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The issue of Microplastics, and the potential role for satellite data



Plenary session #2

Ecosystem Conservation



Dr Ebenezer Nyadjro

Associate Research Professor in Oceanography Mississippi State University Oceanographer for NOAA

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The Issue of Microplastics, and the Potential Role for Satellite Data

National Centers for Environmental Information (NCEI)

Ebenezer Nyadjro

NOAA/ National Centers for Environmental Information, Stennis Space Center, MS Northern Gulf Institute, Mississippi State University, Stennis Space Center, MS

The (Micro)plastics Menace

> Marine debris: materials that are manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment







The Microplastics Menace

- Microplastics (< 5 mm) pollution is ubiquitous, irreversible & disrupts the ecological system</p>
- Come from macroplastics and break down into nanoplastics (< Ι μm)
- Most plastic fragmentation occurs on land: ambient temperatures, frictional forces & UV exposure









The Microplastics Menace

- About 4.8 to 12.7 million tons of plastic debris per year enter the ocean (Jambeck et al., 2015)
- \succ Rate of plastic production expected to exceed carbon
- > Understand and monitor global microplastic occurrence, distribution, transports & fate



NOAR

The Microplastics Menace: Need for Monitoring

Assess & quantify the impact on the blue economy marine ecosystem loss

Estimated between \$3,300-\$33,000 per annum for each ton of plastic into the ocean (Beaumont et al. 2019)

- Numerical modelling & predictions of plastics
- Lack of extensive database on microplastic
- Lack of *a unified repository* of microplastic
 & allied data
- Standardization of units, quality of measurements, applications of data







NOAA Interests in Marine Microplastics

> Need: A large-scale, long-term, comprehensive database and archive on microplastics

Vision: Establish a global, microplastic database that will serve a diverse international customer base, who will use it, together with other NCEI archived data (e.g., Global Ocean Current Database, World Ocean Database, etc.), to attain a holistic understanding of the global microplastic problem.

> Goals:

> Provide a robust repository for information needed for marine microplastic debris monitoring

Develop database and GIS web portal in concert with other microplastic observing efforts (e.g., MOEJ)



Website demonstration: https://www.ncei.noaa.gov/products/microplastics



> The Challenges

- Too small MPs smaller than the pixel size of most optical remote sensors. Sentinel-2 sensors (10 20 m)
- Many different floating objects spectral discrimination
- Mixed pixel variable water background is a challenge



Remote Sensing of Microplastics

> Considerations

- O Spectral signature the number & size of spectral regions (or frequencies) the sensor records data in. E.g.
 B G R NIR
- Radiometric resolution sensitivity of detectors to small difference in EM energy





0.4

R (microplastics)

0.0

900

Garaba and Dierssen (2020)

Micro plastics

Plastic bags Plastic bottles

800

700

Remote Sensing of Microplastics

Spectral characteristics and spectral discrimination – need for several bands



Laboratory experiment of virgin and ocean-harvested plastics (Garaba et al., 2021)



Microplastics pollution is on the rise; need for comprehensive data for monitoring

- NOAA NCEI microplastics database providing reliable, consistent data
- Potential for remote sensing of microplastics; emerging technologies and techniques
- Easy to differentiate floating vegetation and non-vegetation using the 670-nm feature
- Difficult to separate non-vegetation type (macroplastics, other debris)- flat spectra
- A few discrete SWIR bands won't help; more SWIR bands can be useful



Thank You

ebenezer.nyadjro@noaa.gov





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