

UNDERWATER MINING CONFERENCE

UMC
2018
B e r g e n
N o r w a y

10 - 14 SEPTEMBER 2018
GRIEGHALLEN, NORWAY

Deep Sea Mining: Challenges of Going Further and Deeper

Advances in Marine Research and
Subsea Technology Beyond Oil & Gas



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UNDERWATER MINING CONFERENCE, www.underwatermining.org

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Information/Photography/Video Policy

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UMC 2018 – September 10-14, 2018
BERGEN, NORWAY

UMC18 Cover and Brochure Edition

Filipa Marques, KG Jebsen Centre for Deep Sea Research, University of Bergen, Norway

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INDEX

Welcome to the 47th Underwater Mining Conference UMC'18	5
About the hosts	
K.G. Jebsen Centre for Deep Sea Research	6
Global Centres of Expertise, GCE Subsea	7
Acknowledgements	7
Sponsors	8
UMC History	10
Venues	
Welcoming Reception	11
Technical Sessions and Banquet	12
Program	
Oral Presentations	13
Poster Presentations	17
Geotechnical Field Tours	
List of Participants	20
I - Subsea Technology, led by Jon Hellevang	22
II - Geology, led by Professor Rolf B. Pedersen	22
Spouses Guest Tours	
List of Participants	23
Sognefjord and Walk in Bergen Tours	24
Contacts	25
List of Participants	26



Underwater Mining Conference 2018

WELCOME

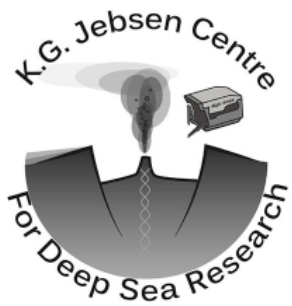
The International Marine Minerals Society (IMMS) and the University of Hawai'i present, and the K.G. Jebsen Centre for Deep Sea Research (University of Bergen) in partnership with the Global Centres of Expertise (GCE) Subsea host, the 47th Underwater Mining Conference (UMC18) to be held in Bergen, Norway.

The deep sea has been an area for pioneering exploration and groundbreaking science. Today the exploration of the deep sea presents itself as a frontier for technological development, parallel to resource exploration, with many nations claiming large seafloor areas for mineral exploitation.

This year the UMC18 strategically harvest the current marine R&D knowledge and bring it forward into the prospective development of subsea solutions for deep sea mining beyond oil and gas.

Norway has been pivotal in subsea innovative approaches with the Bergen area collectively working as a global knowledge hub by hosting excellence deep-sea marine research and a cluster of 100+ R&D and industrial partners (GCE).

Our 2018 technical program focuses on the scientific and technological aspects of deep-sea mining. It will be an exciting conference for the examination of the next commercial and technical developments regarding deep-sea minerals, deep-sea mining and metallurgical processing of marine mineral resources.



About the hosts

K.G. JEBSEN CENTRE FOR DEEP SEA RESEARCH

The **Centre for Deep Sea Research, University of Bergen**, is a leading international Centre for research on the deep oceans taking part in pioneering discoveries, and expanding our knowledge of the deep sea and its potential resources.

The Centre provides insights into deep sea mineral and bioprospecting resources, focusing on areas under Norwegian jurisdiction. It also addresses the potential environmental impacts of industrial activity on the ocean floor.

The Centre for Deep Sea Research advances the Norwegian deep sea research capabilities through its leadership of the Norwegian Marine Robotics Facility as well as through national and international collaborations.

GLOBAL CENTRES OF EXPERTISE SUBSEA

The GCE Subsea cluster represents the world's most complete cluster for subsea life-of-field solutions. GCE Subsea strengthens innovation and internationalisation of the Norwegian subsea cluster, and consists of more than 100 members and partners.

The main goal is to increase the cluster's competitiveness and global market share, and take a leading position in sustainable utilisation of ocean resources. A key focus is developing subsea solutions and knowledge beyond oil and gas.



ACKNOWLEDGEMENTS

Our sincere thanks to the **Bergen Kommune** who awarded us with a grant for Business Development Initiative 2018 "Tilskudd til næringsutviklingstiltak 2018".

A special thank you to Linn Olsen (UiB) who helped with the on-site contacts and visits as well and with the communication with Bergen Kommune. On a final note, a sincere expression of gratitude towards Randi Storeide, a brilliant student that left us too soon. She was a key element in the proposal submitted to the Bergen Kommune.

A sincere thank to our local host the **Norwegian Petroleum Directorate**, that together with the KG Jebsen Centre for Deep Sea Research and the GCE made this event possible.



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KOMMUNE



NORWEGIAN PETROLEUM
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Global Sea Mineral Resources



TechnipFMC

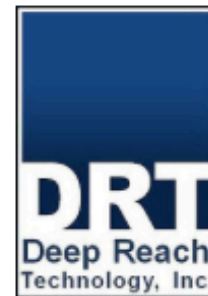


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UMC HISTORY

The Underwater Mining Conference (UMC, previously the Underwater Mining Institute) brings together leaders from academia, industry, and government who share a common interest in marine mining and exploration. For more than four decades, over 25 nations have been represented at this annual forum to exchange ideas, seek expertise, and share in the excitement of this evolving industry. The oversight committee that supervises the conference is the International Marine Minerals Society (IMMS).

Since the first conference was held in Milwaukee, Wisconsin in 1970, the primary goal has been to promote prudent and responsible development of marine mineral resources through technical presentations in venues that encourage informal free exchange. The technical theme varies each year, as does the meeting location and host.

These components were all initiated by the conference's founder, the late **Professor J. Robert Moore**, whose vision and contributions have laid the groundwork for the success of the conference far beyond the borders of Wisconsin. Professor Moore chaired each conference until his passing. **Dr. Charles L. Morgan**, a former President of IMMS, longtime worker in the area of seabed minerals, and 2015 IMMS Moore Medal Award recipient, has served as Professor Moore's successor since 1994 through 2015. From 2016 on, the technical chair of the conference is the standing president of IMMS.

Conference coordination started in 1970 by the Sea Grant Advisory Program at the University of Wisconsin (notably Greg Hedden, Barbara Arnold, Gene Woock and Allen Miller). From 1992 through the present, **Karynne Chong Morgan** of the Hawai'i Undersea Research Laboratory, University of Hawai'i, has served as conference coordinator.

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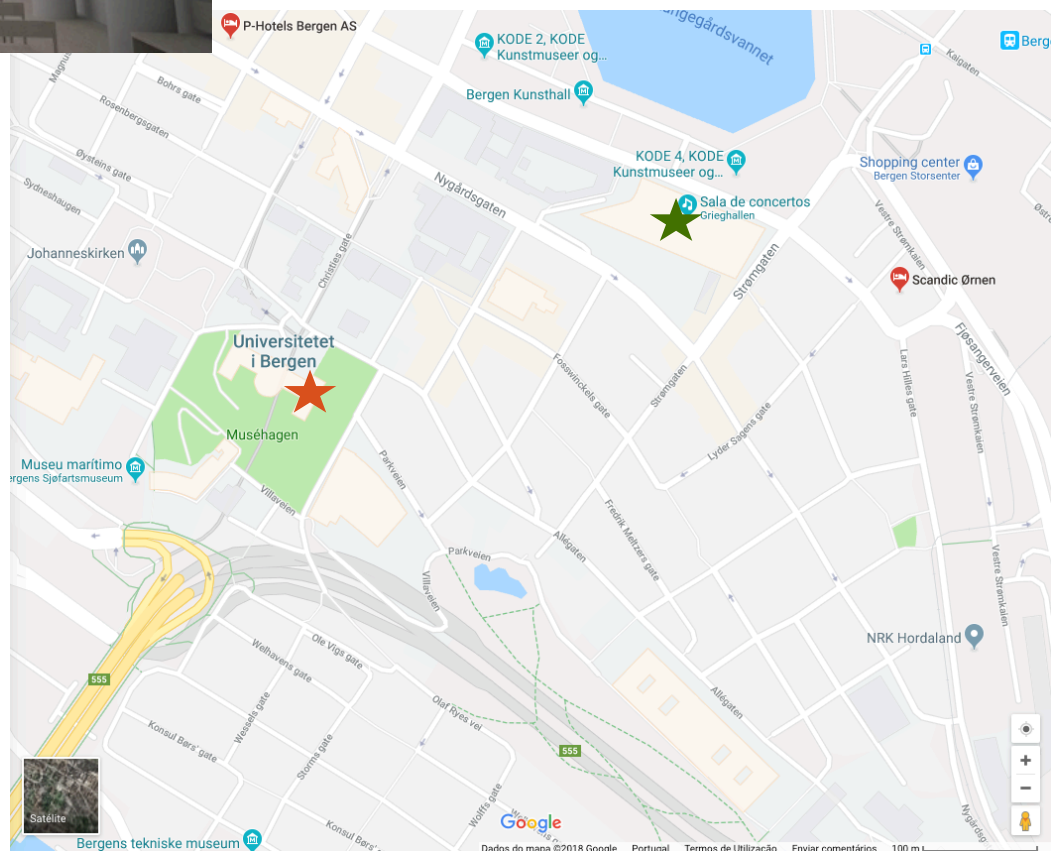
VENUES

AULA | WELCOMING RECEPTION

Monday, September 10th 2018, 17.00 - 20.00

AULA, Natural History Museum, University of Bergen

Join us for a taste of organic food tapas and local drinks provided by the renowned “Godt Brød”. Inaugurated in 2015, this is the new grand hall of the University of Bergen and the whole of Western Norway. The University AULA is located in the newly refurbished south wing of the Natural History Museum.



AULA | Welcoming Reception

Olav Ryes Vei



Grieghallen | Technical Sessions & Banquet

Edvard Griegs Plass 1

GRIEGHALLEN | TECHNICAL SESSIONS & BANQUET

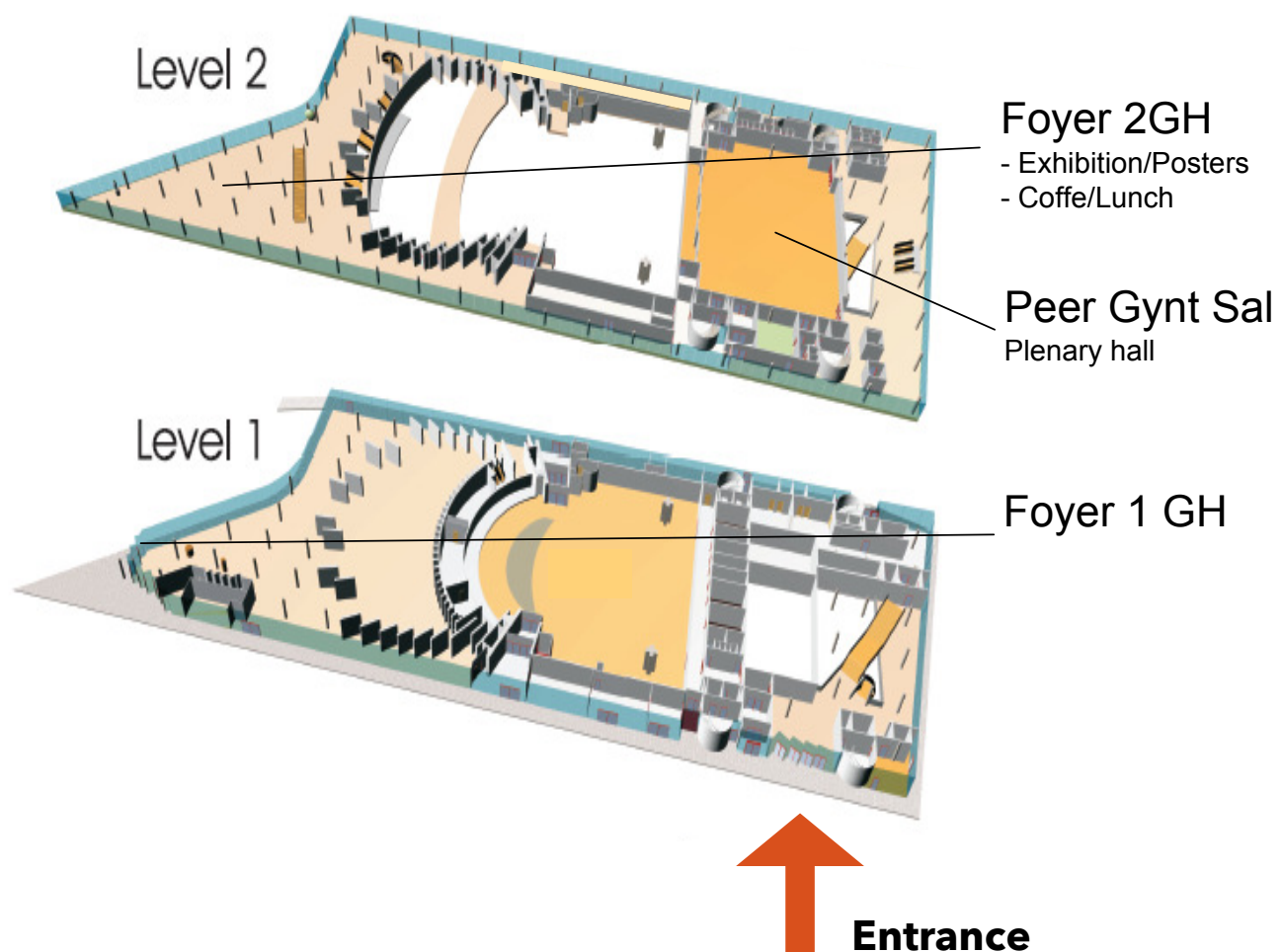
Technical Sessions | Tuesday & Wednesday, September 11-12th 2018

Banquet | September 12th 2018 | 19.30 - 22.00

The Grieghallen, home of the Bergen Philharmonic Orchestra, was designed in modernist architecture and completed in 1978. It is Norway's largest combined congress and culture venue, located in the city centre and within walking distance to hotels, shopping areas and tourist attractions.



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PROGRAM

MONDAY, SEPTEMBER 10TH

17.00 Welcoming reception at **AULA**

TUESDAY, SEPTEMBER 11TH

8.00 Reception at **Grieghallen**

8.30 Opening | IMMS President

8.40 Welcome Remarks | HOSTS

8.50 **Opening Note | Ingvil Smines Tybring-Gjedde - State Secretary, Deputy Minister in the Norwegian Ministry of Petroleum and Energy**

Resource Management of Seabed Minerals on the Norwegian Continental Shelf

A Law of the Sea & Regulatory Framework

Session Chair Professor Tore Henriksen

KG Jebsen Centre for the Law of the Sea, Faculty of Law, University of Tromsø

9.10 ISA draft regulations for exploitation

Harald Brekke, NPD and Vice-Chair of the LTC at International Seabed Authority

9.30 Deep Sea Miners' Obligations to Transfer Technology Under UNCLOS and ISA Rules

Andreas Kaede, Kanzlei Kaede, Germany

9.45 Offshore mineral resources in the Norwegian Sea: latest developments

Jan Stenløkk, Norwegian Petroleum Directorate, Norway

10.00 Deep Seabed Mining in National Jurisdiction: Key Challenges

Joshua Brien, Cooley (UK) LLP

10.15 Navigating marine management regimes under the New Zealand Exclusive Economic Zone Act

Siobhan Quayle, EPA New Zealand

10.30 Deep-Sea Mining: Intersections with Other Activities

Maria das Neves, Faculty of Law, University of Tromsø

10.50 30' Coffee Break

B Seafloor Massive Sulfides

11.20 Hydrothermal activity and deep-sea mineral deposits at the ultraslow spreading ridges: examples from the Arctic Mid-Ocean Ridge system

Rolf B. Pedersen, KG Jebsen Centre for Deep Sea Research, University of Bergen

11.40 Development of exploration criteria for massive sulfides on slow-spreading ridges - lessons learned from the TAG hydrothermal field

Student | *Sebastian Graber, GEOMAR, Germany*

B	Seafloor Massive Sulfides
11.55	Hydrothermal activity, sea level and glaciation: evidence of correlation from the Atlantic SMS
	<i>Georgy Cherkashov, VIOkeangeologia, Russia</i>
12.10	Tectono-magmatic controls for seafloor massive sulfide deposit (SMS) formation in a back-arc setting; a clue to exploration
	<i>Toru Yamasaki, Geological Survey of Japan, AIST</i>
12.25	Stakeholder's Perspectives on Deep Sea Mining: a Case Study in Germany
	<i>Tina Schneider, University of Bremen, Germany</i>
12.40	Germany's exploration for seafloor massive sulfides in the Indian Ocean
	<i>Ulrich Schwarz-Shampera, BGR, Germany</i>
13.00	60' Lunch Break
14.00	20' Poster Session
C	Tools for Exploring the Seafloor
14.20	Eyes in the Deep- how autonomous underwater vehicles can support & enhance deep sea mining operations
	<i>Stephen Hall, Society for Underwater Technology, SUT, London UK</i>
14.40	Swire Seabed & UiB Use of Autonomous Technology for mapping Seabed Minerals
	<i>Lars-Kristian Trellevik, University of Bergen, and Per Norvald Boge, Swire Seabed</i>
15.00	Meeting client needs in a new market. Fugro's first commercial AUV, geotechnical, and resource survey for polymetallic nodules in the CCZ
	<i>Daniel McConnell, FUGRO, US</i>
15.15	Seafloor backscatter data: a cost and time-effective method for exploration of seafloor massive sulfide deposits?
	<i>Ewan Pelleter, IFREMER, France</i>
15.30	EVA a robotic vehicle for underwater mining operations support
	<i>Eduardo Silva, INESC TEC Portugal</i>
15.45	A System Approach to Survey, Exploration and Environmental Assessment
	<i>Atle Gran, Kongsberg, Norway</i>
16.00	30' Coffee Break
D	Technological Challenges & Developments of Underwater Mining
16.30	Vertical Mining Approach to SMS deposits - Chances and Challenges
	<i>Peter Platzek, BAUER, Germany</i>
16.50	Excavating the deep sea: modeling the pressure effect in rock cutting processes
	<i>Rudy Helmons, Delft University of Technology, Netherlands</i>
17.10	Free-Hanging vs Free-Standing Seabed Mining Vertical Transport Systems
	<i>Frank Lim, China University of Petroleum</i>
17.30	Microtexture mineral analyses - a preparatory stage in SMS mineral processing
	<i>Kristian Drivenes, Norwegian University of Science and Technology (NTNU), Norway</i>

WEDNESDAY, SEPTEMBER 12TH

8.30	KEYNOTE: World's First Lifting Test for Polymetallic Sulphides in the EEZ of Japan
	Dr. Nobuyuki Okamoto, Deputy Director General, JOGMEC (Japan Oil, Gas and Metals National Corporation)
E	Critical Elements in Underwater Minerals
9.00	Seabed Mineral Deposits in European Seas: Metallogeny and Geological Potential for Strategic and Critical Raw Materials (MINDeSEA Project)
	Javier González, Geological Survey of Spain, IGME
9.20	Draft Exploitation Regulations: Commercial Viability
	Eleanor Martin, Norton Rose Fullbright, UK
9.40	Sustainability Aspects in Deep-Seabed Mining of Polymetallic Nodules
	Sup Hong, IDSSE (China) and KRISO (Korea)
9.55	A Comparison of Terrestrial and Seabed Mineral Resources for Cobalt
	Campbell McKenzie, RSC Global, New Zealand
10.10	Critical Elements in Hydrothermal Manganese Deposits from the Global Ocean
	James Hein, US Geological Survey, USGS
10.30	Updated Economic Feasibility Analysis of Cobalt-rich Manganese Crust Mining Including the Substrate Rock Usage for Phosphates
	Tetsuo Yamazaki, Osaka Prefecture University, Japan
10.50	Coffee Break
F	Resource, Reserve & Mining the Seafloor
11.20	Towards a Formal Definition of Active and Inactive Seafloor Massive Sulfide Deposits
	John Jamieson, Memorial University of Newfoundland, Canada
11.40	Metalliferous sediments in the Red Sea deeps: from resource to reserve
	Joshua Smith, KAUST, Saudi Arabia
11.55	Towards an improved nodule resource estimation and classification using hard and soft data
	Steinar Ellefmo, Norwegian University of Science and Technology (NTNU), Norway
12.10	Processes of metal sulfide oxidation at hydrothermal vents and in seafloor massive sulfides
	Amy Gartman, US Geological Survey, USGS
12.25	Hydrothermal Fluxes along the Mohns Ridge - implications for mineral resources at ultraslow spreading ridges
	Student Anne Stensland, KG Jebsen Centre for Deep Sea Research, University of Bergen
12.40	Deep-Sea Mining R&D Activities in the NMRI
	Joji Yamamoto, National Maritime Research Institute, NMRI, Japan

13.00	Lunch Break
14.00	20' Poster Session
G	Plume Dispersal and Environmental Impact
14.20	Plumes of deep-sea mining: what do we know?
	<i>Livia Ermakova, VIOkeangeologia, Russia</i>
14.40	The initial spreading of turbidity plumes - Dedicated laboratory experiments for model validation
	<i>Frans van Grunsven, Delft University of Technology, Netherlands</i>
15.00	Studies on the properties and environmental impact of deep seabed mine tailings in Korea
	<i>Inah Seo, KIOST, Korea</i>
15.10	Weathering of sulfides in a deep-sea environment: a case study
	Student <i>Linn Ølsen, KG Jebsen Centre for Deep Sea Research, University of Bergen</i>
15.20	Towards operational environmental threshold levels for exploitation of mineral resources in the deep sea
	<i>Jens Laugesen, DNV GL, Norway</i>
15.40	Deep-sea mining impacts above the surface
	Student <i>Luise Heinrich, Jacobs University Bremen, Germany</i>
16.00	30' Coffee Break
H	Technological Challenges & Developments of Underwater Mining
16.30	GSR's PROCAT-Project: Technical de-risking of deep sea mining equipment - A step-by-step approach towards future exploitation
	<i>Kris de Bruyne, Global Sea Mineral Resources, Deme Group, Belgium</i>
16.50	Design considerations for deep sea mining umbilicals
	<i>Sander Van Leeuwen, De Regt Marine Cables, Netherlands</i>
17.10	Upscaling towards deep-sea mining by 130 meter vertical riser experiments.
	<i>Siemen Dasselaar, Royal IHC - IHC Mining BV</i>
17.30	Autonomous robotic seafloor infrastructure for benthic-pelagic monitoring (ARIM)
	<i>Olav Rune Godø, Institute of Marine Research, NORCE Bergen, Norway</i>
	Final Remarks

POSTER PRESENTATIONS

A Law of the Sea & Regulatory Framework

Latest developments from the Cook Islands relating to the management of its large Seabed minerals resource of Cobalt rich Ferromanganese nodules.

Paul Lynch, Seabed Minerals Authority; Cook Islands

Site-banking of the Reserved Areas with the International Seabed Authority: for operation of the Enterprise or Joint Venture

Pratima Jauhari, International Seabed Authority (ISA), Jamaica

B Seafloor Massive Sulfides

Atlantis II Deep Deposit, Red Sea - the world's largest sea floor massive sulphide, update and progress

R D Hamer, Manafai, Kingdom of Saudi Arabia

Managing Deep-Sea Exploration Programs to Satisfy Regulatory, Commercial and Engineering Demands

John Longley, Odyssey Marine Exploration (OME), US

Permeability and fault control on seafloor massive sulfides in the Lucky Strike hydrothermal field (Mid-Atlantic ridge) using Leapfrog Geo software

Student | Dennis Sanchez Mora, Memorial University of Newfoundland, Canada

C Tools for Exploring the Seafloor

The HERMINE cruise: an example of multi-scale and multi objective exploration strategy.

Ewan Pelleter, IFREMER, France

An innovative solution to a common problem: SAGRES decision support for deep-sea mining and maritime spatial planning activities

João Carvalho, Sustainable Innovation Centre, ISQ, Portugal

An Information Theoretic Approach to Polymetallic Nodule Exploration using AUVs

Bharath Kalyan, National University of Singapore, NUS

Impact of High-Resolution Bathymetric Mapping on Resource Estimation in the French Exploration Contract for Polymetallic Nodules

Florian Besson, IFREMER, France

Experimental application of underwater hyperspectral imaging on seafloor massive sulphides from the Loki's Castle on the Arctic Mid-Ocean Ridge, Norway

Student | Øystein Sture, Norwegian University of Science and Technology, NTNU, Norway

MARTEMIS - An electromagnetic coil system for the detection of buried seafloor massive sulfides

Sebastian Hoelz, GEOMAR, Germany

Characteristics of oceanic core complexes (OCCs) in Central Indian Ridge (8°-12°S) by high-resolution bathymetry and backscatter images

Youngtak Ko, Korean Institute of Ocean Science and Technology, KIOST, Korea

D H Technological Challenges & Developments of Underwater Mining

Development of A Vertical Transport System: An Experimental Approach

Wiebe Boomsma, Royal IHC - IHC Mining BV, Netherlands

Design of Power Distribution System for Deep-Sea Mining: What are the Criteria and Challenges?

Razieh Fard, Norwegian University of Science and Technology, NTNU, Norway

Simulation of two-phase flow in airlift pump using 1D two-fluid model

Niranjan Challabotla, Norwegian University of Science and Technology, NTNU, Norway

Electric motor drive systems for mobile mining equipment for deep-sea mining to maximize the productivity

Student | Aravinda Perera, Norwegian University of Science and Technology, NTNU, Norway

Multi-criteria decision making application for sustainable deep sea mining transport plan selection

Student | Wenbin Ma, Delft University of Technology, Netherlands

Ocean Minerals' Cook Island Cobalt Project - Enabling the EV revolution

Hans Smit, Ocean Minerals

E Critical Elements in Underwater Minerals

Unlocking Critical Metals from Ferromanganese Nodules and Crusts - The Role of Iron during Dynamic Mineral Recrystallization

Student | Tobias Hens Monash University, Australia

Tellurium-bearing minerals in sulfide chimneys from ultramafic-hosted Semyenov-2 hydrothermal field, Mid-Atlantic Ridge

Anna Firstova, VIOkeangeologia, Russia

Mineral phases and element associations of ferromanganese crusts, Amerasia Basin Arctic Ocean, based on sequential leaching

Student | Natalia Konstantinova, St. Petersburg University / VNIIOkeanologia, Russia

Lead and other trace metal concentrations in the carbonate fluorapatite fraction of phosphatized FeMn crusts

Student | Kira Mizell, US Geological Survey, USGS

Geomorphology and Structure of the Clairon Clipperton Zone

John Parianos, Nautilus Minerals, Australia

Concentration of Pt, Au and Ag in Ferromanganese Deposits from the N-W Pacific: Preliminary Results Recrystallization

Pavel Mikhailik, Far East Geological Institute (FEGI), Russia

F Resource, Reserve & Mining SMS

A study on processing of seafloor massive sulphides from the Loki's Castle area at the Arctic Mid-Ocean Ridge

Kurt Aasly, Norwegian University of Science and Technology, NTNU, Norway

DSM Concept Cube - A classification system for deep sea mining concepts

Rolf Kleiv, Norwegian University of Science and Technology, NTNU, Norway

G Plume Dispersal and Environmental Impact

Effects of sedimentation from deep-sea mining: a benthic disturbance experiment off New Zealand

Malcolm Clark, National Institute of Water and Atmospheric Research, NIWA, New Zealand

On-site Observations and In-situ Experiments for the Ferromanganese Deposit at the Seamounts in the Northwestern Pacific: A Review for the ROV Geoscientific Exploration

Akira Usui, Kochi University, Japan

Assessment of impacts of deep-sea mining plumes to sediment biogeochemistry in polymetallic nodule fields: developing a modelling approach

Dmitry Shcherbin, Norwegian University of Science and Technology, NTNU, Norway

GEOTECHNICAL FIELD TOURS

LIST OF TOUR PARTICIPANTS

Surname	First name	Field Tour I	Field Tour II
Boomsma	Wiebe	X	X
Brussee	Peter	X	
Carvalho	Joao	X	X
Chi	Sang-Bum		X
Christie	Robert	X	
Crome	Tim	X	
Dasselaar	Siemen	X	
DeJonge	Laurens	X	X
Dettweiler	Tom	X	X
Devine	Christine		X
Ellefmo	Steinar		X
Ermakova	Livia	X	X
Firstova	Anna	X	X
Gonzalez	Javier	X	X
Goodden	Robert	X	X
Goodden	Beatrice	X	X
Graber	Sebastian	X	
Henry	Michael	X	X
Hein	James	X	X
Hellevang	Jon	X	
Hens	Tobias	X	X
Hong	Sup	X	X
Jauhari	Pratima	X	X
Kalyan	Bharath	X	
Knapp	Rodin	X	X
Ko	Youngtak		X
Konishi	Shunsaku	X	
Konstantinova	Natalia	X	X
Luther	Mark	X	
Marques	Filipa		X
McConnell	Dan	X	X
McKenzie	Campbell	X	
Mikhailik	Pavel	X	X

Surname	First name	Field Tour I	Field Tour II
Mizell	Kira	X	
Mizell	John	X	
Moore	Chris	X	X
Nantuaa	Tamekeni	X	
Oliver	David		X
Okamoto	Nobuyuki	X	X
Pedersen	Rolf		X
Quayle	Siobhan	X	X
Rovang	Kathryn		X
Rupert	Emile	X	
Sanchez Mora	Dennis		X
Schwarz-Schampera	Ulrich	X	X
Scott	Steve	X	X
Scott	Joan	X	X
Scott	Chris Killey	X	X
Scott	Sue Killey	X	X
Seo	Inah		X
Silva	Eduardo	X	
Smith	Joshua	X	X
Son	Seung-Kyu		X
Sorensen	Thore	X	
Stemm	Gregory	X	
Stevenson	Ian	X	
Sugishima	Hideki	X	
Van Leewen	Sander	X	
Vindstad	Jens	X	
Watson	Gavin	X	
Williams	Christopher	X	
Wiltshire	John	X	
Yamamoto	Marcio	X	
Yamasaki	Kikuko		X
Yamasaki	Toru	X	X
Yamazaki	Tetsuo	X	
Yamazaki	Takako	X	

I | SUBSEA TECHNOLOGY FIELD TRIP

Thursday, September 13th

8:45 Bus departs from Grieghallen, Bergen

DOF Subsea, Bergen

9:00 Presentation at DOF Subsea Bergen

Deep-sea mapping

10:15 Tour of the DOF Subsea and Norwegian Ocean Laboratory Facilities (UiBergen)

11:15 Lunch at DOF Subsea cantina

12:00 Bus to Horsøy

OneSubsea, Horsøy

12:30 Registration, safety briefing

13:00 Presentation at OneSubsea - Erik Andre Torbergesen, Section Manager
Technology Development

13:30 Dress-up protection equipment

14:00 Tour of facilities (2 groups) with Rune Inge Karlsen, Operation Manager

15:30 Bus return to Bergen

16:30 Estimated time of arrival in Bergen

II | GEOLOGY FIELD TOUR

Friday, September 14th

9:00 Bus departs from Grieghallen, Bergen

Field trip around the fjord area South of Bergen where Caledonian ophiolite and arc complexes are well exposed in numerous islands. A VMS deposit, mined from 1865 to 1969, and an ophiolite-hosted gold deposit that was mined in the late 19th century will be visited. The field trip will be run by bus with a ferry crossing from the Bergen Peninsula to the Islands of Stord. Weather permitting, we will use two rigid inflatable boats to visit some of the localities.

19:00 Estimated time of arrival in Bergen

Led by Professor Rolf B. Pedersen (University of Bergen, KG Deep Sea)

SPOUSES TOURS

LIST OF TOUR PARTICIPANTS

Surname	First name	Sognefjord, Sept 11 th	Bergen, Sept 12 th
Burton	Christine	X	
Goodden	Beatrice	X	X
Lynch	Shona	X	X
McConnell	Beth	X	X
McConnell	Ruthmary	X	X
Mizell	John		X
Moore	Kathleen	X	
Morgan	Karynne		X
Scott	Joan	X	X
Killey	Chris	X	
Killey	Sue	X	X
Venema	Mahani	X	X
Yamamoto-Ueda	Reina	X	
Yamazaki	Tatako	X	X



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I | SOGNEFJORD IN A NUTSHELL

September 11th 2018

08:00	Meet at Grieg's statue outside Grieghallen
08.43 – 10.51	Local train Bergen – Myrdal; own section for the group
10.58 – 11.55	Flam Railway Myrdal – Flåm; own section for the group
12.30	Lunch at Flåmstova, Flåm (Buffet with starters, main courses, desserts and coffee /tea. Other drinks must be paid directly.
15.30 – 20.45	Expressboat Flåm – Bergen; operated by Fjord Tours

II | MORNING WALKING TOUR OF BERGEN

September 12th 2018 (3 hours):

9:00 - Meet at Grieg's statue outside Grieghallen. Walk to the Fishmarket, along Bryggen to Haakonshallen, to the Funicular and visit Mt. Fløyen.



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CONTACTS

Emergency Numbers

- 110 Fire Brigade
- 112 Police
- 113 Ambulance & medical emergencies

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Thank You for Participating

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