Floating Litter and its Oceanic TranSport Analysis and Modelling (FLOTSAM)

SCOR Working Group 153

http://scor-flotsam.it/

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Nikolai Maximenko (U. Hawaii, USA)

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2. Georg Hanke (EU-JRC)
3. Nancy Wallace (NOAA)
4. Paolo Corradi (ESA)

FLOTSAM Terms of Reference

- ✓ Identify gaps in our knowledge of the near-surface ocean dynamics that may affect litter distribution and transport.
- ✓ Improve future marine litter modelling capabilities.
- ✓ Evaluate existing and emerging remote sensing technologies that can be applied to marine litter in the open ocean.
- Improve awareness of the scientific understanding of marine debris, based on better observations and modelling results

FLOTSAM WG meetings

11 March 2018 San Diego, CA

7-9 May 2019 Utrecht, Netherlands

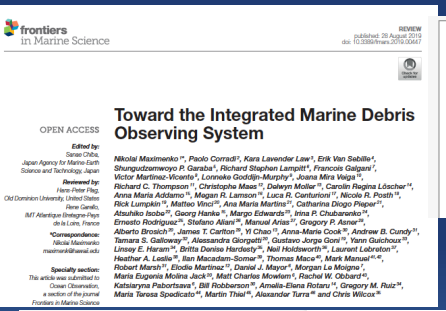
2021 plans Japan

2022
UN Decade Event
UN Ocean Conference Lisbon
SETAC
7IMDC
GESAMP

Richard Lounsbery Foundation additional support online ECOPs webinair

Many FLOTSAM products

Papers
Highly cited


frontiers in Marine Science

REVIEW

published: 29 August 2019

doi: 10.3389/fmars.2019.00447

OPEN ACCESS

Toward the Integrated Marine Debris Observing System

Edited by:
Sanae Chiba,
Japan Agency for Marine-Earth Science and Technology, Japan

Reviewed by:
Hans-Peter Plag,
Old Dominion University, United States
Rene Garello,
IMT Atlantique Bretagne-Pays de la Loire, France

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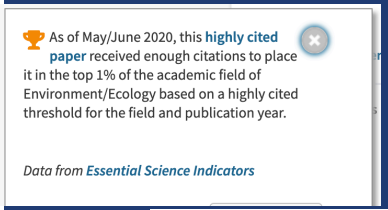
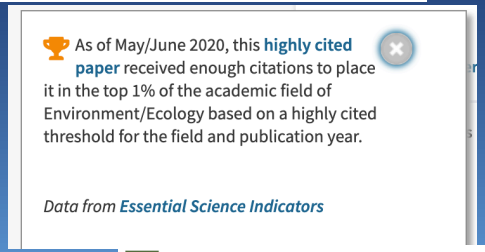
Specialty section:
This article was submitted to Ocean Observation, a section of the journal Frontiers in Marine Science

Nikolai Maximenko[1*], Paolo Corradi[2], Kara Lavender Law[3], Erik Van Sebille[4], Shungudzemwoyo P. Garaba[5], Richard Stephen Lampitt[6], Francois Galgani[7], Victor Martinez-Vicente[8], Lonneke Goddijn-Murphy[9], Joana Mira Veiga[10], Richard C. Thompson[11], Christophe Maes[12], Dalwyn Moller[13], Carolin Regina Löscher[14], Anna Maria Addamo[15], Magan R. Lamson[16], Luca R. Centurioni[17], Nicole R. Posth[18], Rick Lumpkin[19], Matteo Vinci[20], Ana Maria Martins[21], Catharina Diogo Pieper[22], Atsuhiko Isobe[23], Georg Hanke[24], Margo Edwards[25], Irina P. Chubarenko[26], Ernesto Rodriguez[26], Stefano Aliani[28], Manuel Arias[27], Gregory P. Asner[29], Alberto Brosich[30], James T. Carlton[31], Yi Chao[32], Anna-Maria Cook[33], Andrew B. Cundy[34], Tamara S. Galloway[35], Alessandra Giorgetti[36], Gustavo Jorge Goni[16], Yann Guichoux[37], Linsey E. Haram[38], Britta Denise Hardesty[39], Neil Holdsworth[40], Laurent Lebreton[17], Heather A. Leslie[38], Ilan Macadam-Somer[38], Thomas Mace[41], Mark Manuel[42,43], Robert Marsh[31], Elodie Martinez[17], Daniel J. Mayor[4], Morgan Le Moigne[7], Maria Eugenia Molina Jack[30], Matt Charles Mowlem[44], Rachel W. Obbard[45], Katsiaryna Pabortsava[6], Bill Robberson[46], Amalia-Elana Rotaru[47], Gregory M. Ruiz[34], Maria Tarasa Spodicato[48], Martin Thiel[49], Alexander Turra[48] and Chris Wilcox[50]


As of May/June 2020, this **highly cited paper** received enough citations to place it in the top 1% of the academic field of Environment/Ecology based on a highly cited threshold for the field and publication year.

Data from ***Essential Science Indicators***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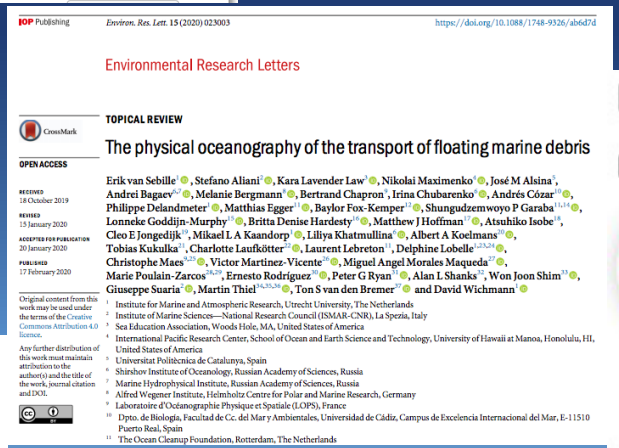
IOP Publishing Environ. Res. Lett. 15 (2020) 023003 https://doi.org/10.1088/1748-9326/ab6d7d

Environmental Research Letters

TOPICAL REVIEW

The physical oceanography of the transport of floating marine debris

OPEN ACCESS

RECEIVED 18 October 2019

REVISED 15 January 2020

ACCEPTED FOR PUBLICATION 20 January 2020

PUBLISHED 17 February 2020

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11 The Ocean Cleanup Foundation, Rotterdam, The Netherlands


remote sensing

MDPI

Perspective

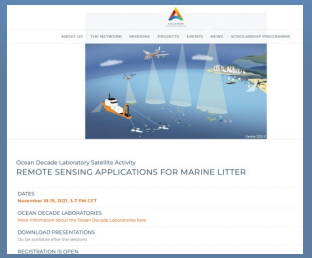
Measuring Marine Plastic Debris from Space: Initial Assessment of Observation Requirements

Víctor Martínez-Vicente [1,*], James R. Clark [1], Paolo Corradi [2], Stefano Aliani [3], Manuel Arias [4], Mathias Bochow [5], Guillaume Bonnery [6], Matthew Cole [1], Andrés Cózar [7], Rory Donnelly [8], Fidel Echevarría [7], François Galgani [9], Shungudzemwoyo P. Garaba [10,11], Lonneke Goddijn-Murphy [12], Laurent Lebreton [10], Heather A. Leslie [13], Penelope K. Lindeque [1], Nikolai Maximenko [14], François Péché Martin Lucas [4]

TOPIC 4. POLLUTANTS AND CONTAMINANTS AND THEIR POTENTIAL IMPACTS ON HUMAN HEALTH AND ECOSYSTEMS

An Integrated Observing System for Monitoring Marine Debris and Biodiversity

By Nikolai Maximenko*, Artur P. Palacz*, Lauren Biermann, James Carlton, Luca Centurioni, Mary Crowley, Jan Hafner, Linsey Haram, Rebecca R. Helm, Verena Hormann, Cathryn Murray, Gregory Ruiz, Andrey Shcherbina, Justin Stopa, Davida Streett, Toste Tanhua, Cynthia Wright, and Chela Zabin (*equal first authors)


ABOUT US THE NETWORK MISSIONS PROJECTS EVENTS NEWS SCHOLARSHIP PROGRAMME

Ocean Decade Laboratory Satellite Activity

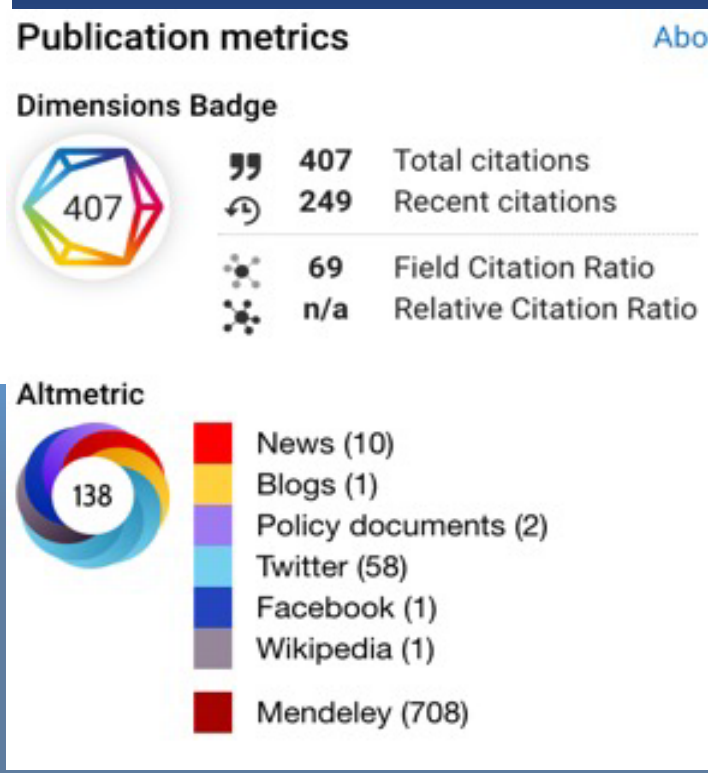
REMOTE SENSING APPLICATIONS FOR MARINE LITTER

DATES

OCEAN DECADE LABORATORIES

DOWNLOAD PRESENTATIONS

REGISTRATION IS OPEN


Publication metrics About

Dimensions Badge

407

407 Total citations
249 Recent citations
69 Field Citation Ratio
n/a Relative Citation Ratio

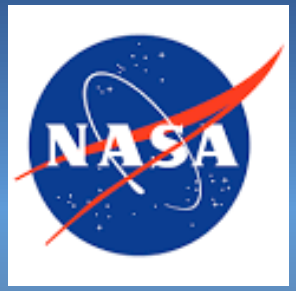
Altmetric

138

News (10)
Blogs (1)
Policy documents (2)
Twitter (58)
Facebook (1)
Wikipedia (1)
Mendeley (708)

Other FLOTSAM products

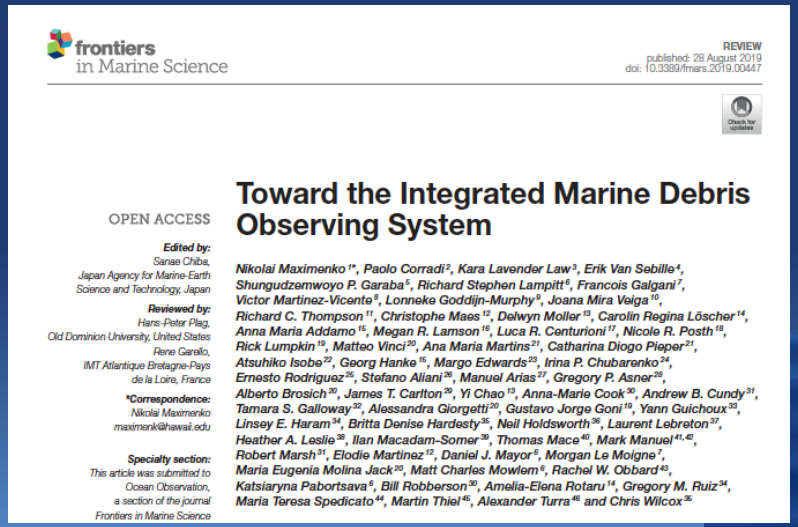
ESA OSIP
NASA interest
Scientific projects after FLOTSAM



Ministry of the Environment
Government of Japan

National
Science
Foundation

Other FLOTSAM products



frontiers in Marine Science

REVIEW
published: 28 August 2019
doi: 10.3389/fmars.2019.00447

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Moving Forward from FLOTSAM

IMDOS 2023 meeting and FLOTSAM

SCOR is being supporting the development of the IMDOS program.

Part of FLOTSAM funds have been used to meet in Japan and discuss new guidelines for remote sensing and a common database structure based upon FLOTSAM framework

Note: Japan was the original location planned for 3° FLOTSAM meeting

IMDOS

INTEGRATED MARINE DEBRIS OBSERVING SYSTEM

From vision to implementation

Artur Palacz (IOCCP/IOPAN), Audrey Hasson (GEO Blue Planet/MOi)

Community vision for an IMDOS


Toward the Integrated Marine Debris Observing System

- Integration of remote sensing and in situ observations
- Use of models to optimize the design monitoring system
- Interaction with other observing systems monitoring physical, chemical and biological processes in the ocean and on shorelines
- Engagement of volunteer and citizen science initiatives
- Establishing best practices and harmonized methodologies for the different elements of the observing system
- Enabling synthesized data to support innovative research and serve a diverse community of users

Also calling for identification of relevant EOV(s).

OCEAN OBS'19

IMDOS

Front. Mar. Sci., 28 August 2019 | https://doi.org/10.3389/fmars.2019.00447

SOCIETAL NEEDS FOR INFORMATION

OBSERVATIONS REQUIREMENTS

IMDOS
INTEGRATED MARINE DEBRIS OBSERVING SYSTEM

DATA HARMONIZATION

SUSTAINED OBSERVATIONS

INCREASE OF TECHNICAL READINESS LEVELS

COORDINATION & GUIDANCE

FEDERATED & INTEROPERABLE DATA MANAGEMENT SYSTEMS → RESEARCH

DATA-BASED INFORMATION FOR SCIENCE & DECISION-MAKING

E.G. INDICATORS, POLICY BRIEFS, SCIENTIFIC PAPERS, ASSESSMENTS, TOOLS, ETC.

Mission

Provide coordination and guidance to lead the marine debris community in establishing a sustained global observing system.

IMDOS Project Office and Governance

Audrey Hasson

Artur Palacz

Mine Tekman (ECS)

MERCATOR OCEAN INTERNATIONAL

Stakeholder Engagement
Capacity Development
Cooperation and Co-design
BLUE PLANET

Institute of Oceanology
Polish Academy of Sciences

GOOS
The Global Ocean Observing System

IMDOS Interim Governance

- Interim Coordination office
  - Artur Palacz (GOOS)
  - Audrey Hasson (GEO Blue Planet)
  - Mine Tekman (ECS)
- Interim Steering Committee
  - ***Nikolai Maximenko***
  - ***Stefano Aliani***
  - **Alex Turra**
  - ***Kara Lavender Law***
  - Francois Galgani
  - Georg Hanke
  - *Paolo Corradi*

Version: 1.0 - April 2022

Essential Ocean Variable Specification Sheet NEW

Marine Plastics Debris

Name of EOV	**Marine Plastics Debris**
EOV sub-variables	• beach litter: abundance per type & size category • floating microplastics: abundance, weight • floating macroplastics: abundance • seafloor litter: abundance per type & size class (macro, micro) *Additional sub-variables under consideration:* • Macroplastics in biota (ingestion by seabirds, fish, sea turtles) • Microplastics in biota (ingestion by seabirds, bivalves)

- Based on GESAMP WG40 recommendations for global scale monitoring
- Setting global requirements for what to observe, when, where and how
- Concept of TRLs used to describe the maturity of different EOV elements → direct application of EUROqCHARM's work on the RAPs and respective TRL assessment

IMDOS

The Global Ocean Observing System

GOOS

Marine Debris EOV

Version: 1.0 - April 2022

Essential Ocean Variable Specification Sheet

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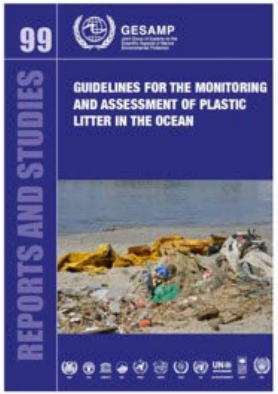
- Based on GESAMP WG40 recommendations for global scale monitoring
- Reconciling EOVs & SDG indicator frameworks
- Broad public consultation to be launched later in 2022



What does it take to build an observing network?

Observations sustained over multiple years

Data and metadata delivered free, open and in a timely manner

Standards and best practices developed and followed

Community-of-practice with a multi-year strategy and implementation plan

Capacity development and technology transfer to ensure inclusivity

Tracking and assessment of progress

The Global Ocean Observing System

GOOS

IMDOS

JAPAN MEETING 2023 – SCOR SUPPORT

A federated & interoperable data management system [for surface MP]

digital.gpmarinelitter.org

IMDOS as a GOOS project

GOOS network standards

Progress reported at highest level

Mission – fit for purpose – addressing science, policy and management needs

Spatial scale – local and national needs, contributing to global - reporting to relevant indicators

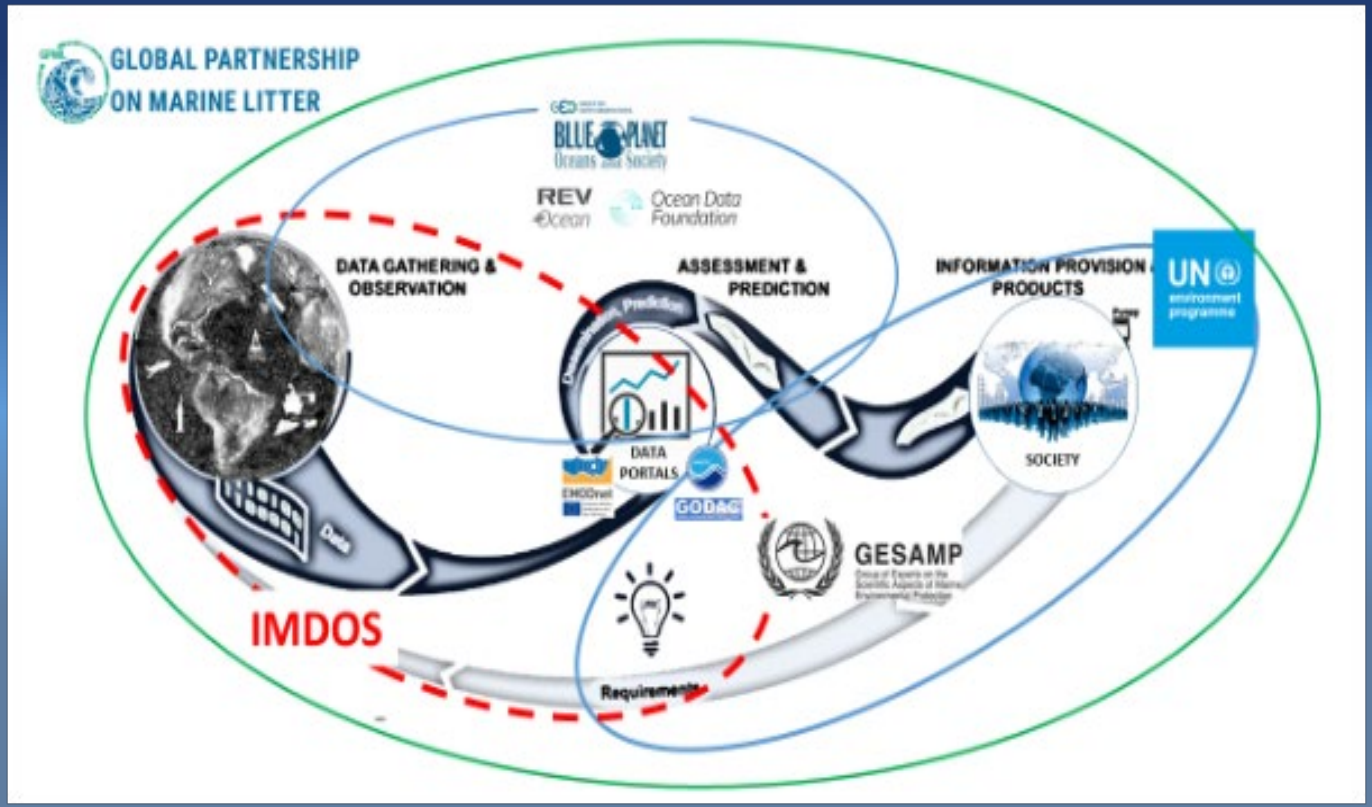
Sustainability –trends over time - repeatability

Best practice – global accepted standards - new technologies (SOPs, data management and delivery)

FAIR and open data standards – data attribution and provenance - open data, metadata supporting interoperability, data aggregation and reuse

Capacity development and technology transfer – supports extension of SOPs and best practices supporting local/regional and/or global needs and priorities

IMDOS as a GOOS project



IMDOS and GPML Digital Platform

- IMDOS SC are co-lead of the “Data Harmonization” Community of practice

- Met on Feb 16th with UNEP (Marta, Heidi + DHI) to discuss our relation to them and the evolution of the possible partnership IMDOS/GPML-DP
  - UNEP will work with GOOS and GEO BP on MoUs to officialize cooperation
  - UNEP agrees to co-organize the UN OC official side event

- **Met with UNEP during Plastic Treaty Paris**

Session 1.5: Integrated Marine Debris Observing System

progress in development and examples of early products

Chairs: **Francois Galgani** (IFREMER, France) and **Nikolai Maximenko** (University of Hawaii, U

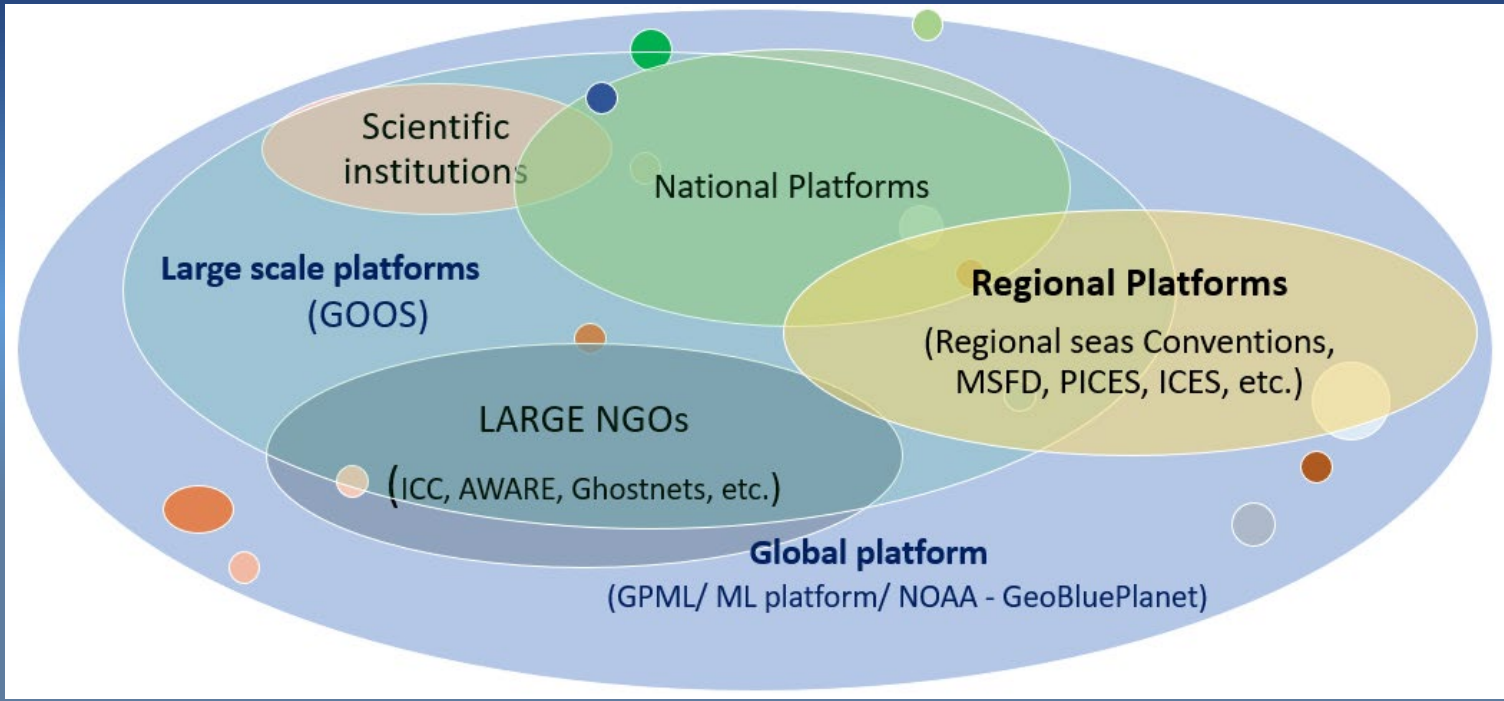
IMDOS is based on the holistic approach to the problem of plastic pollution and it provides a framework for a synthesis of all specialized observational activities.

MILESTONES

- 2018: 6IMDC: A session on global Monitoring
- 2018-2021: IEEE/ EOS and OPBS meetings
- 2019: OceanObs'19 IMDOS session & white paper
- 2018-present: SCOR FLOTSAM Working Group
- 2019: IOC/ GESAMP (technical report on monitoring)
- 2020-present: IOCCG Remote Sensing of Marine Litter and Debris Task Force
- 2021: A G20 Platform on microplastics
- 2021: IMDOS event at the UN Ocean Decade Clean Ocean Laboratory
- 2022: IMDOS event at the UN Ocean Conference (Portugal)
- 2022: IMDOS interim Steering Committee is formed

- 2023: MOEJ Meeting Japan Digital management
- 2023: Moej Meeting on remote sensing guidelines
- 2023: EqC meeitng Brussels

FLOTSAM IMDOS stakeholders analysis



The value chain of marine debris observations

Artur Palacz (GOOS)

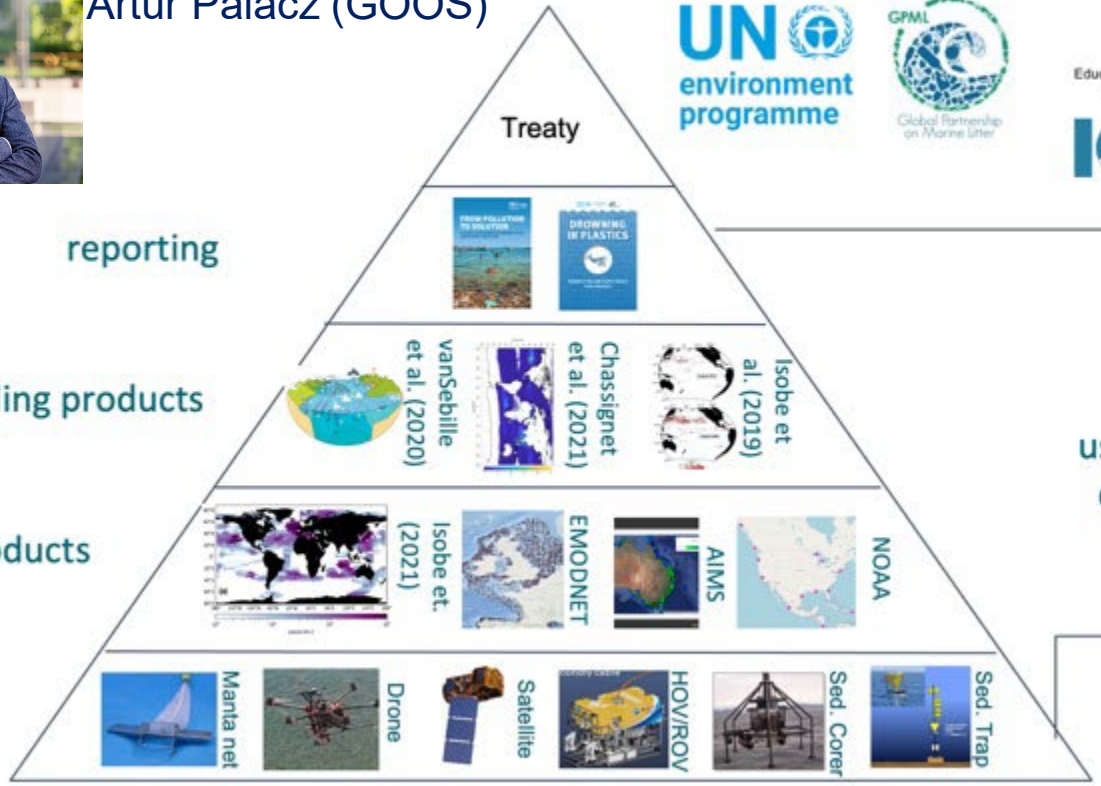
UN environment programme

GPML Global Partnership on Marine Litter

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

IODE International Oceanographic Data and Information Exchange



user feedback on data adequacy

IMDOS
INTEGRATED MARINE DEBRIS OBSERVING SYSTEM

FLOTSAM for the Plastic Treaty

In March 2022, at the resumed fifth session of the UN Environment Assembly (UNEA-5.2), a historic resolution was adopted to develop an international legally binding instrument on plastic pollution, including in the marine environment.

FLOTSAM for the Plastic Treaty

International Science Council

Thematic side events

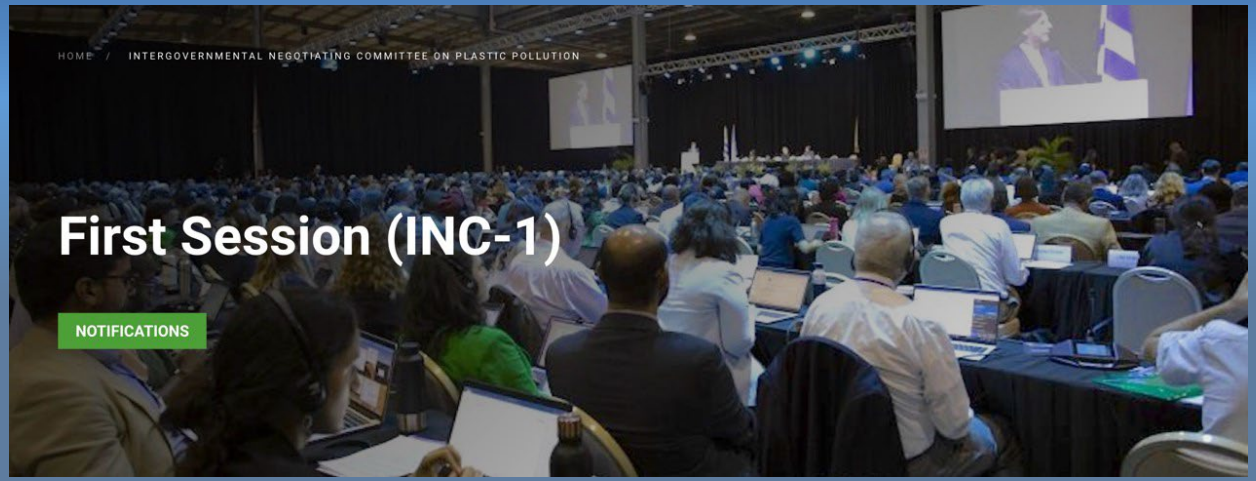
Technical webinars

Advisory Zero draft

FLOTSAM for the Plastic Treaty

International Science Council

Punta de l'Este

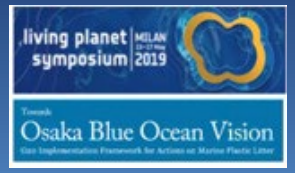


FLOTSAM for the Plastic Treaty

International Science Council

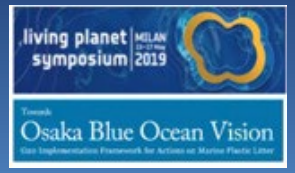
Paris

The future of FLOTSAM



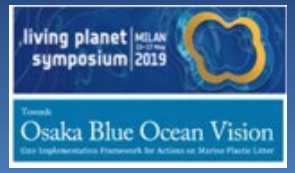
The future of FLOTSAM

IMDOS



The future of FLOTSAM

IMDOS is growing fast




Thank You