free and uses the hotspot of the name of the buildings in the park, so, for instance, if you are in “Edifici Jaume Casademont” you need to look for the Casademont network; in case you were in Giroempren building, you need to join “Giroempren” network.

User name is: parc

Password is: parc

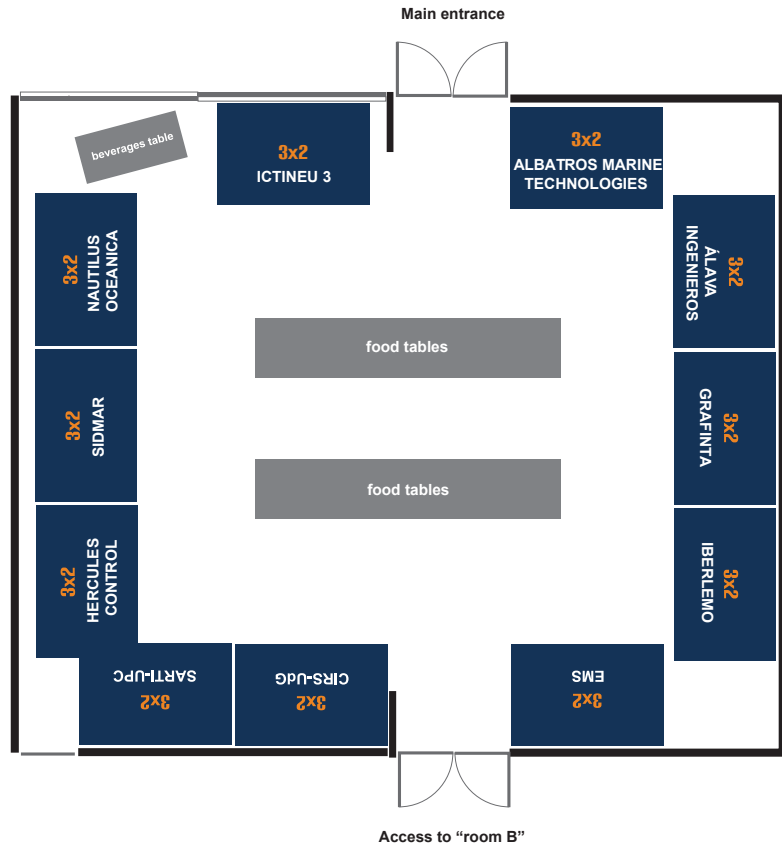
LOCATIONS OVERVIEW



COMMERCIAL EXHIBITION

EXHIBITION AREA

Martech 2013 will have a Commercial Exhibition area located in the Giroempren Building, floor -1 at the Scientific and Technological Park of the University of Girona. Coffee breaks and lunches will be served in the Exhibition Area.



Commercial presentations will take place from 11 to 17h on the 10th of October and from 11 to 14h on the 11th of October in the meeting rooms in Giroempren building. The exhibitors may inform in their booths about their presentations while the conference take place.

EXHIBITOR LIST**SIDMAR** - SIDMAR – www.sidmar.es

SIDMAR Oceanographic Research and Services, focuses his career in the field of Marine Science and Technology. Highlight the following lines:

- Representation and sale of oceanographic instrumentation. Services include custom made instrumentation, with advice from the decision-making to the operational.
- Comprehensive services in oceanography. Specializing in the observation and analysis of oceanographic processes, and in the field of coast engineering.
- R+D+i. Serves as a testing ground for products and services. All of them are in constant renovation to offer clients the latest available techniques and technologies.

**ÁLAVA INGENIEROS** – www.alava-ing.es

Alava Ingenieros Group is an entirely privately owned group which has been providing high technology solutions in the Testing, Measurement, Communications, Security, Defence and Preventive Maintenance fields since it was first founded in 1973. The group offers consultancy, engineering, distribution, training and technical services, providing turn-key projects for several sectors including Aerospace, Automotive, Security, Defence, Energy, Communications and Finance, as well as Testing and Research Centres, Universities, Public Services and Industry in general.

During Martech workshop, we will present the latest developments in Oceanographic and Hydrographic systems from our partners: Teledyne Reson, AML Oceanographic, Applanix, QPS, Trimble Marine, Teledyne TSS, Riegl, SBG systems et al.

**IBERLEMO** – www.iberlemo.es

LEMO is the acknowledged leader in the design and manufacture of precision custom connection solutions. LEMO's high quality push-pull connectors are found in a variety of challenging application environments including medical, industrial control, test and measurement, audio-video, and telecommunications.

LEMO has been designing precision connectors for six decades. Offering more than 50,000 combinations of product that continues to grow through custom specific designs LEMO, and it's affiliated sister companies REDEL and COELVER, currently serve more than 100,000 customers in over 80 countries around the world.

**GRAFINTA** – www.grafinta.com

Grafinta SA founded in 1964, offers the most innovative products for the fields of Cartography, Geodesy, Topography, Hydrography, Construction, Control in civil engineering machinery, port civil works, and agriculture Defense Systems, Control of time; Instruments for Oceanology.

Currently Grafinta SA has a staff of 21 people, of whom more than half are senior engineers and highly skilled technicians to provide the appropriate support and assistance to our customers.

Grafinta SA account on the other hand, a quality control laboratory specialist, and certified customer that will extend the warranty and build quality offered towards our suppliers, and demanded by our customers.

Within our services our offices have a customer service unit that combines personalized attention on specific issues, with repair services approved by the various manufacturers.



- EMS Sistemas de Monitorización Medio Ambiental SL - www.ems-sistemas.com

EMS offers a solid background in sensors, systems and vehicles, serving the oceanographic community and users of marine and underwater technology for more than 15 years with offices in Barcelona and Paris. EMS represents leading manufacturers in the industry and offers advanced technical capabilities focused on system integration and data providing, as well as an own product line and associated technical services.

EMS sensors : Sea-Bird Electronics, WETLabs, Turner Designs, Teledyne RD Instruments, Biospherical Instrument, Sequoia Scientific, Paroscientific, Campbell Scientific, Ocean Waves, et al.

EMS systems : Teledyne Blueview, ATLAS Hydrographic, MacArtney, Chelsea Technologies, Flotation Technologies, Deep Sea Power & Light, Technicap, Link-Quest, Falmat Cables, et al.

EMS vehicles : Liquid Robotics, ATLAS SeaCat, Bluefin Robotics, International Submarine Engineering, Deep Ocean Engineering, VideoRay, et al.



- ICTINEU 3 – www.ictineu.net

ICTINEU 3 is the first project of the company Ictineu Submarins SL. The objective of the project is to build and operate a modern and highly competitive manned submersible, suitable for a wide range of tasks such as scientific research, oceanography, archaeology, science dissemination, and even to provide personalized diving to an exclusive tourist sector looking for exciting experiences.

ICTINEU 3 is conceived as a modern submersible and employs innovative materials, efficient and environmentally friendly power systems, robotic manipulators, intelligent management and control systems and the most advanced technologies in security, positioning, navigation, communication, sensing and data logging. It is an extremely versatile tool conceived to be transformed and modified as newer technological solutions and equipment become available.



- ALBATROS MARINE TECHNOLOGIES – www.albatrosmt.com

This project-company was founded on the initiative of a group of scientists, technicians and evolution of the work of several years of research in the oceanography market. The company was founded as a limited company Albatros Marine Technologies SL being an IMEDEA (Instituto Mediterráneo de Investigaciones Científicas CSIC-UIB) spin-off.

The initial intention was to commercially exploit a niche market not currently covered by any company, consisting of oceanographic products and innovative marine technology, simple, reliable and affordable.



- Nautilus Oceanica – www.nautilusoceanica.com

Nautilus Oceanica has a large fleet of equipment working for the development of field campaigns that its customers might need: Echo sounders, side scan sonar, GPS receivers, multiparameter probes, gauges, current meters, dredgers and sample bottles, underwater cameras, diving equipment, boats, etc. The company is working on various projects, offering its services to private companies (energy sector, environmental sector, civil works, engineering) and the different administrations (universities, municipalities, autonomous regions, ministries, etc.).



- SARTI UPC – www.cdsarti.org

Created in 2000, SARTI is formed by a multidisciplinary team and focuses on developing environmental instruments and sensors for industrial and scientific applications. Its areas of expertise are as follows:

- Marine and terrestrial technologies
- Electronic design of remote data-acquisition systems (including simulation methods and statistical analysis)
- Automation of complex measurement systems
- Digital signal processing



- ViCOROB UdG – <http://cirs.udg.edu>

ViCOROB is a research group at the University of Girona (Spain) specialized in Computer Vision and Robotics. Founded in 1993, ViCOROB is currently a consolidated research group, recognised since 2008 by the Government of Catalonia as a Technological Innovation Network Center (TECNIO).

CIRS is the Underwater Robotics Research Centre of ViCOROB, located in the Scientific and Technological Park. We are a leader team in the research and development of Autonomous Underwater Vehicles for accurate seafloor mapping and light intervention.



R&D+Hydrography

- Hércules Control – <http://www.herculescontrol.com>

HCTech is a company focused on the design, manufacture and marketing of hydrographic products.

This company was born after years of collaboration between the company **CIS** and the research group **GPI-RV** from the University of Vigo (Spain).

Over the years we have developed many **application products for control and exploitation of marine resources**.

In HCTech we develop all our products in our **R&D department**, thanks to own and public investments.

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WWW.MARTECH-WORKSHOP.ORG