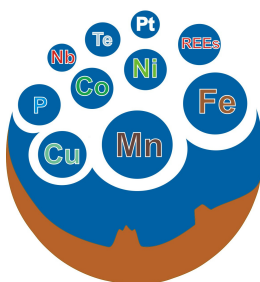


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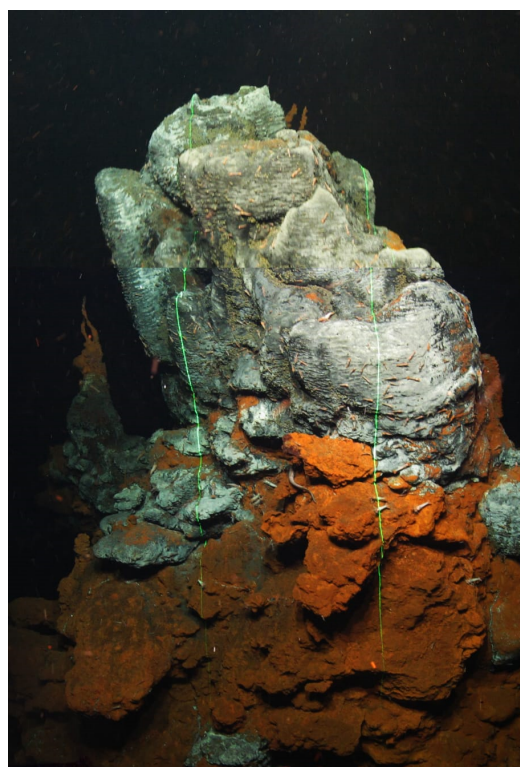
Seabed Mineral Deposits in European Seas:
Metallogeny and Geological Potential for
Strategic and Critical Raw Materials

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Submarine image taken by ROV “Luso” during the “EXPLOSEA 2 Cruise” on hydrothermal chimneys from Moytirra, Northern Mid-Atlantic Ridge.

MINDeSEA International Seminar: “SEAFLOOR MINERAL DEPOSITS FOR THE GLOBAL SUSTAINABLE DEVELOPMENT”

The workshop “Seafloor Mineral Deposits for the Global Sustainable Development” was held in Madrid 7 May 2019, on the occasion of the GeoERA-MINDeSEA internal meeting coordinated by IGME. The workshop has been benefited from the presence of renowned international speakers, members of MINDeSEA, and experts in the investigation and exploration of marine minerals.

The objectives reached during the workshop are defined as:

1. To provide introductions to all participants on the principal deep-sea mineral deposits.
2. To introduce and provide an overview of the International Seabed Authority, including structure, regulations on exploration of minerals in the Area and update on the contracts.
3. To contribute to awareness raising of the potential of seabed mineral deposits to provide critical metals essential for the development of the green- and high-tech industry.
4. To gather relevant inputs and data on the different mineralization styles of recent and fossil massive sulphide deposits and their economic importance to plan future exploration targets.
5. To provide participants with an overview of modern techniques to explore and providing economic quantification of different seabed resources like polymetallic nodules and massive sulphides.
6. To provide introductions to all participants on the high potential of the Iberian margins and Macaronesia region for the investigation and exploration of cobalt-rich ferromanganese crusts, phosphorites and polymetallic nodules.

The workshop was officially opened by Santiago Martín-Alfageme (Deputy of the Director Office at the Geological Survey of Spain, IGME) and José Luis Parra-Alfaro (Director of the School of Mining and Energy Engineering in Madrid, ETSIME-UPM). The seminar was divided into six key talks to facilitate discussion between different keynote speakers and the participant experts; presenting topics in relation to investigation of deep-sea mineral deposits (cobalt-rich ferromanganese crusts, polymetallic nodules, phosphorites and hydrothermal sulphides); technological developments in exploration; and the regulatory framework of the International Seabed Authority in waters beyond the national jurisdictions. Georgy Cherkashov (VNIIOkeangeologia), James Hein (USGS), Fernando Tornos (IGEO), Thomas Kuhn (BGR) and Luis Somoza (IGME) conducted brilliant talks and discussion on the topics of the workshop (Figure 1).

Key stakeholders included GeoERA partners, The Spanish Ministry of Foreign Affairs, the mining sector, IGME Departments and the Academia (Universities Complutense and Politécnica of Madrid). An abstracts book of the International meeting was provided to all participants identifying the key outcomes from the workshop. The participants and stakeholders had taken an active part in the program and discussions, ensuring that all have the opportunity to provide their input about relevant issues on deep-sea mining at this early stage of project development.

The abstract book and photographs on the workshop can be downloaded here:

<https://geoeramindesea.wixsite.com/mindesea>.



Figure 1. Images of the Lecture Hall and Workshop. Top left: Georgy Cherkashov (VNIIOkeangeologia); Top right: Luis Somoza (IGME); Middle left: James Hein (USGS); Middle right: Fernando Tornos (IGEO); Bottom left: Thomas Kuhn (BGR); Bottom right: MINDeSEA Team visiting IGME Library. Photos courtesy of ETSIME and IGME .

MIND_eSEA UPDATES

The flagship project of EuroGeoSurveys' on European submarine mineral deposits is entering its first year, and the project is beginning to produce meaningful results. MINDeSEA consortium has contributed to “**The EU Blue Economy Report 2019**” attending the petition of the DG MARE for comments and contribution in the section 4.3 Marine Minerals (DOI: 10.2771/21854).

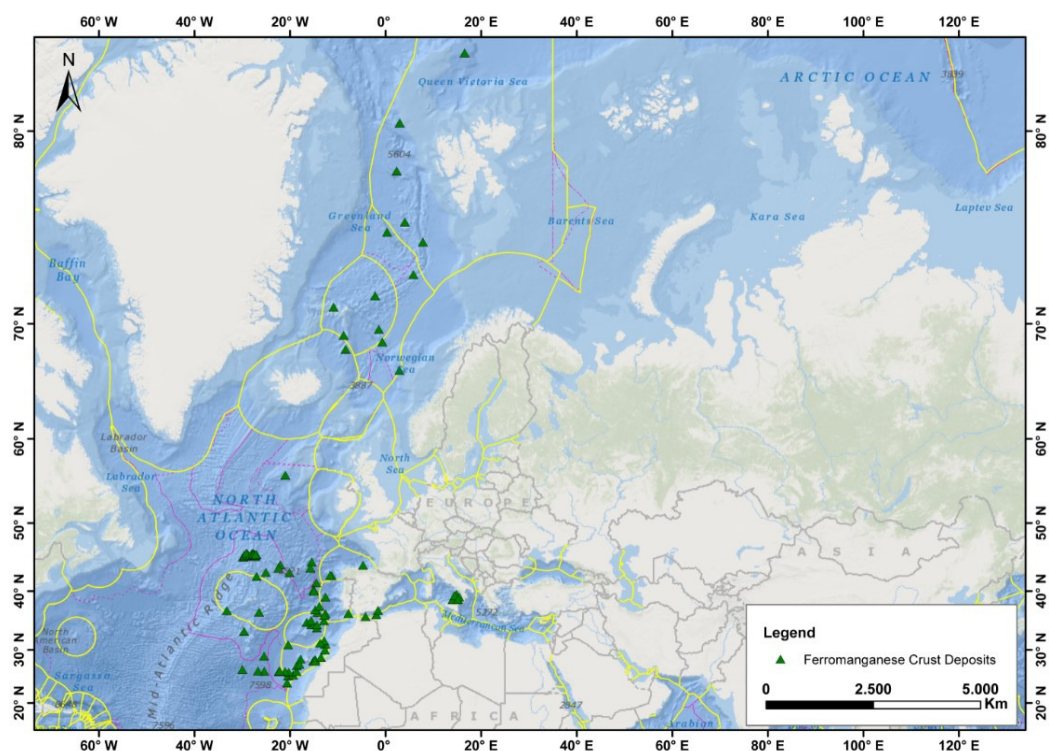
WP2 Communications, Dissemination & Exploitation Team is continuously working in new developments for our stakeholders. MINDeSEA consortium has conducted the second internal meeting at IGME in Madrid (6-7 May 2019) with the participation of all the project partners including non-funded partners. NGU will host the next MINDeSEA meeting due for November 2019. Conferences and Seminars at the University and other education institutions were led for the transference of information and knowledge on seafloor mineral deposits and MINDeSEA activities. Presentation of activities and results during the regular meetings of the EGS Expert Groups with the EGS National Delegates (Mineral Resources and Marine Geology Expert Groups). During 2019 the MINDeSEA social media: Twitter account, Facebook profile and website were full operative and uninterruptedly updated with news and events on marine geology and seafloor mineral deposits worldwide distributed (scientific studies and legal-environmental management and regulations). The website (<http://geoera.eu/projects/mindesea/>) was integrated in the GeoERA site (www.geoera.eu). The website contains all relevant information about the project, results and allow download of maps and documents. MINDeSEA consortium is creating a visual identity including photo galleries and videos on the European submarine mineral deposits and main operations carried out in the sampling and data acquisition, with the aim to make the project identifiable to its target audiences.



MINDeSEA Team at the “Geominero”-IGME Museum. From left to right Johan Nyberg (SGU), Teresa Medialdea (IGME), Maria Judge (GSI), Vitor Magalhaes (IPMA), Javier González (IGME), Egidio Marino (IGEO), Georgy Cherkashov (VNIIOkeangeologia), Tom Heldal (NGU), Thomas Kuhn (BGR), Pedro Ferreira (LNEG), James Hein (USGS) and Irene Zananiri (HSGME).

WP3 Seafloor Massive Sulphide Deposits. This WP includes all the “Hydrothermal Deposits” as more representative of this group of mineralization not only “Seafloor Massive Sulphide Deposits”. Many of these mineralizations are represented by other than sulphides like in the case of hydrothermal oxides, silica caps or sulfate/carbonate chimneys being more indicated the use of the generic term “hydrothermal deposit”. More than 15 occurrences on hydrothermal deposits have been reported in the Canary Islands (Spain), Tyrrhenian Sea (Italy) and Aegean Sea (Greece). Work is progressing in the mid-Atlantic Ridge area (Portugal) and the North Atlantic (Iceland) and Norwegian Sea (Norway) within the allotted time scale to refine the data and produce the next deliverable.

WP4 Ferro-manganese Crusts, Phosphorites and Critical Raw Materials. The MINDeSEA consortium is working now on the compilation and creation of databases of existing data on ferromanganese crusts and phosphorites in European waters. New analyses on critical metals like cobalt, lithium, tellurium, and rare earth elements are being developed in specific representative samples. Three scientific papers have been published by consortium partners (IGME, IGEO) on SCI international journals (Marine Geology, Minerals) covering topics on exploration and cartography, mineralogy, geochemistry, processing and metal-recovery of ferromanganese deposits.



First draft MINDeSEA compilation map of ferromanganese crust deposits/occurrences in the European Seas.

WP5 Marine Placer Deposits. The inspire-compliant harmonized database and maps are in progress. Correspondences between on-land hydrothermal fields and pegmatites in coastal areas (tin, gold, tantalum, rare earth elements, lithium...) and marine placer deposits are being explored. Work is progressing within the allotted time scale to refine the data and produce the next deliverable.

WP6 Polymetallic Nodules. Cooperative works are being developing to compile data on the Baltic Sea (LNEG, Okeangeologia, SGU) and the Atlantic Ocean (LNEG, BGR, IGME) where de data are very fragmented in different repositories (Universities and industry from Russia, EGS organizations, ISA, etc). Scientific papers have been published by consortium partners (BGR) on SCI international journals (Minerals) focused on mineralogy, geochemistry, processing and metal-recovery of polymetallic nodules.

WP7 Exploration in the Atlantic, Mediterranean, Baltic and Black Sea. IGME presented first examples of compilation maps and tables in the Canary Islands and Iberian margins. A research cruise “EXPLOSEA 2” has been conducted by IGME onboard the Spanish research vessel “Sarmiento de Gamboa” in the mid-Atlantic Ridge, exploring and discovering, with the support of ROV-6000 “Luso” from EMEPC (Portugal), new active-inactive hydrothermal systems between Moytirra (45°N) and South Azores (38°N). More information at: <http://www.igme.es/explosea/>



Submarine images taken by ROV “Luso” during the “EXPLOSEA 2 Cruise” on sulphide-anhydrite chimneys in an active vent from Moytirra hydrothermal system, at 3000 m water depth. Below, EXPLOSEA Team aboard Spanish Research Vessel “Sarmiento de Gamboa” in the first leg of “EXPLOSEA 2”.

MINDeSEA UPDATES

WP8 Link to Information Platform. GSI and MINDeSEA consortium are working in cooperation with GIP-P to propose new project vocabulary. The establishment contact with the GeoERA Information Platform team, learn planned approaches to: website set; principals and guidelines; standards and methodologies; prototyping; testing and implementation of fully functional data services; communication (this will be ongoing throughout the project lifespan).

STUDENT SHORT-TERM INTERSHIPS

The MINDeSEA consortium is hosting Earth Sciences students to provide working-training experiences for last year and PhD students from national and international Universities. These internships are designed to encourage collaboration between EGS and Academia, on any aspect of MINDeSEA goals, in the research of submarine mineral resources from the European seas, by graduate students, trying to play an important role in the careers of early career ocean scientists. Three students: Janine Wegner, Egidio Marino and Iñigo Zalba, have been granted by BGR, IGME and SGU to do research on ferromanganese nodules and crust deposits under the MINDeSEA umbrella. The students are developing studies on compilation and analysis of publications and reports, mineralogical, geochemical and isotopic analysis and on critical raw materials (CRM) of mineralization samples. All these works will contribute to different objectives of MINDeSEA: 1) Characterise deposit types; 2) Characterise the trace element content of the deposit type including CRM; 3) Identify the principal metallogenic provinces; 4) Develop harmonised mineral maps and datasets of seabed deposits. We expect to offer a number of short-term internships each year.



Left, Egidio Marino, PhD student, preparing thick ferromanganese crusts for analysis of critical elements at BGR Laboratory. In the middle Iñigo Zalba working in the Cádiz Bay marsh. Right, examples of polymetallic nodules from the Baltic Sea studied in cooperation with SGU.

NEWS AND EVENTS

EU RAW MATERIALS WEEK 2019

18-22 November, 2019; Brussels, Belgium

It builds up on a series of events organised by the European Commission addressing the latest news on raw materials in the EU.

<https://www.eurawmaterialsweek.eu/event>



WORKSHOP ON THE REGIONAL ENVIRONMENTAL MANAGEMENT PLAN FOR THE AREA OF THE NORTHERN MID-ATLANTIC RIDGE

25-29 November, 2019; Evora, Portugal

The EU is funding a study to identify the ‘Areas of particular environmental interest in the Atlantic’. The main objective of this study is to support the **International Seabed Authority (ISA)** to set the Atlantic Regional Environmental Management Plan for the Atlantic area beyond national jurisdiction.

<https://www.isa.org.jm/workshop/workshop-regional-environmental-management-plan-area-northern-mid-atlantic-ridge>



OS004 - Beyond Hydrography: Seafloor Mapping as Critical Data for Understanding Our Oceans

This session showcases varied uses for mapping data by illustrating the benefits of: data-sharing within and across different communities and establishing programs to increase mapping coverage; increasing use of integrated ocean data observations through emerging technologies, innovative solutions incorporating AI, machine learning, and autonomous modalities; and establishing best-practices that maximize data quality, acquisition, and integration.

<https://agu.confex.com/agu/fm19/prelim.cgi/Session/81525>



36TH INTERNATIONAL GEOLOGICAL CONGRESS

2 - 8 MARCH 2020, DELHI, INDIA

Theme 36: Exploration and Mining of Marine Mineral Resources

<https://www.36igc.org/science-program>

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The digital Newsletter is also available in our website

Our next newsletter is scheduled for December 2019,

SO GET IN ALL YOUR NEWS AND VIEWS, SIGNIFICANT PUBLICATIONS, CRUISE SUMMARIES, CONFERENCES, etc. submitted to Coordinator Javier Gonzalez for inclusion (fj.gonzalez@igme.es)



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 731166

