Atlas of Ocean MIcroplastics;
AOMI 青海 (blue ocean)

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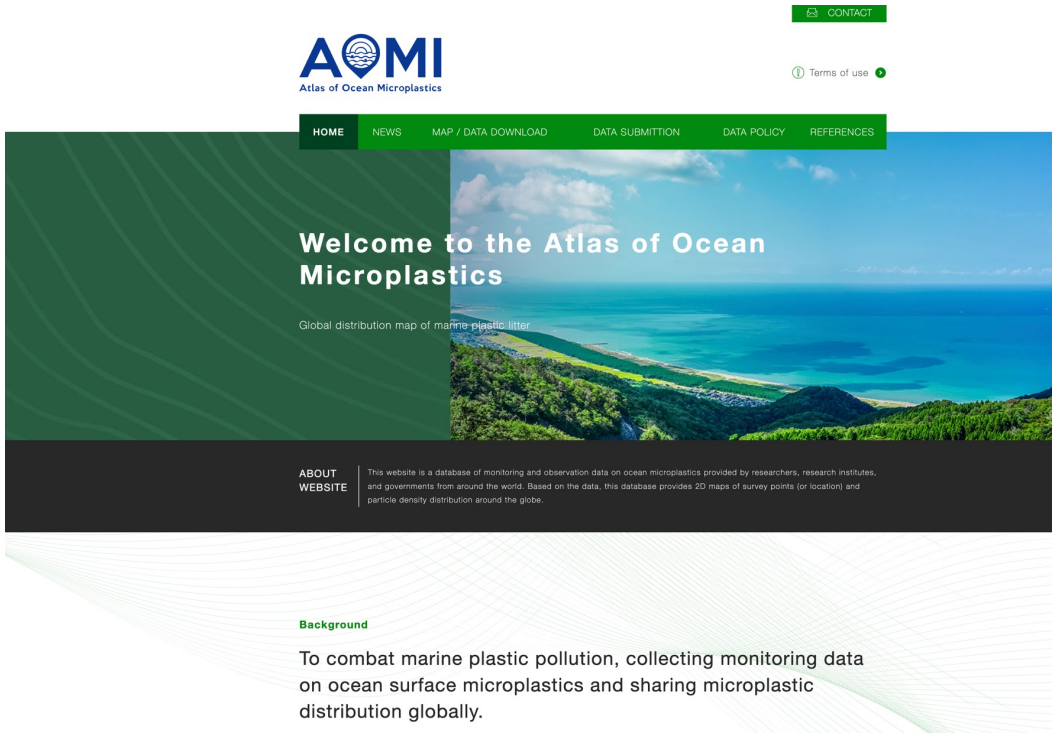

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https://aomi.env.go.jp/

To do list for ocean sciences

(1) Standardization/Harmonization of field surveys

→ **Guideline (standardized protocols)**

(2) Field surveys to accumulate the observed data

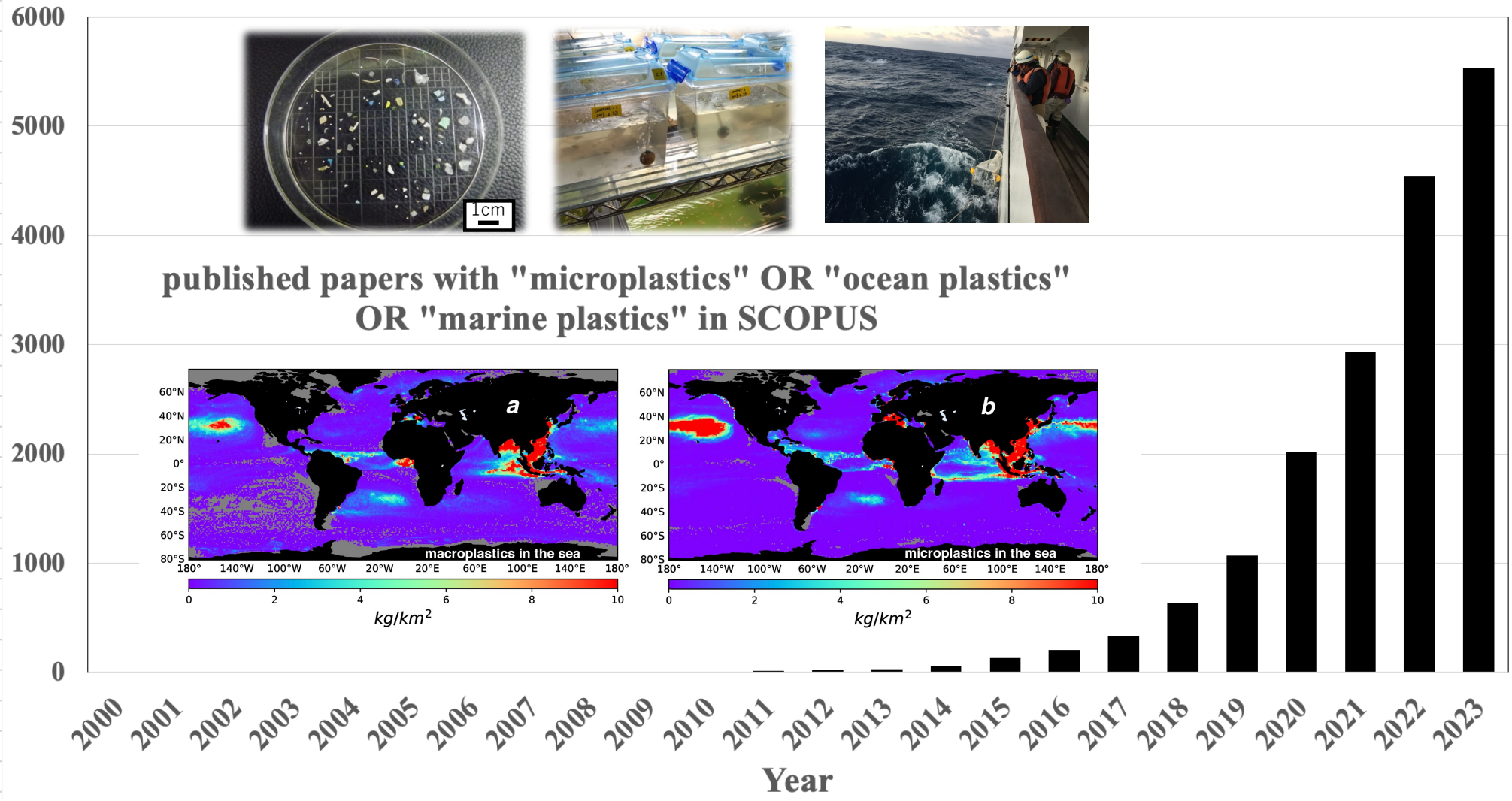
→ **Survey platforms** such as R/Vs, Moorings, Satellites…

(3) Mapping of items

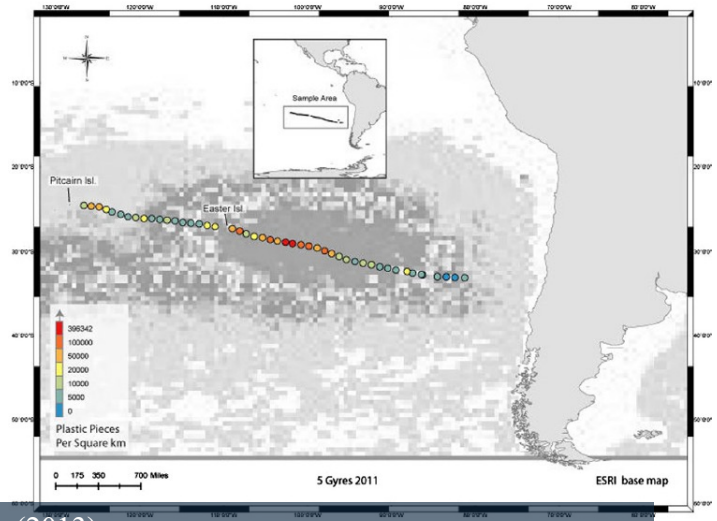
→ **Database** smoothly accessible for stakeholders

(4) Numerical modeling validated using the database.

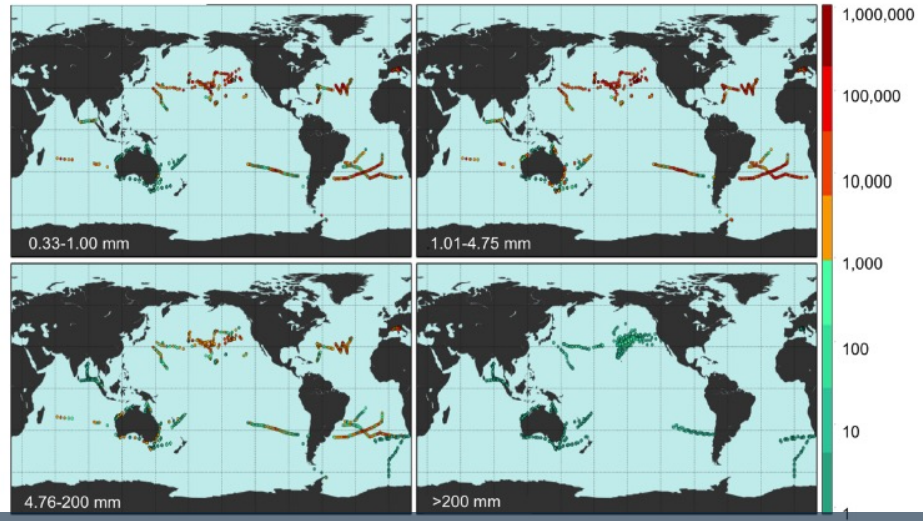
(5) Reanalysis products, Forecasts


6000
5000
4000
3000
2000
1000
0
1cm
published papers with "microplastics" OR "ocean plastics"
OR "marine plastics" in SCOPUS
a
macroplastics in the sea
b
microplastics in the sea
60°N
40°N
20°N
0°
20°S
40°S
60°S
80°S
180° 140°W 100°W 60°W 20°W 20°E 60°E 100°E 140°E 180°
0 2 4 6 8 10
kg/km²
2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023
Year

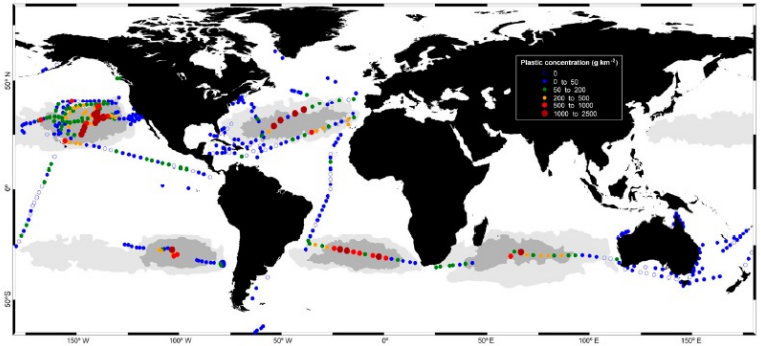
It was not well harmonized/standardized even in “metrics”



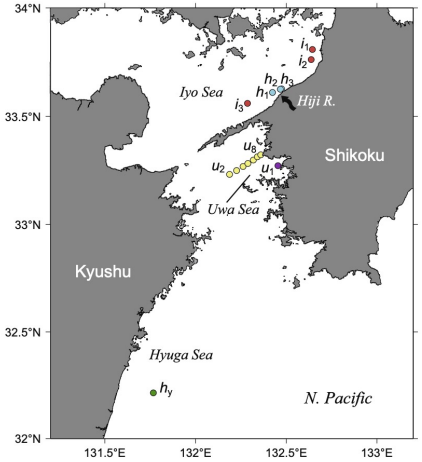
Eriksen et al. (2013)
pieces/km^2 Particle counts per study area

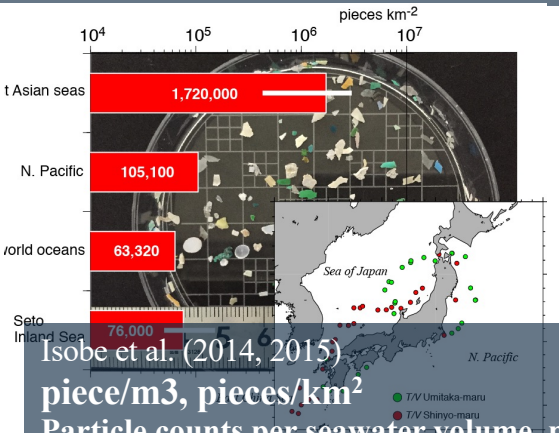


Eriksen et al. (2014)
pieces/km^2; **Particle counts per seawater volume time net height**



Cozar et al. (2014)
weight/km^2
Weight per seawater volume time net height





Isobe et al. (2014, 2015)
piece/m3, pieces/km^2
Particle counts per seawater volume, per area vertically integrated

Background to establish the AOMI database by MOEJ

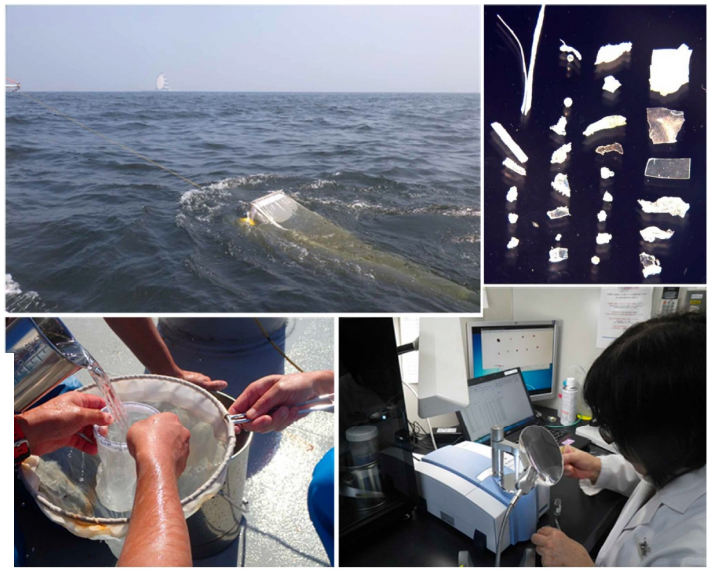
Harmonization/ Standardization of monitoring methods of ocean microplastics

Guidelines for Harmonizing Ocean Surface Microplastic Monitoring Methods

Yutaka Michida[1], Suchana Chavanich[2], Andrés Cózar Cabañas[3], Pascal Hagmann[4], Hirofumi Hinata[5], Atsuhiko Isobe[6], Peter Kershaw[7], Nikolai Kozlovskii[8], Daoji Li[9], Amy L. Lusher[10], Elisa Martí[3], Sherri A. Mason[11], Jingli Mu[12], Hiroaki Saito[1], Won Joon Shim[13], Agung Dhamar Syakti[14], Hideshige Takada[15], Richard Thompson[16], Tadashi Tokai[17], Keiichi Uchida[17], Katerina Vasilenko[18], Juying Wang[12]

guideline is available from MOEJ

1. Planning
2. Equipment
3. Sampling
4. On-board processing
5. Lab analysis



Michida et al., (2019)

A prototype of the AOMI database

~2D mapping project of surface microplastic abundance in the world's ocean ~

Isobe *et al. Microplastics and Nanoplastics* (2021) 1:16
https://doi.org/10.1186/s43591-021-00013-z

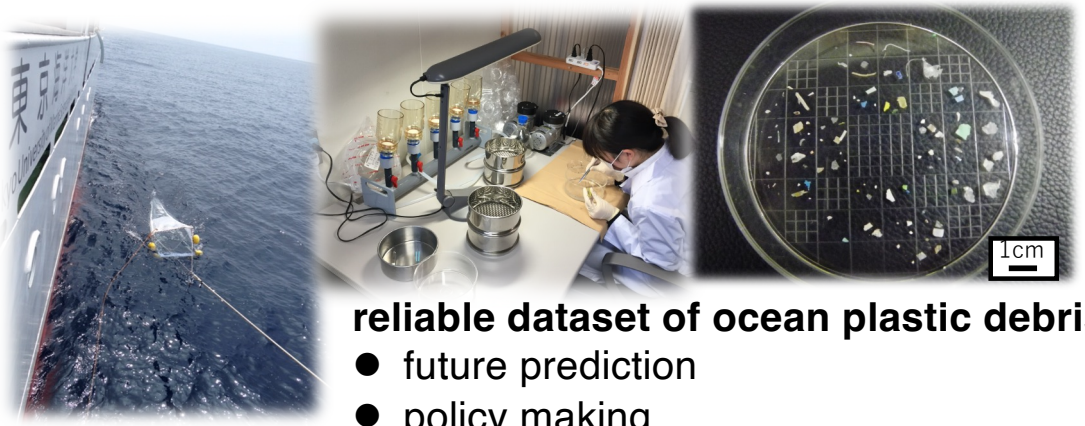
Microplastics and Nanoplastics

(Isobe et al., 2021, *Micropla. & Nanopla.*)

RESEARCH ARTICLE Open Access

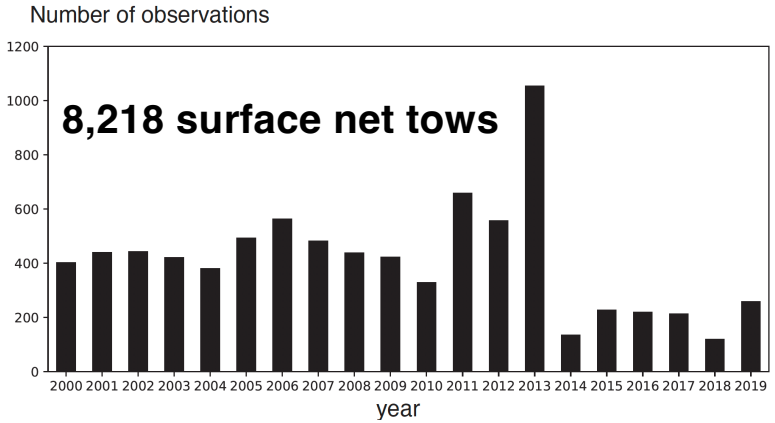
A multilevel dataset of microplastic abundance in the world's upper ocean and the Laurentian Great Lakes

Atsuhiko Isobe[1*], Takafumi Azuma[2], Muhammad Reza Cordova[3], Andrés Cózar[4], Francois Galgani[5], Ryuichi Hagita[6], La Daana Kanhai[7], Keiri Imai[8], Shinsuke Iwasaki[9], Shin'ichro Kako[10], Nikolai Kozlovskii[11], Amy L. Lusher[12,13], Sherri A. Mason[14], Yutaka Michida[15], Takahisa Mituhasi[2], Yasuhiro Morii[16], Tohru Mukai[17], Anna Popova[11], Kenichi Shimizu[18], Tadashi Tokai[19], Keiichi Uchida[19], Mitsuharu Yagi[18] and Weiwei Zhang[20]



reliable dataset of ocean plastic debris

- future prediction
- policy making
- public awareness



2000~2019

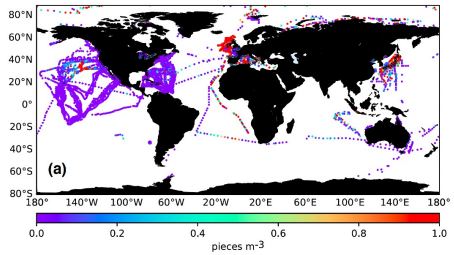
Microplastics > ~0.3 mm, but filaments were discarded in analyses.

sponsored by Ministry of the Environment, Japan

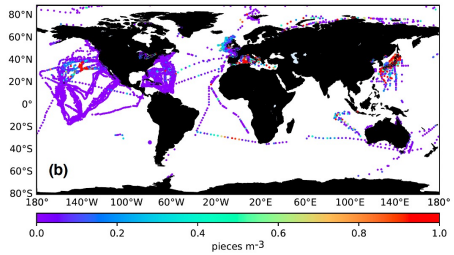
環境省 Ministry of the Environment

Coauthors:
Japan, China, Indonesia
Spain, France, Russia, Norway
USA, Trinidad & Tobago,

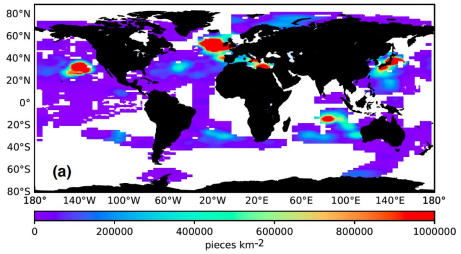
What is the multi-level dataset?



particle count per unit volume
LEVEL 0



without fibrous microplastics
LEVEL 1



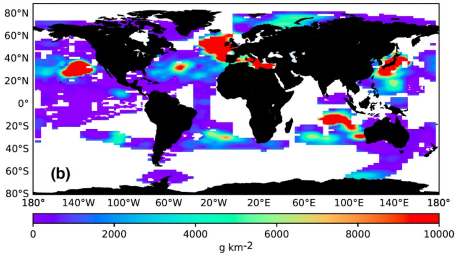
particle count per unit area **LEVEL 3p**

Optimum Interpolation Method (Kako et al., 2011)

$$A_g = B_g + \sum_{i=1}^{N}(O_i - B_i)W_i,$$

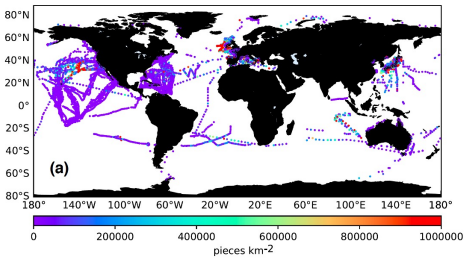
$$\sum_{j=1}^{N}\sum_{i=1}^{N}(\mu_{ij}^{B}+\mu_{ij}^{O})W_i = \mu_{ig}^{B},$$

$$\mu^B = e^{\left(-\frac{r_m^2}{L_m^2}-\frac{r_z^2}{L_z^2}\right)},$$

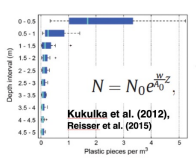


weight per unit area **LEVEL 3w**

1000 km × 500 km



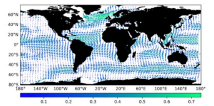
particle count per unit area **LEVEL 2p**



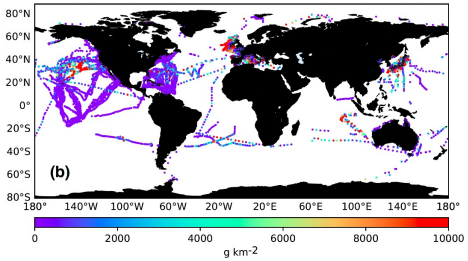
Isobe et al. (2015, MPB), Isobe et al. (2017, MPB), Isobe et al. (2019, Nature Comm)

$A_0 = 1.5\,u_* k H_{S_*}$ Significant wave height derived in a wave model

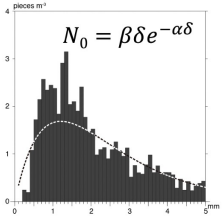
$(u_*=0.0012\,W_{10})$ Satellite-derived winds

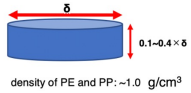


$M = \frac{N_0 A_0}{w}$ upward terminal velocity of microplastics (e.g., 5.3 mm/s in Reisser et al., 2015)



weight per unit area **LEVEL 2w**





density of PE and PP: ~1.0 g/cm^3

Isobe et al. (2019, Nature Comm)

- ✓ **Ecotoxicologists and/or environmental chemists** who set up laboratory-based studies regarding ”toxicity” of microplastics in realistic situations.
- ✓ **Physical Oceanographers** who set up numerical modeling approaches to reproduce and/or forecast the ocean microplastic abundance
- ✓ **Oceanographers and/or NPOs** who set up field surveys to collect microplastics efficiently
- ✓ …….

Atlas of Ocean MIcroplastics;

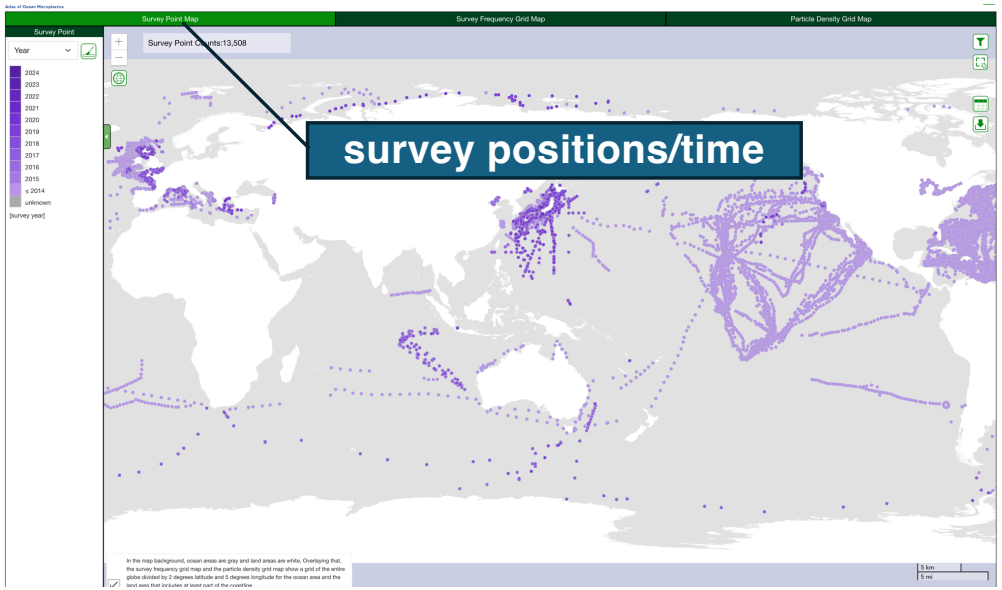
AOMI 青海 (blue ocean)

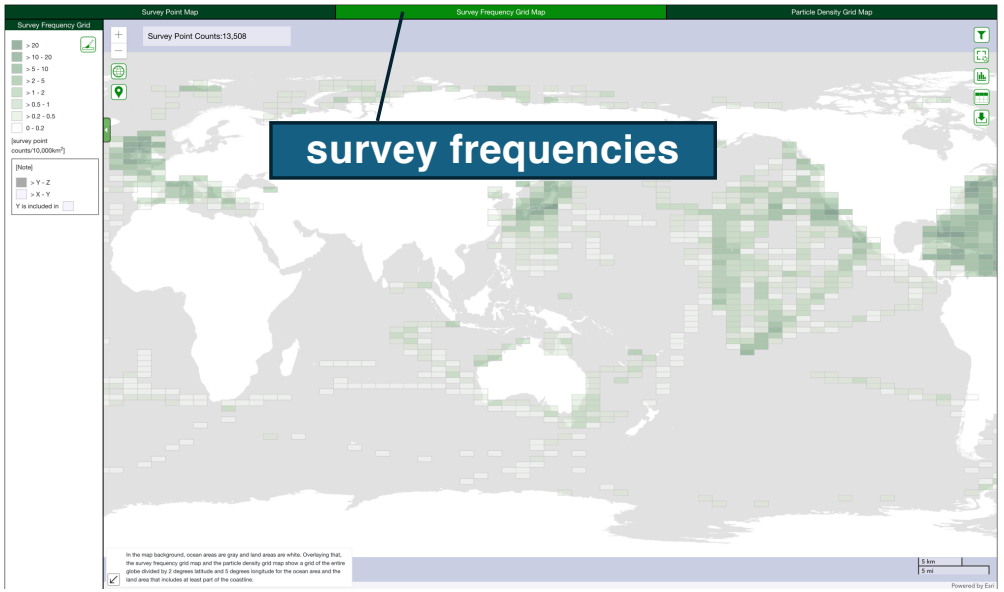
was opened publicly from the website from 9 May 2024

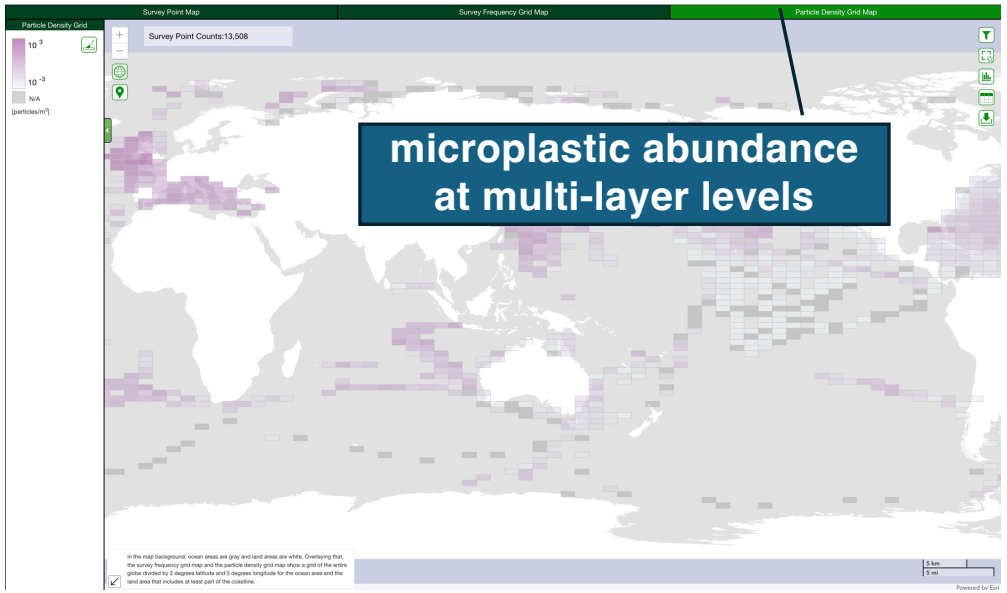
https://aomi.env.go.jp/

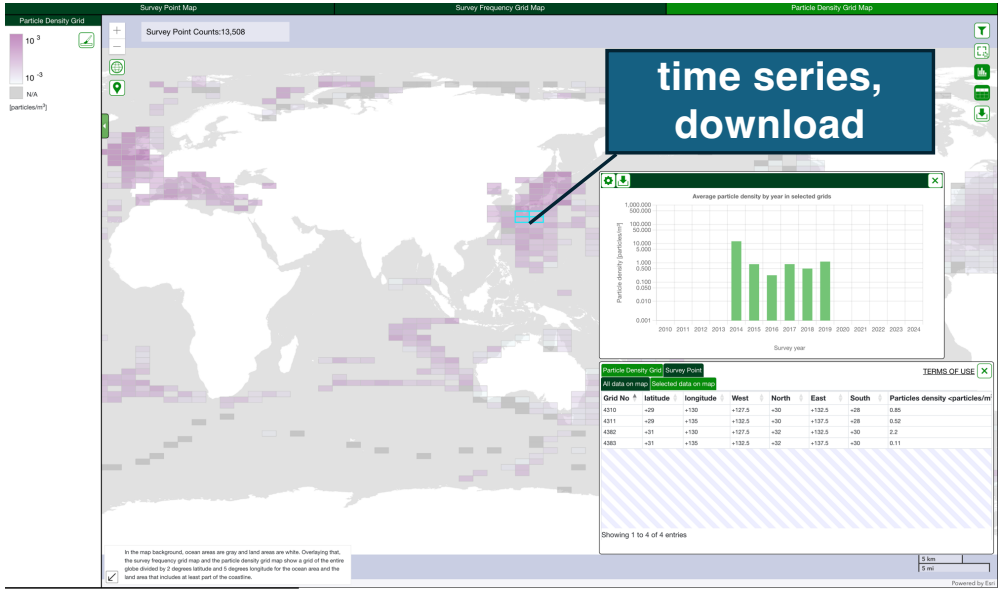
What is AOMI?

- Multi-level dataset of microplastic (MP) abundance in the world's upper ocean
- It is available for everyone freely
- Anyone can upload/download the MP data through the AOMI website
- This is a MP data sharing project sponsored by Ministry of the Environment, Japan (MOEJ)


Survey Point Map
Survey Frequency Grid Map
Particle Density Grid Map
Survey Point
Survey Point Counts:13,508
survey positions/time


Survey Point Map
Survey Frequency Grid Map
Particle Density Grid Map
Survey Frequency Grid
Survey Point Counts:13,508
survey frequencies


Survey Point Map
Survey Frequency Grid Map
Particle Density Grid Map
Particle Density Grid
Survey Point Counts:13,508
microplastic abundance
at multi-layer levels


Survey Point Map
Survey Frequency Grid Map
Particle Density Grid Map
Particle Density Grid
Survey Point Counts:13,508
time series,
download
Average particle density by year in selected grids
TERMS OF USE

Uploading to AOMI database

How to contribute to AOMI?

You can **download an excel file** to provide your information

UPLOAD FORM

Excel file

Form File.xlsx

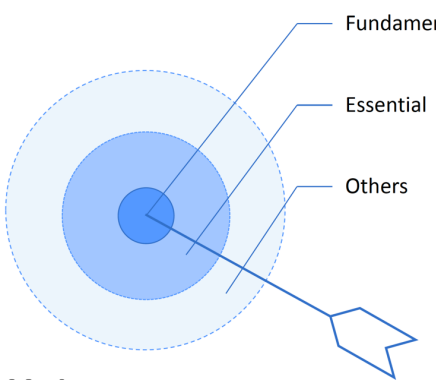
(Please find "Data Entry Form Sheet & Data List Sheet")

Please create your data files using the templates provided (.xlsx and .xlsm), and submit them using the upload area below.
Our administrators will review the data, if there is any question, we may contact you via email to request data revisions and resubmission.

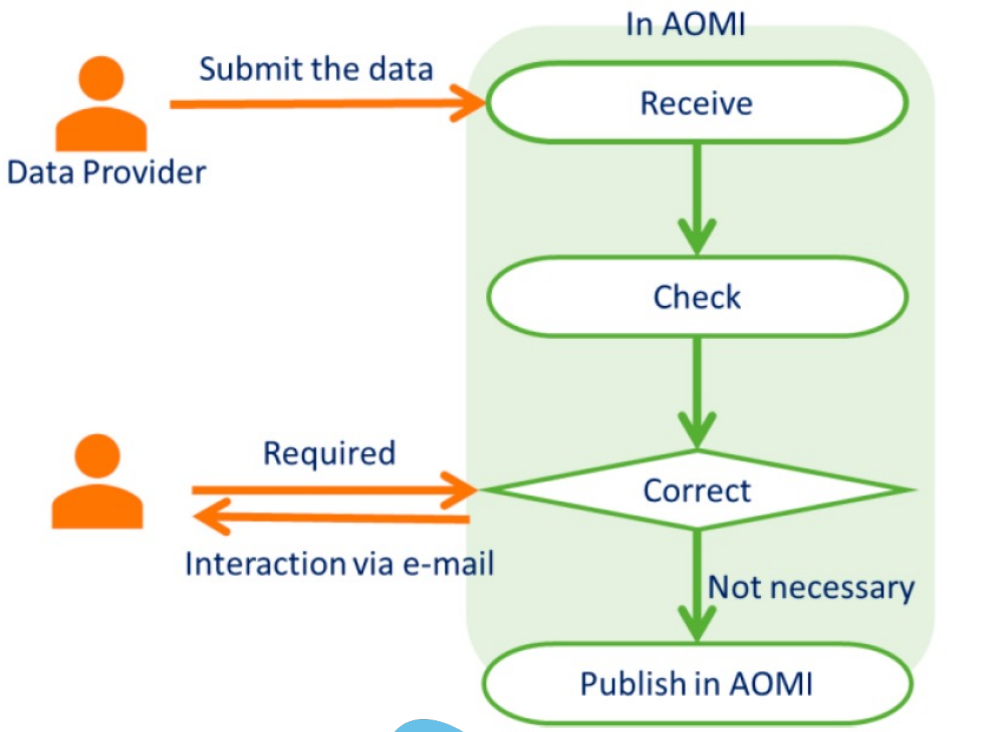
- Terms of data submission

Individual data records will be provided to those who have agreed to use them within the scope permitted by their respective Creative Commons licenses.
We will use the data you provide to create charts and graphics in this database. The charts and graphics created will be distributed under a Creative Commons license (CC-BY-SA), with the condition that proper attribution to this database is given.

Data items categories



Fundamental	Necessary to display the number of particles per volume/area
Essential	Necessary for the harmonization of monitoring methods
Others	Might be necessary in future surveys and research data accumulation



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We have to fill in the data gaps!