ISCO INTERNATIONAL SPILL CONTROL ORGANIZATION ESTABLISHED 1984

NEWS

THE NEWSLETTER OF THE INTERNATIONAL SPILL RESPONSE COMMUNITY

info@spillcontrol.org | www.spillcontrol.org

ISSUE 841 | 6 JUNE 2022

ISCO & THE ISCO NEWSLETTER

The International Spill Control Organization, a not-for profit organization dedicated to raising worldwide preparedness and co-operation in response to oil and chemical spills, promoting technical development and professional competency, and to providing a focus for making the knowledge and experience of spill control professionals available to Intergovernmental, Governmental, NGO's and interested groups and individuals

ISCO holds consultative status at the International Maritime Organisation and observer Status at International Oil Pollution Compensation Funds

INTERNATIONAL NEWS

PLEASE CLICK ON THE BANNERS BELOW FOR MORE INFORMATION

IMO MEPC 78 PREVIEW

MARINE ENVIRONMENT PROTECTION COMMITTEE (MEPC) 78TH SESSION, 6-10 JUNE 2022 – HIGHLIGHTS

1. Tackling climate change - cutting GHG emissions from ships - progressing the work
2. Proposal to designate the Mediterranean Sea, as a whole, as an Emission Control Area for Sulphur Oxides
3. BWM Convention experience-building phase, application and proposed amendments
4. Discharge water from exhaust gas cleaning systems (EGCS) – guidelines and guidance
5. Marine plastic litter from ships - mandatory garbage record books for smaller ships and marking of fishing gear
6. Adoption of amendments (watertight doors, GESAMP Hazard Evaluation procedure)
7. Protecting seas in the Arctic - regional arrangements for port reception facilities
8. Revision of the Anti-fouling Systems Convention guidelines
9. Unified interpretations of provisions of IMO environment-related conventions
10. MEPC 78 arrangements including media accreditation

More details at https://www.imo.org/en/MediaCentre/IMOMediaAccreditation/Pages/MEPC-78-preview-.aspx

ISCO AMBASSADORS
(Members with special responsibilities in specified geographical areas)

Carlos Sagrera	Región Iberoamericana
Matthew Sommerville	UK London
John Noble	UK London & South'ton
Wu Yue	China

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Professional recognition is a visible mark of quality, competence and commitment, and can give you a significant advantage in today's competitive environment. All who have the relevant qualifications and the required level of experience can apply for Professional Membership of ISCO. The organization offers independent validation and integrity. Each grade of membership reflects an individual's professional training, experience and qualifications. You can apply for MEMBERSHIP (MISCO) or FELLOWSHIP (FISCO)

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ISCO NEWS

CARLOS SAGRERA, ISCO'S REPRESENTATIVE IN LATIN AMERICA TO GIVE MARINE ENVIRONMENT PRESENTATION IN MEXICO

Carlos Sagrera has been invited as a speaker in Mexico to the Inter-American Petroleum Technology Exhibiton, that will take place form June 6 to 8, 2022 in the Tampico Tamaulipas Convention Center. The event is organized by the Government of the State of Tamaulipas through the Secretariat of Economic Development and the Energy Commission of Tamaulipas, the support of the Strategic Energy Innovation Group of the National Polytechnic Institute, the International Society for Automation and Instrumentation, the Mexican Institute of Chemical Engineers and the organization of Grupo Comunicador Alba and the objective is to hold an international technological exhibition with presentations of Latin American projects and business tables with the commercial and special business representations of each operating company. The current international situation with oil has revitalized Latin America that has started hydrocarbon projects both in exploitation and unexplored, as well as the development and growth of its energy infrastructure. The most important oil companies in the region are awarding service contracts for the exploration and extraction of hydrocarbons and the development of their infrastructure. Argentina, Brazil, Mexico, Colombia, Venezuela and currently the discoveries of Guyana allow these countries to offer investment projects for the development of their industry.

Within this framework, ISCO, through its Spanish-speaking Representative in Latin America and with the support of the main OSRO of Tamaulipas Marterra (www.marterra.com.mx), will make a presentation on the topic: "SAFETY AND ENVIRONMENT IN THE MARITIME AND OIL INDUSTRY: Lessons Learned for OSROs and Terminals in Mexico with the Response to the Level III Oil Spill Incident at the La Pampilla Refinery Port Terminal (Peru – January 2022)".

Links with details of the event, of the ISCO Presentation and its Program - https://exitep.com.mx/english-version https://exitep.com.mx/speakers https://img1.wsimg.com/blobby/go/d93a2bc5-2df0-46e2-9b9e-f9404286ecdd/Programa%20Ok-0007.pdf

ISCO VOLUNTEER GROUP MEETING – MAY 26, 2020

The meeting began at 3 pm est time with attendance by 14 members

Carlos Sangrea (Panama) reported on the oil spill in Peru. The cause is still being investigated.

Dan Sheehan (USA) reported that IMO's Maritime Environmental Protection Committee will be meeting virtually on June 6th through June 10th. We are looking for volunteers to attend virtually. Please let Neil Marson know if you are interested.

Marc Shaye (USA) reported on the project he and D. C. Sekhar (India) are heading. They are producing a series of podcasts regarding ISCO and its members. Larissa Montas (one of our student members) has volunteered to assist. If anyone would like to also assist with the project please contact us.

Interspill – it is being held in Amsterdam and will be attended by Captain Bill Boyle (UK) and Helena Rowland (USA). It will be held June 21st through June 23rd. Our booth is A11. Many of our members will also be exhibiting at the event.

INTERNATIONAL NEWS (CONTINUED)

Merv Fingas (Canada) has completed his new book. It is a new compilation "The Chemistry of Oil and Petroleum Products". Information about the publication can be found on Pages 11-12 of Issue 840 of the ISCO Newsletter.

Student Members – Any student members who have not submitted their information regarding their studies please do so asap. We will publish the information in our weekly Newsletter. If you require further information please contact either Mary Ann Dalgleish at mrydetroit@aol.com or Kayode Peter Balogun (Peter) at balogunkayodepeter@yahoo.com

We are also looking for ideas on how to assist the students in their further studies, job searches and how they can assist ISCO. Any suggestions are appreciated.

Volunteer group meetings are held on the third Thursday of each month at 3pm (est). The next meeting will be held on June 23rd. [Thanks to Mary Ann Dalgleish, VP Membership]

MORE INTERNATIONAL & REGIONAL NEWS

BLINKEN DISCUSSES RISK OF SAFER OIL TANKER SPILL IN RED SEA WITH SAUDI FM

May 31 - https://www.aninews.in/news/world/asia/blinken-discusses-risk-of-safer-oil-tanker-spill-in-red-sea-with-saudi-fm20220531090004/

P&IQ SCHOLARSHIP WINNERS – CONGRATULATIONS!

June 1 - The International Group of P&I Clubs and our Education Committee are pleased to announce the winners of the 2022 P&IQ Scholarship Programme. "We are delighted that Darius Aga and Joomi Park have accepted the International Group's offer of a Scholarship for them to study the P&IQ course. In our inaugural year for these scholarships, we were blown away by the quality of candidates applying worldwide. Our successful applicants are both excellent candidates and have real value to deliver to the industry in future. IG P&I / Read more

CANADA AND INDIA SIGN MEMORANDUM OF UNDERSTANDING TO ESTABLISH STRONGER COOPERATION ON ENVIRONMENTAL PROTECTION AND CLIMATE ACTION

June 2 - Today in Stockholm, the Honourable Steven Guilbeault, Minister of Environment and Climate Change, and the Honourable Bhupender Yadav, India's Minister of Environment, Forest and Climate Change, signed a Memorandum of Understanding (MOU) to increase bilateral cooperation on climate action, environmental protection and conservation.

Under the MOU, both countries have agreed to collaborate, exchange information and expertise, and support our respective ambition in a wide range of areas, including increasing renewable energy capacity, decarbonizing heavy industries, reducing plastic pollution, supporting the sound management of chemicals, and ensuring sustainable consumption. Govt. of Canada / Read more

NEWS REPORTS FROM AROUND THE WORLD

CANADA: COAST GUARD CONCLUDES SUCCESSFUL SUMMIT WITH UNITED STATES COAST GUARD

May 27 - Canada and the United States have a long history of working together to help mariners in need and manage the coastlines and shared waterways that run along the borders between the two countries.

This week, the Canadian Coast Guard hosted the 2022 Canada-United States Coast Guard Summit in St. John's, Newfoundland and Labrador. This year's Summit was the first to take place in person since the start of the COVID-19 pandemic, with additional presenters joining the Summit virtually. Canadian Coast Guard / Read more

CHILE: BEACH CLEANING CARRIED OUT ON THE BIG ISLAND OF CHILOÉ

May 27 - The activity brought together hundreds of volunteers of all ages from the towns of the Island of Chiloé, as well as members of the Carabineros, Municipalities, Private Companies, Schools, among others, who under an atmosphere of camaraderie proceeded to the collection of all kinds of household and fishing waste along the coastal edge. Governorate of Puerto Montt / Read more

CHINA: WIETEC 2022

June 2 - Since 2007, WieTec has brought together innovative products and services, experts and the sustainable development community to address one of the largest concerns of the modern world: environment. WieTec is an exhibition platform focused on environmental protection and home comfort innovations and solutions. Join us and introduce your brand, projects and innovations to our local audience that counts more than 120,000 visitors and 2,500 exhibitors.The annual event includes seven concurrent trade shows, namely Aquatech China, Flowtech China, Ecotech China, AirVentec, Intelligence & Environment China, Buildex China and Comforteco China. The shows respectively focus on: water and wastewater technologies, pump, pipe and valve technologies, waste gas & solid waste, air control, smart environmental monitoring and home comfort solutions, which allows visitors to gather an overall environmental industry knowledge. Environmental Expert / Read more

FINLAND: RISK OF CYANOBACTERIAL BLOOMS IS CONSIDERABLE IN FINNISH SEA AREAS THIS SUMMER

June 2 - The risk of large cyanobacterial blooms in Finnish sea areas this summer remains at the same level as previous summers, as nutrient levels in the Baltic Sea remain largely unchanged. The risk of cyanobacterial accumulations is considerable in the northern parts of the Baltic Proper, in the Gulf of Finland, the Archipelago Sea and in the southern parts of the Bothnian Sea. In the Bothnian Sea, cyanobacterial blooms are not necessarily limited to the southern areas SYKE / Read more

INDONESIA: PHILIPPINES, INDONESIA, AND JAPAN CONCLUDE MARPOLEX 2022

Above: The crew of BRP Teresa Magbanua departing in a send-off ceremony on May 29th. (PCG Photo)

May 31 - Regional Marine Pollution Exercise (MARPOLEX) 2022 concluded last week with operations drawing to a close on Friday, 21 May. Philippine Coast Guard (PCG), Japan Coast Guard (JCG), and organizations under Indonesia's Directorate General for Sea Transportation (DGST) participated in the exercise off Makassar, Indonesia. Joint drills involving search and rescue, firefighting, and oil spill response were held between 22 and 29 May. This exercise was the first for BRP Teresa Magbanua, commissioned just 16 days before MARPOLEX on 6 May.

19 vessels participated in the exercise, with 14 from Indonesia, four from the Philippines, and one from Japan. The Philippines sent BRP Teresa Magbanua (MRRV-9701), BRP Gabriela Silang (OPV-8301), BRP Malapascua (MRRV-4403), and BRP Cape Engaño (MRRV-4411) to the exercise. Japan sent the Patrol Vessel Large with Helicopter Mizuho. This vessel is similar to Teresa Magbanua as both are enlarged Kunigami-class designs with more displacement, helipads, and aviation facilities. OVD / Read more

ROMANIA: EMSA RPAS FLYING OVER THE BLACK SEA REGION IN SUPPORT OF NATIONAL AUTHORITIES

May 31 - Romanian national authorities have been using EMSA RPAS to conduct flights over the Black Sea region from a base in Mangalia. The flights are offering enhanced maritime surveillance to the country's Border Police, Naval Authority and National Agency for Fishing and Aquaculture. The day-to-day monitoring provided by the remotely piloted aircraft is particularly useful for the implementation of coast guard functions where getting a clear picture of what is happening at sea helps enable an efficient and effective response. EMSA / Read more

RUSSIA: PETERSBURG OIL TERMINAL COMPLETED TESTING OF ITS FLOATING OIL SPILL CONTAINMENT BOOMS

May 31 - Petersburg Oil Terminal has conducted its annual maintenance of floating booms designed for oil containment during emergency oil spills while handling crude oil/petroleum products tankers.

The booms are normally anchored to seabed. When activated they come up to the surface and surround the spill area. "We have been constantly improving environmental safety of POT. Floating booms have been acknowledged to be excellent since 2018 when they were installed in the water area of the terminal. The recent inspection has confirmed the parameters declared by the manufacturer," said POT. Port News / Read more

SPAIN: ADDRESSING MARINE LITTER IN THE MEDITERRANEAN IN FOCUS AT SEVILLE MEETINGS

May 31 - On 17-18 May 2022 UNEP/MAP organized the Regional Meeting on "Marine Litter Best Practices" in Seville, Spain. Participants from 16 Mediterranean countries examined best practices in the implementation of the new measures included in the updated Regional Plan on Marine Litter Management in the Mediterranean (RPML)—a legally-binding instrument the original version of which was adopted by the Contracting Parties to the Barcelona Convention in 2013. The technical deliberations addressed the various facets of marine litter, including the variants emanating from wastewater treatment plants, aquaculture and shipping or carried by watercourses. UNEP / Read more

UK: OCEAN GOVERNANCE PANEL DISCUSSION

June 2 – National Oceanography Centre - Tuesday 14 June 2022. Panel discussion begins at 3.00 pm, with networking 5.00 - 6.00 pm

NOC and the Centre for Global Constitutionalism are partnering together to host a panel discussion about ocean governance and sustainable development entitled "A Constitution for the Ocean?". This interdisciplinary panel from the social sciences, humanities and ocean diplomacy will reflect on what kinds of global governance instruments are required for the world to meet UN Sustainable Development Goal 14: Ocean and Life Below Water. Speakers will also consider the challenges set by the United Nations Decade of Ocean Science for Sustainable Development in light of existing and emerging international norms, laws and institutions.

The moderated panel discussion is open to the public, and audience members will be encouraged to engage with the panelists on the role governance plays in helping to achieve SDG 14, to "conserve and sustainably use the oceans, seas and marine resources for sustainable development."

Confirmed panelists include Professor Chris Armstrong (University of Southampton), Professor Steve Fletcher (University of Portsmouth), Dr Katherine (Katy) Hill (UK G7 Marine Science Coordinator) and Dr Emma McKinley (Cardiff University), with Associate Professor Laurie Wright (Solent University) chairing the discussion. NOC / Read more

USA: EPA: TWO TOXIC HOT SPOTS IN MICHIGAN WILL TAKE LONGER TO CLEAN UP THAN MANY OTHERS IN GREAT LAKES

May 31 - "With one billion dollars in funding from the Bipartisan Infrastructure Law, combined with funds from the annual Great Lakes Restoration Initiative, appropriations, and funding from other sources, we projected by the end of the decade, we will have completed work at 22 of the 25 remaining Areas of Concern," said Debra Shore, Administrator of the U.S. Environmental Protection Agency's Region 5 and Great Lakes National Program Office.

That's important to Michigan because of the 43 Areas of Concern, or AOCs, in Canada and the U.S., 14 — nearly a third of them — are in Michigan. So far, only three in Michigan have been completely cleaned up.

"EPA's goal for the management work to be completed on all but three AOCs in the U.S. by the end of this decade is absolutely bold, and I also find it quite inspiring," said Liesl Clark, Director of Michigan's Department of Environment, Great Lakes, and Energy (EGLE). https://www.interlochenpublicradio.org/2022-05-31/epa-two-toxic-hot-spots-in-michigan-will-take-longer-to-clean-up-than-many-others-in-great-lakes-st

USA: BSEE CONDUCTS UNANNOUNCED OIL SPILL RESPONSE EXERCISE

June 2 - As part of its mission to ensure that oil and gas companies are prepared to respond quickly and effectively to an offshore oil spill, the Bureau of Safety and Environmental Enforcement (BSEE) held a Government Initiated Unannounced Exercise (GIUE) on May 24, and an equipment deployment on June 1, to assess an operator's ability to activate its Incident Management Team in Houston and carry out the procedures described in its approved oil spill response plan.

This exercise required the operator, Equinor USA E&P Inc., to respond to a simulated discharge of oil resulting from exploration drilling activity in Walker Ridge Block 316, about 167 miles off the Louisiana coast. Offshore / Read more

Corporate Members of ISCO can submit news about new products and services in the "News from ISCO Members" section of the ISCO Newsletter. This is a free facility for Members. Given that the ISCO Newsletter has a large and highly targeted readership in over 50 countries, it's a cost-effective way to promote your company. If you have some news you would like to share with readers of the ISCO Newsletter, send it to John.McMurtrie@spillcontrol.org

CLEANING PLASTICS FROM RIVERS – From AlphaMERS

When we set out to clean river plastics, we asked all the hard questions at the drawing board stage. Do we need fuel or energy for this work? What about the energy in the river flow ? Can we configure to allow boat traffic to cross? How to cope with the seasonally changing bathymetry of the river? How strong should we make to withstand the monsoon flow? How much modularity is good in a remote unattended installation?

If your project is not funded, you cannot afford prototypes that are expensive and not well-thought-out. This reality, in fact, brings out the best in you. The human mind provides most of the answers before you get to the shop floor. The human mind is the best design software. The more you think through, the less is this cost of learning by expensive prototyping.

https://alphamers.com
Capt. D. C. Sekhar
info@alphamers.com

#innovation #productdesign
#scienceandenvironment #scienceandtechnology
#rivercleanup #oceancleanup #sustainability #plastics
#plasticpollution

EPE REVOLUTIONIZES ON-BOARD DISINFECTION WITH INNOVATIVE GENERATOR

Environmental Protection Engineering (EPE) has launched POWERKLOR – a complete disinfection solution for ship surfaces which generates sodium hypochlorite on-demand using only salt and water.

The pioneering Greek provider of solutions for ships which safeguard the global marine environment says that POWERKLOR represents a new standard for on-site chlorine generators in terms of balancing the needs of disinfection, cost effectiveness and sustainability. The fully automatic system generates sodium hypochlorite through the electrolysis of brine to produce a chlorine-based solution on-demand to meet the exact needs of the user with minimal operational costs and maintenance requirements. The Maritime Executive / Read more

OHMSETT STAFF TO PARTICIPATE AT THE INTERSPILL 2022 CONFERENCE

Ohmsett, The National Oil Spill Response Research & Renewable Energy Test Facility will exhibit at the Interspill 2022 Conference, www.interspill.org, to be held at the RAI Convention Center in Amsterdam, Netherlands June 21-23, 2022. Interspill attracts international experts and leaders from the spill industry to exhibit, discuss key topics, and debate issues around spill prevention, preparedness, response, and restoration.

During the conference sessions, Ohmsett Facility Manager, Dr. Tom Coolbaugh will present in Session 4: Offshore Surface Response, Equipment Testing in Ice-Infested Waters: Recent Experience and Lessons Learned from the Ohmsett Test Facility, discussing experiences associated with the deployment of spill response equipment, and the safety concerns that come with the realities of

testing in cold weather and ice-infested water. Additionally, he will emphasize the benefit of collaboration among graduate students and industry scientists during Session 16: Outreach and Communications 2, with the presentation Oil Spill Response Science: The Value of Graduate Student/Industry Scientist Interactions. Finally, he will chair a session on Dispersants in Session 11.

While visiting the exhibits during the conference, be sure to stop by Ohmsett's display, Booth (Stand) #A31, to learn why Ohmsett is an International Center of Excellence for performance testing of oil spill response technology and a desired venue for training oil spill responders. Ohmsett / https://ohmsett.bsee.gov/

CONTRIBUTED ARTICLE: RECENT INTERESTING PEER-REVIEWED OIL SPILL PUBLICATIONS

A COLUMN CREATED BY DR. MERV FINGAS, MEMBER OF ISCO COUNCIL

This is part of a weekly column which provides the references and abstracts of new peer-reviewed scientific publications on oil spills. These references are selected on the basis of those papers that provide new insights into the fate, effects and control of oil spills. Readers may choose to obtain the full publications and to do so, one of three methods is suggested; contact your library, search the internet with the DOI (digital object identifier) provided, or search the internet for the exact title. These are given in the order of likely success in obtaining the article. Merv Fingas, ISCO Colleague.

55. PARALLEL QUANTITATION OF SALT DIOCTYL SODIUM SULFOSUCCINATE (DOSS) AND FINGERPRINTING ANALYSIS OF DISPERSED OIL IN AQUEOUS SAMPLES

Yang, C., Fieldhouse, B., Waldie, A., Yang, Z., Hollebone, B., Lambert, P., Beaulac, V. (2022)
Journal of Hazardous Materials, 435, art. no. 129046,
DOI: 10.1016/j.jhazmat.2022.129046

ABSTRACT: In many jurisdictions, dispersants are included in contingency plans as a viable countermeasure that can help reduce the overall environmental impact of marine oil spills. When used, it is imperative to monitor the progression of dispersant and oil to assess their environmental fate and behaviour. Amphiphilic salt dioctyl sodium sulfosuccinate (DOSS) is the major effective component of the most commonly available dispersants, such as Corexit® EC9500A. Without proper sample preparation, dispersed oil in water samples could interfere with the accurate analysis of DOSS and easily contaminate the LC-MS system. In this work, solid phase extraction (SPE) weak anion exchange (WAX) cartridges were used to separate oil and DOSS in aqueous samples. DOSS was accurately determined by liquid chromatography coupled with a high resolution Orbitrap mass spectrometer (LC-HRMS). Oil fingerprinting analysis was conducted and total petroleum hydrocarbons (TPHs), polycyclic aromatic hydrocarbons (PAHs), and petroleum biomarkers were determined by gas chromatography-flame ionization detection (GC-FID) and mass spectrometry (GC-MS). This SPE-LC/GC-MS method was used for the analysis of oil-dispersant water samples containing a mixture of Corexit® EC9500A and a selection of crude oils and refined petroleum products. Nearly a 100% DOSS recovery was obtained for various oil-surfactant conditions. Parallel quantitation of oils with dispersants was achieved using this method. A portion of the TPH loss was possibly attributed to oil retained by the SPE column. Chemical fingerprints and diagnostic ratios of target compounds in recovered dispersed oil overall remain unchanged compared with those of all studied oils.

56. POLYCYCLIC AROMATIC HYDROCARBONS IN GIANT AFRICAN SNAILS ARCHACHATINA MARGINATA (SWAINSON, 1821) (GASTROPODA: PULMONATA ACHATINIDAE) FROM SOUTHERN NIGERIA

Iwegbue, C.M.A., Chukwudi-Madu, E., Tesi, G.O., Ikpefan, J.O., Martincigh, B.S. (2022)
Journal of Food Composition and Analysis, 111, art. no. 104592,
DOI: 10.1016/j.jfca.2022.104592

ABSTRACT: Giant African snails were collected from different zones in southern Nigeria, and analyzed for their polycyclic aromatic hydrocarbon (PAH) content. The purpose was to provide information on the health risk arising from exposure to PAHs through consumption of these snails. A mixture of acetone/dichloromethane/n-hexane was used for the Soxhlet extraction of PAHs from the snail samples, and the resulting extracts were assayed by gas chromatography-mass spectrometry (GC-MS). The concentrations of the Σ17 PAH concentrations varied from 290 to 4180, 48–4150, 23–1560, 303–2970, and 2230–2880 μg kg−1 for snails purchased in Warri, Port Harcourt, Calabar, Onitsha, and Benin City zones respectively. The benzo(a)pyrene (BaP) concentrations in 53% of these snails exceeded the permissible limit of 6.0 μg BaP kg−1 in molluscs meant for consumption by humans. The PAH4 concentrations in 42% of these snail samples exceeded the specified limit of 35 μg kg−1 for molluscs. The hazard index (HI) from consumption of snails from these zones was less than one, while the total cancer risk relating to the consumption of snails from these zones by adults and children was of the order of 10−4 and 10−6, respectively. There is a need for caution in the consumption of snails from these regions because higher intake values than those assumed in this work could pose considerable carcinogenic risks to the consumers. The source analyses indicated PAHs in these snail samples originated from oil spills, biomass combustion, traffic emissions, and gas flaring.

57. HYDROCARBON BIOREMEDIATION ON ARCTIC SHORELINES: HISTORIC PERSPECTIVE AND ROADWAY TO THE FUTURE

Góngora, E., Chen, Y.-J., Ellis, M., Okshevsky, M., Whyte, L. (2022)

Environmental Pollution, 305, art. no. 119247,
DOI: 10.1016/j.envpol.2022.119247

ABSTRACT: Climate change has become one of the greatest concerns of the past few decades. In particular, global warming is a growing threat to the Canadian high Arctic and other polar regions. By the middle of this century, an increase in the annual mean temperature of 1.8 °C–2.7 °C for the Canadian North is predicted. Rising temperatures lead to a significant decrease of the sea ice area covered in the Northwest Passage. As a consequence, a surge of maritime activity in that region increases the risk of hydrocarbon pollution due to accidental fuel spills. In this review, we focus on bioremediation approaches on Arctic shorelines. We summarize historical experimental spill studies conducted at Svalbard, Baffin Island, and the Kerguelen Archipelago, and review contemporary studies that used modern omics techniques in various environments. We discuss how omics approaches can facilitate our understanding of Arctic shoreline bioremediation and identify promising research areas that should be further explored. We conclude that specific environmental conditions strongly alter bioremediation outcomes in Arctic environments and future studies must therefore focus on correlating these diverse parameters with the efficacy of hydrocarbon biodegradation.

58. MICROBIAL COMMUNITY RESPONSE TO SIMULATED DILUTED BITUMEN SPILLS IN COASTAL SEAWATER AND IMPLICATIONS FOR OIL SPILL RESPONSE

Cobanli, S.E., Wohlgeschaffen, G., Ryther, C., MacDonald, J., Gladwell, A., Watts, T., Greer, C.W., Elias, M., Wasserscheid, J., Robinson, B., King, T.L., Ortmann, A.C.
(2022) FEMS microbiology ecology, 98 (5),
DOI: 10.1093/femsec/fiac033

ABSTRACT: Oil spills in coastal waters can have devastating impacts on local ecosystems, from the microscopic base through to mammals and seabirds. Increasing transport of diluted bitumen has led to concerns about how this novel product might impact coastal ecosystems. A mesocosm study determined that the type of diluent and the season can affect the concentrations of hydrocarbons entering the water column from a surface spill. Those same mesocosms were sampled to determine whether diluent type and season also affected the microbial response to a surface spill. Overall, there were no differences in impacts among the three types of diluted bitumen, but there were consistent responses to all products within each season. Although microbial abundances with diluted bitumen rarely differed from unoiled controls, community structure in these organisms shifted in response to hydrocarbons, with hydrocarbon-degrading bacteria becoming more abundant. The relative abundance of heterotrophic eukaryotes also increased with diluted bitumen, with few photosynthetic organisms responding positively to oil. Overall shifts in the microbial communities were minimal relative to spills of conventional oil products, with low concentrations of hydrocarbons in the water column. Oil spill response should focus on addressing the surface slick to prevent sinking or stranding to minimize ecosystem impacts.

59. CHANGES IN CHEMICAL COMPOSITION AND COPEPOD TOXICITY DURING PETROLEUM PHOTO-OXIDATION

Katz, S.D., Chen, H., Fields, D.M., Beirne, E.C., Keyes, P., Drozd, G.T., Aeppli, C. (2022)
Environmental Science and Technology, 56 (9), pp. 5552-5562.
DOI: 10.1021/acs.est.2c00251

ABSTRACT: Photoproducts can be formed rapidly in the initial phase of a marine oil spill. However, their toxicity is not well understood. In this study, oil was irradiated, chemically characterized, and tested for toxicity in three copepod species (Acartia tonsa, Temora longicornis, and Calanus finmarchicus). Irradiation led to a depletion of polycyclic aromatic hydrocarbons (PAHs) and n-alkanes in oil residues, along with an enrichment in aromatic and aliphatic oil photoproducts. Target lipid model-based calculations of PAH toxicity units predicted that PAH toxicities were lower in water-accommodated fractions (WAFs) of irradiated oil residues ("irradiated WAFs") than in WAFs of dark-control samples ("dark WAFs"). In contrast, biomimetic extraction (BE) measurements showed increased bioaccumulation potential of dissolved constituents of irradiated WAFs compared to dark WAFs, mainly driven by photoproducts present in irradiated oil. In line with the BE results, copepod mortality increased in irradiated WAFs compared to dark WAFs. However, low copepod toxicities were observed for WAFs produced with photo-oxidized oil slicks collected during the Deepwater Horizon oil spill. The results of this study suggest that while oil photoproducts have the potential to be a significant source of copepod toxicity, dilution and dispersion of these higher solubility products appear to help mitigate their toxicity at sea.

60. PHENOTYPIC AND GENE EXPRESSION PROFILES OF EMBRYO DEVELOPMENT OF THE ASCIDIAN CIONA ROBUSTA EXPOSED TO DISPERSANTS

Eliso, M.C., Corsi, I., Manfra, L., Spagnuolo, A. (2022)
Water (Switzerland), 14 (10), art. no. 1539,
DOI: 10.3390/w14101539

ABSTRACT: Within EU approval policies, most dispersant ecotoxicity testing considers lethal concentrations for marine adult species, overlooking the embryotoxicological effects. Here we studied the ecotoxicity of two commercial dispersant formulations (dispersant A and B) on the embryogenesis of the ascidian Ciona robusta. Embryotoxicity and phenotypic alterations stated that dispersant B resulted more toxic than A (EC50 value of 44.30 and 160 µg mL−1, respectively) and induced severe larvae malformations at lower concentrations. Furthermore, the analysis of genes involved in different cellular response pathways indicated that those belonging to

biotransformation were upregulated by dispersant A treatment, likely related to the presence of hydrocarbons. Instead, dispersant B induced cas8 gene downregulation, probably as a result of the prolonged exposure to mixture components. Our preliminary findings support the use of the C. robusta embryotoxicity test as a valuable tool for dispersant approval procedures, by providing sub-lethal responses on marine invertebrates closely related to vertebrates.

61. AN OVERVIEW OF OIL-MINERAL-AGGREGATE FORMATION, SETTLING, AND TRANSPORT PROCESSES IN MARINE OIL SPILL MODELS

Zhong, X., Niu, H., Li, P., Wu, Y., Liu, L. (2022)
Journal of Marine Science and Engineering, 10 (5), art. no. 610,
DOI: 10.3390/jmse10050610

ABSTRACT: An oil spill is considered one of the most serious polluting disasters for a marine environ-ment. When oil is spilled into a marine environment, it is dispersed into the water column as oil droplets which often interact with suspended particles to form oil-mineral-aggregate (OMA). Knowing how OMA form, settle, and are transported is critical to oil spill modelling which can determine the fate and mass balance of the spilled volumes. This review introduces oil weathering and movement, and the commonly used numerical models that oil spill specialists use to determine how a spill will evolve. We conduct in-depth reviews of the environmental factors that influence how OMA form and their settling velocity, and we review how OMA formation and transport are modelled. We point out the existing gaps in current knowledge and the challenges of studying OMA. Such challenges include having to systematically conduct laboratory experiments to investigate how the environment affects OMA formation and settling velocities, and the need for a com-prehensive algorithm that can estimate an OMA settling velocity.

62. THE CAPTURE OF CRUDE OIL DROPLETS BY FILTER FEEDERS AT HIGH AND LOW REYNOLDS NUMBERS

Letendre, F., Cameron, C.B. (2022)
The Journal of experimental biology, 225 (8),
DOI: 10.1242/jeb.243819

ABSTRACT: Crustacean filter feeders capture oil droplets with the use of their ramified appendages. These appendages behave as paddles or sieves, based on the system's Reynolds number. Here, we used high-speed videography, scanning electron microscopy and fluid mechanics to study the capturing mechanisms of crude oil droplets and the filtering appendage's wettability by two species of barnacles (Balanus glandula and Balanus crenatus) and of the freshwater cladoceran Daphnia magna. Our results show that barnacle appendages behave as paddles and capture droplets in their boundary layers at low Reynolds number. At high Reynolds number, droplets are most likely to be captured via direct interception. There is an intermediate range of Reynolds number where droplets can be captured by both mechanisms at the same time. Daphnia magna captures droplets in the boundary layers of the third and fourth pair of thoracic legs with a metachronal motion of the appendages. All studied surfaces were revealed to be highly lipophobic, demonstrating captured oil droplets with high contact angles. We also discuss implications of such capture mechanisms and wettability on potential ingestion of crude oil by filter feeders. These results further our understanding of the capture of crude oil by filter feeders, shedding light on the main entry point of oil in marine food webs.

63. ESTIMATION OF AIRBORNE VAPOR CONCENTRATIONS OF OIL DISPERSANTS COREXIT™ EC9527A AND EC9500A, VOLATILE COMPONENTS ASSOCIATED WITH THE DEEPWATER HORIZON OIL SPILL RESPONSE AND CLEAN-UP OPERATIONS

Stenzel, M.R., Arnold, S.F., Ramachandran, G., Kwok, R.K., Engel, L.S., Sandler, D.P., Stewart, P.A. (2022)
Annals of Work Exposures and Health, 66, pp. I202-I217.
DOI: 10.1093/annweh/wxab056

ABSTRACT: The Deepwater Horizon (DWH) drilling unit explosion above the Macondo oil well on 20 April 2010 caused the release of approximately 4.9 million barrels (779 million L) of oil into the Gulf of Mexico. As part of a larger spill response and clean-up effort, approximately 1.84 million gallons (6.81 million L) of chemical dispersants COREXIT™ EC9500A and COREXIT™ EC9527A were applied to the resultant oil slicks through spraying on the water surface by plane and by vessel and through injection at the release source near the seabed. The GuLF STUDY is investigating the health effects of workers involved in the oil spill response and clean-up after the DWH explosion, and estimates of possible exposure to chemical dispersants were needed. Exposures were estimated to the volatile components of COREXIT™ EC9500A [petroleum distillates, hydrotreated light, and propylene glycol (PG)] and of COREXIT™ EC9527A [2-butoxyethanol (2-BE) and PG] using two of AIHA IHMOD2.0© mathematical modeling tools along with the dispersants' chemical and physical properties. Monte Carlo simulations were used to reflect uncertainty in input parameters with both the two-box, constant emission model and the near and mid field plume model for indoor and outdoor activities, respectively. Possible exposure scenarios considered various evaporation rates, sizes of the dispersant pool, wind speeds, and ventilation rates. For the two-box model, mean near field exposure estimates to 2-BE ranged from 0.9 to 5.7 ppm, while mean far field estimated exposures ranged from 0.3 to 3.5 ppm. Estimates of mean near field plume model exposures ranged from 0.01 to 3.7 ppm at 2.5 ft from the source, and <0.01 to 0.3 ppm at 10 ft from the source. Estimated exposures to PG were approximately 10% of the calculated 2-BE exposures and exposures to petroleum distillates about 40% higher than the 2-BE estimates. Results indicate that compared with current occupational exposure guidelines, overexposure to petroleum distillates and PG probably did not occur in our study, but under some

conditions, for short periods, exposure to 2-BE may have exceeded the limits for peak exposures. These estimates were developed for use in job-exposure matrices to estimate exposures of workers having contact with dispersant vapors for the GuLF STUDY.

64. A COMPARATIVE ANALYSIS OF IN-SITU OPTICAL VELOCIMETRIES FOR OIL SPILL FLOW RATE ESTIMATION

Bkar, O.A., Ovinis, M., Mohmmed, A.O. (2022)
Fluids, 7 (4), art. no. 126,
DOI: 10.3390/fluids7040126

ABSTRACT: In the Deepwater Horizon oil spill, optical plume velocimetry (OPV), a flow measurement technique for use in seafloor hydrothermal systems, was found to have the least uncertainty in estimating the rate at which oil was escaping from the well in the deep sea. However, OPV still had a high uncertainty of 21%, partly due to the limited accuracy of the temporal cross-correlation algorithm used. In this work, the accuracy of several in-situ optical velocimetries, namely wavelet-based optical velocimetry (WOV), OPV, and two classical correlation-based algorithms, namely fast Fourier transform (FFT) and normalized cross-correlation (NCC), for a plume flow with Reynolds numbers varying from 1847 to 11,656 was investigated. WOV, FFT, and NCC resulted in flow rates closer to the expected turbulent plume flow rate as compared to OPV. Moreover, a noisy velocity field was found using OPV. The accuracy of wavelet-based algorithm outperformed all cross-correlation based algorithms. The flow rate was measured with an error of 8.5% using WOV, whereas errors of 18.2%, 19.7%, to 21.1% were obtained when applying FFT, OPV, and NCC, respectively. There was a statistically significant difference between wavelet-based and correlation-based algorithms, but no statistically significant difference between the estimation of the three cross-correlation based velocimetries. WOV outperformed the other velocimetries and estimated flow rates with an error of 8.5%, whereas the OPV, FFT, and NCC were estimated with errors of 19.7%, 18.2%, and 50.8%, respectively.

65. ASSESSING EXPOSURES FROM THE DEEPWATER HORIZON OIL SPILL RESPONSE AND CLEAN-UP

Stewart, P., Groth, C.P., Huynh, T.B., Gorman Ng, M., Pratt, G.C., Arnold, S.F., Ramachandran, G., Banerjee, S., Cherrie, J.W., Christenbury, K., Kwok, R.K., Blair, A., Engel, L.S., Sandler, D.P., Stenzel, M.R.
(2022) Annals of Work Exposures and Health, 66, pp. I3-I22.
DOI: 10.1093/annweh/wxab107

ABSTRACT: The GuLF Study is investigating adverse health effects from work on the response and clean-up after the Deepwater Horizon explosion and oil release. An essential and necessary component of that study was the exposure assessment. Bayesian statistical methods and over 135 000 measurements of total hydrocarbons (THC), benzene, ethylbenzene, toluene, xylene, and n-hexane (BTEX-H) were used to estimate inhalation exposures to these chemicals for >3400 exposure groups (EGs) formed from three exposure determinants: job/activity/task, location, and time period. Recognized deterministic models were used to estimate airborne exposures to particulate matter sized 2.5 µm or less (PM2.5) and dispersant aerosols and vapors. Dermal exposures were estimated for these same oil-related substances using a model modified especially for this study from a previously published model. Exposures to oil mist were assessed using professional judgment. Estimated daily THC arithmetic means (AMs) were in the low ppm range (<25 ppm), whereas BTEX-H exposures estimates were generally <1000 ppb. Potential 1-h PM2.5 air concentrations experienced by some workers may have been as high as 550 µg m-3. Dispersant aerosol air concentrations were very low (maximum predicted 1-h concentrations were generally <50 µg m-3), but vapor concentrations may have exceeded occupational exposure excursion guidelines for 2-butoxyethanol under certain circumstances. The daily AMs of dermal exposure estimates showed large contrasts among the study participants. The estimates are being used to evaluate exposure-response relationships in the GuLF Study.

66. ESTIMATES OF INHALATION EXPOSURES TO OIL-RELATED COMPONENTS ON THE SUPPORTING VESSELS DURING THE DEEPWATER HORIZON OIL SPILL

Huynh, T.B., Groth, C.P., Ramachandran, G., Banerjee, S., Stenzel, M., Blair, A., Sandler, D.P., Engel, L.S., Kwok, R.K., Stewart, P.A. (2022)
Annals of Work Exposures and Health, 66, pp. I111-I123.
67 DOI: 10.1093/annweh/wxaa113

ABSTRACT: The Deepwater Horizon oil spill response and clean-up (OSRC) involved over 9000 large and small vessels deployed in waters of the Gulf of Mexico across four states (Alabama, Florida, Louisiana, and Mississippi). For the GuLF STUDY, we developed exposure estimates of oil-related components for many work groups to capture a wide range of OSRC operations on these vessels, such as supporting the four rig vessels charged with stopping the spill at the wellhead; skimming oil; in situ burning of oil; absorbing and containing oil by boom; and environmental monitoring. Work groups were developed by: (i) vessel activity; (ii) location (area of the Gulf or state); and (iii) time period. Using Bayesian methods, we computed exposure estimates for these groups for: total hydrocarbons measured as total petroleum hydrocarbons (THC), benzene, toluene, ethylbenzene, xylene, and n-hexane (BTEX-H). Estimates of the arithmetic means for THC ranged from 0.10 ppm [95% credible interval (CI) 0.04, 0.38 ppm] in time periods 2 and 3 (16 July-30 September 2010) to 15.06 ppm (95% CI 10.74, 22.41 ppm) in time period 1a (22 April-15 May 2010). BTEX-H estimates were substantially lower (in the parts per billion range). Exposure levels generally fell over time and differed statistically by activity, location, and time for some groups. These exposure estimates have been used to develop job-exposure matrices for the GuLF STUDY.

67. METHODS FOR THE ANALYSIS OF 26 MILLION VOC AREA MEASUREMENTS DURING THE DEEPWATER HORIZON OIL SPILL CLEAN-UP, GROTH

C.P., Banerjee, S., Ramachandran, G., Stewart, P.A., Sandler, D.P., Blair, A., Engel, L.S., Kwok, R.K., Stenzel, M.R. (2022)
Annals of Work Exposures and Health, 66, pp. I140-I155.
DOI: 10.1093/annweh/wxab038

ABSTRACT: The NIEHS GuLF STUDY is an epidemiologic study of the health of workers who participated in the 2010 Deepwater Horizon oil spill response and clean-up effort. Even with a large database of approximately 28 000 personal samples that were analyzed for total hydrocarbons (THCs) and other oil-related chemicals, resulting in nearly 160 000 full-shift personal measurements, there were still exposure scenarios where the number of measurements was too limited to rigorously assess exposures. Also available were over 26 million volatile organic compounds (VOCs) area air measurements of approximately 1-min duration, collected from direct-reading instruments on 38 large vessels generally located near the leaking well. This paper presents a strategy for converting the VOC database into hourly average air concentrations by vessel as the first step of a larger process designed to use these data to supplement full-shift THC personal exposure measurements. We applied a Bayesian method to account for measurements with values below the analytic instrument's limit of detection while processing the large database into average instrument-hour concentrations and then hourly concentrations across instruments on each day of measurement on each of the vessels. To illustrate this process, we present results on the drilling rig ship, the Discoverer Enterprise. The methods reduced the 26 million measurements to 21 900 hourly averages, which later contributed to the development of additional full-shift THC observations. The approach used here can be applied by occupational health professionals with large datasets of direct-reading instruments to better understand workplace exposures.

68. USING REAL-TIME AREA VOC MEASUREMENTS TO ESTIMATE TOTAL HYDROCARBONS EXPOSURES TO WORKERS INVOLVED IN THE DEEPWATER HORIZON OIL SPILL

Ramachandran, G., Groth, C.P., Huynh, T.B., Banerjee, S., Stewart, P.A., Engel, L.S., Kwok, R.K., Sandler, D.P., Stenzel, M. (2022)
Annals of Work Exposures and Health, 66, pp. I156-I171.
DOI: 10.1093/annweh/wxab066

ABSTRACT: Even though the Deepwater Horizon oil spill response and clean-up (OSRC) had one of the largest exposure monitoring efforts of any oil spill, a number of exposure groups did not have sufficient personal data available or there were gaps in days measured to adequately characterize exposures for the GuLF STUDY, an epidemiologic study investigating the health of the OSRC workers. Area measurements were available from real-time air monitoring instruments and used to supplement the personal exposure measurements. Objectives: The objective was to present a method that used real-time volatile organic compounds (VOCs) area measurements transformed to daily total hydrocarbons (THC) time-weighted averages (TWAs) to supplement THC personal full-shift measurements collected using passive charcoal badges. A second objective was to develop exposure statistics using these data for workers on vessels piloting remotely operated vehicle (ROV) vessels and other marine vessels (MVs) not at the job title level, but at the vessel level. Methods: From hourly vessel averages derived from ~26 million real-time VOC measurements, we estimated full-shift VOC TWAs. Then, we determined the relationship between these TWAs and corresponding full-shift THC personal measurements taken on the same vessel-day. We used this relationship to convert the full-shift VOC measurements to full-shift 'THC' TWA estimates when no personal THC measurements existed on a vessel-day. We then calculated arithmetic means (AMs) and other statistics of THC exposures for each vessel. Results: The VOC-derived estimates substantially supplemented the THC personal measurements, with the number of vessel-days for which we have exposure estimates increasing by ~60%. The estimates of the AMs are some of the highest observed in the GuLF STUDY. As expected, the AMs decreased over time, consistent with our findings on other vessels. Conclusions: Despite the inherent limitations of using real-time area measurements, we were able to develop additional daily observations of personal THC exposures for workers on the ROV vessels and other MVs over time. The estimates likely resulted in more representative estimates of the AMs in the GuLF STUDY. The method used here can be applied in other occupational settings and industries for personal exposure estimation where large amounts of area measurements and more limited numbers of personal measurements are available.

69. ESTIMATES OF INHALATION EXPOSURES AMONG LAND WORKERS DURING THE DEEPWATER HORIZON OIL SPILL CLEAN-UP OPERATIONS

Huynh, T.B., Groth, C.P., Ramachandran, G., Banerjee, S., Stenzel, M., Blair, A., Sandler, D.P., Engel, L.S., Kwok, R.K., Stewart, P.A. (2022)
Annals of Work Exposures and Health, 66, pp. I124-I139.
DOI: 10.1093/annweh/wxab028

ABSTRACT: Following the Deepwater Horizon oil spill disaster, thousands of workers and volunteers cleaned the shoreline across four coastal states of the Gulf of Mexico. For the GuLF STUDY, we developed quantitative estimates of oil-related chemical exposures [total petroleum hydrocarbons (THC), benzene, toluene, ethylbenzene, xylene, and n-hexane (BTEX-H)] from personal measurements on workers performing various spill clean-up operations on land. These operations included decontamination of vessels, equipment, booms, and personnel; handling of oily booms; hazardous waste management; beach, marsh, and jetty clean-up; aerial missions; wildlife rescue and rehabilitation; and administrative support activities. Exposure estimates were developed for unique groups of workers by (i) activity, (ii) state, and (iii) time period. Estimates of the arithmetic means (AMs) for THC ranged from 0.04 to 3.67 ppm. BTEX-H estimates were substantially lower than THC (in the parts per billion range). Both THC and BTEX-H estimates were substantially lower than their respective occupational exposure limits. The work group, 'Fueled engines' consistently was one of the higher exposed

groups to THC and BTEX-H. Notable differences in the AM exposures were observed by activity, time and, to a lesser degree, by state. These exposure estimates were used to develop job-exposure matrices for the GuLF STUDY.

70. ESTIMATES OF INHALATION EXPOSURES AMONG LAND WORKERS DURING THE DEEPWATER HORIZON OIL SPILL CLEAN-UP OPERATIONS

Vazquez Roman, K.N., Burggren, W.W. (2022)
Comparative Biochemistry and Physiology Part - C: Toxicology and Pharmacology, 254, art. no. 109274,
DOI: 10.1016/j.cbpc.2022.109274

ABSTRACT: Morphological effects of crude oil exposure on early development in fishes have been well documented, but crude oil's metabolic effects and when in early development these effects might be most prominent remains unclear. We hypothesized that zebrafish (Danio rerio) exposed to crude oil as a high energy water accommodated fraction (HEWAF) would show increased routine oxygen consumption (ṀO2) and critical oxygen tension (PCrit) and this effect would be dependent upon day of HEWAF exposure, revealing critical windows of development for exposure effects. Zebrafish were exposed to 0%, 10%, 25%, 50% or 100% HEWAF for 24 h during one of the first six days post-fertilization (dpf). Survival rate, body mass, routine ṀO2, and PCrit were then measured at 7 dpf. Survival rate and especially body mass were both decreased based on both exposure concentration and day of crude oil exposure, with the largest decrease when HEWAF exposure occurred at 3 dpf. HEWAF effects on routine ṀO2 also differed depending upon exposure day. The largest effect occurred at 3 dpf, when ṀO2 increased significantly by ~60% from 10.1 ± 0.8 μmol O2/g/h compared to control group value of 6.3 ± 0.4 μmol O2/g/h. No significant effects of HEWAF exposure on any day were evident for PCrit (85 ± 4 mmHg in the control population). Overall, the main effects on body mass and ṀO2 measured at 7 dpf occurred when HEWAF exposures occurred at ~3 dpf. This critical window for metabolism in zebrafish larvae coincides with time of hatching, which may represent an especially vulnerable period in development.

71. GuLF DREAM: A MODEL TO ESTIMATE DERMAL EXPOSURE AMONG OIL SPILL RESPONSE AND CLEAN-UP WORKERS

Ng, M.G., Cherrie, J.W., Sleeuwenhoek, A., Stenzel, M., Kwok, R.K., Engel, L.S., Cavallari, J.M., Blair, A., Sandler, D.P., Stewart, P. (2022)
Annals of Work Exposures and Health, 66, pp. I218-I233.
DOI: 10.1093/annweh/wxz037

ABSTRACT: Tens of thousands of individuals performed oil spill response and clean-up (OSRC) activities following the 'Deepwater Horizon' oil drilling rig explosion in 2010. Many were exposed to oil residues and dispersants. The US National Institute of Environmental Health Sciences assembled a cohort of nearly 33 000 workers to investigate potential adverse health effects of oil spill exposures. Estimates of dermal and inhalation exposure are required for those individuals. Ambient breathing-zone measurements taken at the time of the spill were used to estimate inhalation exposures for participants in the GuLF STUDY (Gulf Long-term Follow-up Study), but no dermal measurements were collected. Consequently, a modelling approach was used to estimate dermal exposures. We sought to modify DREAM (DeRmal Exposure Assessment Method) to optimize the model for assessing exposure to various oil spill-related substances and to incorporate advances in dermal exposure research. Each DREAM parameter was reviewed in the context of literature published since 2000 and modified where appropriate. To reflect the environment in which the OSRC work took place, the model treatment of evaporation was expanded to include vapour pressure and wind speed, and the effect of seawater on exposure was added. The modified model is called GuLF DREAM and exposure is estimated in GuLF DREAM units (GDU). An external validation to assess the performance of the model for oils, tars, and fuels was conducted using available published dermal wipe measurements of heavy fuel oil (HFO) and dermal hand wash measurements of asphalt. Overall, measured exposures had moderate correlations with GDU estimates (r = 0.59) with specific correlations of -0.48 for HFO and 0.68 for asphalt. The GuLF DREAM model described in this article has been used to generate dermal exposure estimates for the GuLF STUDY. Many of the updates made were generic, so the updated model may be useful for other dermal exposure scenarios.

TRAINING COURSES

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- **EUROPE –** EMSA Academy 2022. Courses Catalogue
- **FRANCE - CEDRE** - Click on these links training catalogue and 2022 calendar.
- **UK & WORLDWIDE – OIL SPILL RESPONSE LTD.** - https://www.oilspillresponse.com/training/courses/
- **UK & WORLDWIDE – BRIGGS ENVIRONMENTAL SERVICES LTD.** - https://www.briggsmarine.com/services/training/
- **UK – NCEC HAZMAT ACADEMY –** More info
- **USA – TEXAS A&M UNIVERSITY – NATIONAL SPILL CONTROL SCHOOL** https://www.tamucc.edu/research/nscs/
- **USA – MPC, DETROIT -** https://marinepollutioncontrol.com/services/training-and-compliance
- **USA – ALLIANCE OF HAZARDOUS MATERIALS PROFESSIONALS -** https://www.ahmpnet.org/events/event_list.asp

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Newly added to the Upcoming Events page - Interspill Science Workshops, at Interspill on June 21 to 23;

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Newly added to the Upcoming Webinars Page – ALGA: Dealing with Weathered Petroleum, 9th June 2022, 12-1 pm AEST;

Recently added to the Upcoming Webinars Page - ExxonMobil Oil Spill Knowledge Transfer Webinar No.9: Mr David Dickins (D.F. Dickins Associates) will share his extensive experience on Arctic oil spill response, 9th June 2022 10.00 to 11.15 am Houston Time; Interspill Inform Clean Seas Webibar Series - Marine Debris and Plastic Pollution 1400hrs (BST) 31 May; Emerging Pollutants 1400hrs (BST) 8 June; PEMSEA Ocean & Climate Dialogue, 8th June, 9am to 3pm UTC+8.

MESSAGES FROM EVENT ORGANISERS

PAPER SUBMISSION DEADLINE DATES

CANADA: INTERNATIONAL OIL SPILL SCIENCE CONFERENCE - June 17, 2022. About IOSSC 2022 Call for Abstracts Registration

USA: CLEAN GULF CONFERENCE & EXHIBITION – JUST RELEASED – PRELIMINARY CONFERENCE AGENDA

The preliminary conference agenda, with speakers, is now available for the 2022 CLEAN GULF Conference & Exhibition! This year's CLEAN GULF program is the largest we have planned in years, and we are very excited to expand the scope of topics offered in the conference sessions. Check out this year's program and commit to joining your peers in spill prevention and response this November. View Exhibition Contract View Conference Sessions Register for Clean Gulf

EUROPE: INTERSPILL – SCIENCE WORKSHOPS

INTERSPILL 2022 will once again feature science workshops jointly organised by Cedre and ITOPF. These will cover key topical issues relating to both present and future challenges in spill and pollution response. These workshops take the form of four 1-hour sessions, each comprising three presentations by specialists followed by 30 minutes of discussions with the audience to explore these issues in depth.

The speakers will be from both academia and industry in order to offer as broad a perspective as possible and an international viewpoint. The discussion sessions will be an opportunity for you to express your point of view and contribute to the debates, gain insight into the latest advances on topics presented by experts and potentially expand your network.

The provisional programme is below:

- 21 June 1330-1500 – Trend in propulsion, led by Cedre.
- 22 June 1100-1230 – Atmospheric pollution from chemical spills, led by Cedre.
- 22 June 1630-1800 – The issue of plastic pollution, led by ITOPF.
- 23 June 1100-1230 – Sensitive tropical environments; led by ITOPF

For more info please visit https://emailer.interspillevent.com/Science%20Workshop/

ON WATER DEMONSTRATION - As in 2015, Spill Response Holland, SRGH, are organising an onwater demonstration on the River Amstel on the Monday evening. All Exhibitors are invited to take part, and should contact SRGH directly to liaise at info@srgh.nl https://www.interspill.org/about-interspill/on-water-demonstration/

CANADA: 44th AMOP TECHNICAL SEMINAR ON ENVIRONMENTAL CONTAMINATION AND RESPONSE - REVISED PROGRAMME ISSUED

The revised programme can be viewed using the following links -

https://www.canada.ca/en/environment-climate-change/services/science-technology/arctic-marine-oilspill-program/final.html

https://www.canada.ca/fr/environnement-changement-climatique/services/sciences-technologies/programme-deversements-hydrocarbures-mer-arctique/finale.html

This year's AMOP Technical Seminar on Environmental Contamination and will take place virtually from June 7 to 9, 2022. There will be no registration fees, but will have limited availability.

USA: CLEAN PACIFIC - PREVIEW THE SPEAKER LINEUP - AUGUST 23-24

Chris Battaglia, President, Co-Owner, Focus Wildlife International
Michelle Bellizzi, Response Services Manager, International Bird Rescue
Matt Bissell, Plan Development and Review Unit Supervisor, WA State DOE, Spills Program
Barbara Callahan, Senior Director of Response Services, International Bird Rescue
Raymond Cardinal, Committee Member, TMX Indigenous Advisory and Monitoring Committee (IAMC)
Michael Carlson, NRDAR/Spill Response Coordinator, USFWS
Valerie Chu, Fish and Wildlife Biologist, USFWS
CDR Stacey Crecy, Commanding Officer, U.S. Coast Guard Sector Detroit
Rebecca Duerr, Director of Research and Veterinary Science, International Bird Rescue
Todd Duke, General Manager - Compliance Services, Resolve Marine
Becky Elias, Scientist, Environmental Assessment Services, LLC
Jim Elliott, Chief Operating Officer, Teichman Group, LLC
Nicole Franks, President, NJ Resources, Inc.
Steve Garcia, Sr. Manager of Response Services, Gallagher Marine Systems LLC
Amy Gohres, Response Specialist and Strategic Project Manager, NOAA/Genwest
Meg Harris, Executive Coordinator, Pacific States/British Columbia Oil Spill Task Force
Thomas Haug, Response Manager, Witt O'Brien's
Haley Kennard, Natural Resource Policy Analyst, Makah Tribe
Erick Kusnir, Geophysicist, Benthic Geoscience
LT Aidan Leddy-Phillips, U.S. Coast Guard Pacific Strike Team
Ken McLernon, Manager, Emergency Management, Trans Mountain Pipeline LP
Janet Niessner, Tribal Resource Response Specialist, Confederated Tribes of Coos, Lower Umpqua, and Siuslaw Indians
Mark Ploen, Vice President, QualiTech Environmental, Inc.
Carol Reamer, Director, Port of Neah Bay
Beth Sheldrake, Emergency Management Branch Chief, U.S. EPA Region 10
Rachel Stewart-Dziama, Research Associate, CLEAR SEAS Centre for Responsible Marine Shipping
Capt. Josh Temple, Executive Director, Coastal Restoration Society

View full conference programme Registration

AUSTRALIA: SPILLCON 2023: 11-15 SEPTEMBER 2023

We are delighted to announce that Spillcon 2023 has been confirmed for 11–15 September 2023 at the Brisbane Convention and Exhibition Centre, Queensland, Australia.

Proudly organised by Australia's key government and industry agencies responsible for Australia's marine environmental protection arrangements, the Australian Institute of Petroleum (AIP) and the Australian Marine Oil Spill Centre (AMOSC) invite you to attend the international oil spill conference for the Asia-Pacific region, Spillcon 2023.

Spillcon 2023 will bring together local, regional and global environmental and shipping representatives across industry, government and non-government organisations to provide an avenue to discuss issues including causes and prevention, preparedness, response management and environmental issues.

For more information contact Spillcon Event Team, Nicky Reading, GPO Box 279, Canberra ACT 2601, Australia

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JOB VACANCIES

Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)

The International Maritime Organization (IMO) has published three vacancy positions located within REMPEC, based in Floriana, Malta:

For more information please click on https://spillcontrol.org/job-vacancies/

INCIDENT REPORTS

UK: TORQUAY FIRE: £6M SUPERYACHT BURSTS INTO FIREBALL AND SINKS AS 'MAJOR INCIDENT' DECLARED

May 28 - A £6million superyacht which caught fire in a marina sparking a major incident has sank, potentially leaking nine tonnes of diesel into the blue waters around the UK. The Environment Agency fears it could spark a mini-ecological disaster as it had nearly a full tank of fuel aboard which is thought to have leaked into the sea. Mirror / Read more

May 31 - Torquay yacht clean-up underway - A pollution response unit is continuing to work on the aftermath of a yacht fire at the weekend that sank the vessel and caused a scare about the diesel on board. Radio Exe News / Read more

THAILAND & MALAYSIA: 18 CONTAINERS LOST IN STORMY ANDAMAN SEA IN THAILAND WATERS

May 29 - At least 18 containers loaded with processed rubber wood, were washed overboard fro container barge NAMTHONG 27 in Andaman sea, Thailand waters, Petra Marine Park in Satun province. Barge was towed by tug FORTUNE II (no data found), operated by YKP Ocean Line Company, caravan was caught in cyclone raging in Andaman sea while en route from Kantang port in Trang to Penang Malaysia. 5 containers had been found on a beach on Koh Sarai off mainland Satun, while 8 more were spotted by fishermen off Langawi island in Malaysia. YKP Ocean Line Company already dispatched 2 tugs to assist caravan www.maritimebulletin.net

Video https://www.maritimebulletin.net/2022/05/30/18-containers-lost-in-stormy-andaman-sea-in-thailand-waters-video/

USA: SOUTH CAROLINA - DNR INVESTIGATING WHAT'S KILLING FISH IN PORTION OF PEE DEE CREEK

May 30 - The South Carolina Department of Natural Resources is investigating what's killing fish in the portion of Black Creek that flows through the Hartsville area of Darlington County. Several people who went fishing or kayaking on the creek this past weekend said they saw what appeared to be hundreds of dead fish in the water and along the banks of the creek. WPDE / Read more

GREECE: CRUDE OIL TRANSFER CAUSES POLLUTION ON THE COAST

May 30 - According to local sources in Greece, a growing oil spill from a "non-standard" transfer from the seized Iranian vessel off the Greek coast.

On Monday, Greece's local media reported the growing oil spill caused by the "non-standard" and environmentally unprincipled cargo transfer from the seized Iranian vessel off the Greek coast. The news channel Press TV, a European country's media, released images of oil pollution in the Greek port of Chisto. TeleSur / Read more

LIBYA: BROKEN PIPELINE CAUSES CRUDE SPILL

June 1 - A pipeline rupture in Libya is spewing thousands of barrels of oil into the desert, as workers scramble to seal off the leak, authorities said Wednesday. The damage to a land pipeline linking the Sarir oil field to the Tobruk terminal on the Mediterranean was the latest blow to Libya's struggling oil industry.

The Arabian Gulf Oil Company, which operates the pipeline, estimates that some 22,000 barrels a day were being lost from the leak, which started Tuesday. It posted footage of the spill and said efforts to stop it were still underway. Asharq Al Awsat / Read more

UKRAINE: FEARS OF A MASS TOXIC ACID SPILL AFTER RUSSIANS BOMB UKRAINIAN CHEMICAL FACTORY

June 1 - Ukraine's President Volodymyr Zelenskyy has described Russia's attack on a chemical plant in the country's east as "madness". His comments came after a Russian airstrike on Sievierodonetsk hit a tank of toxic nitric acid at a chemical factory, causing a huge leak of fumes, according to local authorities. 9 News / Read more

CARIBBEAN: TANKER SANK IN THE CARIBBEAN, 2 MISSING

June 2 - USCG published a report on SAR operation on May 27, involving USCG and Caribbean CG, to locate and rescue 16 crew of product tanker CETUS. Tanker issued distress signal, reporting sinking after engine failure, crew abandoning the ship. CETUS was 135 nm north of Aruba, Caribbean. Patrol planes and nearby cargo ships were deployed, 14 crew were rescued, 2 remained missing. Tanker was en route from Barahona Dominican Republic, to Venezuela, laden status unknown, probably in ballast. Oil slick was spotted, but whether it's cargo or bunker fuel, or oil residues, is unknown. Maritime Bulletin / Read more

GAMBIA: NEA, GMA REPORT OIL SPILL AT GAM PETROLEUM FACILITIES IN MANDINARING

June 3 - Sunday 29th May, 2022 at 09.30am where the management of Gam Petroleum was summoned to explain the circumstances leading to the oil spill.

During the briefing, stakeholders were informed that from the preliminary figures indicated that 1,501.334 metric tons HFO was discharged from the ship but the fuel depot just recorded 1,430.469 metric tons as received. Based on the fact that the difference between the quantities pumped by the ship and the amount received by the depot was roughly 70.865 metric tons. It is assumed that the difference is the quantities of HFO discharged into the sea is caused by a ruptured submerged pipe through which the HFO was discharged to the shore tank GP. All Africa / Read more