

Software portfolio

Ships and on-board Equipment Department

**Marc Nokin – Ifremer
OFEG-TECH – November 12-13th 2008**

Development of scientific softwares

➤ **Laboratory**

- ✓ 16 permanents – Brest and Toulon

➤ **Scope**

- ✓ Development and maintenance of softwares
- ✓ Training of operational and scientific teams
- ✓ Valorisation of softwares to external laboratories and institution

➤ **Aims**

- ✓ Softwares for the scientific community, ships and underwater vehicles
- ✓ Data acquisition, data real time and post processing, cruise preparation

➤ **Technical fields**

- ✓ Bathymetry & imagery data processing
- ✓ Fishery applications data processing
- ✓ Seismic data processing
- ✓ Underwater systems survey data processing
- ✓ Video data processing

Main Software products

➤ Data acquisition

- ✓ **TECHSAS** Scientific and technical sensors
- ✓ **ACQUANAUT3** *Nautilé* data
- ✓ **STR/SIS Victor** *Victor 6000* data
- ✓ **POSEIDON** Long base line
- ✓ **HERMES** Configuration and acquisition of multibeam echosounder for fishery applications

➤ Real time

- ✓ **CASINO+** **Cahier de quart informatisé**
- ✓ **SUMATRA** Real time tracking
- ✓ **SDIV+** Vidéo diffusion on ships

➤ Post processing tools

- ✓ **CARAIBES** Multibeam echosounders and side scan sonars
- ✓ **SONARSCOPE** Multibeam echosounders and Quality Control
- ✓ **ADELIE** Sensors data and videos of underwater vehicles
- ✓ **MOVIES+** Multibeam echosounder data for fishery applications

➤ Mission planning

- ✓ **OASIS** Simulation of echosounders for fishery applications
- ✓ **MIMOSA** AUV dive management

Institutions with contract (except Ifremer)

Softwares	France	Outside France	Total
ADELIE	7	11	18
CARAIBES	25	17	42
MOVIES+	6	15	21
SDIV+	1	0	1
TECHSAS	1	2	3
MIMOSA	1	2	3
Total	41	47	88

TECHSAS is a technical and scientific sensors acquisition system developed by Ifremer.

TECHSAS (TECHnical and Scientific sensors Acquisition System) is a technical and scientific sensors acquisition system developed by Ifremer. Its functions are:

- sensors data acquisition,
- data time-stamping,
- data recording,
- data control display,
- real time broadcasting on Ethernet network.

TECHSAS can acquire and record the following sensors :

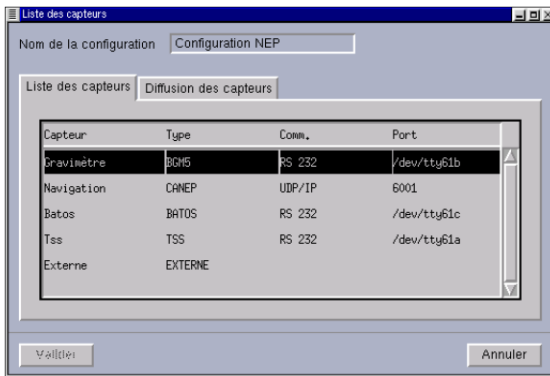
- central clocks,
- Seabird thermosalinographs,
- Seabird water sampler,
- Batos - Météo France weather stations,
- Vaisala weather stations,
- GPS,
- gyrocompass,
- Bodenseewerk KSS and Lockheed-Martin BGM gravimeters,
- Seapsy and Thomson SMMII magnetometers,
- SeaPath and TSS POS/MV attitude sensors,
- Kley and Marelec winches,
- Oceano Posidonia underwater positioning system,
- trawl sensors positioning systems (EBS Geonet, Pacha, Scanmar),
- EA400, EA500, EA600 single beam echo-sounder, ...

The interface between TECHSAS and the sensors are an Ethernet link, RS232 or RS422.



SYSTEM CONFIGURATION

The software **TECHSAS** runs on a Linux PC. It is totally configurable by the user. The software architecture is a multi-process architecture, there is an active process for each sensor to acquire. The acquisition process communicate with the GUI and recording process by an UDP/IP link. With that protocol, the users are able to developed their own acquisition process and to add their specific sensors. Furthermore, any process can be run on different machines.



DATA TIME-STAMPING

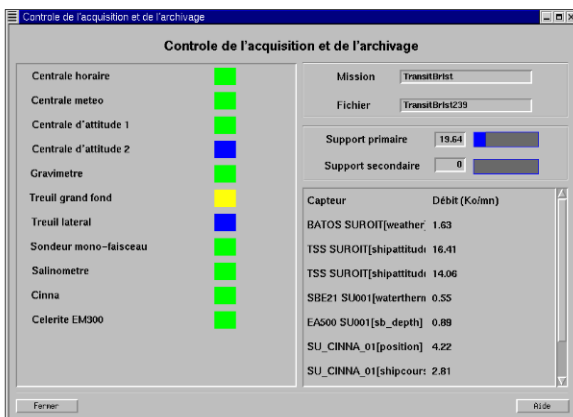
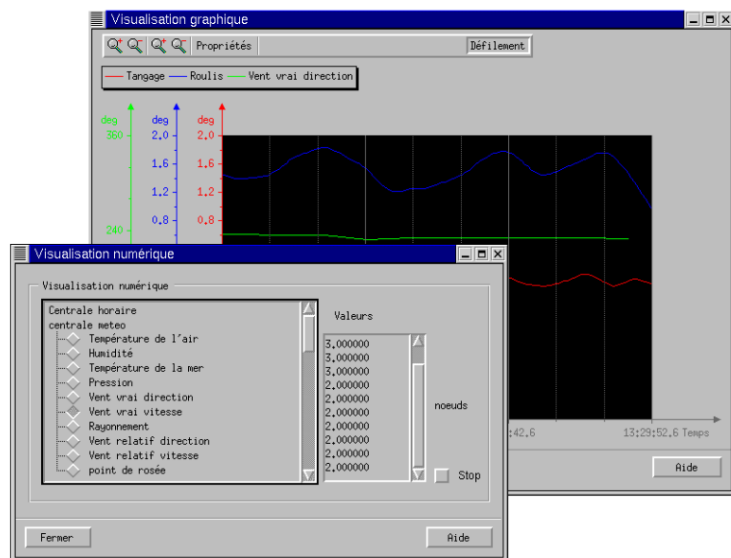
The sensor data can be time-stamped by the acquisition PC system clock, or by a time given by an external central clock. The precision of time-stamping is 10 ms.

DATA TECHNICAL DISPLAY

Three display data modes are possible :

- sensor raw data display,
- digital data preview,
- graphic data preview (curve as a function of time diagram).

A control window shows a synthetic view about every sensor acquisition state and the recording statistics.



DATA ARCHIVING

For safety reasons, a redundancy system is used to record data on the PC's hard disk. **TECHSAS** can record data on two formats : format **ASCII** NMEA type or format binary **NetCDF** type. The operator can check in real-time every sensor's recording rate and the filling's partitions rate.

DATA BROADCAST

TECHSAS broadcast all data in UDP/IP frames on the on-board LAN. There are two broadcasting formats : NMEA broadcasting format or XML broadcasting format. The broadcasting format XML is an self-descriptive format. The data broadcasting allows different users to install, on the vessel network, preview applications, data control programs, scientific logbook, ...

Information and video broadcasting system

The **SDIV+ system** aims at visualizing data acquired onboard in real-time. This system is available either on dedicated terminals or as a downloadable application on the network. The software, written in java, is available on multiple platforms : Windows 2000/XP, Linux, MacOS X and Sun Solaris.

Each user can create his own configuration displaying his relevant data. Specific views are available for navigation, weather, multibeam sounder, GIS, etc.

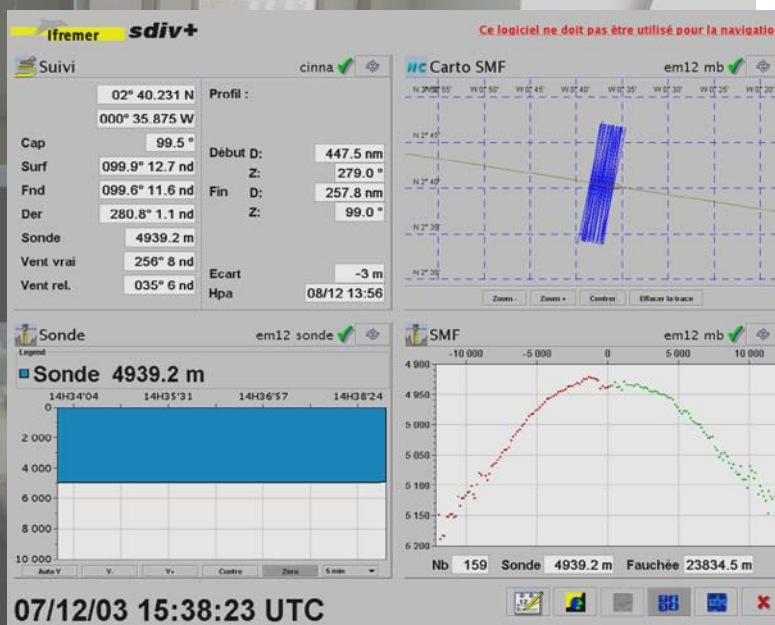
Installed on the R/V *L'Atalante* in 2003, the system also offers up to 8 video streams. Those streams are encoded live in MPEG4/ISMA from analog video signals (mainly video cameras).



R/V *L'Atalante* (Picture : ©Ifremer)

Functionalities

- Automatic detection of sensor data broadcast on the network,
- Data visualisation (chart),
- Custom thematic views according to vessel mission : weather, sounder, GPS, etc,
- Easy installation from the onboard intranet web site,
- MPEG4/ISMA encoded videos.



SDIV software has 4 views in its standard configuration. In this sample in the top left view, main navigation information are shown. Top right view displays the swath of the multibeam along the track of the vessel in a map view. Bottom left view shows a chart of the sounding along time and bottom right view shows a multibeam cross-section.

SUMATRA Real time mission tracking

SUMATRA software © allows oceanographic or hydrographic users to monitor missions in real-time in a GIS (geographic information system - ArcGIS) environment. .

SUMATRA Mission monitoring

The main functions available include:

- monitoring movables such as the ship (route produced by CINNA or from a GPS data) and the devices (BUC or Estime navigations, for ROVs systems),
- displaying the projected route of the ship (plotted by CINNA),
- displaying device events,
- monitoring MBS coverage (for example, the deep-sea MBS on the Vessel or the very shallow water MBS on the ROV).
- displaying scientific parameters along the route of movables (weather, gravimetry, magnetisme, etc.),
- representing physical data (Sippican, CTD, ADCP),
- displaying data from CASINO+
- monitoring MBS surveys (DTM, isocontours, mosaics).



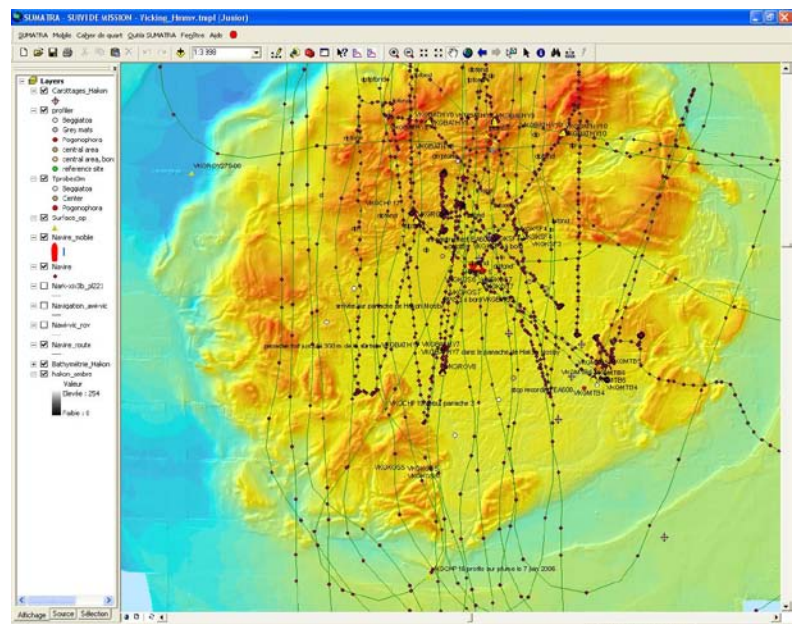
By courtesy of NOC

Supplementary features are available:

- temporal monitoring,
- thermal plotter printing.

Coming soon
(for R/V Southern Surveyor)

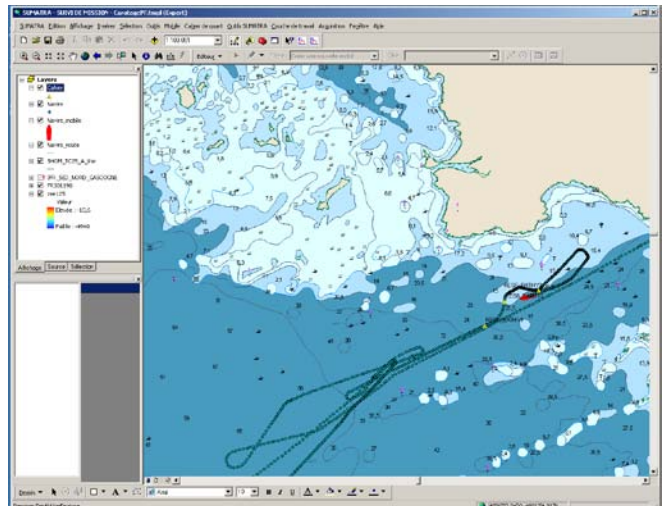
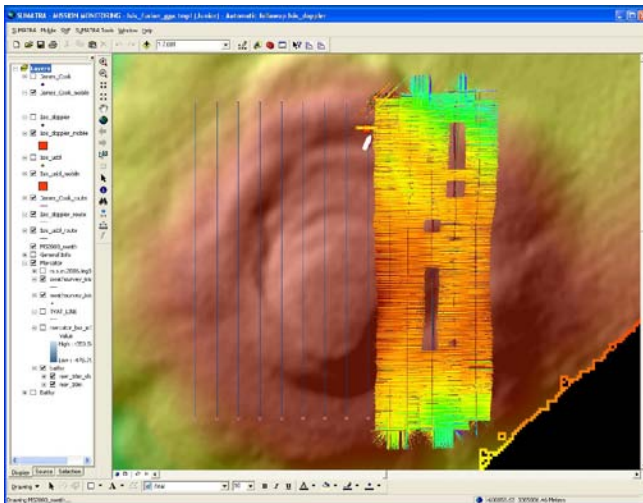
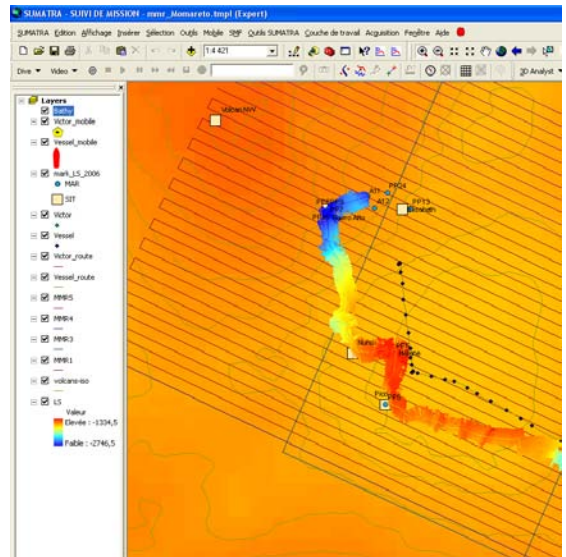
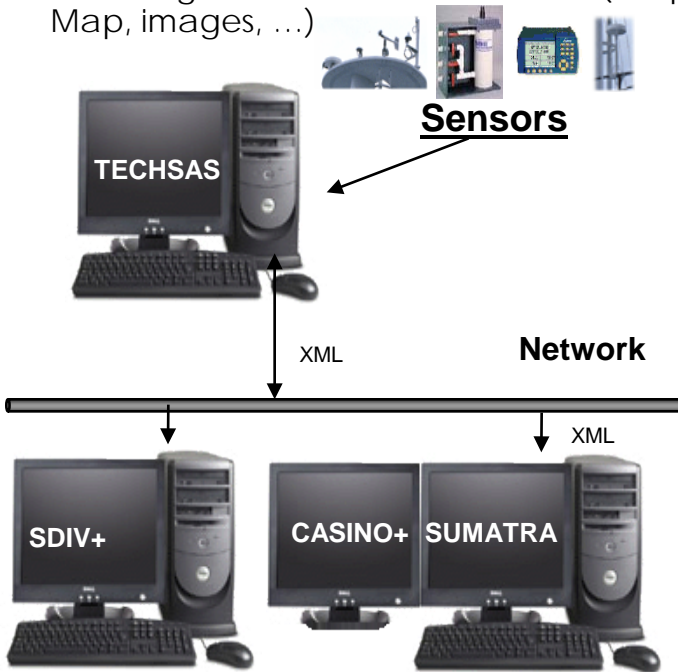
- Seasoar processing,
- USBL positioning
- ENC display.



SUMATRA Configuring

This tool available include :

- to select devices (mobiles, weather station, MBES, ADCP, ...),
- to define the suitable modes with adaptative design (local, raster, vectorial, ...),
- to integrate additional datasets (Shapefile formats, raster file, S57, C-Map, images, ...)



By courtesy of NOC

Required hardware and software – 2008

PC Operating System with ArcGIS 9.2 version.

Fore more information, please browse through our internet site :
<http://www.ifremer.fr/sumatra>

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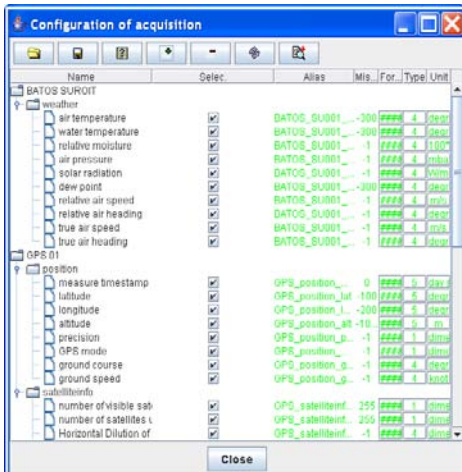
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Ifremer

CASINO+ Electronic logbook Software

CASINO+ software © is a electronic logbook software used to store the meaningful scientific information during a cruise.

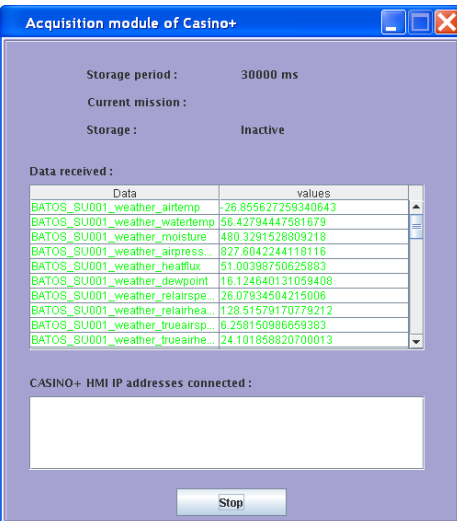
This software can be used at sea during cruises or in any scientific laboratory.



CASINO+ is a real time system.

It enables to:

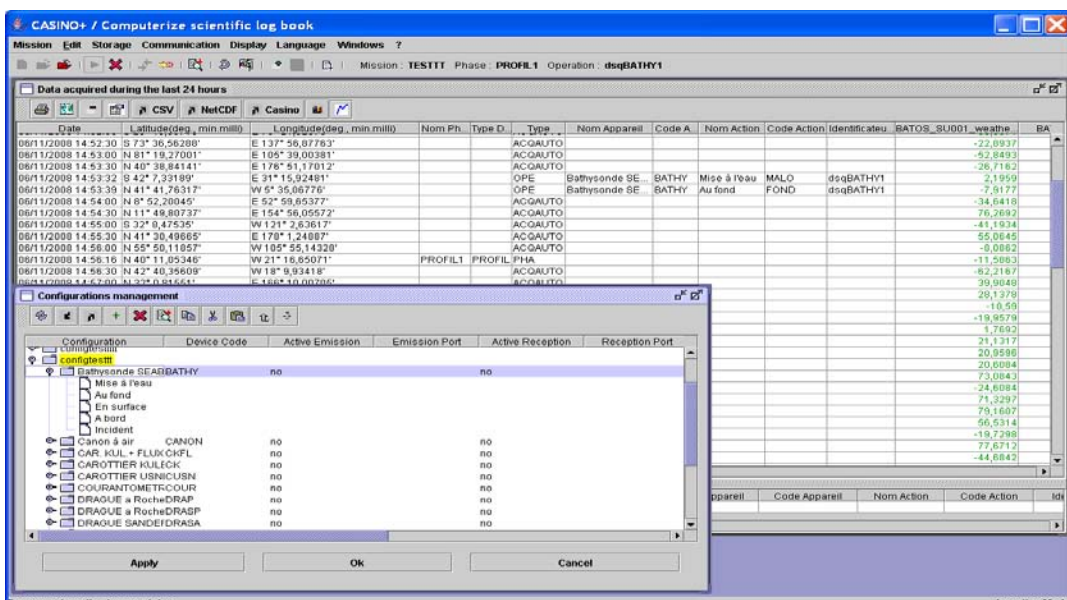
- Acquire on the network the selected scientific parameters by the scientist according to a given period of time. These data come from **TECHSAS** system or **CINNA** navigation system.
- Store them on the Mysql operational base.
- Acquire automatically or manually events(phases, used equipment) or observations during the cruise.



CASINO+ is a post processing system.

It enables to:

- Define equipment configuration.
- Edit all or a part of the scientific logbook to modify events records, delete some or add new ones.
- Plot scientific parameters versus time.
- Get a summary of the cruise (by day, by equipment, by phase).
- View events in a cartographic view.
- Export to EXCEL file, to NetCDF file.
- Save the Mysql operational base to create a Mysql local base.



CARAIBES Submarine Mapping Software

CARAIBES software © is a post-processing tool box to handle, clean, chart and display data from **multibeam echosounders** and **sidescan sonars**.

This software can be used at sea during cruises or in any scientific laboratory.



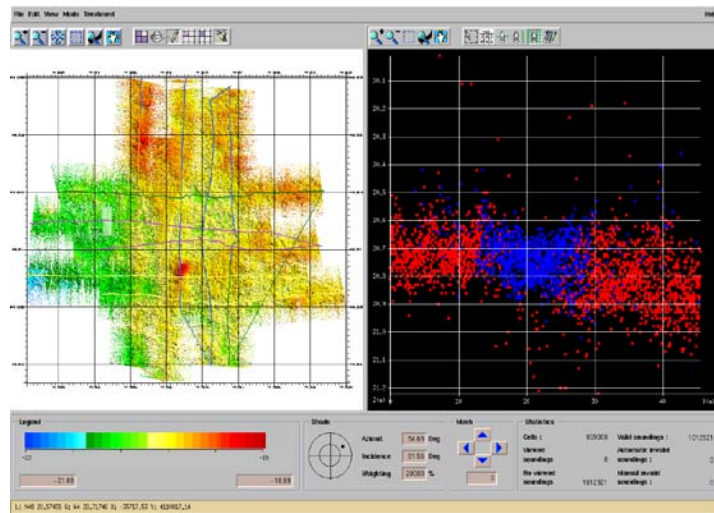
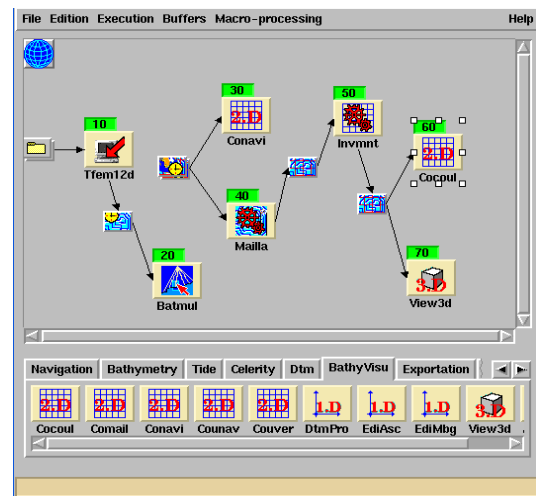
CARAIBES is multi-sensor.

It is able to process many types of multibeam echosounders and sidescan sonars in a single environment.

CARAIBES is very modular.

Each elementary processing executes a specific function, the interactive and graphic editor allows to build complex processing flows.

So, introduction of new functionalities is very easy (at present time, about 200 processing are available).

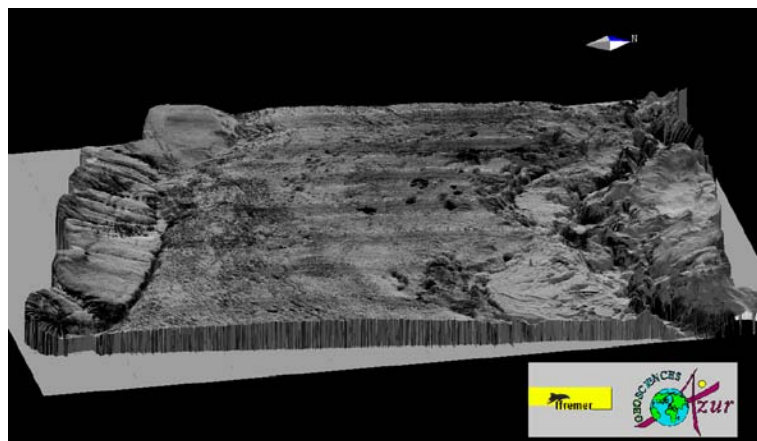


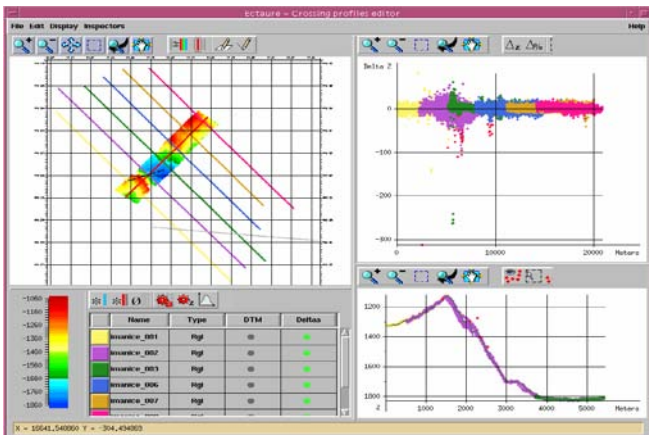
CARAIBES includes a complete tool set to process bathymetric data:

- Ping editors.
- Navigation, sound velocity, tide, attitude corrections.
- Automatic detection of erroneous soundings with various algorithms : Ifremer, Shom, CUBE/UNH.
- Digital Terrain Model creation.
- ...

CARAIBES is able to process backscatter data from multibeam and sidescan sonar data with various processings:

- Specular, antenna gains, lateral reflectivity and absorption coefficient corrections.
- Height detection and slant range corrections.
- Image mosaic creation and editing.



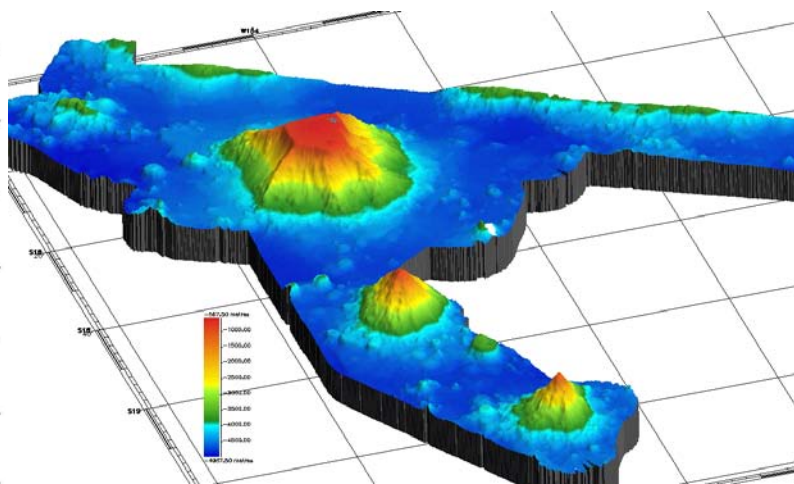
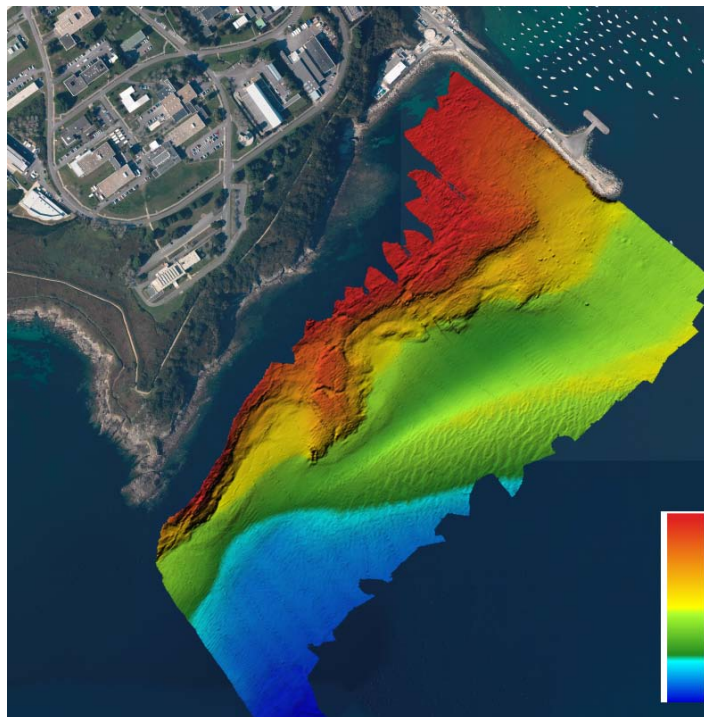


CARAIBES includes several interactive graphical tools to :

- Clean the data.
- Search attitude bias.
- Compare data on different profiles.
- Test changing of sound velocity profiles.
- ...

CARAIBES allows to view bathymetry and imagery in 2D and 3D :

- Contourlines, shaded colored map, 3D view, flyover.
- Profiles along tracks.
- Overlapping between bathymetry and imagery.
- Interface with ESRI/Shapefiles and GoogleEarth formats.



Required hardware and software – 2008

PC and Linux Operating System

Fore more information, please browse through our internet site : <http://www.ifremer.fr/caraibes>

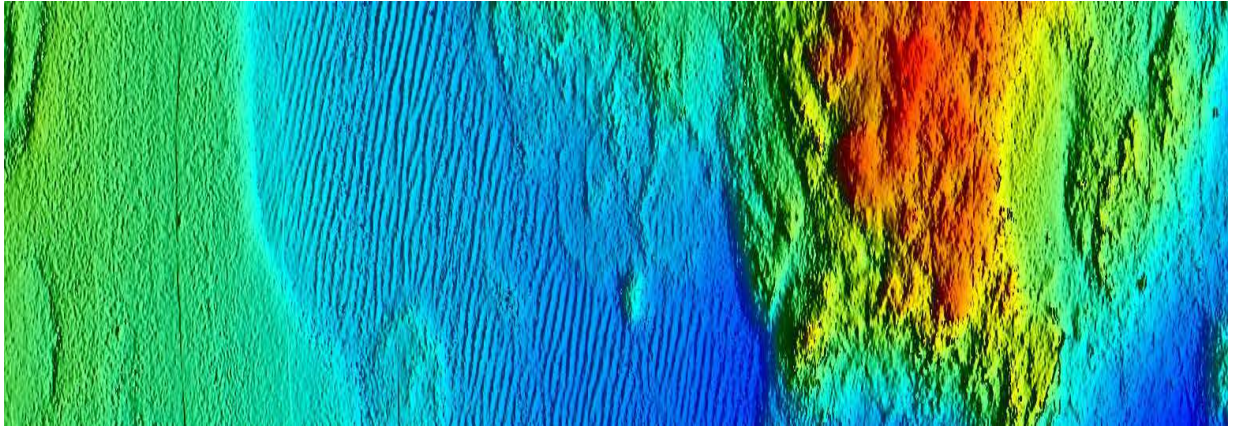
Ongoing : new 3D module. A full new version is being developed and will be Linux, **WINDOWS®** XP and Vista compliant (32 & 64 bits).

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SonarScope : a toolbox for sonar data processing



- Quality control of sonar & sounders

Ex : Detection & correction of artefacts, calibration, accuracy & resolution estimation

- Data processing

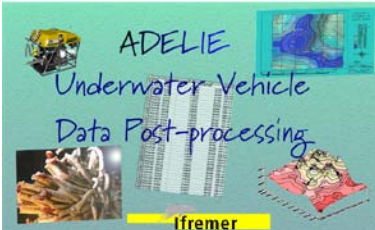
Ex : Digital Terrain Models & Sonar mosaics

- Help to interpretation

Ex : interactive tool for data display, image segmentation, output to the main free viewers : Google-Earth, Nasa-World-Wind, iView3d, ErViewer, GMT, etc ...)

ADELIE

Underwater vehicle data post-processing software



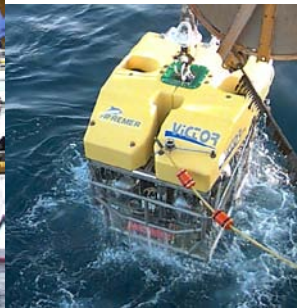
ADELIE software is a post-processing tool-set which has been developed to visualise, handle, and promote images, videos and data recorded during IFREMER underwater vehicle dives (NAUTILE, ROV VICTOR 6000, CYANA, SCAMPI, etc.).

This software can be used at sea during cruises or in any scientific laboratory.

ADELIE has been designed and developed in the IFREMER Data Processing Department in collaboration with a group of scientists and operational crew members who have followed the project. Thus, ADELIE meets the user needs in the underwater data post-processing field.

ADELIE software has been specifically targeted for all IFREMER underwater vehicle users who want to save time and facilitate data manipulation and promotion.

ADELIE helps to import recorded data which can be visualised and synchronized with the corresponding video. They can also be processed and interpreted to produce sea bed maps or image mosaics.



The NAUTILE and the VICTOR 6000 ROV.

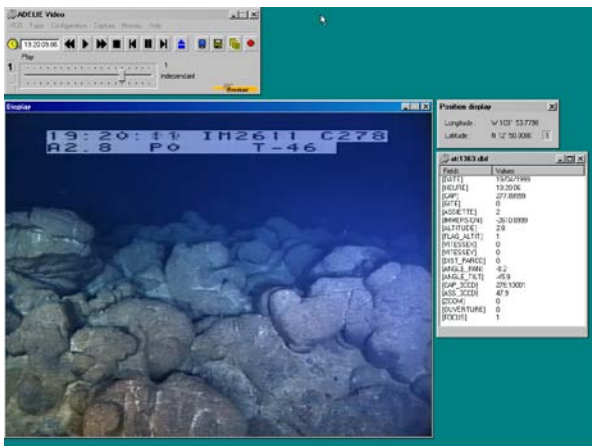


ADELIE imports underwater vehicle data and creates thematic tables (navigation, measurements, events, observation descriptions ...)

ADELIE Import. This first tool helps to convert NAUTILE, VICTOR 6000, etc. raw data into thematic files (such as navigation, attitude, events, measurements, observations descriptions,...). These files can be processed directly by most common PC tools such as *Excel*[®], *Microsoft Access*[®], or any other software able to read *DBase File* (as *ArcMap*[®] GIS).

The import operation can be done dive by dive or for a whole cruise.

ADELIE Video is a Video control software which can synchronise up to 3 videos with the dive data. It means that for each second of the video, the corresponding vehicle position and attitude are displayed. The software can calculate the real time from the video recorder line counter and an offset. Thus, any kind of video tape or DVD can be synchronised with timed data tables.



ADELIE controls video players and synchronise data with the video. It provides video frame capture capabilities.

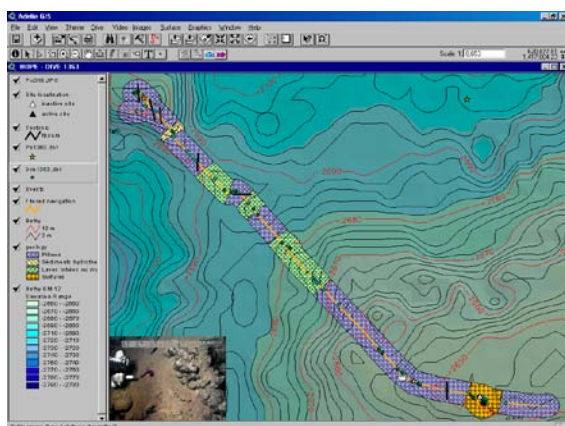
ADELIE allows the capture of new video still images and sequences if it is connected to an overlay video card. Subsequently, video summary can be generated (a summary is a picture succession captured every *n* seconds from the video).

ADELIE integrates an automatic image mosaic generation from video sequences.

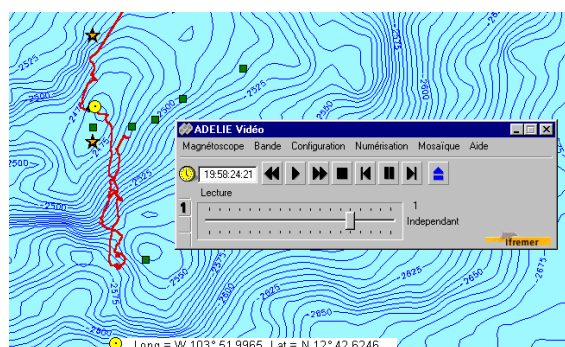


Example of video mosaic

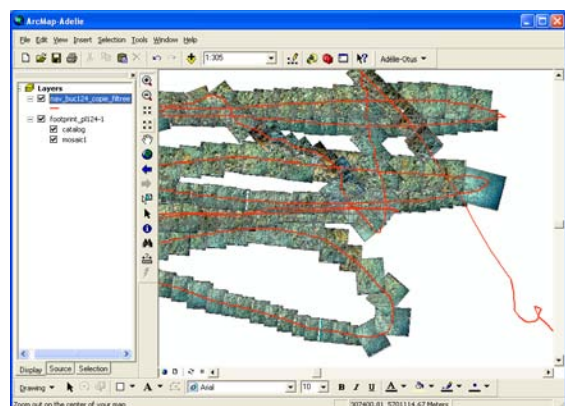
ADELIE GIS. Based on ArcMap® Geographic Information System (distributed by ESRI), ADELIE has many functions which can display and process multimedia information. You can :



Multi layer dive data visualisation.



Video and navigation track synchronisation



Imprints catalogue generated by Adelle OTUS

- Display layered thematic fields in 2D : navigation, events, bathymetry, still pictures ...
- Filter and smooth vehicle navigation,
- Calculate the new position of thematic element from the filtered navigation data,
- Display in the background the sea bed map provided by the CARAIBES IFREMER software (contour lines, Digital Terrain Model, imagery ...),
- Have direct access to pictures and video sequences
- Graphically display the submarine heading, latitude and longitude corresponding to the video (synchronisation with ADELIE video tool) (very useful for analysis),
- Interactively create a sea bed characterization map from video observations. A strip of variable width including the navigation can be cut up into different areas which are associated with geological or biological symbols.
- Export data, results and page layouts in various formats (Dbase, Ascii text, WMF, BMP, JPEG ...).

ADELIE OTUS. Based on ArcMap®, this extension enables images from a vertical camera and from Victor 6000's OTUS camera to be integrated and geo-referenced.

Required hardware and software – 2008

PC and WINDOWS® XP Operating System
Internal DVD player, or external video player
RS232 serial link
IEEE 1394 link,
Video monitor.

For Adelle GIS, OTUS and Observation extensions :
ArcMap 9.x + 3D Analyst extension
 (<http://www.esri.com>)

Fore more information, please browse through our internet site :
<http://www.ifremer.fr/adelle>

Ongoing : ADELIE Video V2.0. A full new version is being developed and will be WINDOWS® XP and Vista compliant (32 & 64 bit).

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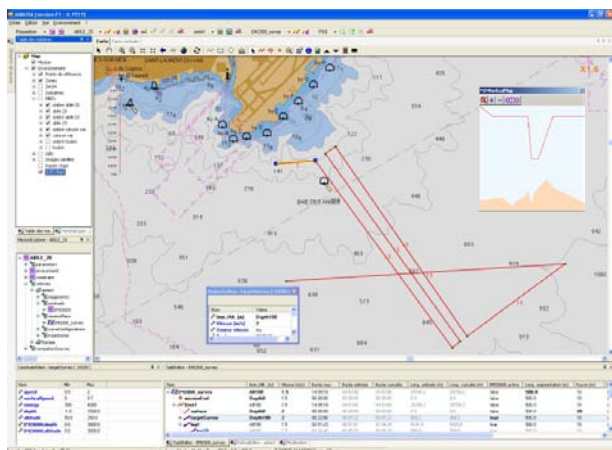
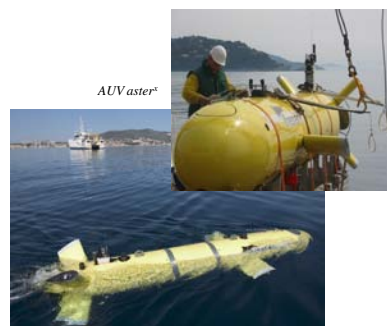
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MIMOSA

Mission management for subsea autonomous vehicles

MIMOSA is an **integrated software tool** designed to bring **operational solutions** to **AUV mission management** :

- mission preparation, planning and validation
- real time mission supervision
- post-mission analysis and playback
- cruise and mission data management

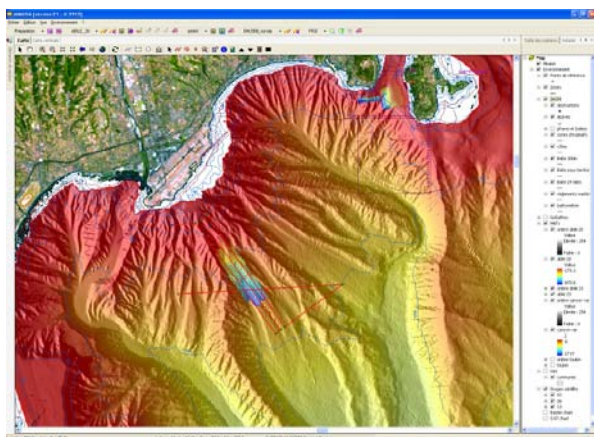
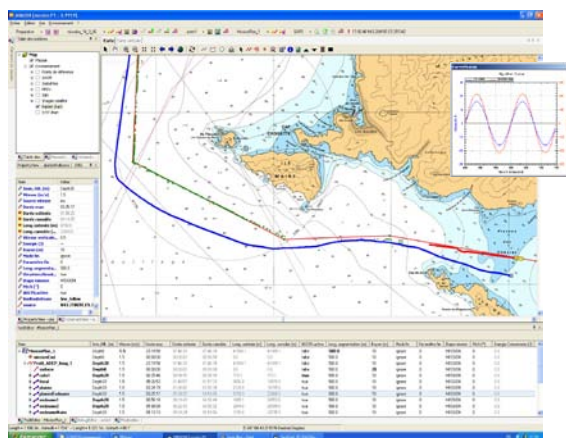


Mission planning

- ✓ highly interactive and assisted mission design process
- ✓ cartographic view based on GIS technology (ArcGIS Engine™)
- ✓ digital marine charts support : vector (S-57) and raster (BSB, ARCS)
- ✓ easy integration of user data
- ✓ user-defined operational constraints
- ✓ mission simulation and validation (according to mission environment)
- ✓ transformation of the mission plan in the vehicle specific language

Mission supervision

- ✓ real time tracking of multiple mobiles (vessel, vehicle navigation, acoustic track, simulated position, buoys, ...)
- ✓ monitoring tools



Mission data management

- ✓ cruise management
- ✓ mission data archiving (mission plans, vehicle and payload configurations and data, navigation, environment and user data, etc.)
- ✓ data selection and export

Post-mission analysis

- ✓ download of vehicle and payload data
- ✓ playback of vehicle navigation
- ✓ visualization of payload raw data
- ✓ vehicle and payload time-based data curves
- ✓ mission reporting

Contact:
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<http://www.ifremer.fr/fleet>

MOVIES+ An acoustic detection

software



Movies+ is a powerful tool for the acquisition, archiving and processing of fishing echo sounders data. It has been used since 1998 during Ifremer oceanographic surveys for the evaluation of fisheries resources.

It benefits from Ifremer experience in submarine acoustics for fishing and its know-how for the development of software for oceanographic vessels particularly on board the new research vessel *Thalassa*.

Movies+ main functions

- Real-time acquisition and processing of data issued from digital sounders of the SIMRAD company (EK500, EK60) and MICREL (OSSIAN).
- Archived data format fully compatible with the international HAC standard.
- Off-line replay of the acquired data.
- On-line and off-line echo-integration of received echoes at the same time by depth layers, by trawled layers and by shoal.
- Automatic shoal classification algorithm.
- Multi-frequency analysis can resample horizontally and vertically all real channels and apply them some simple processing (sum, multiplication by a constant, mask)
- TS data analysis and trajectography of single echoes.
- Assisted calibration of the sounder thanks to the detection of the maximum echo from a reference target.
- Echogram edition functions, available off-line, can be used to correct aberrant echoes in a shoal or near the bottom.

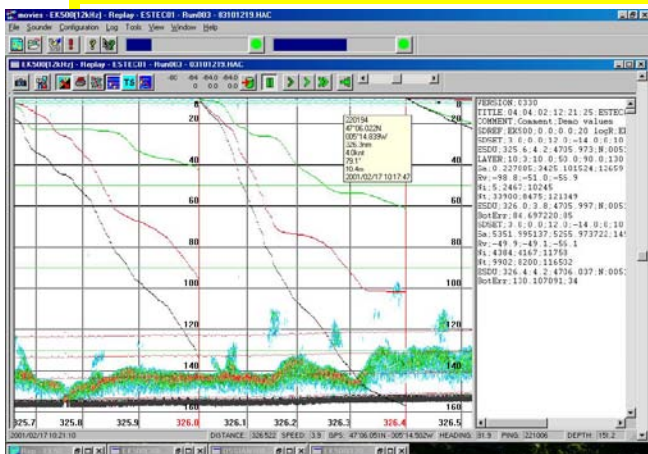
www.ifremer.fr

The HAC Standard format results from a workshop held by the Department of Fisheries and Oceans of Canada and from discussions with various users and echo sounders manufacturers. Since 1999 it is the standard format within ICES community in acoustics in fishery. Since 2000 the format is maintained and evolves through the ICES HAC planning Group.

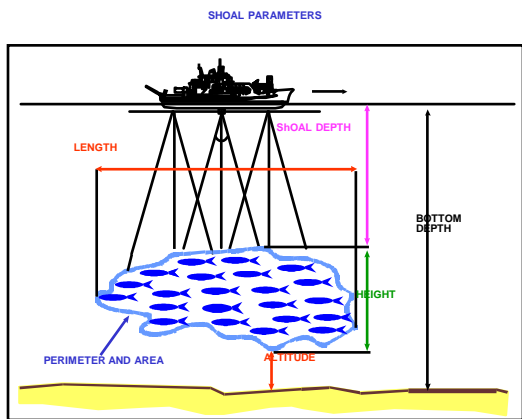
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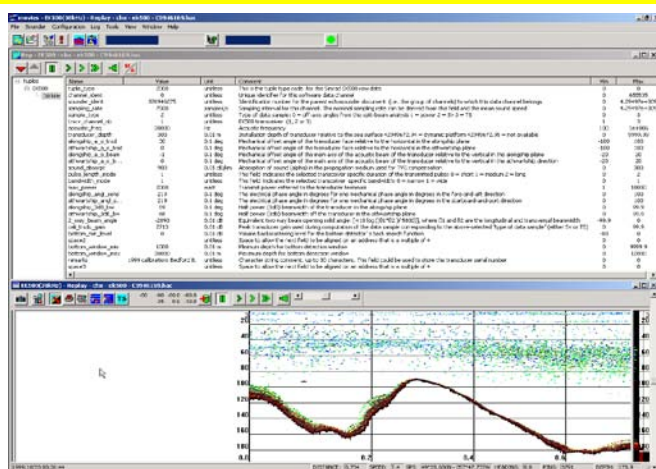
MOVIES+ Illustrations of main functions



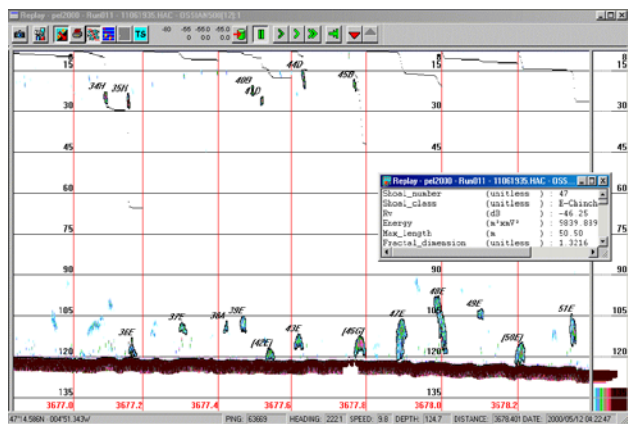
Echo-integration processing analyses echoes in selected depth layers and integrates their characteristics every elementary sampling unit (ESU : usually one mile).



A fish shoal is defined as a set of samples which forms an echogram feature with amplitude values above the echo-integration threshold. The samples also must satisfy a contiguity law for both vertical and horizontal axis. About forty parameters are computed for each shoal.

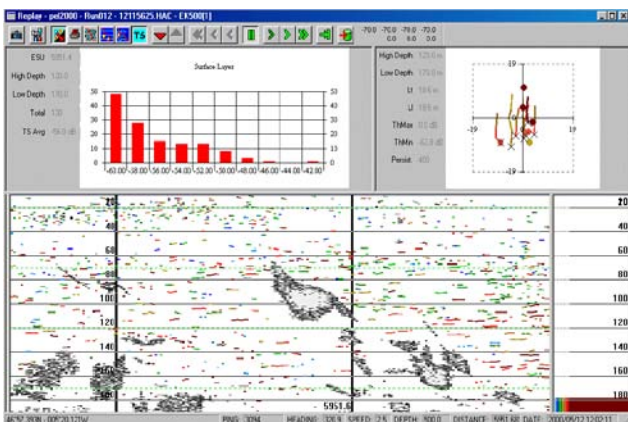


At any time updated sounder settings are available, they are displayed in HAC format (sounder and channel tuples of the acquiring or replaying sounders can then be consulted).

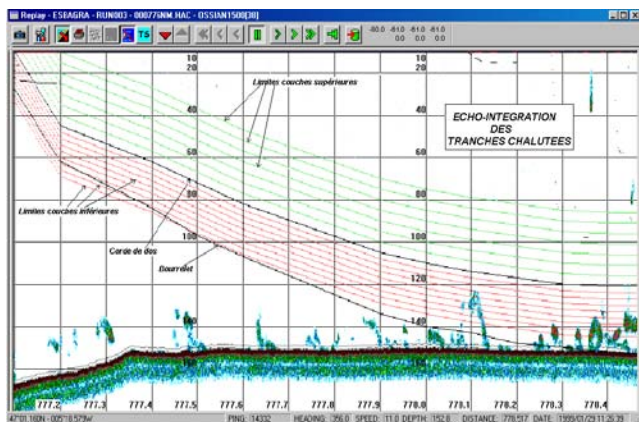


Shoal echo-integration : recognized shoals are outlined and marked out with a number and a label corresponding to classes. At any time it is possible to display informations on the analysis.

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TS analysis : every single echo is displayed with a color corresponding to its index (bottom window), an histogram of predefined classes of TS is displayed for a defined layer (upper left window) and trajectography of each echo in the beam is drawn (upper right window)



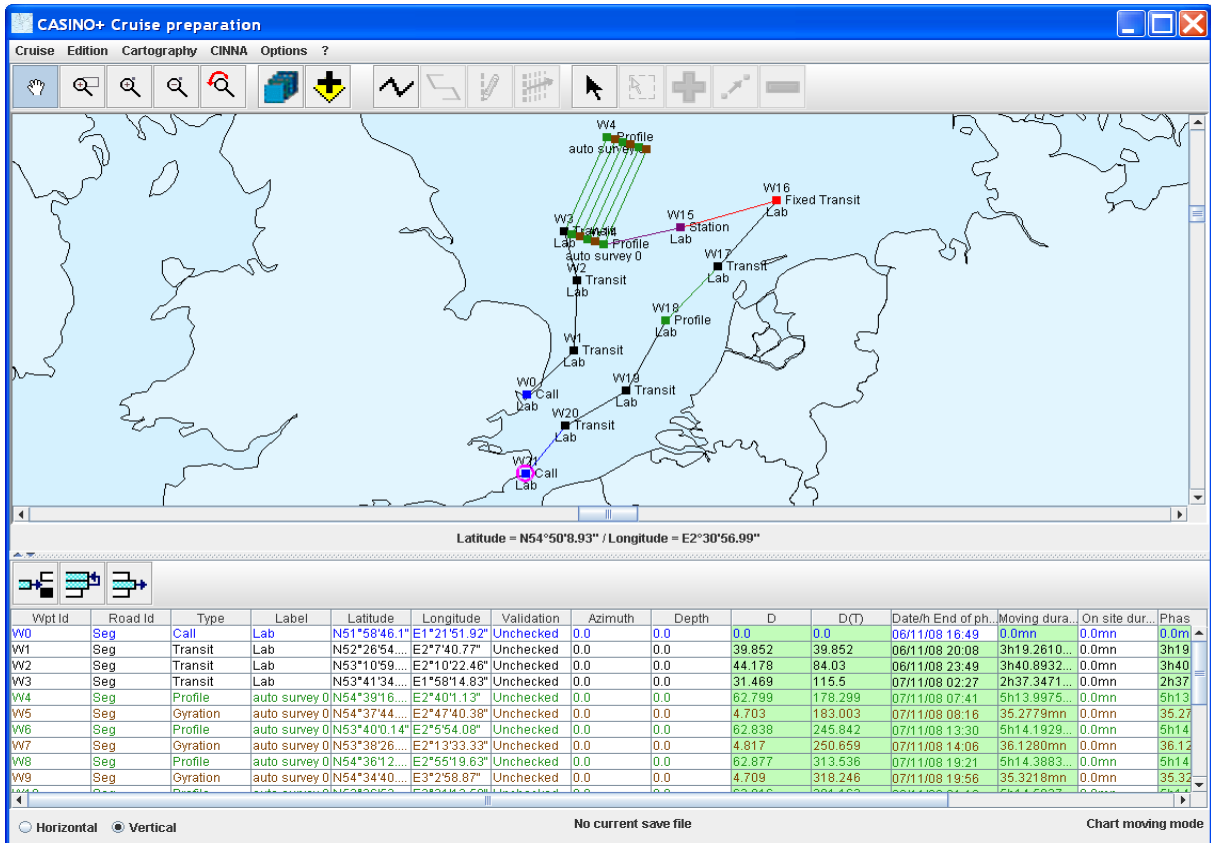
Echo-integration of trawled layers : back-scattered energy is quantified inside the trawl (black lines) and in the layers above or under the headrope of the trawl. Trawl efficiency can be derived from this analysis.

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Recommended hardware:
 PC running Windows 95/98/2000 or Windows NT with 128 Mbytes of memory

CASINO+ Cruise Planning Software

CASINO+ software © is a cruise planning software used to prepare the cruise navigation plan.



CASINO+ cruise planning navigation enables to:

- Define the waypoints of the navigation in the cartographic view or in the planning view (geographic positions, types: transit, station, profil, etc,...).
- Delete and add waypoints.
- Compute the distance between the waypoints and compute the accumulated distance.
- Compute the duration between the waypoints and the accumulated duration.
- Add a shapefile in the cartographic view.
- Save the waypoints in a GML file.
- Import from ascii file, from ARGIS ascii file, from HSA Endeavour Navigator file, from Kongsberg Simrad Merlin file.
- Export to ascii file, to HSA Endeavour Navigator file, to Kongsberg Simrad Merlin file.

Required hardware and software – 2008

PC Operating System

Fore more information, please browse through our internet site : <http://www.ifremer.fr/casino+>

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