GMOS
TRAIN

Global Mercury Observation
Training Network
In Support to the Minamata Convention

Preliminary Call For ESR Applications

www.gmos-train.eu

Jožef Stefan Institute, Ljubljana, Slovenia

15 ESR positions are open to train a new generation of environmental scientists who will work on research topics of great global importance.

The Marie Skłodowska-Curie Action "Global Mercury Observation and Training Network in Support to the Minamata Convention" is an international research project, coordinated by Prof. Milena Horvat from the Jožef Stefan Institute (JSI) and is financed under the funding line "excellent science" of the Horizon 2020 research and innovation programme of the European Commission. In this very competitive scheme the project received total score 100%. It includes 11 European project partners and participates with eminent research institutions, such as Harvard University and MIT, and other organisations, such as UN Environment, JRC Ispra and eminent NGOs.

The overall objectives of the GMOS-Train network are:

(1) to provide urgently needed training in Hg science within the context of the UNEP Minamata Convention, and

(2) to fill key knowledge gaps in biogeochemical Hg cycling linking anthropogenic emissions and Hg in marine food webs.

ESRs will be trained through a structured and comprehensive programme and will not only learn the theory but will gain first-hand lab experience. The partners engaged in the project will work closely together, with each of the partners supervising at least one research project. All ESRs will spend time not only at the hosting institution but also in one of the other partner universities/research centers/regulatory agencies/companies involved in GMOS Train project throughout Europe. Being trained in highly relevant research topics will enhance researchers career prospective and employability. The GMOS-Train aims to recruit outstanding and highly motivated ESRs to meet the ambitious goals of the project.

All applications must be submitted by means of on-line application on the official GMOS-Train project website. Deadline for application is April 30th 2020.

Please find details about the application process and modalities at www.gmos-train.eu.

We are looking forward to your application!

Best regards,
Prof. Dr. Milena Horvat, JSI, Project Coordinator

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This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

ESR Hosts

9 academic and 2 industrial partners in 6 countries

Participating Organisations

(ESRs secondments)

Arctic Monitoring and Assessment Programme	AMAP	Norway
United Nations Environmental Programme	UNEP	Switzerland
Massachusetts Institute of Technology	MIT	USA
Harvard University	Harvard	USA
Institut de Recherche pour le Développement	IRD	France
Swedish Polar Research Secretariat	SPRS	Sweden
European Environmental Bureau	EEB	Belgium
Tekran	Tekran	Canada
Lumex	Lumex	Germany/Russia
Dutch National Standard Laboratory	VSL	The Netherlands
Aristotle University of Thessaloniki	AUTH	Greece
Meteorological Synthesizing Centre – East of EMEP	MSC-E	Russia
International Postgraduate School Jožef Stefan	IPSJS	Slovenia
Université Paul Sabatier	UPS	France
Université Bretagne Loire	UBL	France

COORDINATING ORGANISATION
Jožef Stefan Institute on behalf of the GMOS-Train consortium

RESEARCH FIELD
Environment and Health Science

RESEARCH PROFILE
Early Stage Researcher (ESR)

APPLICATION DEADLINE
30 April 2020 23:00 – CET (Europe/Brussels)

SELECTION COMPLETED
by 30 June 2020

ESR SELECTED AND RECRUITED
by the deadline 30 September 2020

EU RESEARCH FRAMEWORK PROGRAMME
H2020 / Marie Skłodowska-Curie Actions

MARIE CURIE GRANT AGREEMENT NUMBER
860497

WORK LOCATION
Multiple locations (secondments to project partners)

TYPE OF CONTRACT
Temporary

JOB STATUS
Full-time, 36 Months

INDICATIVE WORKING HOURS PER WEEK
40

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Eligibility Criteria

GMOS-Train is looking for a broad international representation of early stage researchers. The network clearly acknowledges its responsibility for the recruitment of the researchers, their working and living conditions, as stated in the document "The European Charter for Researchers - Code of Conduct for the Recruitment of Researchers". Gender equality and minority rights will also be promoted in the selection process. There is no age limit.

- **MOBILITY**

The positions are open to all nationalities. However, your application has to comply with the European **Commission's Mobility Rules**, meaning that at the time of recruitment you must not have resided or carried out your main activity (work, studies, etc.) in the country of the host organisation for more than 12 months in the 3 years immediately before the reference date (indicative start of the employment contract, Month Date 2020). Compulsory national service and/or short stays such as holidays are not taken into account (European Commission's Guide for Applicants).

- **EARLY-STAGE RESEARCHER (ESR)**

In case you have already gained prior work experience in academia, you shall be in the first four years (full-time equivalent research experience) of your research career at the time of recruitment by the host organisation and have not been awarded a doctoral degree. Full-time equivalent research experience is measured from the date when you obtained the degree entitling you to embark on a doctorate, even if a doctorate was never started or envisaged. Part-time research experience will be counted pro-rata (European Commission's Guide for Applicants).

- **RELEVANT UNIVERSITY DEGREE**

master's degree or equivalent in Environmental and Health Science or related fields.

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Selection Process

In case an individual researcher is interested in several advertised ESR projects, he/she may apply for a maximum of three specific ESR projects and list their order of preference.

The selection committee will check applications against the following criteria:

- Scientific background and potential as indicated by candidate experience.
- Fit to a research project.
- Evidence of ability to undertake research.
- Evidence of working within groups or teams.
- Impact and benefit of the proposed training to the candidate's research career.

Three candidates will be short-listed for each research project and invited to an interview (interviews by video link will be held if candidates are not able to travel).

Interviews will consist of two parts:
1) a short presentation by the candidate followed by questions and answers, and
2) competence-based interview.

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Employment Conditions

The selected candidates are employed with a fulltime contract. The salary follows the Marie Curie-Skłodowska ITN funding Scheme. The researcher is hired under an employment contract and benefits from a monthly living allowance, social security cover, plus a mobility and family allowance.

A career development plan will be prepared for each fellow in accordance with his/her supervisor and will include training, planned secondments and outreach activities in partner laboratories of the network. The ESR fellows are supposed to complete their PhD thesis by the end of the 3rd year of their employment. For more information please visit the Marie Curie-Skłodowska website and GMOS-Train website.

ESRs Key Responsabilities

- To manage and carry out the research projects within 36 months.
- To write a PhD dissertation.
- To participate in research and training activities within the GMOS-Train network.
- To write articles for scientific peer reviews.
- To participate in meetings of different GMOS-Train consortium bodies.
- To disseminate the research in the scientific community (international conferences) and non-scientific community, by outreach and public engagement.
- To liaise with the other research staff and students working in broad areas of relevance to the research project and partner institutions.
- To write progress reports and prepare results for publication and dissemination via journals, presentations and the web.
- To attend progress and management meetings as required and network with the other research groups.

ESRs Benefits

- Prestigious EU fellowship.
- Highly competitive and attractive salary and working conditions.
- Excellent training programme covering health and environment science and state-of-the-art technologies.
- Develop multidisciplinary research skills.
- Be part of a team of leading scientists in different fields of academia.
- Establish a professional network in industry and academia.
- Visits and secondments to other project partners within industry and academia for up to 30% of your appointment period.

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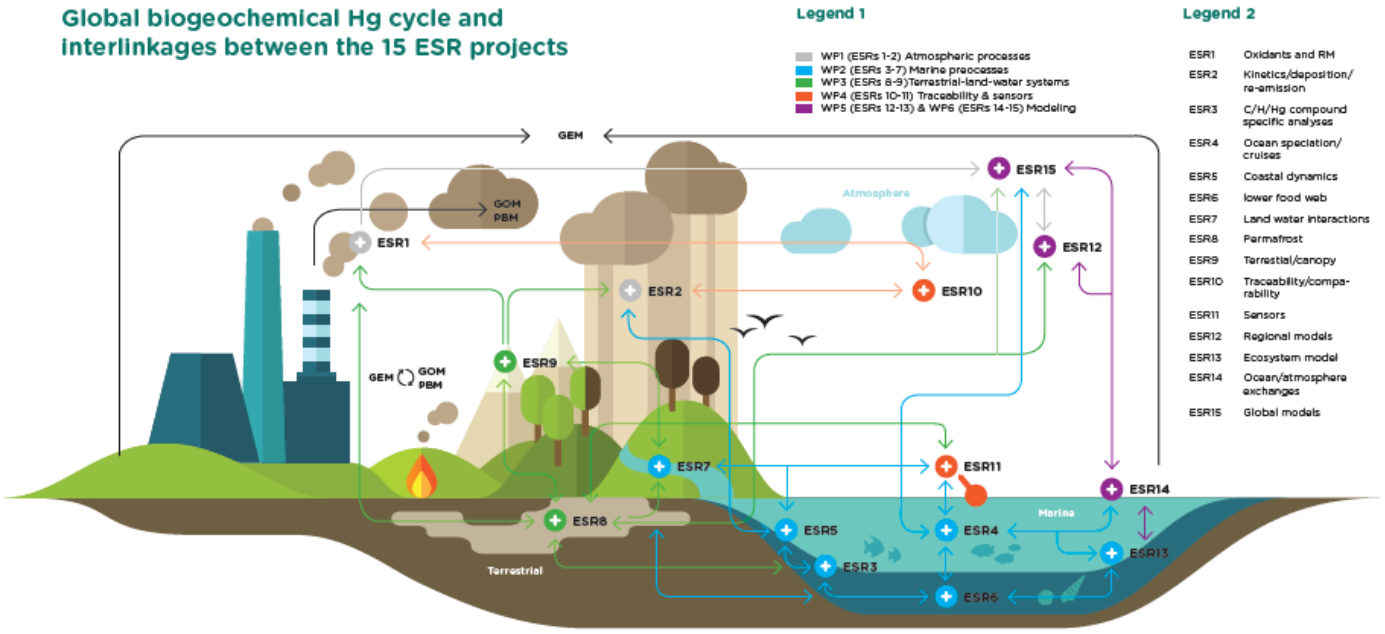
ESR Projects



ESR 1

Project Title: New field observations on reactive Hg (RM) and oxidant dynamics, RM isotopic composition, and revision of Hg oxidation schemes in regional and global 3D atmospheric Hg models.
Host: UGA

Supervisor: A. Dommergue

Co-supervisor: : J. Sonke (CNRS)

Enrolment in Doctoral degree: Université Grenoble Alpes, France

Objectives: To improve understanding of atmospheric Hg observations including the role of key oxidants, and marine emission and sea-ice re-emissions.

Expected Results: Traceable and robust methodology for the quantification of reactive Hg (including stable isotopes) with spatial and temporal variability (paper 1). Measurements of Hg species concentrations and isotopic ratios and oxidants (BrO, NO_x, O_3) in polar regions where high oxidation rates are observed. An improved understanding of re-emission sources (snow, sea-ice, ocean) and their role on Hg atmospheric budget using 1D atmospheric models (paper 2). Improved understanding of of re-emissions sources on Hg budget at a global scale in 3D models. Improvement of reactions schemes and parametrization of GEM oxidation using the last version of models (i.e. GEOSChem 3D). Sensitivity testing and validation using GEM data base that are available worldwide (GMOS network, AMNET) (paper 3). ESR1 will work in close collaboration with ESR2 (marine boundary) and 4, 8, 9, 10, 12, 14, 15.

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ESR 2

Project Title: New experimental constraints on atmospheric Hg red-ox reactions.

Host: JSI

Supervisor: M. Horvat

Co-supervisors: : A. Dommergue(UGA), J. Sonke (CNRS)

Enrolment in Doctoral degree: International Postgraduate School Jožef Stefan

Objectives: The main objective is to understand aqueous Hg red-ox mechanisms and rates from an experimental perspective. This includes the Hg red-ox behaviour of Hg species in marine waters, atmospheric waters and in aerosols, in order to better understand deposition of oxidised fractions of Hg and re-emission of volatile inorganic Hg species, and the two-way flux of Hg species between oceans/atmosphere and land/atmosphere. Close collaboration with ESR1, and ESRs 4, 5, 9, 10, 12, 14, 15

Expected Results: (i) Experimental kinetic rate constants for reduction reactions in the aqueous phase for Hg(II) complexes in seawater, rainwater, cloud water, aerosols , and of GOM in the gas phase under different wavelength regions (using solar simulator) (ii) validation of laboratory experiments with complementary field based experiments, and (iii) mechanistic understanding of photochemical reactions from the Hg stable isotope composition of products and reactants and (iv) improved representation of aqueous and gaseous redox processes in 3D regional and global Hg models (3 papers).

ESR 3

Project Title: Combining carbon, hydrogen and Hg compound specific isotope analysis to understand MMHg origin.

Host: CNRS

Supervisor: D. Point

Co-supervisors: J. Sonke (CNRS); A. Lorrain (IRD)

Enrolment in Doctoral degree: Paul Sabatier University, France

Objectives: to develop novel carbon ($\delta^{13}C$) and hydrogen (δD) isotopic tracers of the 'methyl' group of the MMHg (CH_3Hg) compound; to couple novel C/H isotopic tracers with Hg stable isotopic analysis; to explore and fingerprint the fundamental mechanisms at the origin of MMHg formation under laboratory-controlled experiments, in the field, during oceanographic cruises and in biological samples originating from different ocean basins.

Methodology and Expected Results: This PhD project involves analytical chemistry, method development, analysis of environmental, biological samples, and minor fieldwork. The ESR will (i) validate methodologies for the 3D ($\delta^{13}C$-δD-$\delta^{202}Hg$/$\Delta^{199}Hg$) isotopic analysis of MMHg in natural samples at low concentrations (zooplankton); (ii) study 3D ($\delta^{13}C$-δD-$\delta^{202}Hg$/$\Delta^{199}Hg$) isotopic variations of MMHg during abiotic and biotic Hg methylation experiments, under controlled laboratory conditions; (iii) document the 3D isotopic variations of MMHg in marine organisms collected from different study sites of ESR 4, 5, 6, 7. The trophic ecology and habitat of these organisms will also be documented by complementary analysis of $\delta^{13}C$, and $\delta^{15}N$ signatures on individual amino acids.

This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

ESR 4

Project Title: Marine Hg species dynamics and distribution.
Host: AMU

Supervisor: L.E. Heimbürger-Boavida
Co-supervisors: D.Amouroux (UPPA); M. Horvat (JSI)
Enrolment in Doctoral degree: Université d'Aix-Marseille, France

Objectives: (i) to develop a first high resolution time-series of combined marine (DGM and other Hg species) and atmospheric Hg observations at a coastal Mediterranean site. (ii) to fill identified data gaps for open ocean Hg species distributions (2 cruises planned to Southern Indian and South Pacific Ocean) (iii) use isotopically-label incubation experiments to study in situ methylation/demethylation. Collaboration with ESRs 1, 3, 5, 6, 11,13,14, 15
Expected Results: Provide a DGM time-series to better constrain the large exchange flux at the ocean-atmosphere interface (paper 1). Provide high-resolution full depth open ocean description of all Hg species (tHg, MMHg, DMHg, Hg(0), DGM), and methylation/demethylation rates for uncharted open ocean basins (2 papers). New observations will feed the GEOTRACES global database and be used to confront and update state-of-the-art numerical global open ocean models.

ESR 5

Project Title: MMHg sources in coastal ecosystem: new molecular and isotopic experimental speciation approaches.
Host: UPPA

Supervisor: D. Amouroux
Co-supervisors: R. Guyoneaud (UPPA), C. Schrum (HZG)
Enrolment in Doctoral degree: Université de Pau et des Pays de l'Adour, France

Objectives: (i) to investigate major microbial and photochemical processes connected to the formation of MMHg (and DMHg) in coastal marine ecosystems (Atlantic and Mediterranean coastal, shelf and/or margin stations), (ii) to understand the dynamic of MMHg formation/distribution from coastal to marginal marine areas in collaboration with ESR 4,5, 6. ESR5 will collaborate with ESR3 using isotopic signature information/techniques, with ESR11 to test biosensor information and provide data for ESR13 for modelling purposes, and with ESR 7 on the role of DOM. Collaboration with ESRs 3, 4, 6, 7, 11, 13
Expected Results: Methylation, di-methylation or demethylation rates in various environmental compartments as defined by critical biogeochemical parameters (e.g., microbial diversity and *hgcA* "methylation" genes; sunlight irradiance and DOM chromophoric properties) affecting Hg transformations in coastal, shelf and/or margin stations. Provide new molecular and isotopic information on transformations of the methylated Hg species in coastal environments (3 papers)

ESR 6

Project Title: Bioaccumulation of Hg in lower food web in marine environment.
Host: IFREMER

Supervisor: J. Knoery
Co-supervisors: L.E. Heimbürger-Boavida (AMU), D. Point (CNRS)
Enrolment in Doctoral degree: University of Nantes, France

This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

Objectives: (i) to investigate Hg and MMHg sorption and uptake rates by key marine particles along the abiotic/biotic continuum: particulate organic matter (POM), microbes, phytoplankton, zooplankton, (ii) to implement controlled laboratory and mesocosm experiments, and French Atlantic coastal field campaigns, (iii) to use state-of-the-art analytical isotope tracing to trace Hg and MMHg dynamics. Field studies will be conducted in collaboration with ESR4 and ESR7 to cover three contrasting coast to sea transects (Atlantic, Mediterranean, Baltic, Figure 2). Collaborating with ESR3, 4, 5, 7, 13
Expected Results: New Hg speciation data and uptake rates between different marine particle size classes ranging from field-flow fractionated organic matter, bacteria- and phytoplankton, and zooplankton. (2 papers) and joint paper defined in D2.1.2

ESR 7

Project Title: The role of terrestrial Hg in coastal and open oceans.
Host: SU

Supervisor: S. Jonsson
Co-supervisors: E.Sunderland (Harvard), D. Amouroux (UPPA), L.E. Heimbürger-Boavida (AMU)
Enrolment in Doctoral degree: Stockholm University, Sweden

Objectives: (i) to investigate the desorption kinetics and refractory concentration of Hg transported from the terrestrial compartment to coastal and open seas on particles as well as the reactivity of Hg- and MeHg-DOM complexes along contrasting land to sea transects and open ocean. Collaboration with ESR 3, 5, 6, 11, 12, 13, 15
Expected Results: Improved understanding of the fate and reactivity of terrestrial Hg along land to sea transects by i) applying novel approaches currently developed at SU to study desorption kinetics and refractory concentrations of Hg transported on particulate matter from contrasting terrestrial sources, and ii) study the reactivity (i.e. availability of Hg for photochemical and bacterial transformation reactions, and biological uptake) of Hg and MeHg complexed to TDOM and MDOM from contrasting land-to-sea transects (including Swedish Baltic coast, French Atlantic and Mediterranean coast and Northern Adriatic coasts), a coastal Mediterranean time-series station, and ocean basins (within the framework of ESR 4,5,6) and iii) comparison of experimental and field derived data on the availability of Hg-TDOM and MDOM complexes for biological uptake with the biological reactivity of Hg-TDOM complexes measured using the biosensors (in collaboration with ESR 5 and 11) (2 papers)

ESR 8

Project Title: Release of mercury from thawing permafrost.
Host: SU

Supervisor: S. Jonsson
Co-supervisors: K. Gårdfeldt (SPRS) and D. Kocman (JSI)
Enrolment in Doctoral degree: Stockholm University, Sweden

Objectives: to address the following questions: (i) to what extend is Hg mobilized to the atmosphere or by runoff from thawing permafrost; (ii) can thawing permafrost and subsequent degradation of organic matter turn thawing permafrost soils into hotspots for Hg methylation?, and (iii) what risk does Hg in thawing permafrost pose for the local environment and for altering the global cycle of Hg? Collaboration with ESRs 1, 3, 7, 9, 11, 12, 15
Expected Results: Process based understanding of mobility and intercompartmental transformation processes of Hg stored in thawing permafrost (2 papers)

This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

ESR 9

Project Title: Terrestrial Hg pools inter-compartmental exchanges.
Host: JSI

Supervisor: D. Kocman
Co-supervisors: M.Horvat (JSI), E. Sunderland (Harvard), S. Jonsson (SU)
Enrolment in Doctoral degree: Jožef Stefan International Postgraduate School, Slovenia

Objectives: To improve understanding of controls of terrestrial ecosystems to act as a net source or sink with the focus on canopy and its interactions with atmosphere and aquatic systems by i) applying novel analytical approaches including measurements of stable Hg isotopes in litterfall from contrasting forested ecosystems (study areas - Fig.2) and foliar exchange of mercury, (ii) studying kinetics of Hg during the degradation of litterfall and interactions with the organic matter, and (iii) incorporation and upscaling of the results in regional and global models using existing spatially-resolved datasets and available state-of-the art modelling tools. Collaboration with ESR1, 2, 7, 8, 12, and 15.
Expected Results: Improved understanding of the role of canopy as part of the terrestrial Hg pool and in the global biogeochemical cycle of Hg. Integration of new knowledge on controls and magnitudes of its exchange with atmospheric and aquatic ecosystems into a coupled global multimedia model developed in WP 5. (3 papers).

ESR 10

Project Title: Traceability of Hg speciation measurements in the atmosphere.
Host: PSA

Supervisor: W. Corns
Co-supervisors: M. Horvat (JSI), I.Krom (VSL)
Enrolment in Doctoral degree: Jožef Stefan International Postgraduate School - JSIPS, Slovenia

Objectives: to develop, establish and implement a traceable calibration methodology for the most important oxidized Hg species, especially for $HgCl_2$; to study, develop and compare different methods of measuring oxidized Hg; to accurately compare total Hg concentrations in generated standard gases for elemental Hg Hg(0) and oxidized Hg Hg(II); to apply the developed methodologies to test and validate new and existing methods for on-line Hg measurement under field conditions. Collaboration with ESR1, 2, 7, 8.
Expected Results: Validated calibration sources for Hg(0) and Hg(II) for low level gaseous Hg measurements. Validated and tested protocols applied at observation stations and cruises (Figure 2) (2 papers)

ESR 11

Project Title: Innovative nano-biosensors detecting. MMHg.
Host: IOS

Supervisor: A. Lobnik
Co-supervisors: A. Lapanje (JSI)
Enrolment in Doctoral degree: Jožef Stefan International Postgraduate School – JSIPS, Slovenia

Objectives: to develop highly specific, robust and sensitive MMHg biosensor. Collaborating with ESRs 4, 5, 6, 7, 13

This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

Expected Results: Synthetic biology circuit of directed evolution for proteins of high MMHg specificity. DNA and RNA biomolecules with high MMHg binding affinities obtained and characterised. Mesoporous material with immobilised biomolecules prepared and the prototype biosensor for MMHg detection in seawater validated. Biosensor onsite testing (2 papers)

ESR 12

Project Title: Coupling regional 3D ocean and atmospheric models to quantify the impact of oceanic sources on the regional Hg budget.
Host: CNR-IIA

Supervisor: N. Pirrone

Co-supervisors: I. M.Hedgecock (CNR), V.Matthias (HZG)

Enrolment in Doctoral degree: Jožef Stefan International Postgraduate School – JSIPS, Slovenia

Objectives: to improve the model of Hg exchange processes between the atmosphere and the ocean and to implement new red-ox chemistry schemes into coupled 3D ocean atmosphere models; to evaluate model updates using observational data and investigate the role of oceanic emissions; to investigate the impact of emission changes on Hg cycling in Europe. Collaboration with ESR1, 2, 4, 8, 9, 13, 14, 15
Expected Results: Updated Hg red-ox chemistry in regional models. Quantification of the impact of oceanic sources on observed Hg concentrations and on regional deposition patterns. Clarification to what extent reductions in anthropogenic Hg emissions will be visible in reduced atmospheric concentrations and depositions (2 papers)

ESR 13

Project Title: Modelling methylation and bio-accumulation of Hg in the marine environment.
Host: HZG

Supervisor: C. Schrum

Co-supervisors: J. Bieser (HZG), J. Knoery (IFREMER)

Enrolment in Doctoral degree: University of Hamburg, Germany

Objectives: to generate a better understanding of methylation and bio-accumulation of Hg in the marine environment and implement this into parametrizations for 3D oceanic ecosystem models; to enhance our understanding of Hg accumulation in the food chain; to improve the regional ocean-ecosystem model MECOSMO and its validation with new observational data. Collaborating with ESR3, 4, 5, 6, 7, 11
Expected Results: Improved regional ocean-ecosystem model which can be used to evaluate the impact of emission changes in the Hg burden in sea food (2 papers)

ESR 14

Project Title: Exploration of long-term observational data sets to examine ocean/atmosphere exchange processes of Hg.
Host: HZG

Supervisor: R. Ebinghaus

Co-supervisors: A.Dommergue (UGA), and N.E.Selin (MIT)

Enrolment in Doctoral degree: University of Hamburg, Germany

This project will receive funding from the European Union's Horizon 2020 research and innovation programme under the Marie Sklodowska-Curie grant agreement no. 860497.

Objectives: to investigate atmosphere-ocean Hg interactions by exploring long-term atmospheric Hg datasets, the results from dedicated field studies as well as past emission data. Investigation of natural long-term trends to support emission scenario development. Collaboration with ESR1, 2, 4, 12, 15
Expected Results: Improved understanding of (i) ocean-atmosphere exchange processes and their effects on short- to long-term-scales, (ii) the role of the oceans in the global Hg budget and their source- vs. sink-function, (iii) (re-)construction of past emission data sets (iv) the ratio of anthropogenic vs. natural emissions, (v) the role of oceanic legacy re-emissions on a long-term perspective, (vi) the relevance of oceanic vs. terrestrial causes, such as SST vs. biomass burning (vi) Seasonality in emission based on long term data and emission inventories (1 paper). Supporting the emission scenario development through the analysis of Hg long-term trends and the global model development through an improved ocean atmosphere exchange parameterization.

ESR 15

Project Title: Global Hg modelling to test scenarios and Hg reduction strategies.

Host: CNR-IIA

Supervisor: R N. Pirrone

Co-supervisors: N. E. Selin (MIT), V. Matthias (HZG)

Enrolment in Doctoral degree: Jožef Stefan International Postgraduate School – JSIPS, Slovenia

Objectives: to develop modelling tools to simulate emission scenarios reflecting future Hg reduction policies on a global scale. To evaluate the impact of global emission changes in Europe. Collaboration with ESRs1, 2, 4, 8, 9, 12,13, 14.
Expected Results: Global emission perturbation runs that consider future reductions in line with the recommendation of the Minamata Convention. Validate models through an intercomparison exercise. Identify the source receptor relationship of Hg long-range transport for Europe. Demonstrate the impact of emission reductions on atmospheric concentrations and deposition and Hg concentrations in fish (2 papers) (in collaboration with ESR12-13-14).



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