聖若瑟大學 USJ Institute of Science and Environment

# Quantifying Microplastics Using Gravity Methods in the Classroom

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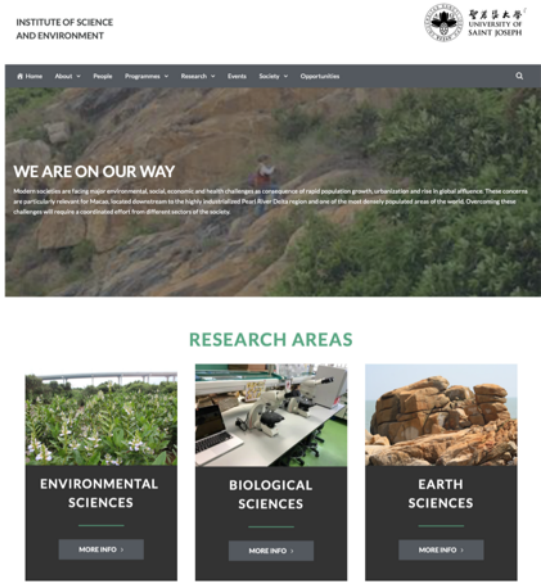
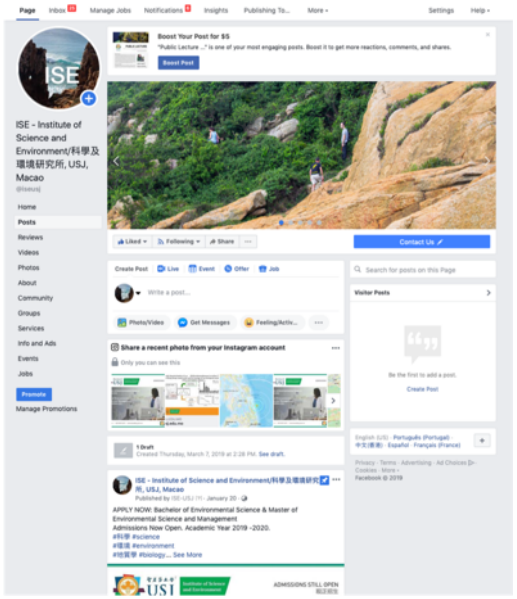
## SOCIAL MEDIA




http://ise.usj.edu.mo/microplastics

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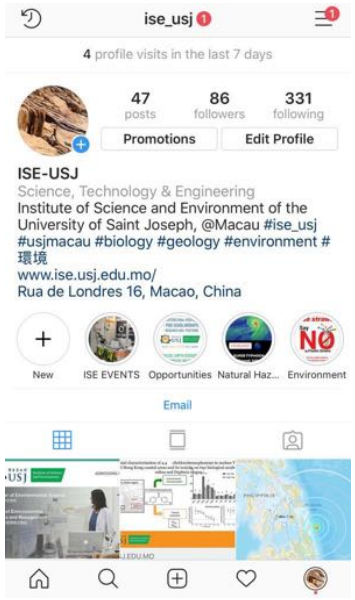


#ise_usj

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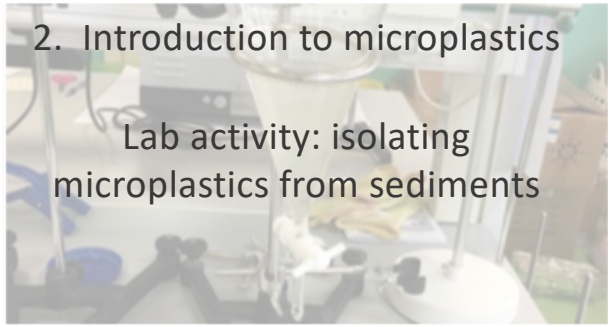
NAPE

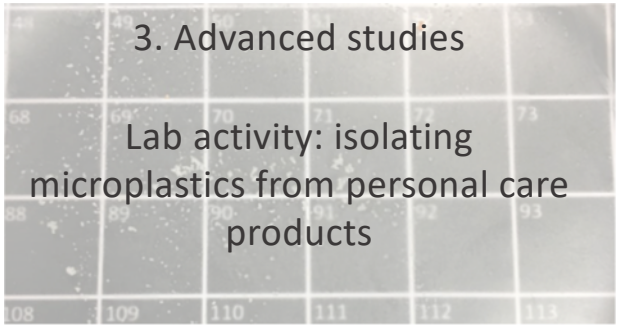
## COURSE OVERVIEW

1. Field activities



2. Introduction to microplastics

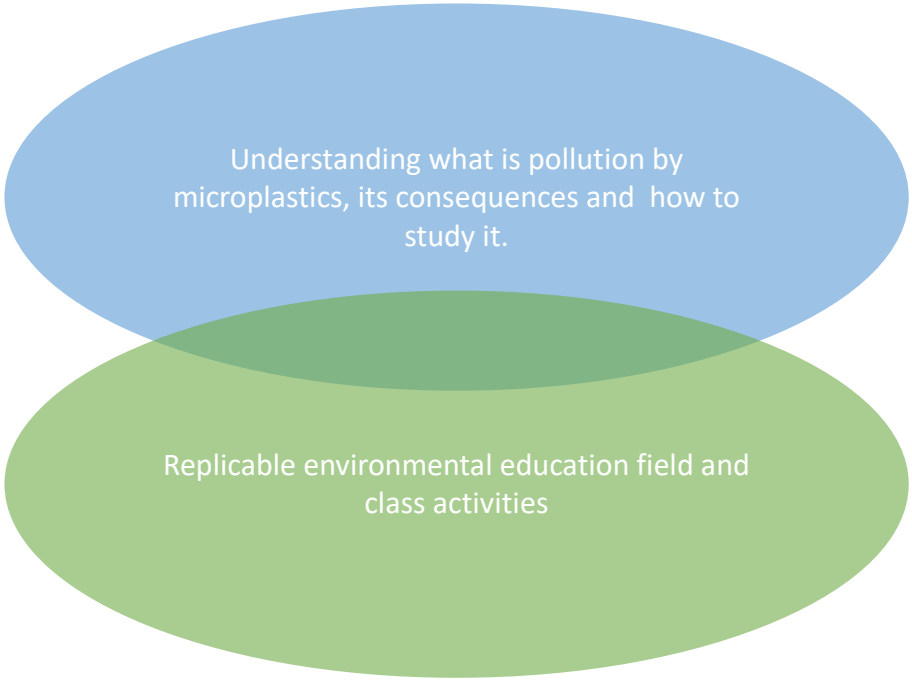
Lab activity: isolating microplastics from sediments



3. Advanced studies

Lab activity: isolating microplastics from personal care products

## COURSE GOALS



Activity | Introduction to microplastics

Give your answer to the following questions:

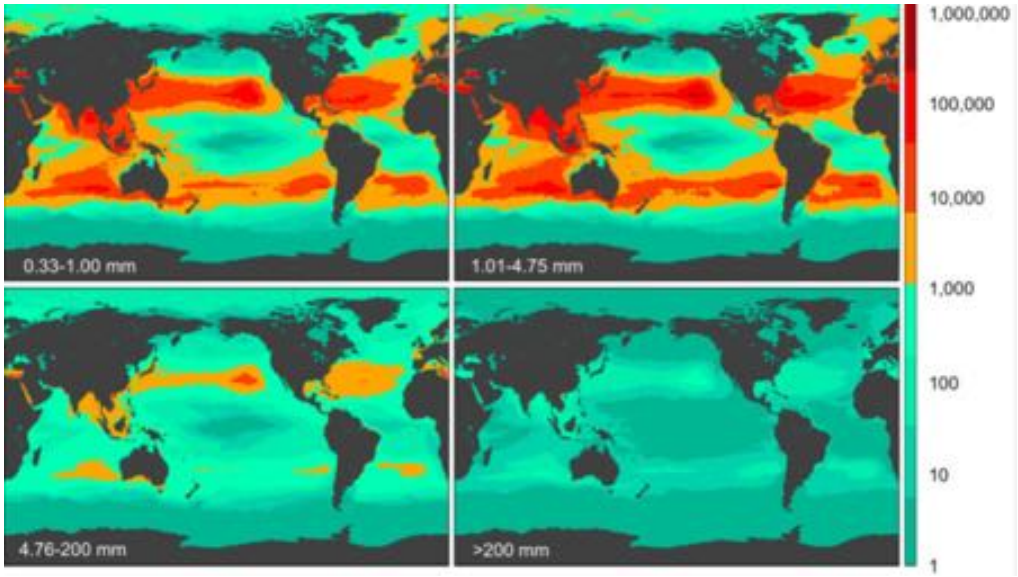
1. **What are microplastics?**
2. **What is the difference between primary and secondary microplastics? Give some examples.**
3. **What are the main routes for environmental contamination by microplastics?**

Objectives: stimulate the capacity to search for information, ability to work in a group

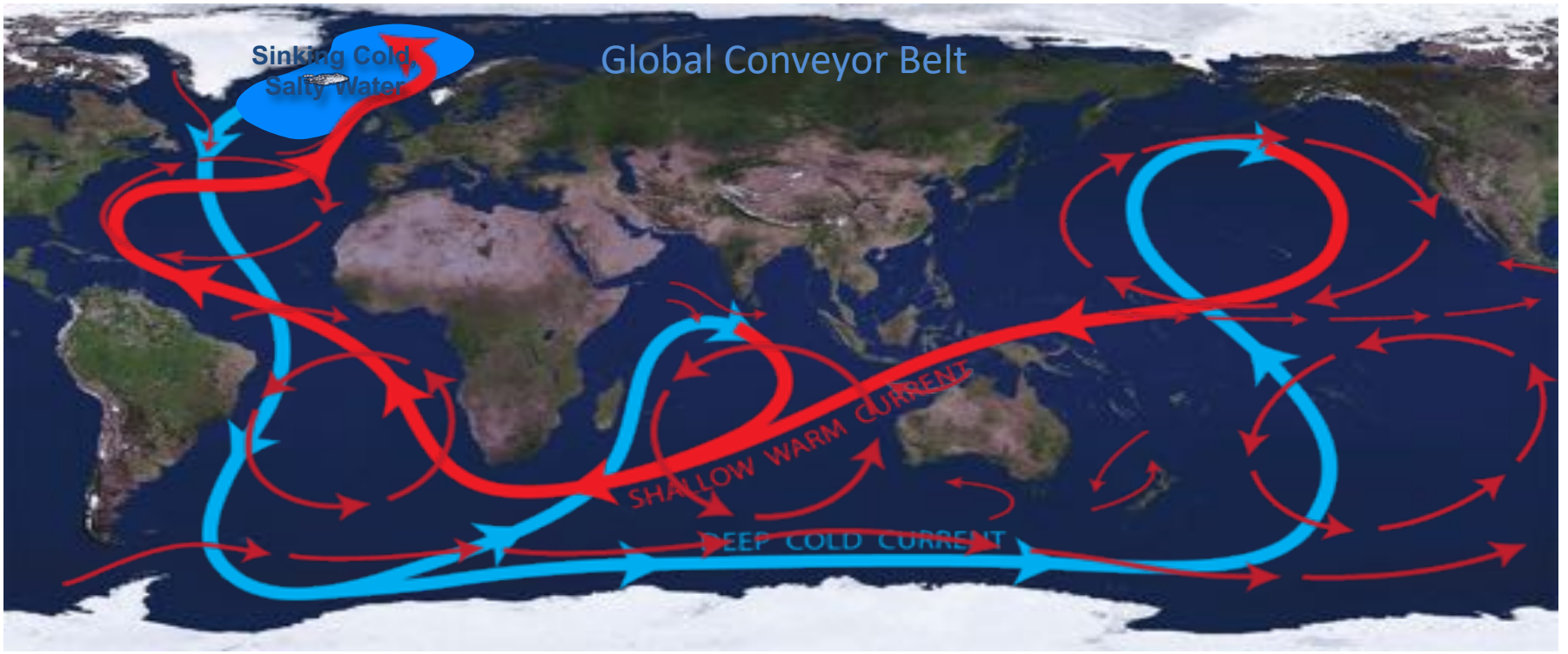
## Trend in global plastic production
## 全球的塑料生產趨勢


## Model estimation of microplastics in the ocean
## 海洋中微型塑料的模型評估

*Eriksen et al, PLoS ONE, 2014; DOI: 10.1371/journal.pone.0111913*

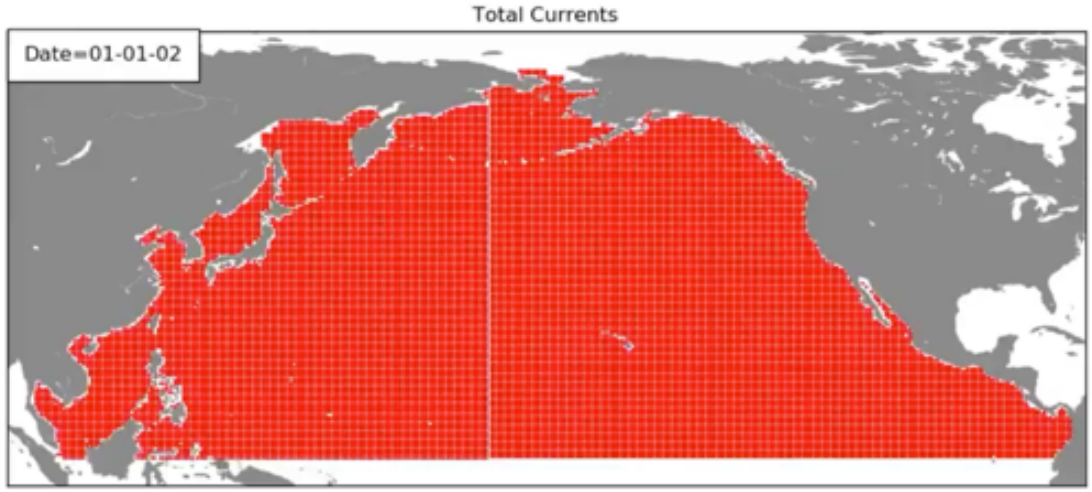


## INTRODUCTION TO MICROPLASTICS



## INTRODUCTION TO MICROPLASTICS

# Where do microplastics go?




*Onink et al. The Role of Ekman Currents, Geostrophy, and Stokes Drift in the Accumulation of Floating Microplastic, Journal of Geophysical Research: Oceans (2019). DOI: 10.1029/2018JC014547*

## INTRODUCTION TO MICROPLASTICS


*Source: Nasa and NOOA*

## TYPES OF PLASTICS

## TYPES OF PLASTICS

# Polyethylene Terephthalate (PET)

**Density: 1.38 g/cm$^3$**

**USES**

- Soda bottles
- Water bottles
- Salad dressing bottles
- Medicine jars
- Peanut butter jars
- Jelly Jars
- Combs
- Bean bags
- Rope
- Tote bags
- Carpet
- Fiberfill material in winter clothing

## TYPES OF PLASTICS

# High-Density Polyethylene (HDPE)

**Density: 0.95 g/cm$^3$**

**USES**

- Milk jugs
- Juice containers
- Grocery bags
- Trash bags
- Motor oil container
- Shampoo and conditioner bottles
- Soap bottles
- Detergent containers
- Bleach containers
- Toys

## TYPES OF PLASTICS

# Polyvinyl Chloride

**Density:**

| rigid | flex. |
|---|---|
| 1.3-1.45 g/cm$^3$ | 1.1-1.35 g/cm$^3$ |

**USES**

- Some tote bags
- Plumbing pipes
- Tile
- Cling films
- Shoes
- Gutters
- Window frames
- Ducts
- Sewage pipes

## TYPES OF PLASTICS

# Low-Density Polyethylene

**Density: 0.917-0.930 g/cm$^3$**

**USES**

- Cling wrap
- Sandwich bags
- Squeezable bottles for condiments such as honey and mustard
- Grocery bags
- Frozen food bags
- Flexible container lids

## TYPES OF PLASTICS

# Polypropylene

**USES**

- Plastic diapers
- Tupperware
- Kitchenware
- Ropes
- Yogurt containers
- Prescription bottles
- Bottle caps
- Drinking strawa
- Disposable cups and plates

**Density: 0.895-0.92 g/cm³**

## TYPES OF PLASTICS

# Polystyrene

- **USES**
- Disposable coffee cups
- Plastic food boxes
- Plastic cutlery
- Packing foam
- Packing peanuts

**Density: 0.96-1.04 g/cm$^3$**

## TYPES OF PLASTICS

# Others

**Include:**

- Polycarbonate
- Polylactide
- Acrylic
- Acrylonitrile butadiene
- Styrene
- Fiberglass
- Nylon

**USES**

- Plastic CDs and DVDs
- Baby bottles
- Large water bottles with multiple-gallon capacity
- Medical storage containers
- Eyeglasses
- Exterior lighting fixtures

## TYPES OF PLASTICS

What is the density of a saturated NaCl solution?

What about a 25% zinc bromide (ZnBr2) solution?

**Specific gravity of various plastics**

| Plastics | Specific gravity |
|---|---|
| LDPE | 0.91~0.93 |
| HDPE | 0.94~0.97 |
| PP | 0.90~0.91 |
| PS | 1.04~1.07 |
| PVC | 1.35~1.45 |
| ABS | 0.99~1.10 |
| Polyester | 1.38~1.39 |
| PC | 1.2 |
| Nylon 66 | 1.13~1.15 |
| Teflon | 2.1~2.2 |

Source: "Polymer dictionary" by Taiseisha Co., Ltd (1970)

## Activity | Types and origins of plastic waste in Macao

Input in a shared google spreadsheet data for the waste that you collected during the field trip and analyse the results.

1. **What were the most common plastic items?**
2. **What was their origin?**
3. **What was the oldest plastic item that you could identify?**

Discuss the results under the theme “think globally, act locally”.

Objectives: raise awareness about both the local and global origin of waste. Train numeric and graphical skills

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THANK YOU!