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Significant investment in marine infrastructure at the University of Gothenburg: a new research vessel and mobile underwater systems (AUV and ROV)

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The largest research vessel operated by the Sven Lovén Centre is the 39 m long “Skagerak” build in 1968.





New-building R/V SKAGERAK



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MAIN PARTICULARS:

L _{OA}	Length over all	45.50	m
L _{PP}	Length betw. Perpendiculars	40.22	m
B _M	Breadth, moulded	11.00	m
D _M	Depth, moulded	6.00	m
T _{DWL}	Draught	3.80	m
GT	Gross Tonnage	abt. 850	GT
DWT	Deadweight Capacity	abt. 190	T
ICE	Ice Class Finish /Swedish	F/S ICE	1B
V _S	Service Speed	12.00	kts
	Endurance	14	Days
	Range	2 000	NM

PROPULSION SYSTEM:

Diesel-Electric	690 VAC/50	Hz
Gen. Sets.	abt. 4x420	kWe
Propulsion Motor	1x 1 200	kWe
Propeller with Nozzle	1xCPP Ø2.40	m
Bow Thruster, Ultra Silent, abt 4.5 T	290	kW

COMPLEMENT:

Crew, Single Cabins	5	Pers
Special Personnel, Double Cabins	16	Pers

Open Deck, Working Deck Aft	abt. 140	m ²
Hangar	abt. 30	m ²
ROV/CTD Control Room		
Main Laboratory	abt. 28	m ²
Dry Laboratory	abt. 14	m ²
Atmospheric Laboratory	abt. 12	m ²
Uncontaminated Seawater Laboratory		

LAUNCHING AND RETRIEVAL SYSTEMS:

A-Frame, reach 7m, ±60°	SWL	8.0 T@7m
Working Deck Crane,	Static	SWL 4.0 T@6m
	Dynamic	SWL 2.0 T@4m
Utility Crane,	Static	SWL 1.5 T@5m
LARS in Hangar,	Dynamic	SWL 3.0 T@3m

General Purpose Winch x2, 2 000m x 16mm	8.0	T
Oceanographic Winch x1, 2 000m x 12mm	4.0	T
Hydrographic Winch x1, 1 000m x 6mm	2.0	T
CTD/ROV Winch x1, 4 000m x 8.3mm	4.0	T
CTD/ROV Spooling Drive + Drum		

HYDRO-ACOUSTIC SENSORS:

- Multi-Beam Echo Sounder
- Sub-Bottom Profiler
- Acoustic Doppler Current Profiler, ADCP
- Hydro-acoustic Underwater Positioning System



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ENVIRONMENT, SUSTAINABILITY AND SOCIAL RESPONSIBILITY:

MARPOL	Annex I, II, III, IV, V, VI - in particular: Sewage Treatment Unit NO_x – IMO Tier III SO_x – EN 590, Ultra-Low Sulphur Fuel Energy Efficiency in all Operation Modes
BWM	Ballast Water Treatment Unit
AFS	EcoSpeed Coating
Hong Kong	Convention for the Safe and Environmentally Sound Recycling of Ships
ILO	Eight Core Conventions, MLC
GU	GU policy for procurement GU policy for installation/use of materials and compounds on-board

NOISE AND VIBRATIONS:

ICES Report 209 – Recommendations to be taken into consideration

DNV Silent-R – Compliance to be verified and certified

Noise and Vibration Expert engaged throughout Design and Construction Phase



New-building R/V SKAGERAK



DESIGN CONSIDERATIONS AND CHALLENGES:

- **Geometrical Constraints: Length, Breadth, Draught**
- **Minimum Impact on the Environment = High Energy Efficiency**
- **Comfortable and Safe Research Platform in Sea States \leq Bft 6**
- **Scientific Mode 0 – 6 knots = Cavitation Free Operation**
- **Mitigating risk for Bubble Sweep-down over Sonars**



Careful Compromises with regard to Hull Form:

- **4 different Fore Body Shapes evaluated**
- **Early CFD-Analyses**
- **Extensive Model Testing Programme**



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HULL FORM ALTERNATIVES:

HULL 06

HULL 07

HULL 08

HULL 09

REV	DATE	DESCRIPTION	BY	CHKD	APPD
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CLIENT		UNIVERSITY OF GOTHENBURG			
ISSUED BY		TITLE		DRAWN BY	
UNIVERSITY OF GOTHENBURG		RESEARCH VESSEL HULL LINES PROPOSALS		JBz	
				SCALE 1:150	
DESIGN		PROJECT		DATE	
Kattesatt Design		GU RESEARCH VESSEL		2013-08-26	
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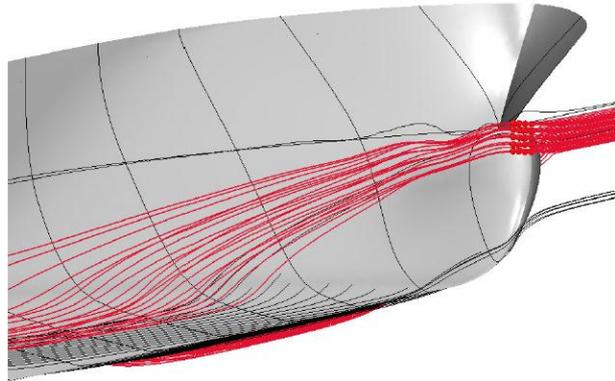


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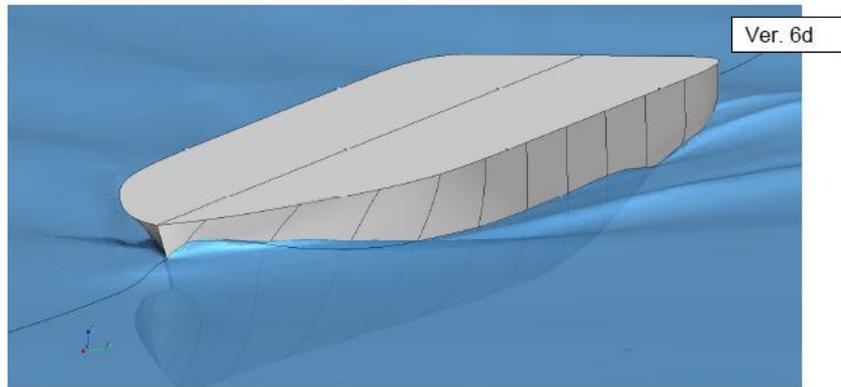


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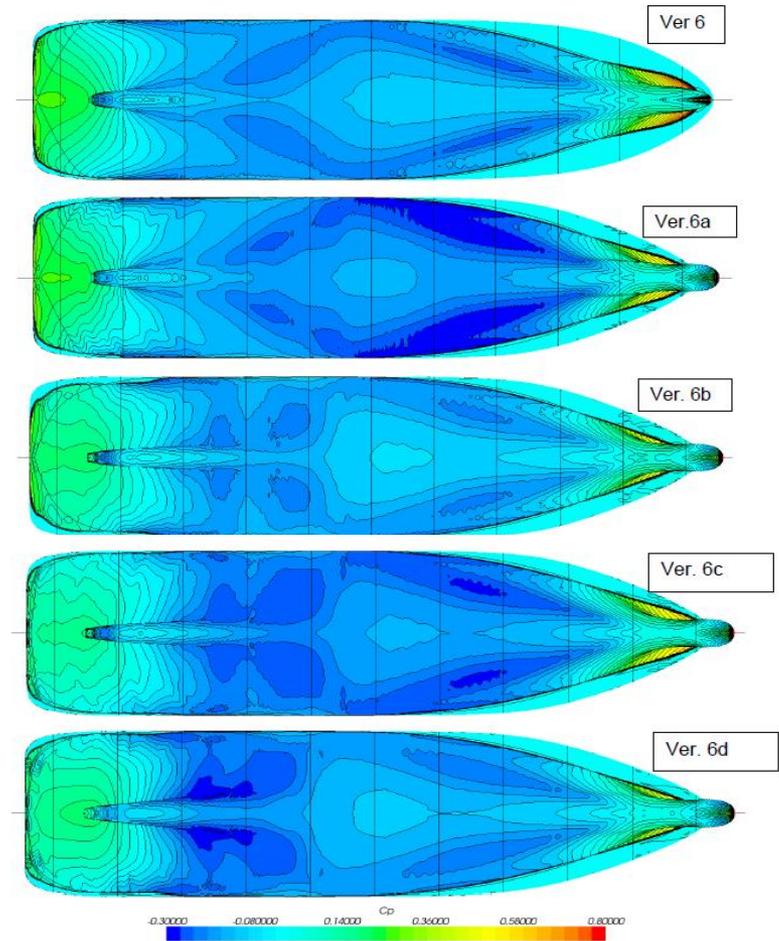
CFD-ANALYSES:



Tracing of surface streamlines
Mitigating Bubble Sweep-Down @ 6 knots



Visualization of Wave Generation @ 12 knots



Pressure Distribution Different Hull Forms 12 knots



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MODEL TESTS:



- Still Water Resistance and Propulsion Tests
- Propeller + Nozzle Open Water Test
- Streamline Test
- 3D Wake Measurements



Streamline Test



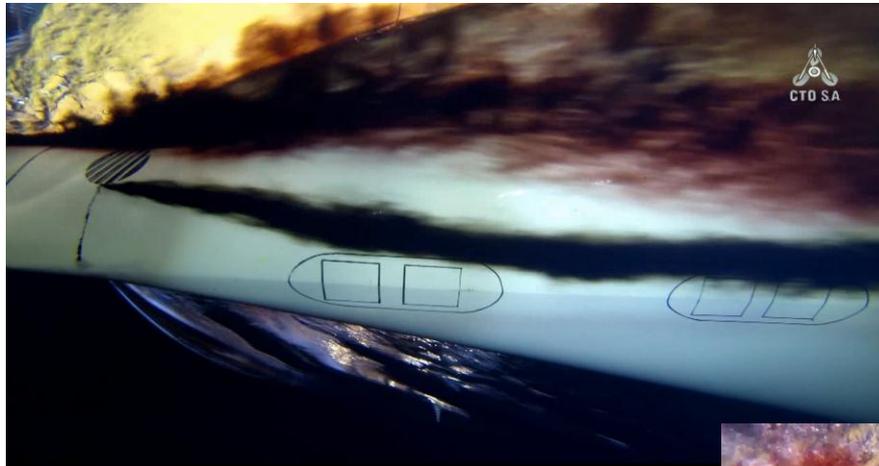
Still Water Resistance and Propulsion Tests



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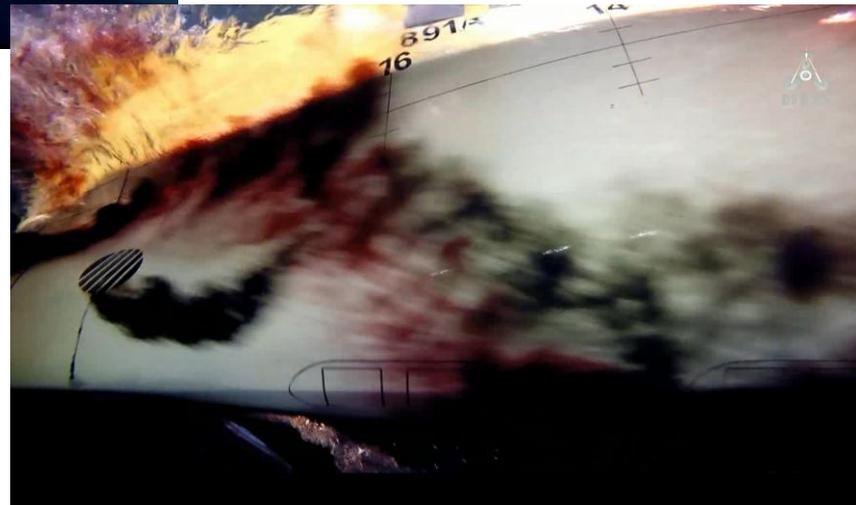


MODEL TESTS – BUBBLE SWEEP-DOWN MITIGATION:



Still Water @ 6 knots

Flow Visualization in way of two alternative Sensor Positions by means of Underwater Camera Footage



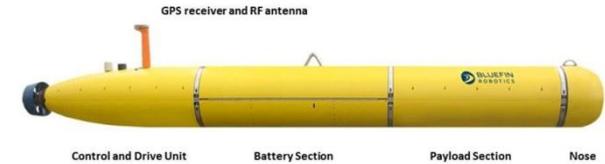
Head Seas, $H_{1/4} = 1.5\text{m} / T_z = 4.57\text{ s}$, @ 6 knots

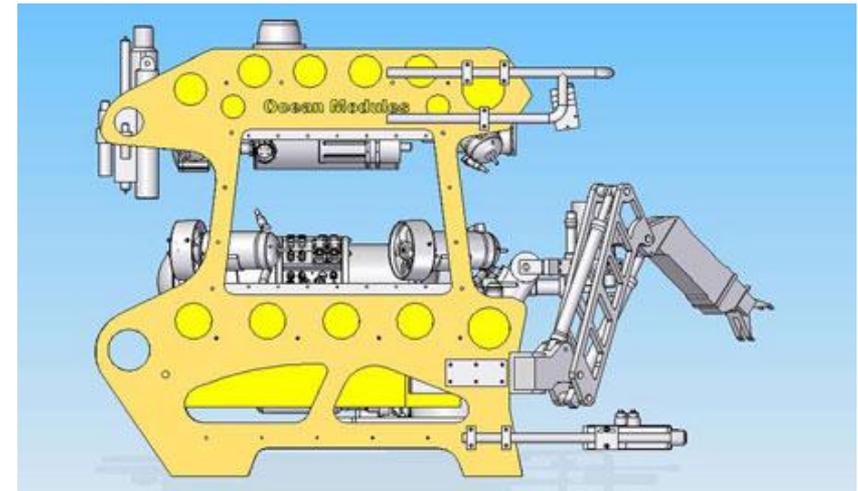
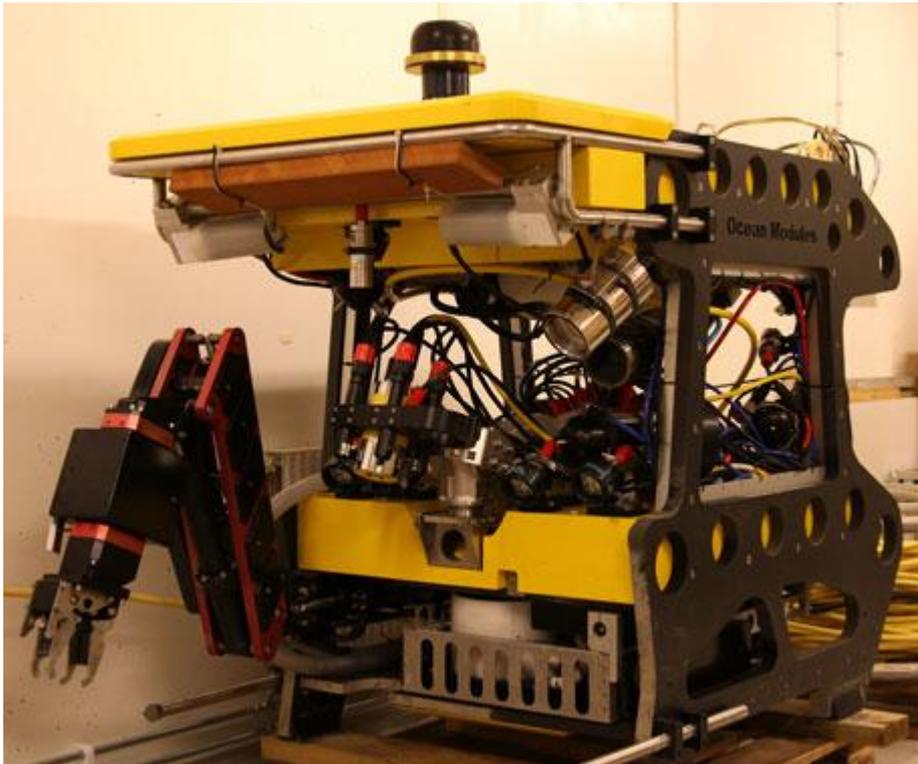
A National Core Facility for Marine Research

Granted with 38.1 MSEK in March 2014

MUST – Mobile Underwater System Tools

Application to the Knut and Alice
Wallenberg Foundation





V8 Offshore (Ocean Modules Sweden AB)

L x W x H (cm): 156 • 86 • 118

Weight in air: 650 kg

Thruster: 8 st / 1500 W/st

Maximum speed: 1.5 knots

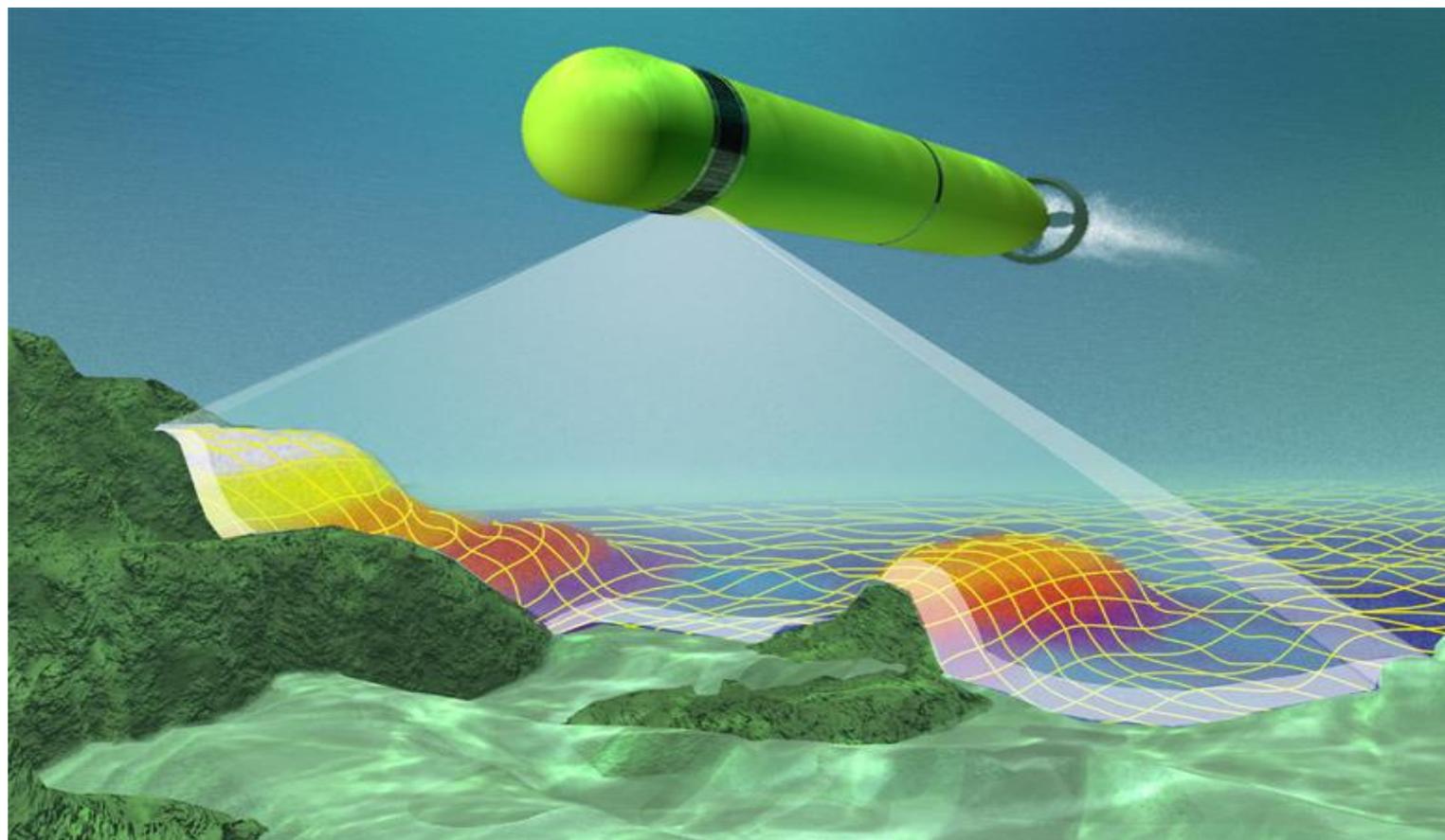
Max. Depth rating: 3000 m

Instrumentation:

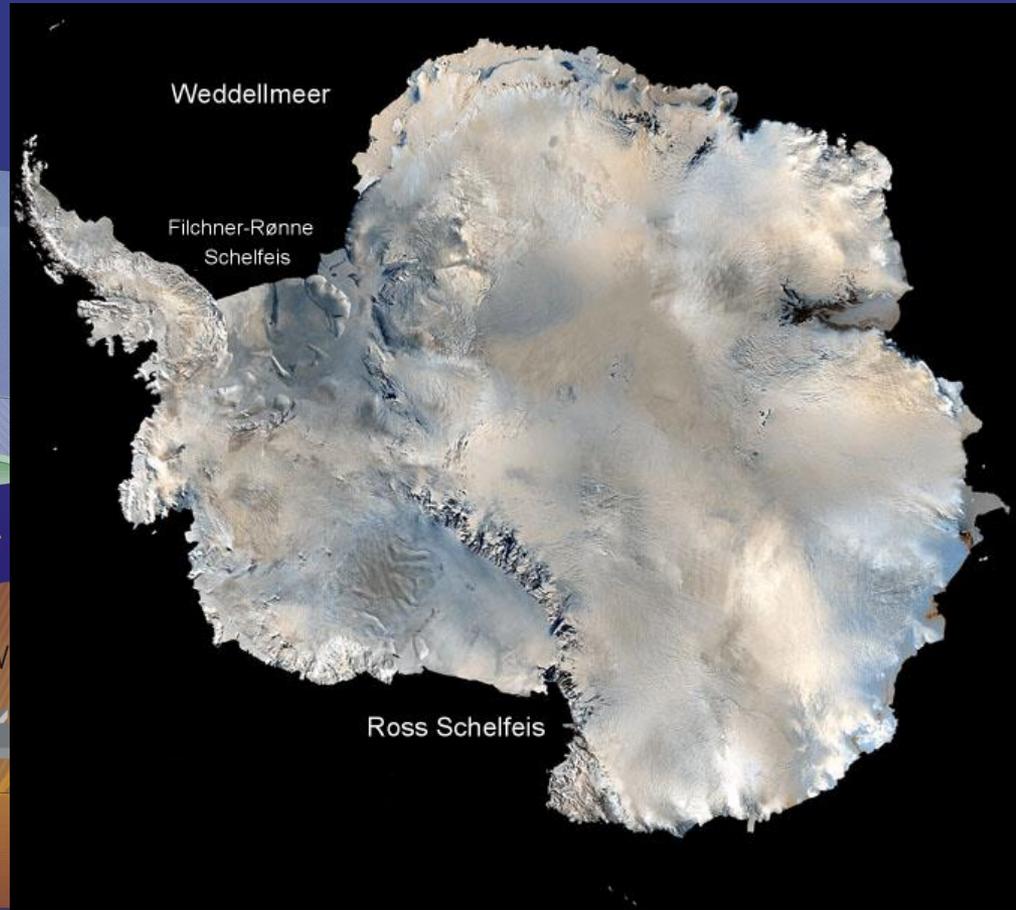
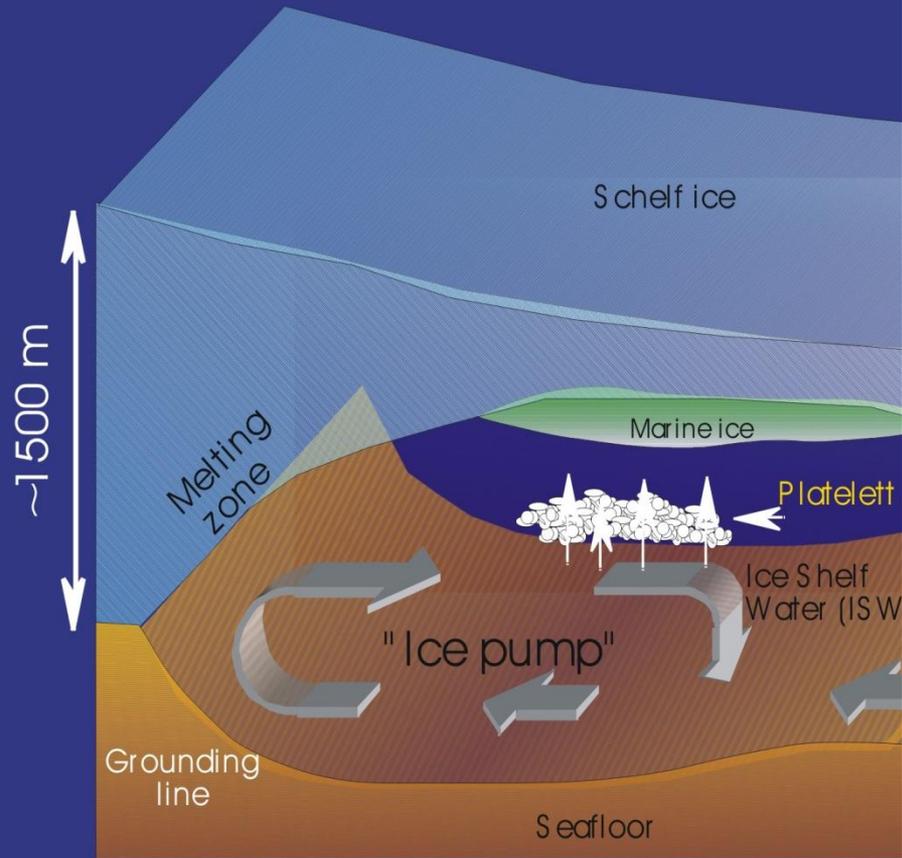
- videocamera HD, 2 videocamera 720 x 576 pixel, still photograph camera
- LED lamps
- Five function manipulator
- Slurp gun
- Tool sled
- CTD
- ph - meter (optode)
- Turbidity sensor
- Forward looking sonar
- Laser pointer
- Acoustic Underwater positioning (transducer - transponder)



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Processes in shelf ice caverns:



Water mass modification of Global significance

Melt and freeze processes

Unexplored life

Deep-water re-newal



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The next steps

- Out-sourcing the operation of the new vessel is under preparation
- Employment of a Scientific Coordinator at SLC
- Installation of a Web-Portal for on-line application (research vessel, ROV and AUV)
- Investigating the opportunity of GU to apply for membership in OFEG