



KONGSBERG

# Kongsberg Maritime

## 13th MACHC Meeting

La Antigua, Guatemala 19th to 22nd November 2012

by

Chris Hancock and Jan Haug Kristensen



# Organisation



# Core business areas

## Kongsberg Maritime



Dynamic positioning systems

Automatic positioning of vessels, regardless of weather conditions



Navigation systems

Systems for navigation and the identification of vessels



Monitoring & control systems

Systems for monitoring and control of engines, cargo and propulsion



Process automation

Systems for control and coordination of different operations on oil platforms or production ships



Subsea

High-tech products using sound waves for seabed surveying, subsea communication, positioning and monitoring. Marine electronics for fisheries (SIMRAD)

# Milestones singlebeam echosounders



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- 1975: EA - Simrad's first Hydrographic Singlebeam Echo Sounder
- 1977 EA 100 – 2 channel SBE,
- 1980 EA 300 – 2 channel SBE, replacing EA og EA 100
- 1983 EA 300P – 2 channel portable SBE
- 1988: EA 500 – 3 channel SBE, replacing EA 300
- 1995 EA 501P – 1 channel portable SBE, replacing EA 300P
- 1997: EA 502 – 2 channel
- 1998: EA 400 – 4 channel SBE, replacing EA 500
- 2000: EA 600 – 4 channel SBE, replacing EA 500
- 2004: EA MCU

# Milestones Multibeam echosounders



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1986: EM 100 - Simrad's first Multibeam Echo sounder

1990: EM 12 - First deep water Multibeam

1992: EM 1000 replaces the EM 100

1993: EM 121

1995: EM 3000

1996: EM 300

1998: EM 1002 replaces EM 1000

1999: EM 120 replaces EM 12 and EM 121

2000: EM 2000

2004: EM 3002 replaces EM 3000

2005: EM 710 replaces EM 1002

2006: EM 302 replace EM 300

2007: EM 122 replace EM 120

2008: Acquired Geoacoustics

**2009: EM 2040 replaces EM 3002 and EM 2000**

2012: EM 2040 C (C = Compact) released

# Product range - 2011



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Model	Frequency	Range	Coverage
Geoswath +	125,250,500kHz	0.5 - 200m	12xD
EM 2040	200-400kHz	0.5 - 500m	5.5xD / 140-200 deg
EM 3002	300 kHz	0.5 - 270m	4-10xD / 130-200 deg
EM 710	70-100 kHz	3 - 2000m	5.5xD / 140 deg
EM 302	30 kHz	10 - 7000m	5.5xD / 140 deg
EM 122	12 kHz	50 - 11000m	6xD / 150 deg
SBP 120/300	2.5 - 7 kHz	20 - 11000m	3,6,12 degree
TOPAS PS18	0.5 – 6 kHz	20 – 11000m	5 degree
TOPAS PS40	1 – 10 kHz	4 – 1000m	5 degree
GeoChirp II	2 – 12 kHz	Towed	55 degree
EA 400/600	12-710kHz	0.5 - 11000m	
2094 digital SSS	114/410 kHz	Towed	
HiSAS 1030	70-100 kHz	AUV	>400m

Number of system sold: >1000 EM multibeam systems / >1250 EA singlebeam systems

# Product range - 2011



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## Model

## Geoswath+ Wide swath bathymetry system

### Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

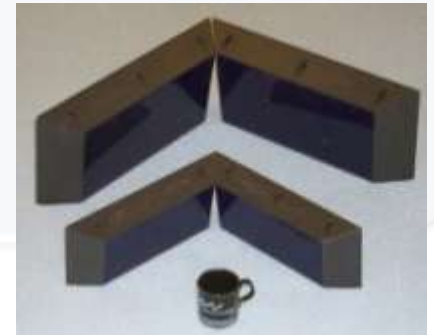
2094 digital SS

HiSAS 1030

Applications from shallow to very shallow water surveys

### Key features:

- 125 / 250 and 500 kHz version available
- Max range >200, 100 and 50 m
- Dual transducer system
- Max coverage 780 / 390 and 195m or >12x D (240dg)
- Along track beam width 0.85°(125), 0.75(250), 0.5(500)
- Depth resolution 6mm(125), 3mm(250), 1.5mm(500)
- Pulse length 32  $\mu$ s to 896  $\mu$ s
- Pingrate >30Hz
- For ROV / AUV
- Transducer depth rating 4000m



# Product range - 2011



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## Model

## Geoswath+ Wide swath bathymetry system

### Geoswath +

EM 2040  
EM 3002  
EM 710  
EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

EA 400/600  
2094 digital SS

HiSAS 1030





# Product range - 2011



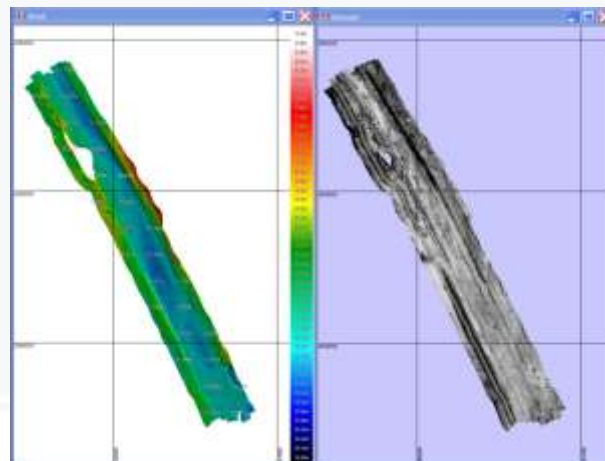
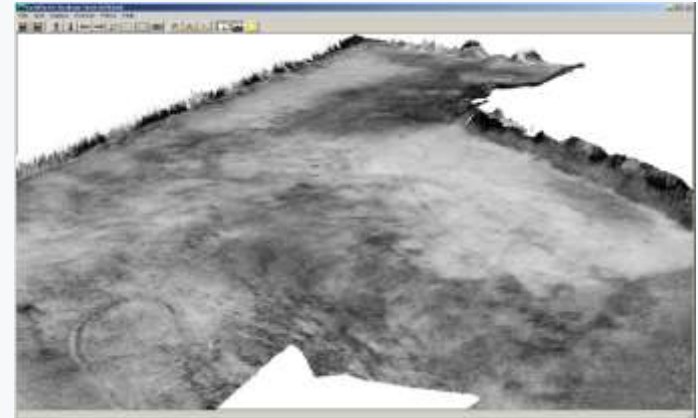
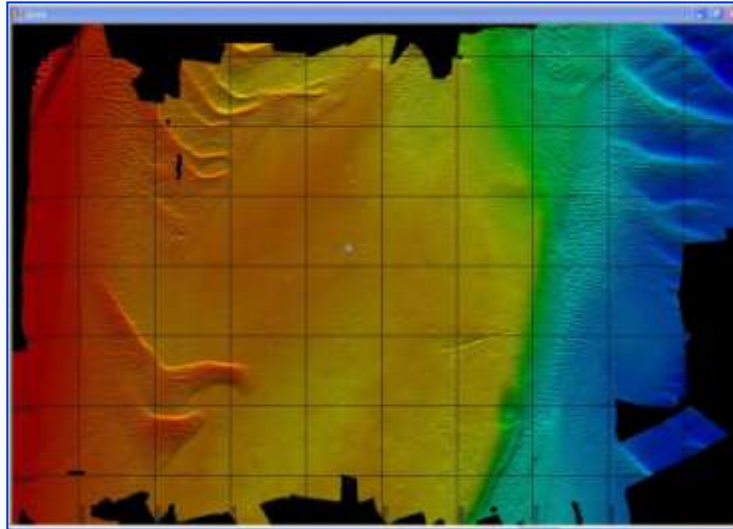
KONGSBERG

## Model

## Geoswath+ Wide swath bathymetry system

### Geoswath +

- EM 2040
- EM 3002
- EM 710
- EM 302
- EM 122
  
- SBP 120/300
- TOPAS PS18
- TOPAS PS40
- GeoChirp II
  
- EA 400/600
- 2094 digital SS
  
- HiSAS 1030



# Product range - 2011



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## Model

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030

## EM 2040 True wide band and high resolution Multibeam echosounder

Applications from very high resolution  
inspection to shallow water surveys

### Key features:

- 200 – 400 kHz operating frequency
- Max range >500m
- Single and dual RX
- Max coverage >500m, 140dg(S)/200dg(D)
- Dual swath with 800 soundings
- Sector transmitting, 3 sectors
- Modular design 0.5x1 and 1x1 (300kHz)
- Pingrate >50Hz
- Pulse length from <20ms to 600us using FM chirp and CW
- Roll, pitch compensated
- Roll, pitch, yaw stabilized
- Transducer depth rating 6000m



# Product range - 2011



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## Model

## EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

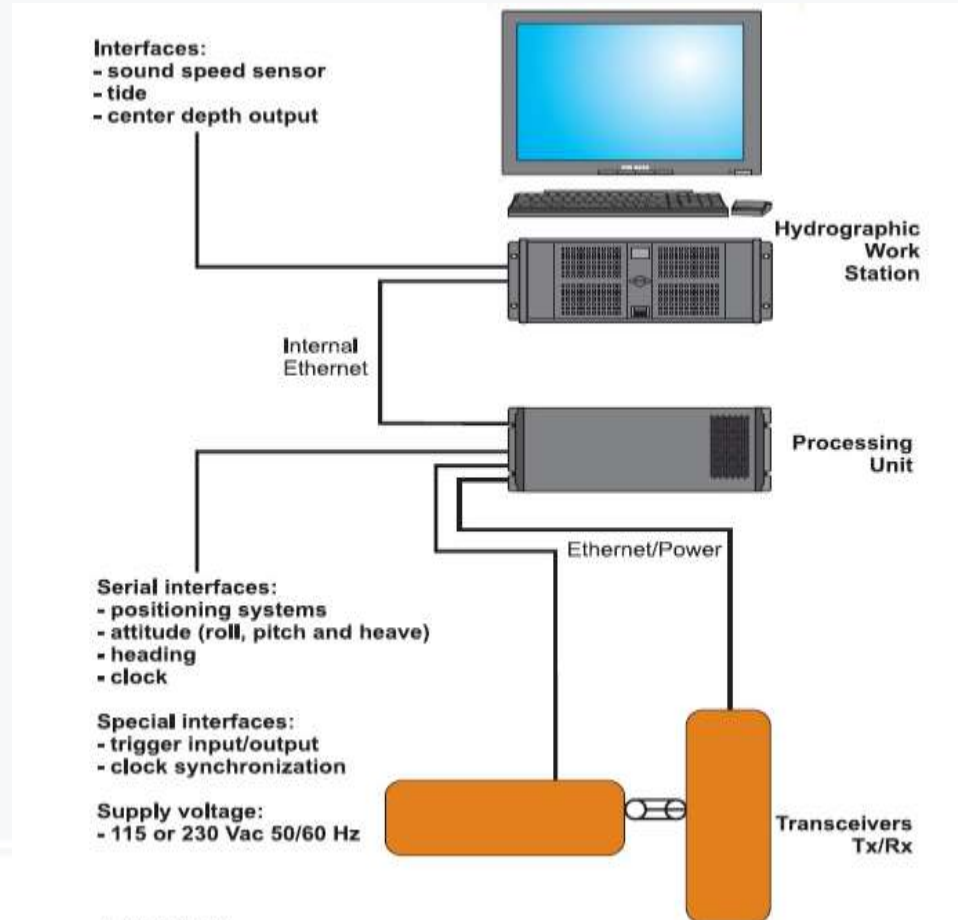
TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



# Product range - 2011



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## Model

## EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

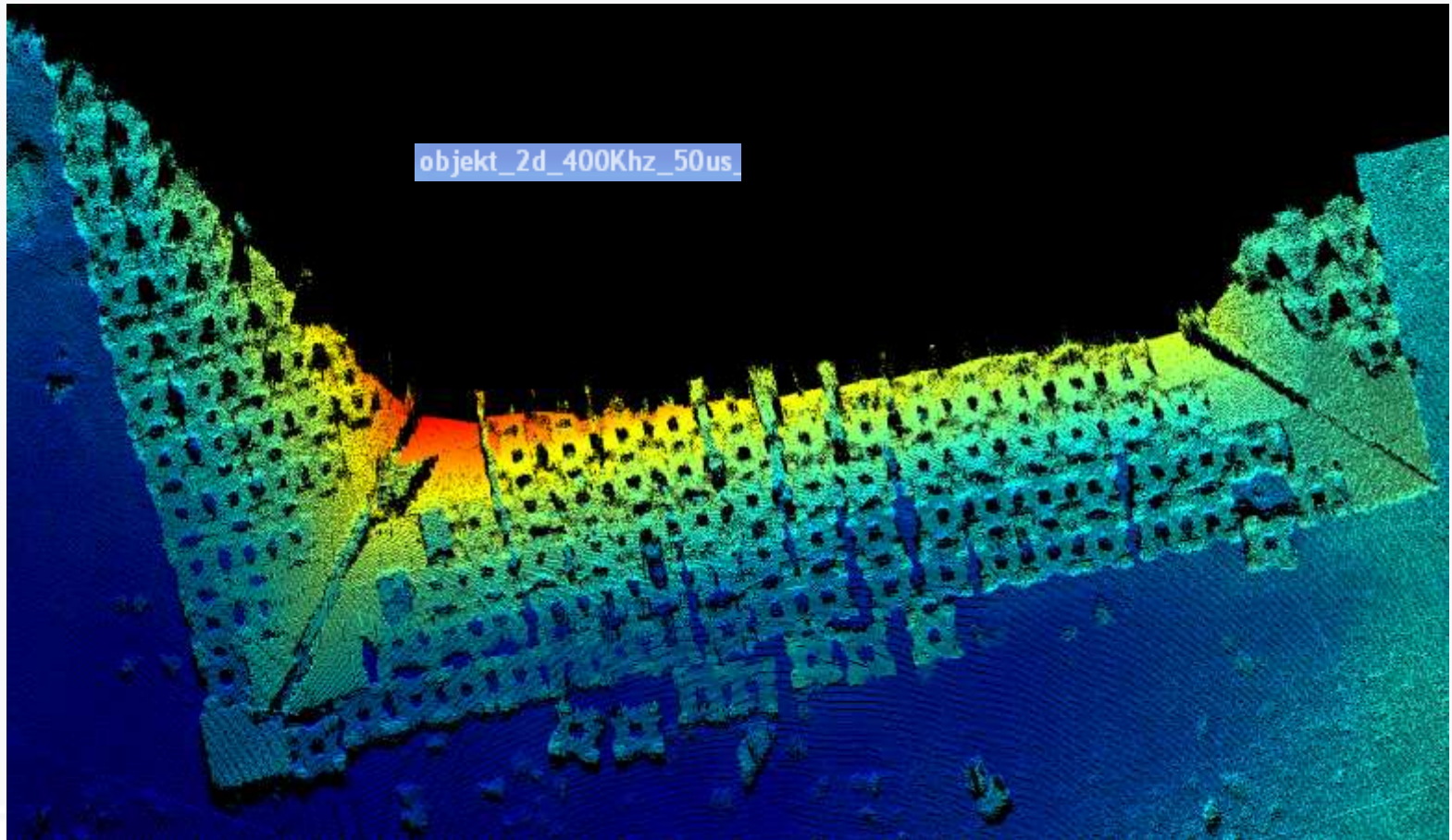
TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



# Product range - 2011



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## Model

### EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

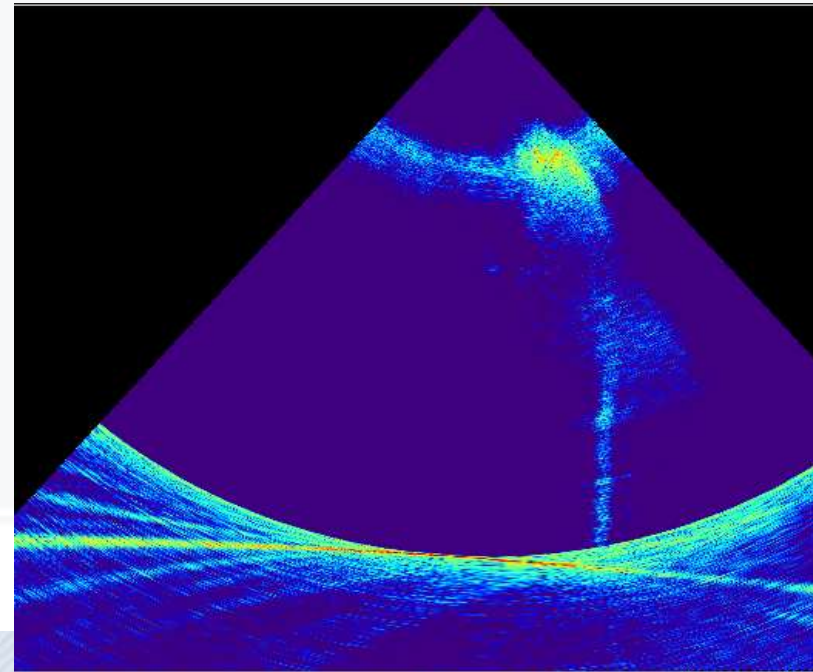
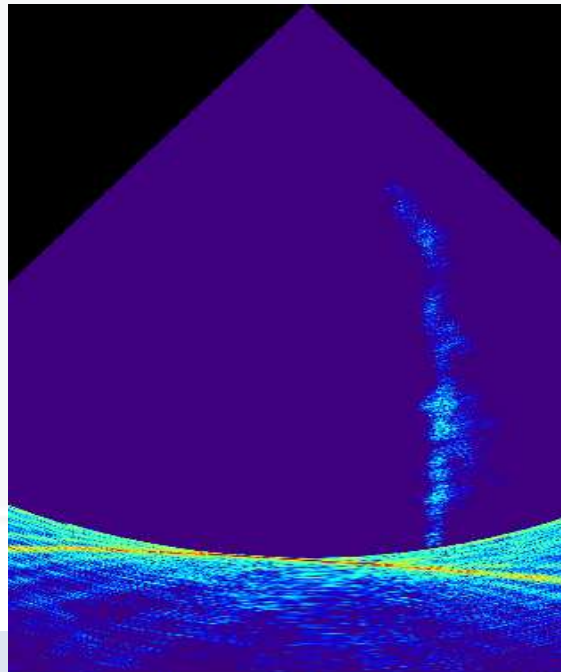
2094 digital SS

HiSAS 1030

Passing over a forced  
hydrocarbon leakage

Mode: 400 kHz

Water depth: 20 m



# Product range - 2011



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## Model

### EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030

Victor Hensen installation:

EM 2040

0.5 \* 1 degree

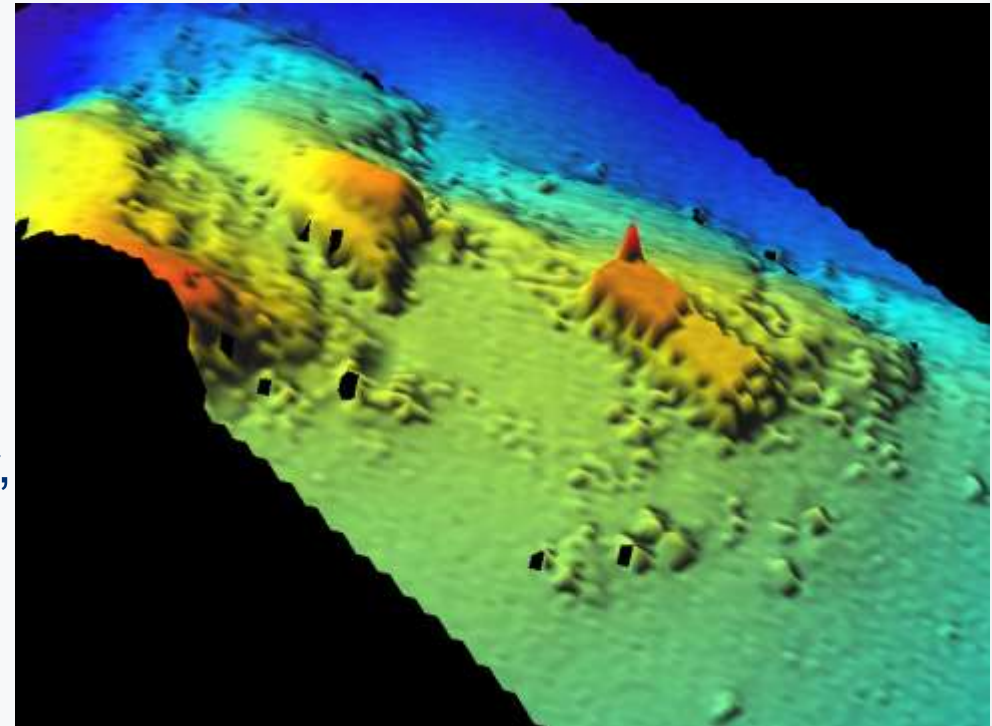
Dual swath

Concrete target 2\*8 m

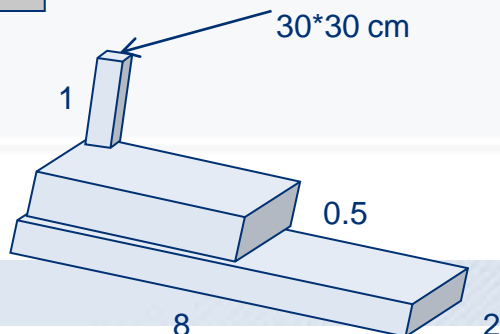
One half is 50 cm higher

A 1 m "tower" at the corner,  
30\*30 cm at top.

19 m depth



400 kHz, 50 us, one single line,  
gridded.



@Fugro OSAE, Victor Hensen

# Product range - 2011



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## Model

## EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

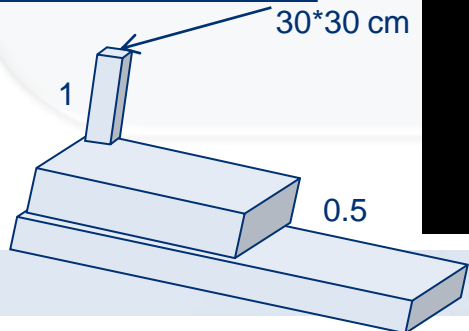
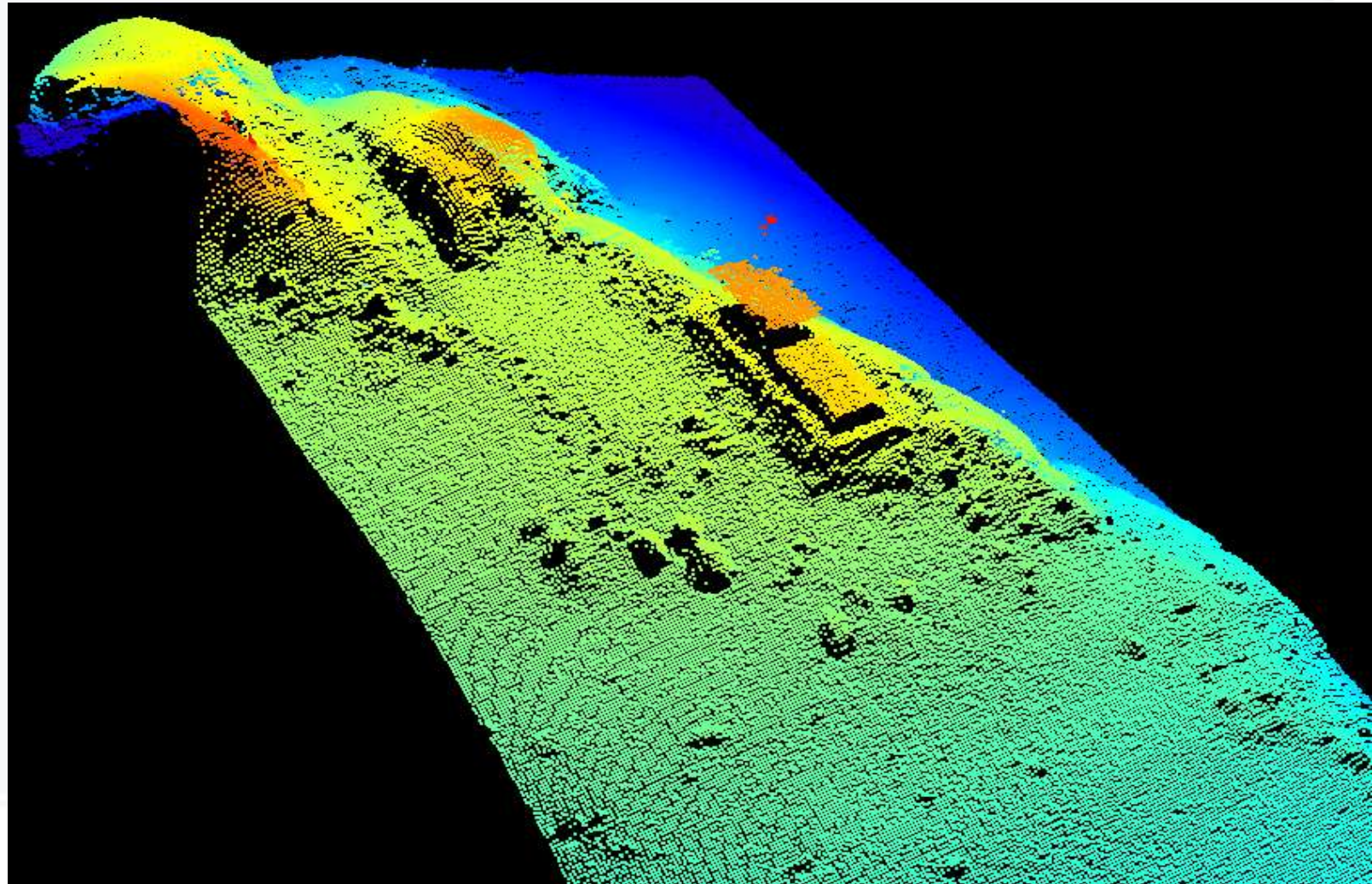
TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



Same line, 3D, allpoints. Std = 2 cm on target surface

# Product range - 2011



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## Model

## EM 2040 True wide band and high resolution Multibeam echosounder

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

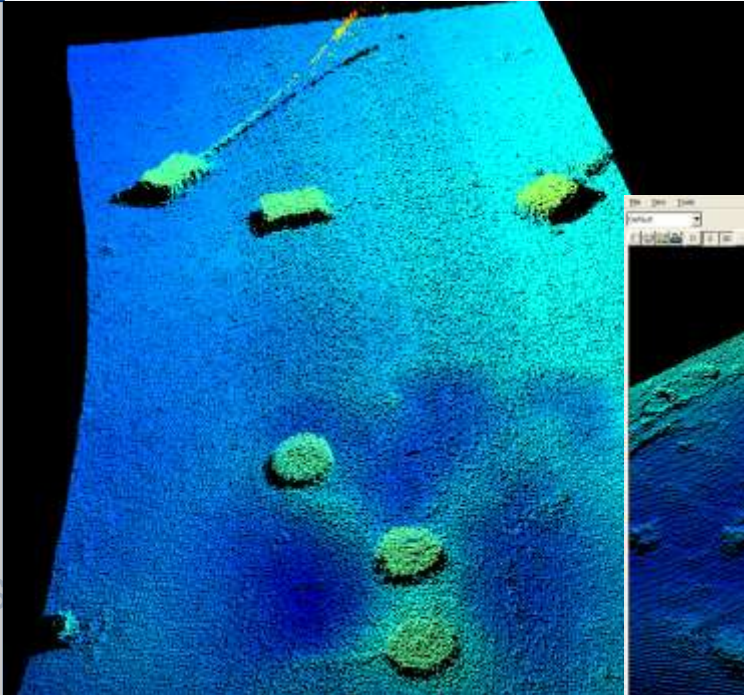
TOPAS PS40

GeoChirp II

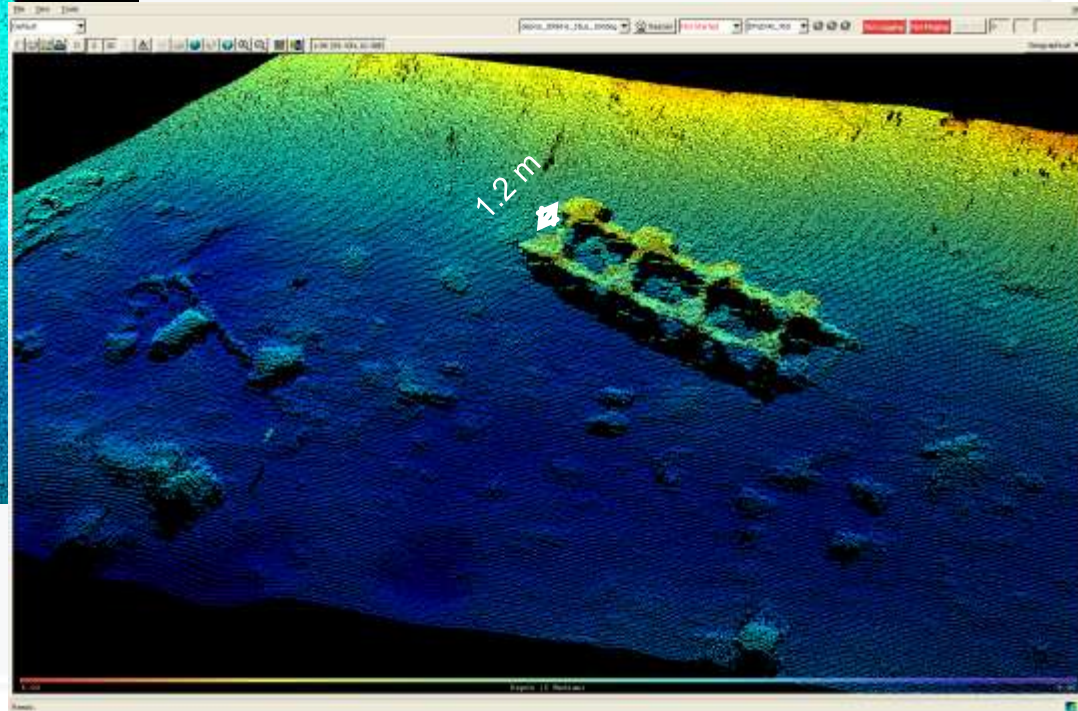
EA 400/600

2094 digital SS

HiSAS 1030



Marina moorings  
(1m diameter),  
allpoints



Debris, allpoints, 3D



# Product range - 2011



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## Model

### EM 2040 True wide band and high resolution Multibeam echosounder

ROV test at 2000m depth  
GOM

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

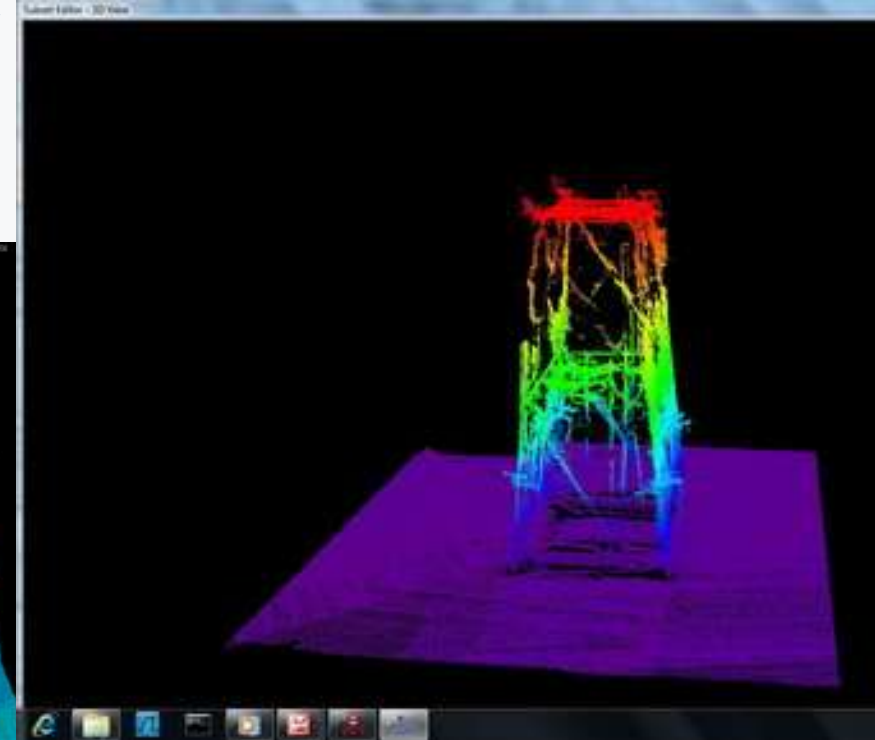
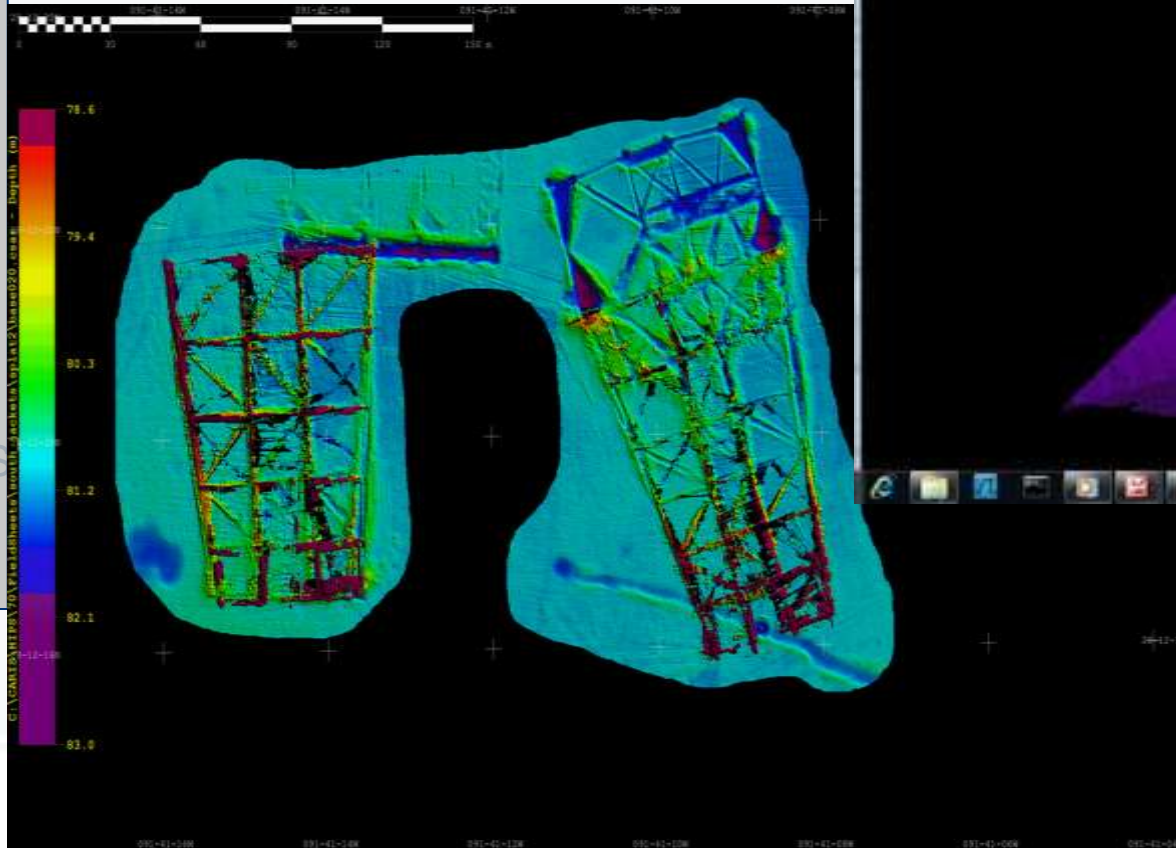
TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



Courtesy of Chevron

# Product range - 2011



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## Model

## EM 2040 True wide band and high resolution

Geoswath +

EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



Pole mounting, over the side

# Product range - 2011



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## Model

## EM 3002 High resolution Shallow water Multibeam echosounder

Geoswath +  
EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030

Applications from high resolution  
inspection to shallow water surveys

### Key features:

- 300 kHz operating frequency
- Max range >270m
- Single or dual sonar head configuration
- Swath coverage of 130deg (S) / 200deg (D)
- 1.5 x 1.5 beam width
- Pingrate >40Hz
- Pulse length of 50ms to 400us using CW
- Dynamic focusing on receive
- Roll, pitch compensated
- Roll, pitch stabilization
- Compliance with IHO Special order

# Product range - 2011



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**Model**

## EM 3002 High resolution Shallow water Multibeam echosounder

Geoswath +  
EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

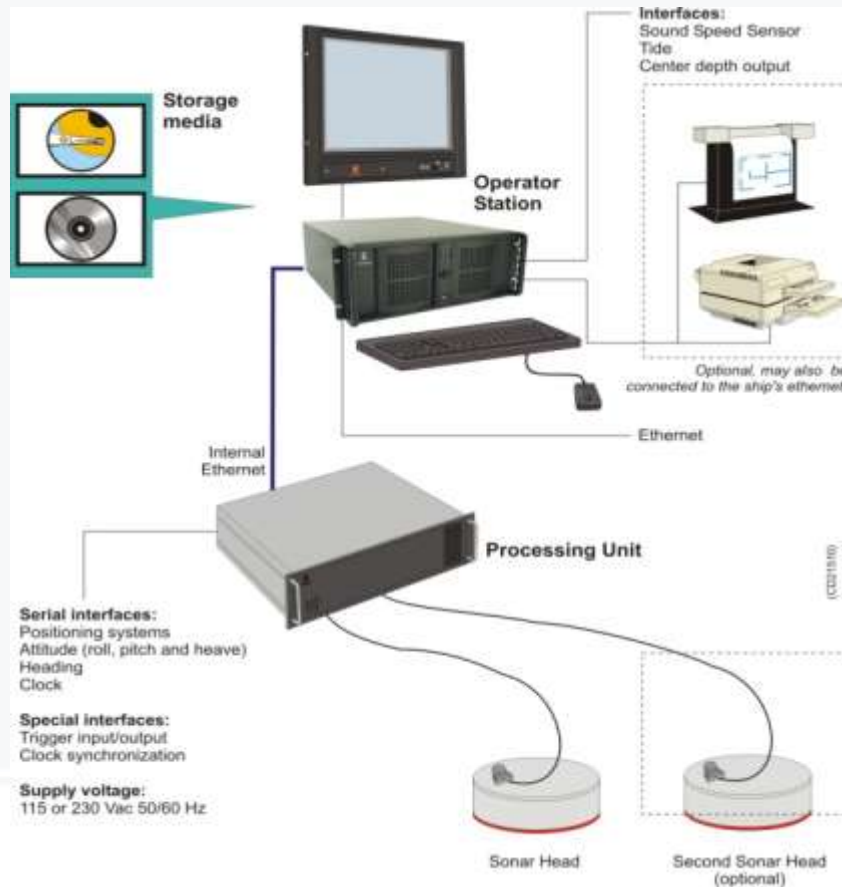
GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030

Applications from high resolution  
inspection to shallow water surveys



# Product range - 2011



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## Model

## EM 3002 High resolution Shallow water Multibeam echosounder

Geoswath +  
EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

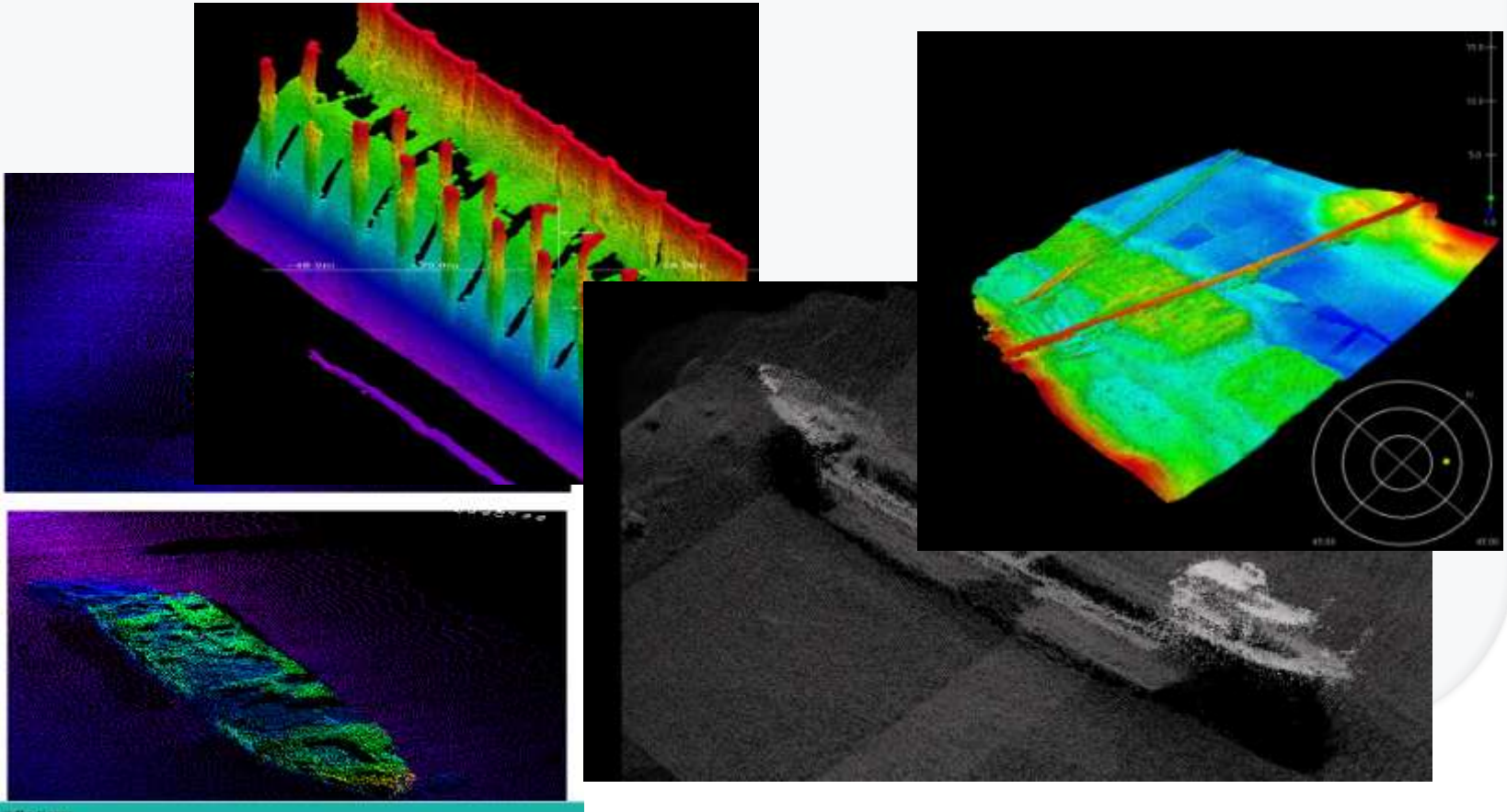
GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030

Applications from high resolution  
inspection to shallow water surveys



# Product range - 2011



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**Model**

## **EM 3002 High resolution Shallow water Multibeam echosounder**

Applications from high resolution  
inspection to shallow water surveys

Geoswath +  
EM 2040

EM 3002

EM 710

EM 302

EM 122

SBP 120/300

TOPAS PS18

TOPAS PS40

GeoChirp II

EA 400/600

2094 digital SS

HiSAS 1030



Bow mount



Retractable hull unit



Blister

# Product range - 2011



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## Model

## EM 710 High resolution wide band Medium water Multibeam echosounder

Geoswath +  
EM 2040  
EM 3002

### EM 710

EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

EA 400/600  
2094 digital SS

HiSAS 1030

Applications from high resolution to  
medium water survey

### Key features:

- Operating frequency 70 to 100 kHz
- Max range >2000m
- Max coverage >2500m / 140dg
- Modular design, from 0.5x1 to 2x2 degree beam width
- Dual swath with 800 soundings
- Sector transmitting, 3 sectors for increased performance
- Pingrate >30Hz
- Pulse length from 0.2ms to 120ms utilizing CW and FM
- Dynamic focusing on both transmit and receive
- Roll, pitch compensated
- Roll, pitch, yaw stabilization
- Compliance with IHO Special order

Shoal of fish

# Product range - 2011



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## Model

## EM 710 High resolution wide band Medium water Multibeam echosounder

Geoswath +  
EM 2040  
EM 3002

### EM 710

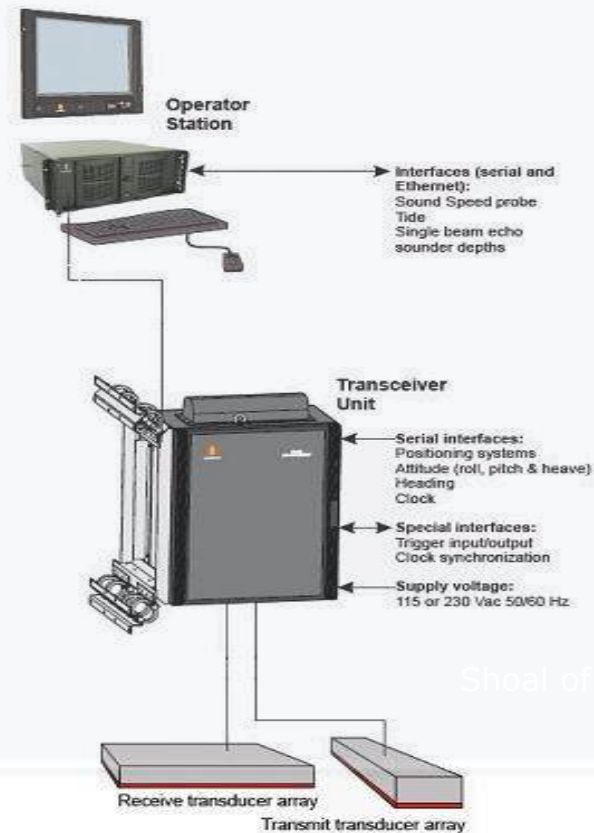
EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

EA 400/600  
2094 digital SS

HiSAS 1030

Applications from high resolution to  
medium water survey





# Product range - 2011



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## Model

## EM 710 High resolution wide band Medium water Multibeam echosounder

Geoswath +  
EM 2040  
EM 3002

### EM 710

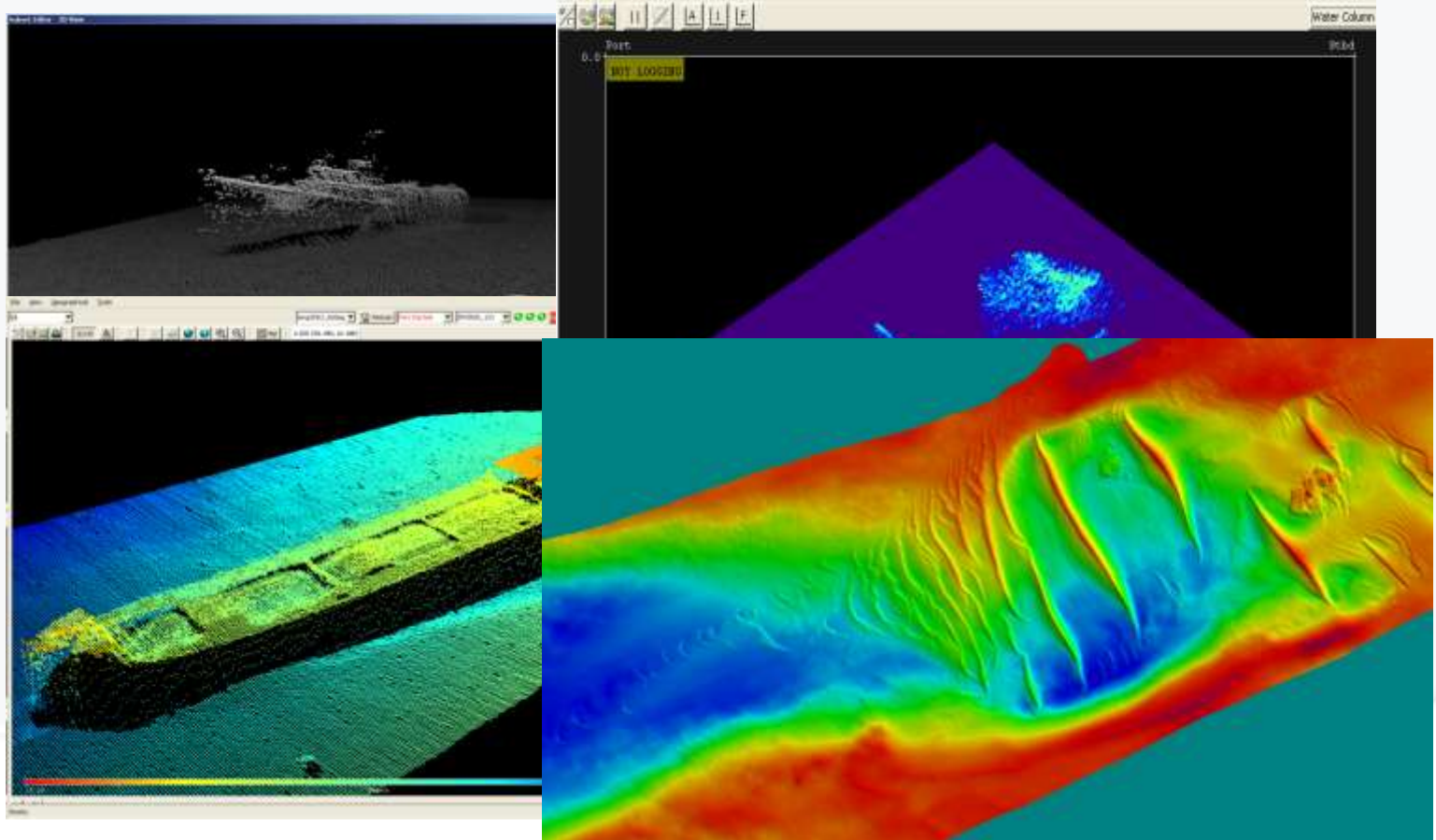
EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

EA 400/600  
2094 digital SS

HiSAS 1030

Applications from high resolution to  
medium water survey



# Product range - 2011



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## Model

## EM 302 Deep water Multibeam echosounder

Applications from medium to deep water surveys, for the continental rise including the shallower ocean basins, down to 7000m.

Geoswath +  
EM 2040  
EM 3002  
EM 710

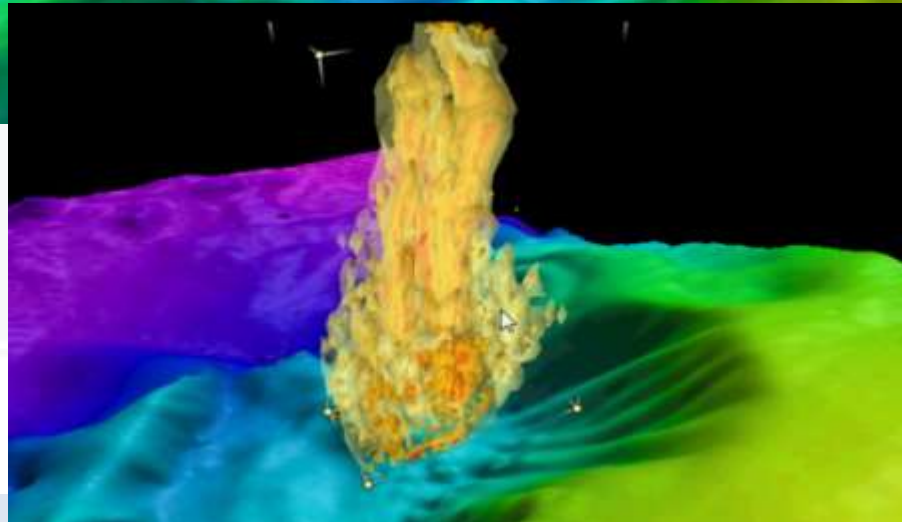
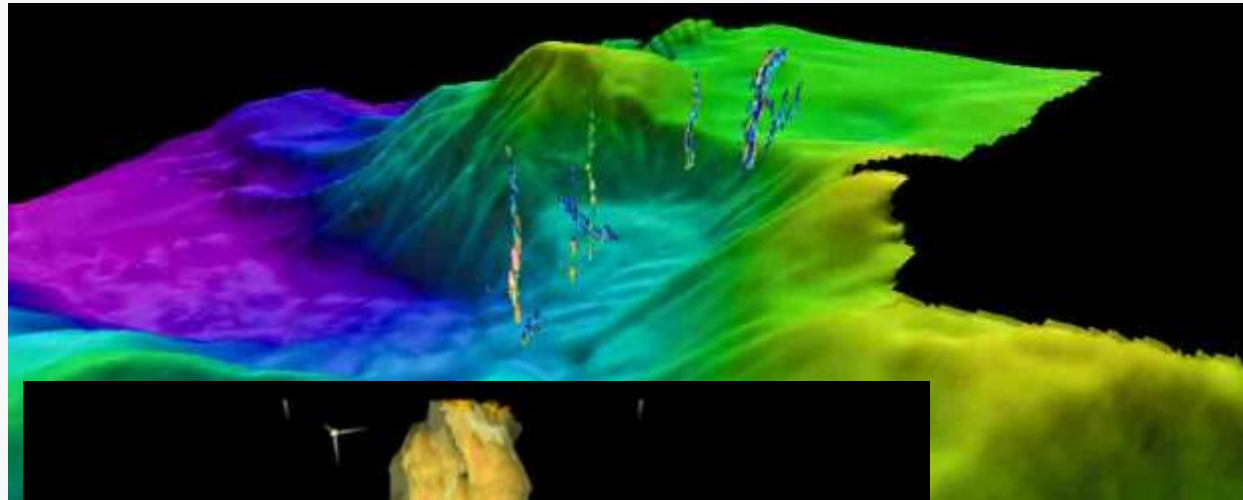
### EM 302

EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

EA 400/600  
2094 digital SS

HiSAS 1030



Bubbles from Subsea Chimney, detected Using Water column From EM 302

Courtesy of NOAA, Okeanos Explorer





# Installations examples

Deep water multibeams  
Gondola and blister installations



# Product range - 2011



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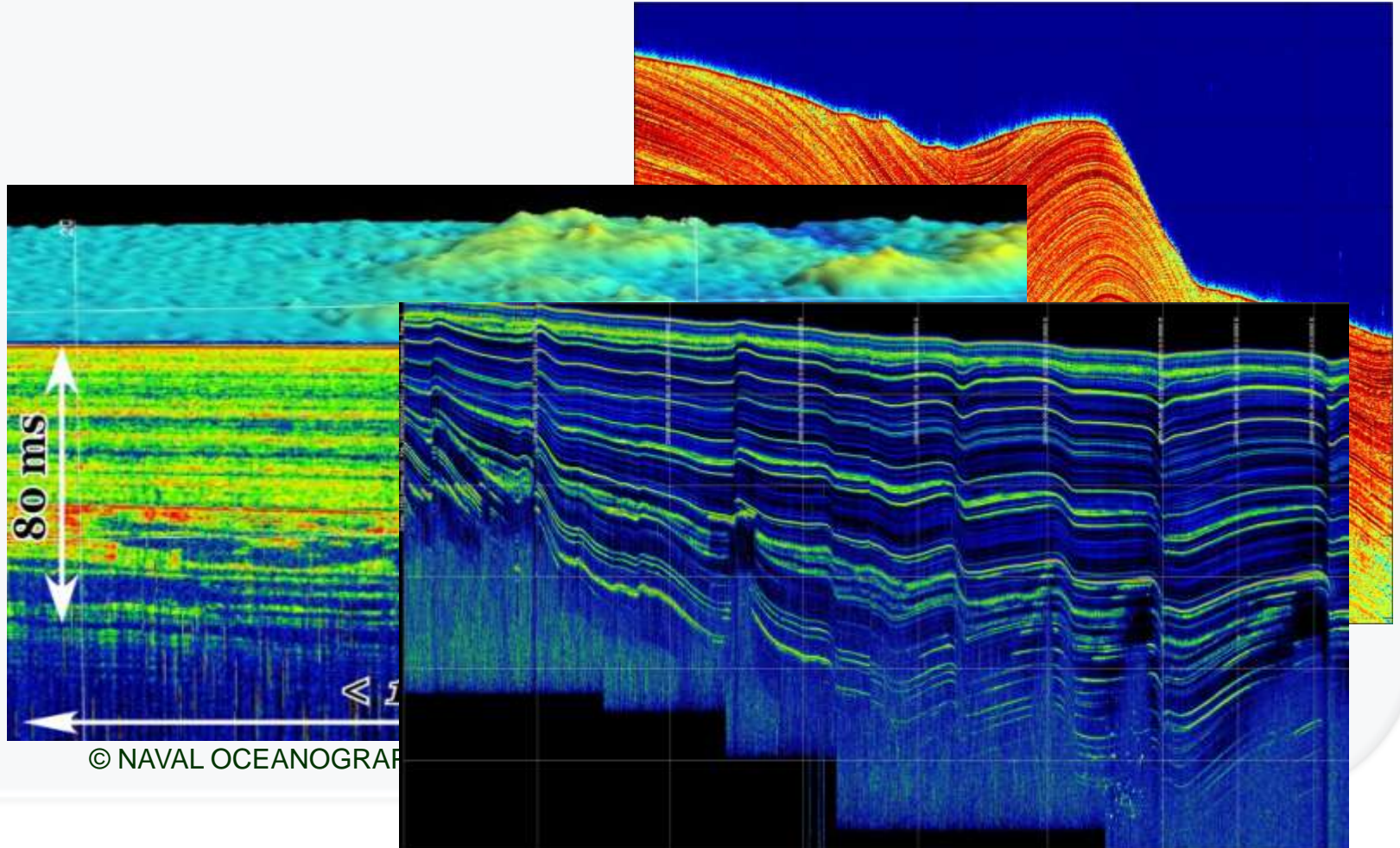
## Model

## SBP 120 and SBP 300 Sub bottom profiler extension to EM 122 and EM 302

Geoswath +  
EM 2040  
EM 3002  
EM 710  
EM 302  
EM 122

## SBP 120/300

TOPAS PS18  
TOPAS PS40  
GeoChirp II  
  
EA 400/600  
2094 digital SS  
  
HiSAS 1030



Data courtesy of NAVAL OCEANOGRAPHIC OFFICE

# Product range - 2011



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## Model

## EA 400 / EA 600 hydrographic singlebeam echosounders

Geoswath +  
EM 2040  
EM 3002  
EM 710  
EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

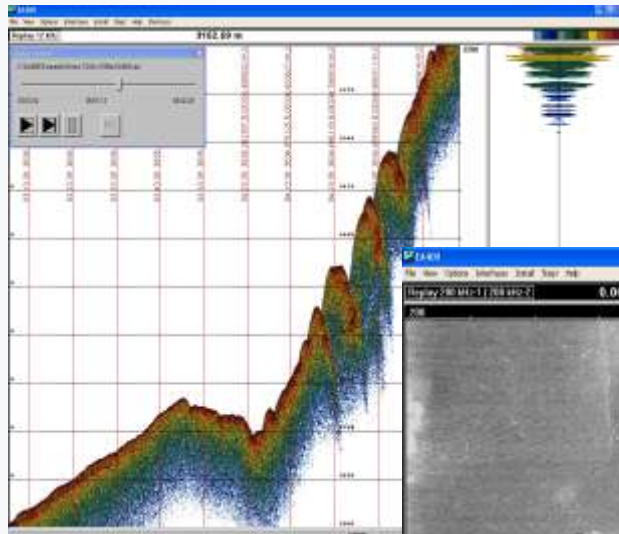
EA 400/600

2094 digital SS

HiSAS 1030

### Key features:

- EA 400 operating frequency 33 – 710 kHz
- EA 600 operating frequency 10 – 710 kHz
- Up to 4 channels per system
- 2 channels per GPT



# Product range - 2011



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## Model

## Sonar 2094 Digital sidescan sonar, Towed

Geoswath +  
EM 2040  
EM 3002  
EM 710  
EM 302  
EM 122

SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II

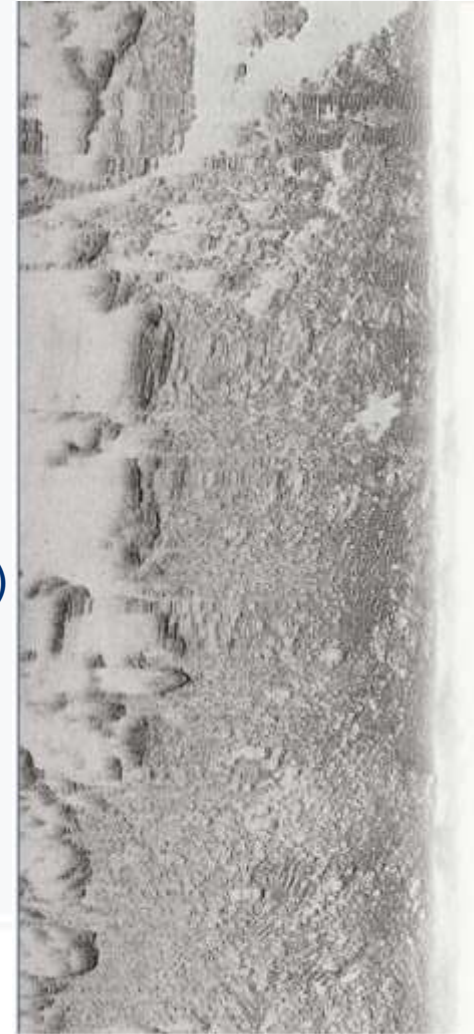
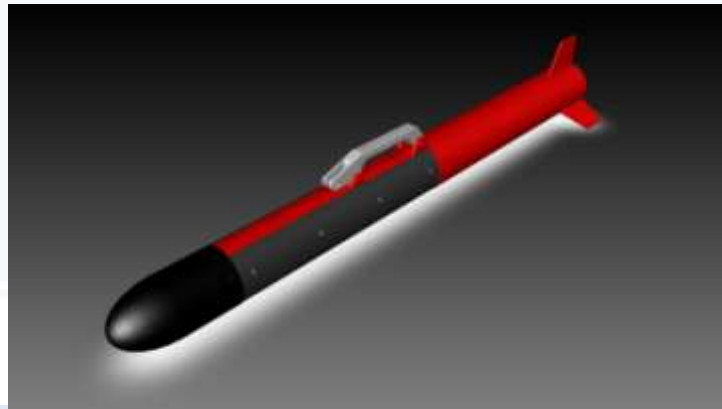
EA 400/600

2094 digital SSS

HiSAS 1030

### Key features:

- Operating frequency 114 and 410 kHz
- Simultaneously acquires data at both frequencies.
- The signals are digitized in the towfish
- 24bit dynamic range
- 1000 m depth rated
- Tow speed: 1 to 12 knots
- Beam width 50° by 1° (114), 40° by 0.3° (410)
- Max range 600 m (114), 150 m (410)
- Max resolution across track 6 cm (114), 2 cm (410)



# Product range - 2011



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## Model

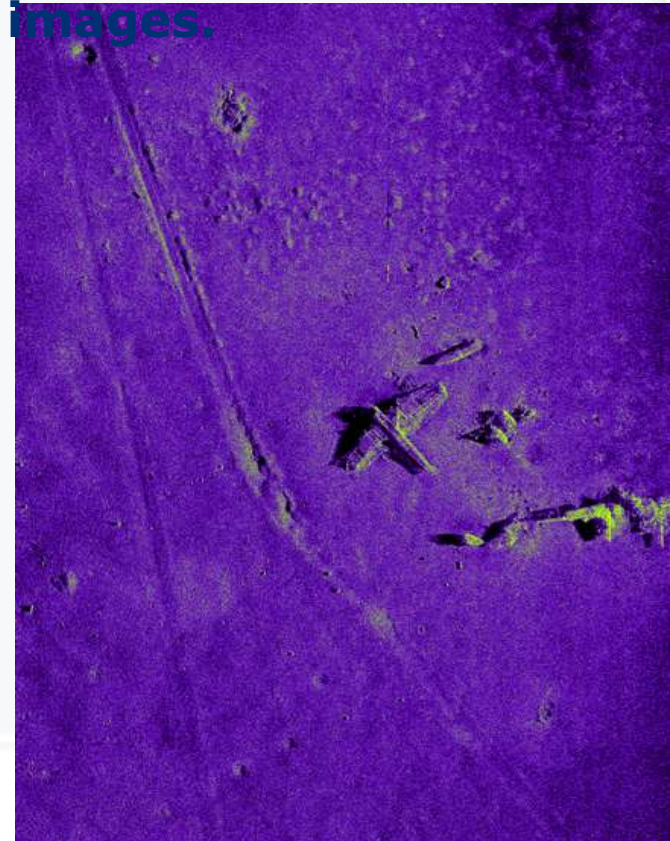
## Synthetic Aperture Sonar – HiSAS 1030

When the sensor is moving, a long transducer array is synthesised by a coherent combination of many pings.

**The result is very high resolution images.**

### Key features:

- $\sim 3 \times 3$  cm resolution
- Max range  $\sim 200$ m
- Operating frequency 60-110kHz
- Resolution is range in-dependent



Geoswath +  
EM 2040  
EM 3002  
EM 710  
EM 302  
EM 122  
  
SBP 120/300  
TOPAS PS18  
TOPAS PS40  
GeoChirp II  
  
EA 400/600  
2094 digital SS

HiSAS 1030



# Product range - 2011

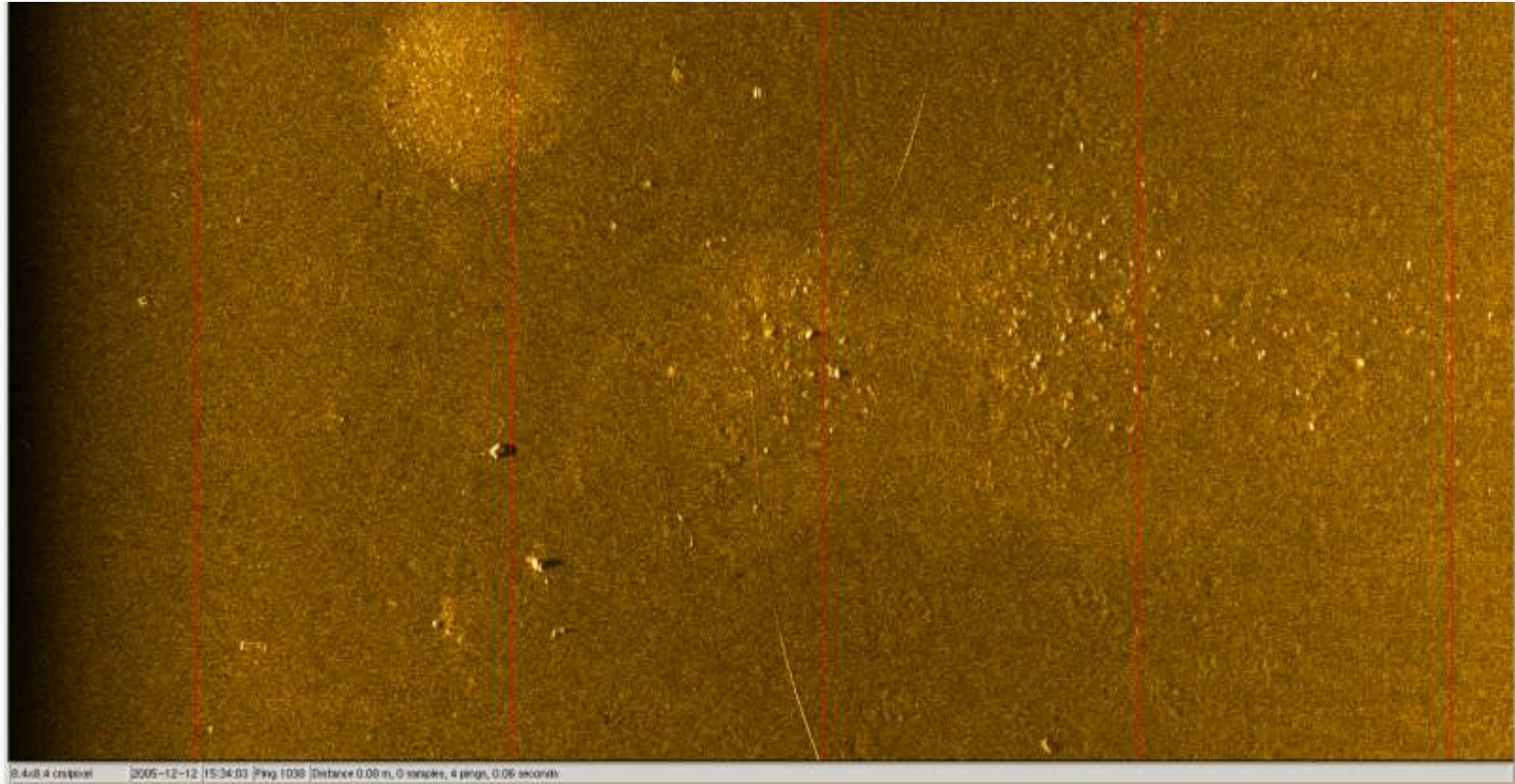


KONGSBERG

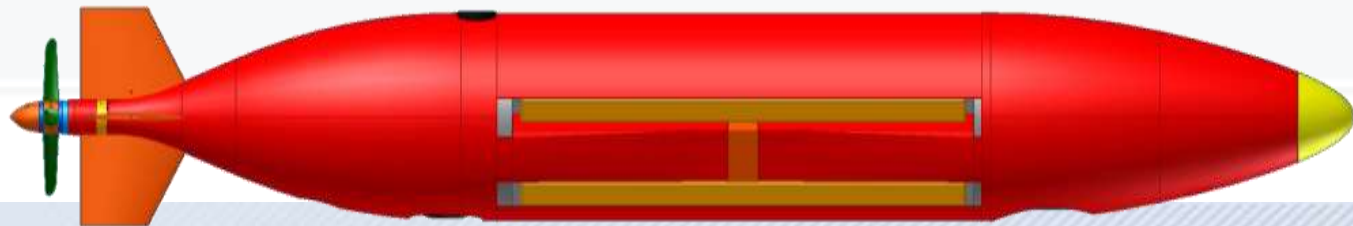
## Model

## Synthetic Aperture Sonar – HiSAS 1030

- Geoswath +
- EM 2040
- EM 3002
- EM 710
- EM 302
- EM 122
  
- SBP 120/300
- TOPAS PS18
- TOPAS PS40
- GeoChirp II
  
- EA 400/600
- 2094 digital SS



## HiSAS 1030



Maximizing performance by providing

# THE FULL PICTURE



## Hydrography offers the following services:

- Free advice for multibeam echo sounder installation
- Professional management of projects
- 24 hr service and support telephone / email
- Maintenance agreements for sw, electronics and transducers
- International network of service centra

## In addition:

- Regular newsletter, 4 editions/year
- FEMME User conferences, every 2. year



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