One Integrated Marine Debris Observing System for a Clean Ocean

SESSION 2: Fostering new monitoring capacities

18 Nov 2021, 10-12 am (CET)

EU4oceanobs · MERCATOR OCEAN INTERNATIONAL · GEO BLUE PLANET · University of Hawai'i Mānoa · CLS · CNR ISMAR · EMODnet European Marine Observation and Data Network

OGS · The Ocean Cleanup · IEEE Oceanic Engineering Society (OES) · SEA Semester · UNESCO Chair in Ocean Sustainability · Ifremer · The Global Ocean Observing System (GOOS) · EuroSea

Existing Marine Debris Monitoring Capacities

The Usual Suspects

Audrey Hasson, PhD

GEO Blue Planet

EU Coordinator / Marine Debris WG Lead

UN Decade Lab for a Clean Ocean

IMDOS Satellite Activity

Nov 18th 2021

Funded by the European Union

EU4oceanobs INTERNATIONAL OCEAN GOVERNANCE EU COMPONENT TO GLOBAL OCEAN OBSERVATIONS

Implemented by MERCATOR OCEAN INTERNATIONAL

To understand Marine Debris Monitoring we need to understand WHAT, WHERE and WHEN …

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To understand Marine Debris Monitoring we need to understand WHAT, WHERE and WHEN …

WHAT ?

- **Type / size of Marine Debris**
  - Floating / beached
  - Specific items
  - Size ranges (Nano to Mega)
- **Parameter to characterize Marine Debris**
  - Nb of particles
  - Mass of Debris
  - Type of Polymer
  - Presence of additional chemicals
  - Pathways

A whole range of sizes and types …

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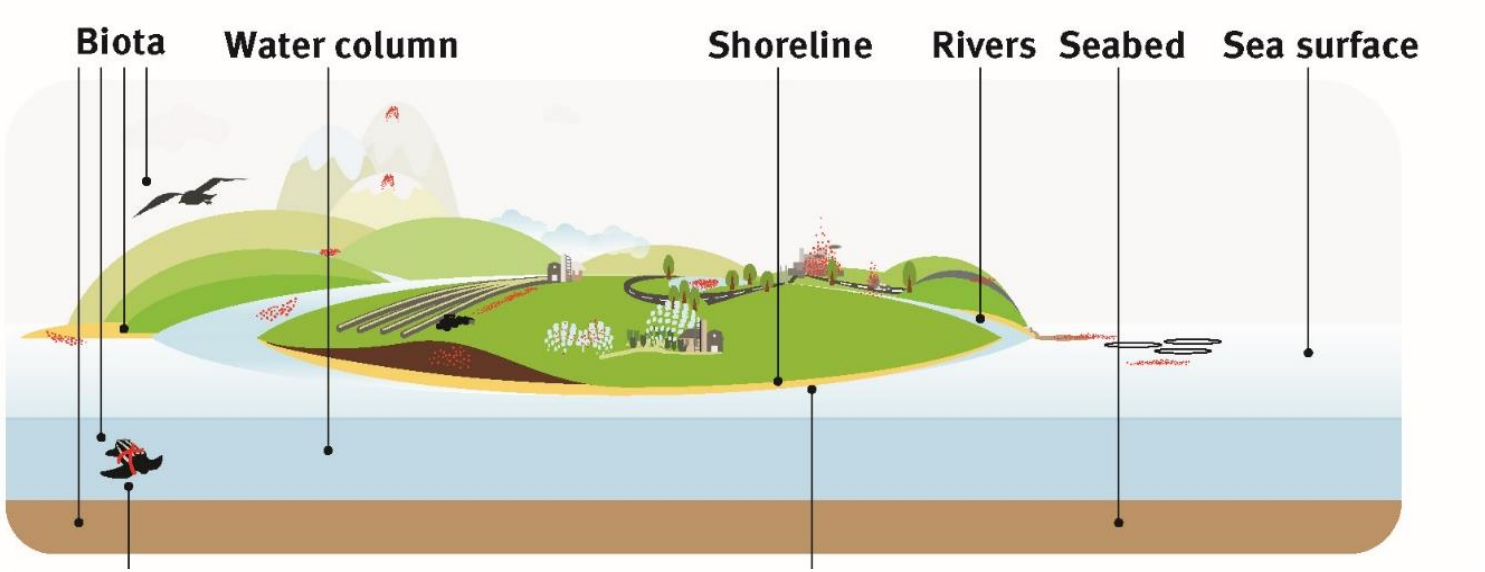
WHERE ?



UNEP (2021). Drowning in plastics – Marine Litter and Plastic Waste Vital Graphics.

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WHERE ?

- **Shorelines**
- **Rivers**
- **Sea Surface**
- **Water column**
- **Seabed**
- **Biota**

WHEN ?

- **Specific scientific experiment**
  - Non-recurring (and usually local/regional)
  - Normal / extreme conditions
- **Repeated Surveys**
  - Seasonal, yearly etc

It all comes down to WHY ?

IMDOS aims to move from “monitoring for answering a set of questions” to “monitoring to benefit all”

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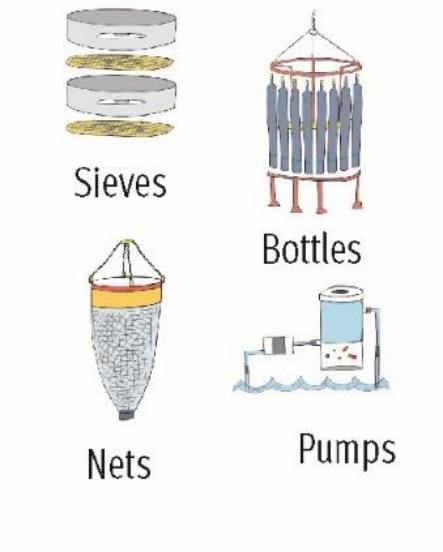
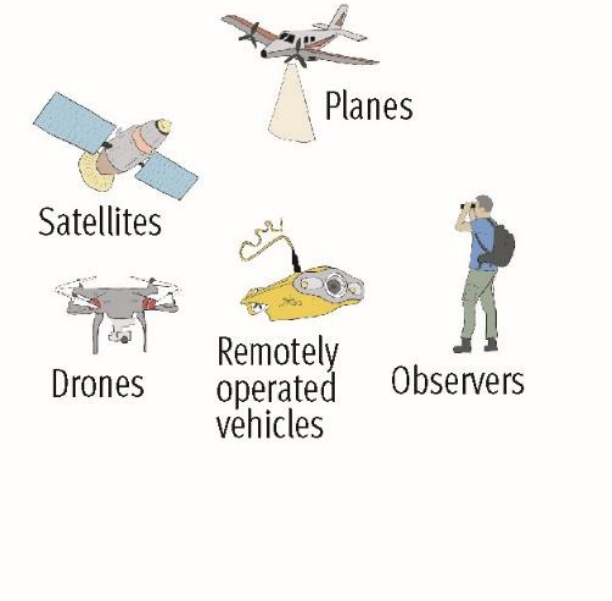
Monitoring Marine Debris : 3 big families

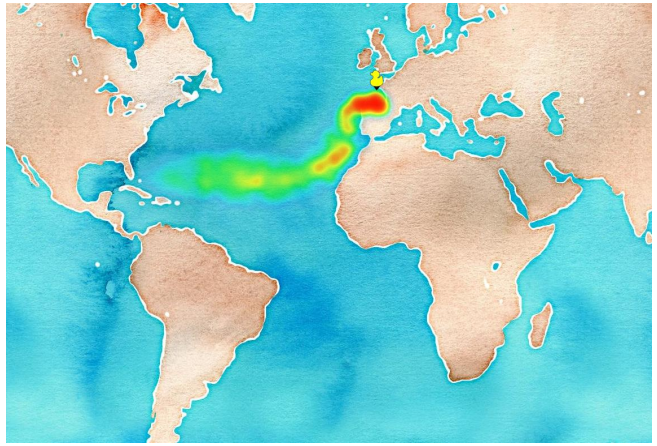
In Situ collection and sample analysis



Remote Sensing Imaging



Particle Drift Modelling



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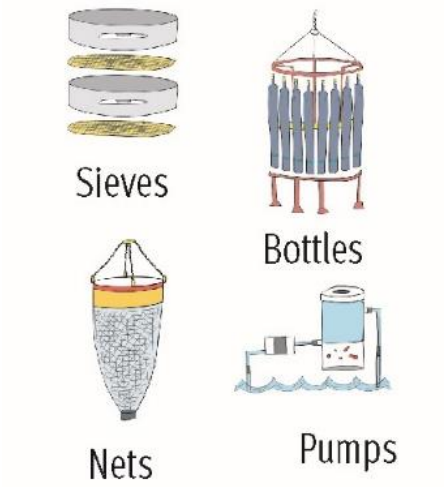
In Situ collection and sample analysis

Physical Collection



Sample preparation

Analysis techniques

Microscopy
- Relies on visual identification
- Relatively light to implement
- Time consuming

Weighting
- Provides quick and simple analysis
- Bias from water, sand and biofouling
- Light weight plastic leads to underestimations

Spectroscopy
- Provides the type of plastic
- Time consuming and expensive
- Highly trained technician needed
- Semi-automated analysis under test

Mass-Spectronomy
- Provides the type of plastic and other chemicals
- Time consuming and expensive
- Highly trained technician needed

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Remote Sensing Imaging

Direct Visual Estimations

- No advanced technologies required
- Can be implemented by citizen scientists
- Depends on human error
- Resources and time intensive
- Requires global implementation of harmonized methodology

Visual Imagery and Video

- Simple and affordable
- Variety of systems that can be attached to all kind of vessels
- Can provide visual information from areas difficult to access
- Limited to large debris
- Image processing (human and AI)
- Regulatory issues can restrict fly-over areas

Multi-spectral and Hyper-spectral Imagery

- Survey of large areas in limited time
- Global near-continuous
- Regulatory issues can restrict fly-over areas
- Image processing very challenging
- Limited to surface and large pieces

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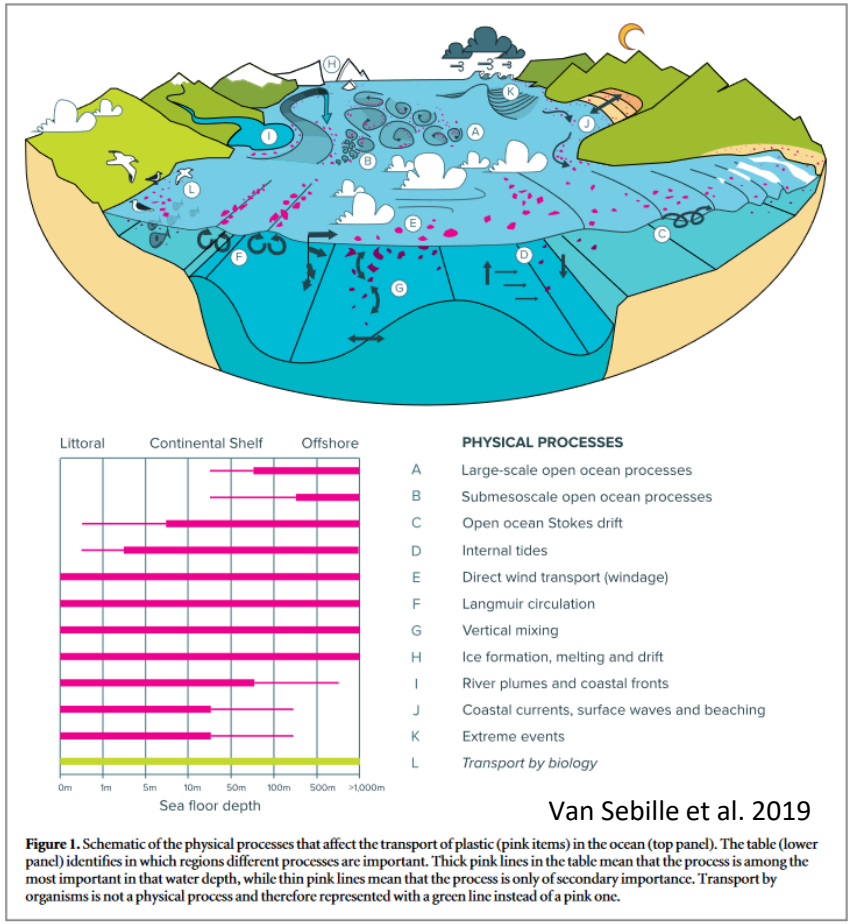
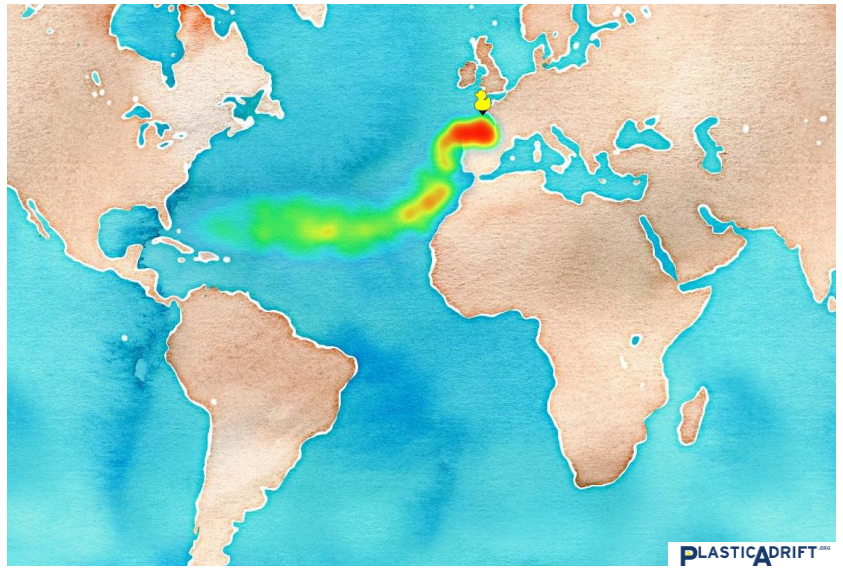


Van Sebille et al. 2019

Figure 1. Schematic of the physical processes that affect the transport of plastic (pink items) in the ocean (top panel). The table (lower panel) identifies in which regions different processes are important. Thick pink lines in the table mean that the process is among the most important in that water depth, while thin pink lines mean that the process is only of secondary importance. Transport by organisms is not a physical process and therefore represented with a green line instead of a pink one.

Understanding of the physical and chemical processes to represent the pathways of marine debris in a hydrodynamical model.



Modelling

- Provides 4D representations of the dispersion
- Developed on existing Lagrangian tracking methods
- Supports the identification of marine litter hot spots (shoreline and at sea)
- Dependent on the quality of both the hydrodynamical model and the tracking model
- Computing resource intensive

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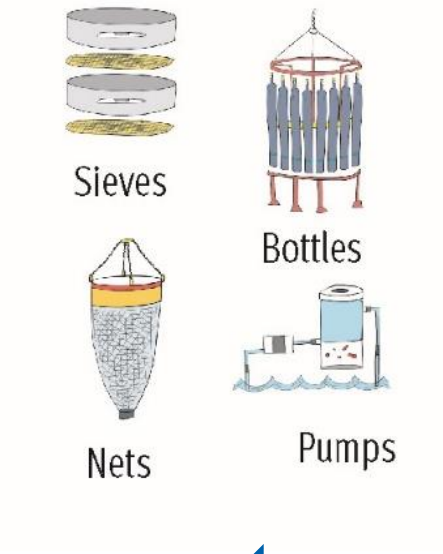

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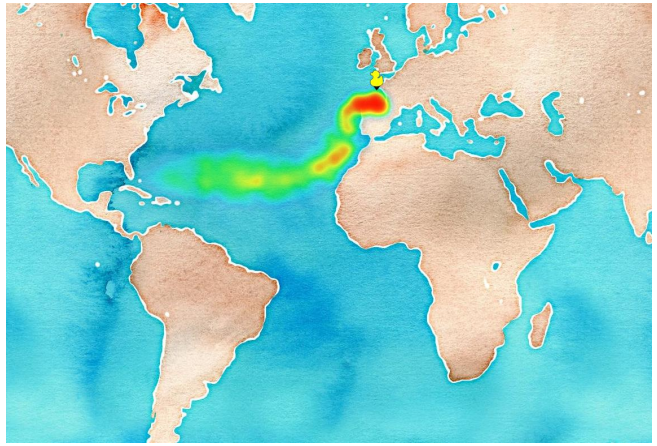

They all benefit from the other

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Our Agenda

10:10 -10:20 am CET	**Plastic industries - Data and Quality**	Jean-Yves Daclin, Plastics Europe (France)
10:20 – 10:30 am CET	**Chemical Tracers to determine plastic origin**	Jennifer Lynch, National Institute of Standards and Technology and Hawaii Pacific University's Center for Marine Debris Research
10:30 – 10:40 am CET	**Rivers inputs**	Romain Tramoy, École des Ponts ParisTech (ENPC), France
10:40 – 10:50 am CET	**Atmospheric inputs**	Maria Kanakidou, University of Crete, Greece

10-minute break

11:00 – 11:10 am CET	**Tracking Marine Debris in situ**	Marc Lucas, Collecte Localisation Satellites – CLS, France
11:10 – 11:20 am CET	**Monitoring by local communities**	Max Schmiel, GOT BAG, Germany
11:20 – 11:30 am CET	**Light-weight optical technologies**	Laurent Lebreton, The Ocean Cleanup, New Zealand
11:30 – 11:40 am CET	**Monitoring by citizen scientists**	Toshka Barnardo, Sustainable Seas Trust (SST), South Africa
11:40 – 11:50 am CET	**Marine Debris in the Digital Twin Ocean**	Erik van Sebille, Utrecht University, Netherlands.
11:50 - 12:00 am CET	**Monitoring inputs from extreme events**	Francois Galgani, Ifremer, France

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