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Spatial and Temporal Analysis of Microplastic Distribution in the Great Pacific Garbage Patch





Research background and motivation

- The Great Pacific Garbage Patch refers to the concentration of human-made debris, mainly microplastics, half-way between California and Hawaii.¹
- Floating plastics and other debris are carried by gyres into the ocean and stay in the gyre, where the debris starts to degrade into microplastics due to the sun, waves, and marine life.²
- Organizations such as the Ocean Cleanup have efforts to remediate the issue by collecting plastic pollution from the area.²
- Plastic pollution affects animals through ingestion and entanglement. It also affects humans by entering our food chain and affecting vital fisheries and other economies.²



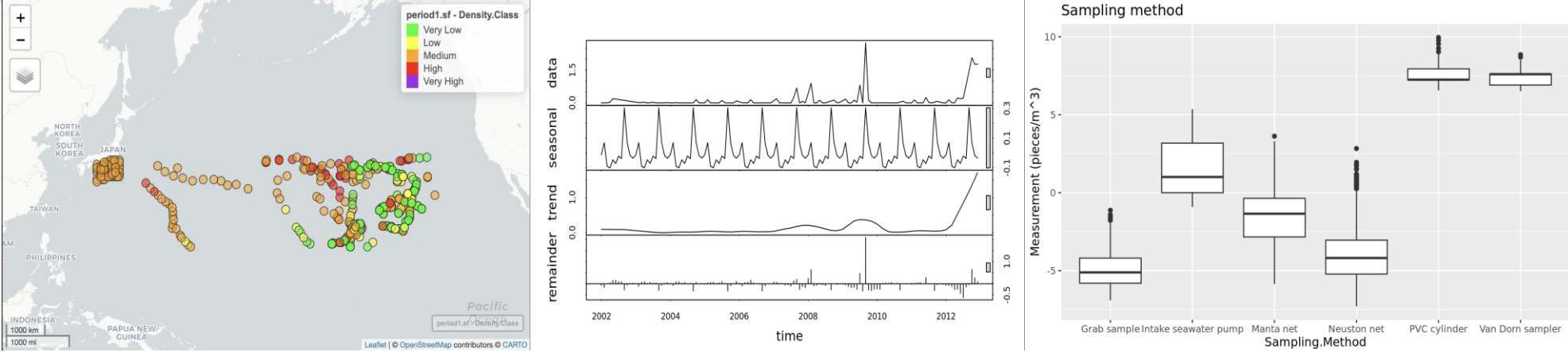
Dataset

- NOAA NCEI Marine Microplastics Map Portal
 - repository for datasets from different sources around the world
- North Pacific Subtropical Gyre (NPSG) subset
 - Known as the Great Pacific Garbage Patch
 - Data from 15N to 35N, 135E to 135W³
 - Downloaded East Pacific and West Pacific separately
 - Chose only surface samples (Neuston net method)
- Wrangling
 - Joined East and West
 - Selected columns: Measurement, Unit, Density Range, Density Class, Latitude, Longitude, and Date
 - Cleaned up date column, separated D/M/Y, made it date class
- Broader scope
 - Extracted all Pacific Ocean data with all sampling methods to ask broader research questions

Analysis

Research Question	Where in the NPSG is microplastic pollution the highest?	How has the pollution level changed throughout the years?	What are the differences among various sampling methods?
Alterative hypothesis	We propose that the concentration of microplastic is the center of the NPSG	We predict that pollution increases over time due to global mass consumption	We predict there are significant differences among sampling methods
Null hypothesis	The distribution could be random throughout the NPSG	The pollution level fluctuates and does not reflect a fixed pattern	The sampling methods are not different from one another
Analytical method	Spatial analysis of the microplastic distribution from 1972 to 2014 in the NPSG	Time series analysis of microplastic distribution from 1972 to 2014 in our selected region	Observing the entire Pacific dataset using <i>summary</i> and <i>unique</i> commands; creating boxplots; running ANOVA tests

Example output



Bibliography

1. “The Great Pacific Garbage Patch.” *The Ocean Cleanup*, <https://theoceancleanup.com/great-pacific-garbage-patch/>. Accessed 21 Nov. 2024.
2. US Department of Commerce, National Oceanic and Atmospheric Administration. *What Is the Great Pacific Garbage Patch?* <https://oceanservice.noaa.gov/facts/garbagepatch.html>. Accessed 21 Nov. 2024.
3. Karl, D. M. (1999). A sea of change: Biogeochemical variability in the north pacific subtropical gyre. *Ecosystems*, 2(3), 181-214. doi:<https://doi.org/10.1007/s100219900068>