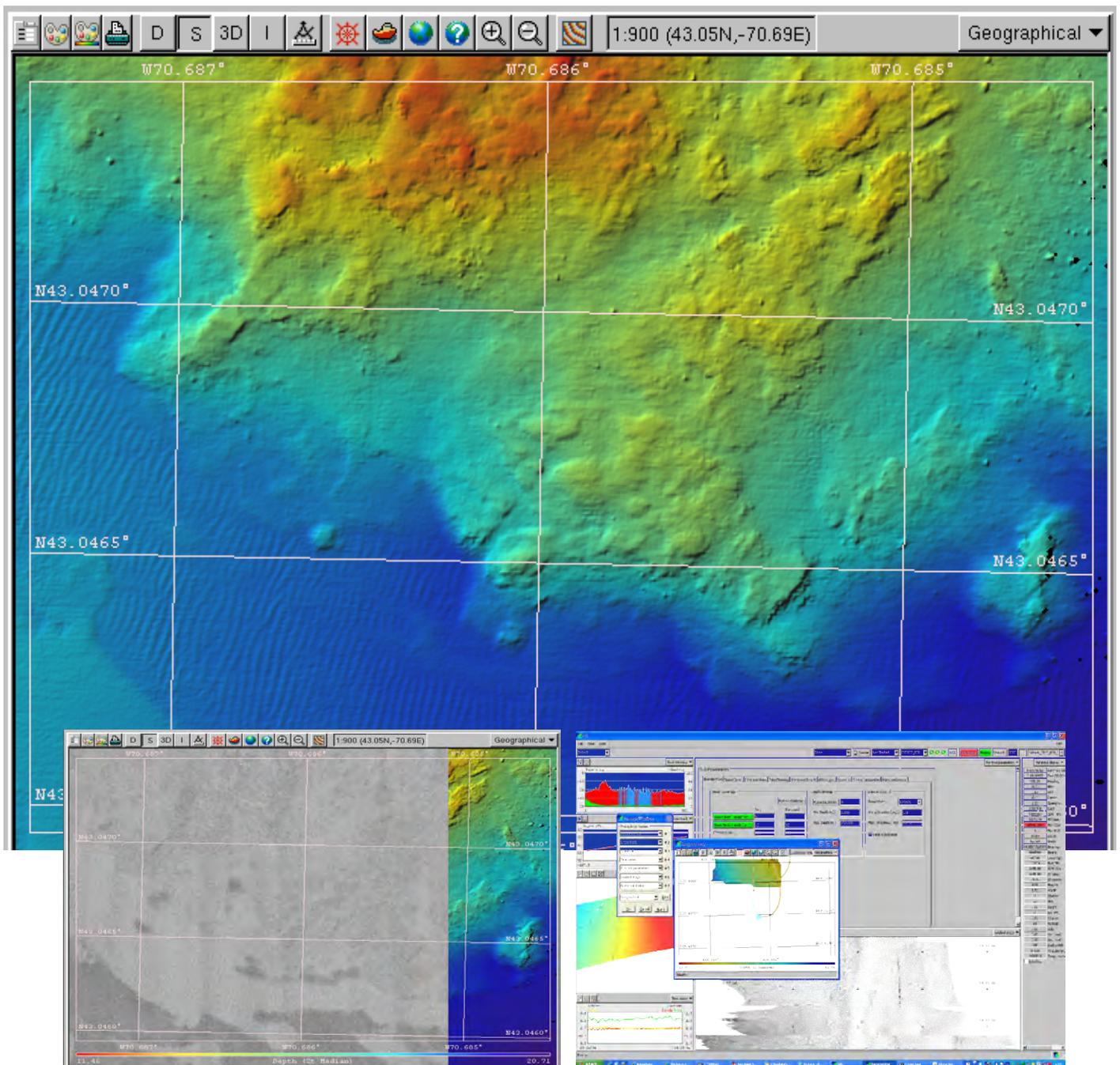




### Multibeam echo sounder software



## Introduction

The Seafloor Information System, SIS, is a real time software designed to be the user interface and the real time data processing system for hydrographic instruments produced by Kongsberg Maritime. Today the echo sounders EM 3002, EM 3001, EM 3000, EM 2000, EM 1002, EM 710, EM 302, EM 300, EM 122, EM 121A, EM 120, EM 2040, EM 2040C, ME 70, EA 400 and EA 600 are supported.

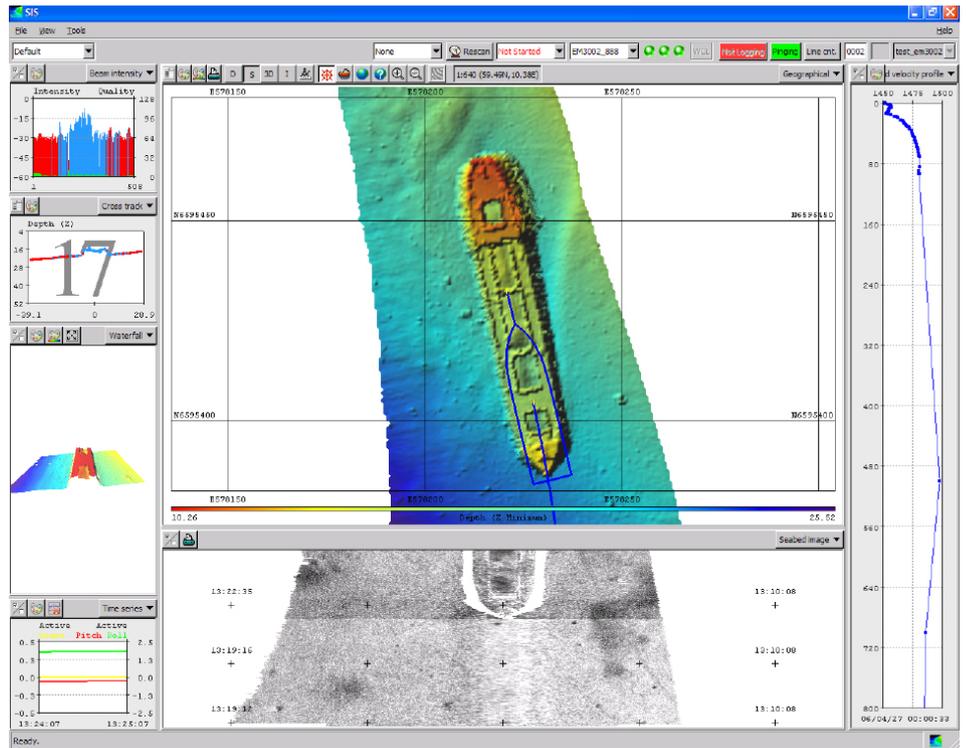
SIS operates under the Windows operating system, and is compatible with the HWS (Hydrographic Work Station) hardware. Up to two screens can be used on one HWS, and SIS can also show geographical displays on several remote PCs in the network.

The main task for SIS is to be an intuitive and user friendly interface for the surveyor, providing him with the functionality needed for running a survey efficiently. One major achievement in SIS is the capability to do real time data cleaning of bathymetric data. This is now possible thanks to increased computer speed and highly optimized software programs, which is needed because of the very high data volume produced by the new generation survey instruments.

SIS defines the screen layout with up to seven simultaneous panes. The boundaries between the panes can be shifted so that the pane sizes fits the user's needs, but SIS will make sure that no pane is hidden behind another. The information displayed in each pane can be freely defined by the operator. The screen layout can be stored so that each user can have his own preferences.

## Instrument control

SIS can control several instruments simultaneously. The user selects which instrument to operate, turn it on/off, store data on/off, change setup and operating parameters and export



data. There are graphical windows for quality checking of sensor input and the data produced. Sound speed at sonar head and sound speed profile input are interfaced and handled correctly in real time.

Multibeam echosounders have built-in tests which can be activated to verify that the hardware is working correctly. In addition SIS constantly monitors input data to ensure the data quality. Error situations are logged and user notifications are given with advice of what action the operator should take.

## Geographical window

The Geographical window can display a terrain model in 2D and 3D mode. In 2D mode background maps can be displayed (DXF, C-MAP, S-57, KSGPL ascii files, GeoTIFF are supported), planned survey lines, a user defined vessel symbol, raw (limited) soundings and gridded (unlimited) terrain model. In 3D mode the seafloor surface can be viewed from different angles and in different resolutions, the light source can be shifted, and the surface can be rotated around all axis to obtain the best view.

The Geographical window can be zoomed and panned, and it can

be set to follow the ship's position automatically.

Grid model from previous surveys can be imported and used as background information or used for comparison purposes.

A planning module makes it possible to define and edit planned lines, make parallel lines, define survey regions, etc. Plans can be imported and exported between systems.

SIS has an unique plotting module which not only makes screendumps, but properly scaled maps of the selected area to a postscript plotter of any size up to A0.

## Real time data cleaning

SIS includes highly efficient algorithms for automatic flagging of soundings which should be eliminated from the survey. The soundings are not removed, simply flagged as invalid so it is always possible to reverse the decision easily. For the majority of user needs, this processing will be satisfactory so that further processing is made either not necessary or at least substantially reduced.

The terrain model is generated in real time from input of all

soundings available in one area, not just the current soundings, but all previous soundings in that area. The processing algorithm automatically chooses the best cell size, and then defines a curved surface through the majority of the soundings in that cell. This adaptive approach makes the processing very robust and “clouds” of invalid soundings (like schools of fish) can be flagged invalid automatically.

The gridding algorithm updates a multi-resolution display grid which makes it possible to select a grid with the best fit resolution to the selected map scale. Large areas can then be displayed with low resolution, but still important details can be shown. SIS can quickly zoom to smaller areas and display the terrain in full detail, even down to every single depth point.

## Watercolumn

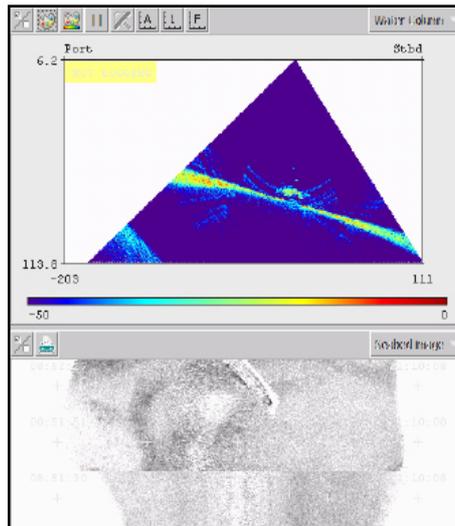
The new multibeam echosounders have built-in support for imaging of acoustic reflectors in the watercolumn like fish or other biomass, submerged bouys, moorings etc. SIS can store and display this data.

## Seabed image

SIS provides three views of seabed image data from multibeam echosounders. In the first view, the user is presented with a classical time/across window where all seabed image is displayed along a time-axis. Second, in the Geographical window the user can see a low resolution seabed image mosaic by simply displaying reflectivity per display cell. Third, in Geographical window the user can call for a high resolution seabed image mosaic image to be displayed on top of the terrain. The resolution is typically 9 to 25 times higher than the maximum resolution of the bathymetric data.

## GPS RTK and tide input

SIS provides users of GPS RTK systems to use geoid models in real



time. The distance from the vertical reference to the seafloor, the distance from the geoid to the seafloor, and the distance from the ellipsoid to the seafloor are all calculated in real time. This eliminates heave and tide effects in the data in real time.

Tide input can also be used in real time, either predicted tide from ascii files, or tide input from serial lines or network interfaces.

## ROV operations

ROV operations are also supported in SIS. The depth of the ROV can be given to the echosounder in real time, and SIS will create a terrain model from the data collected by the ROV. Displays like Crosstrack and Waterfall are also useful when running a ROV survey.

## SIS Objects

An addition to SIS makes it

possible to add markers during survey. The user can define a set of lines, points, images and text to be displayed, and then the user can add such objects during survey. Such markers can be bouys, wrecks, shoals, coastlines, dryfall, etc. These objects can be exported to xml-files, and they can be read and displayed as background information later.

## Singlebeam echo sounders

Singlebeam echo sounders EA 400/600 can be controlled by SIS. SIS will automatically detect their presence on the network and allow the SIS operator to start/stop pinging and start/stop logging of data from them. Data can still be stored as EA-data, as SIS survey data, or both. The depths from the EA will be displayed in the Geographical window.

## TerraPOS integration

SIS integrates logging of raw GNSS observations from the Seapath 300 system. This data can later be post-processed by TerraPOS (by TerraTec) to give very precise positions, typically 6 cm horizontally and 8 cm vertically (95%), without use of GPS reference signals. This process is highly automated in SIS and very easy to use.

## Advanced functions

- Controls several echo sounders simultaneously, also singlebeam
- SIS Objects for adding objects into the geographical view in SIS
- High resolution seabed mosaic image displayed in the geographical view
- Real time data cleaning of bathymetric data
- Enhanced functions for visual and automated data quality control
- Unique features for plotting of scaled maps in size up to A0
- Imaging of acoustic reflectors in the water column (fish, biomass, etc.)
- Real time computation of the mean sea level using a geoid model
- Real time compensation for tide
- Fully operational when echo sounder is mounted on ROV/AUV
- Post processing of GNSS raw data using TerraPOS to achieve high accuracy positioning

# SIS - Seafloor Information System

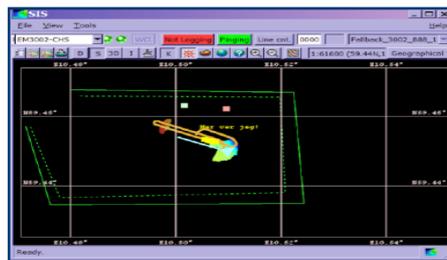
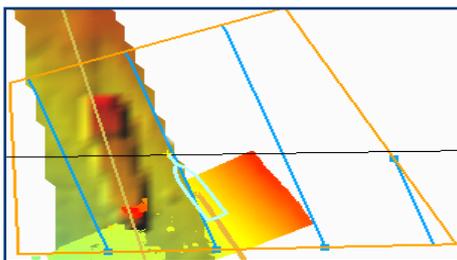
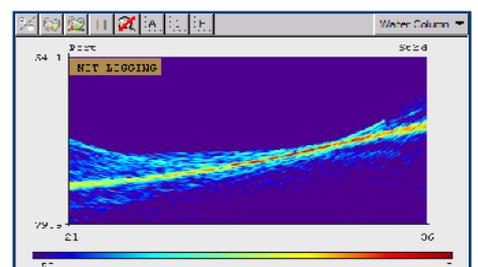
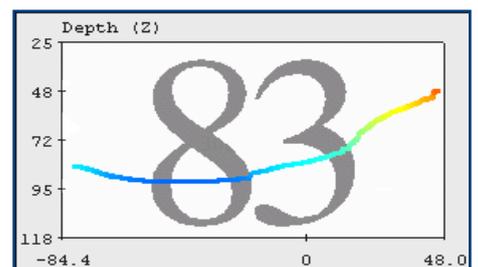
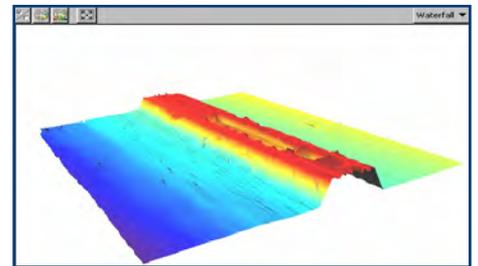
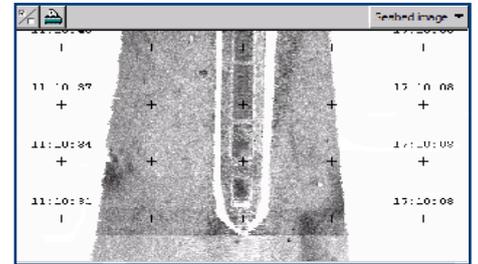
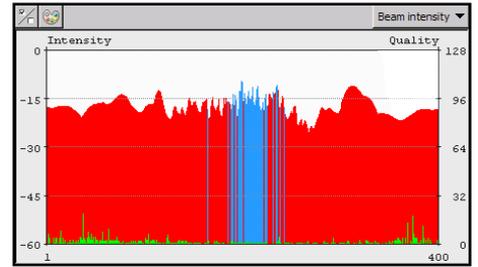
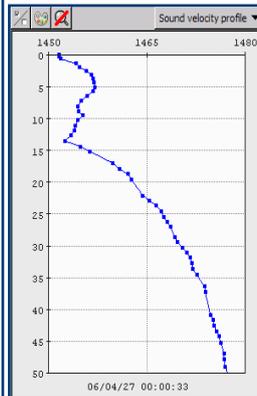
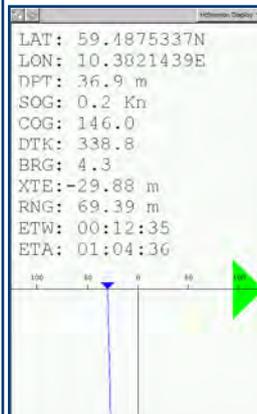
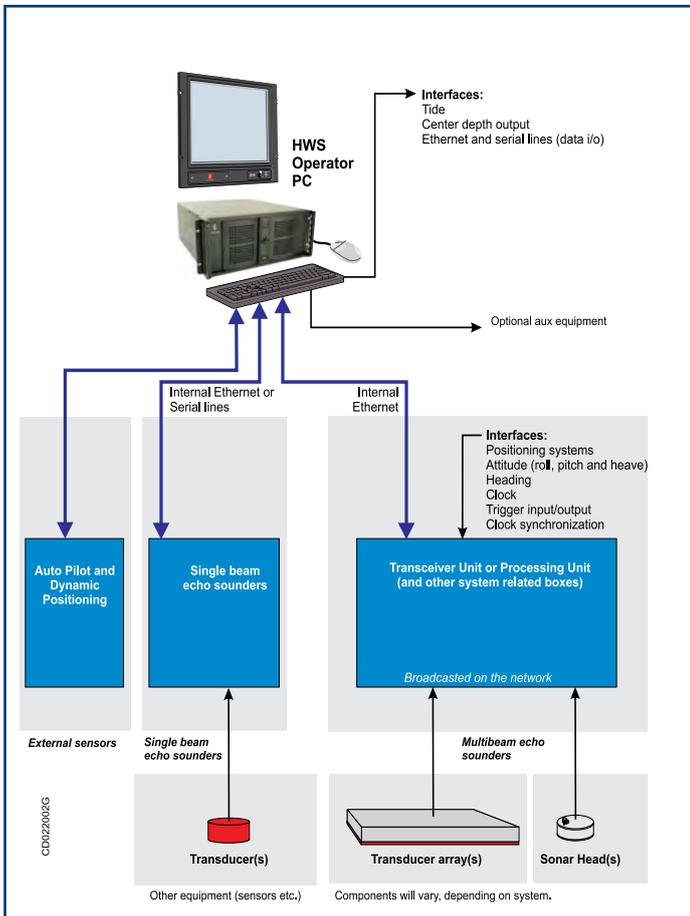
## System information

- SIS runs on Windows XP and Windows 7 64-bits
- Hardware requirement: HWS or equivalent, 1 to 2 displays
- Licence control: Dongle in the USB-port.

## Options/versions

- Basic/Instrument control: No licence needed
- SIS Light: Licensed
- Multibeam support: Licensed, requires SIS Light
- Real Time Data Cleaning: Licensed, requires Multibeam support
- Watercolumn: Licensed, requires Multibeam support
- Automatic calibration: Licensed, requires Multibeam support
- SIS Objects: Licensed

SIS Instrument Control is compatible with 3. parth software



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