IT'S RAINING MICROPLASTICS! Storm-driven deposition of atmospheric microplastic in Newfoundland

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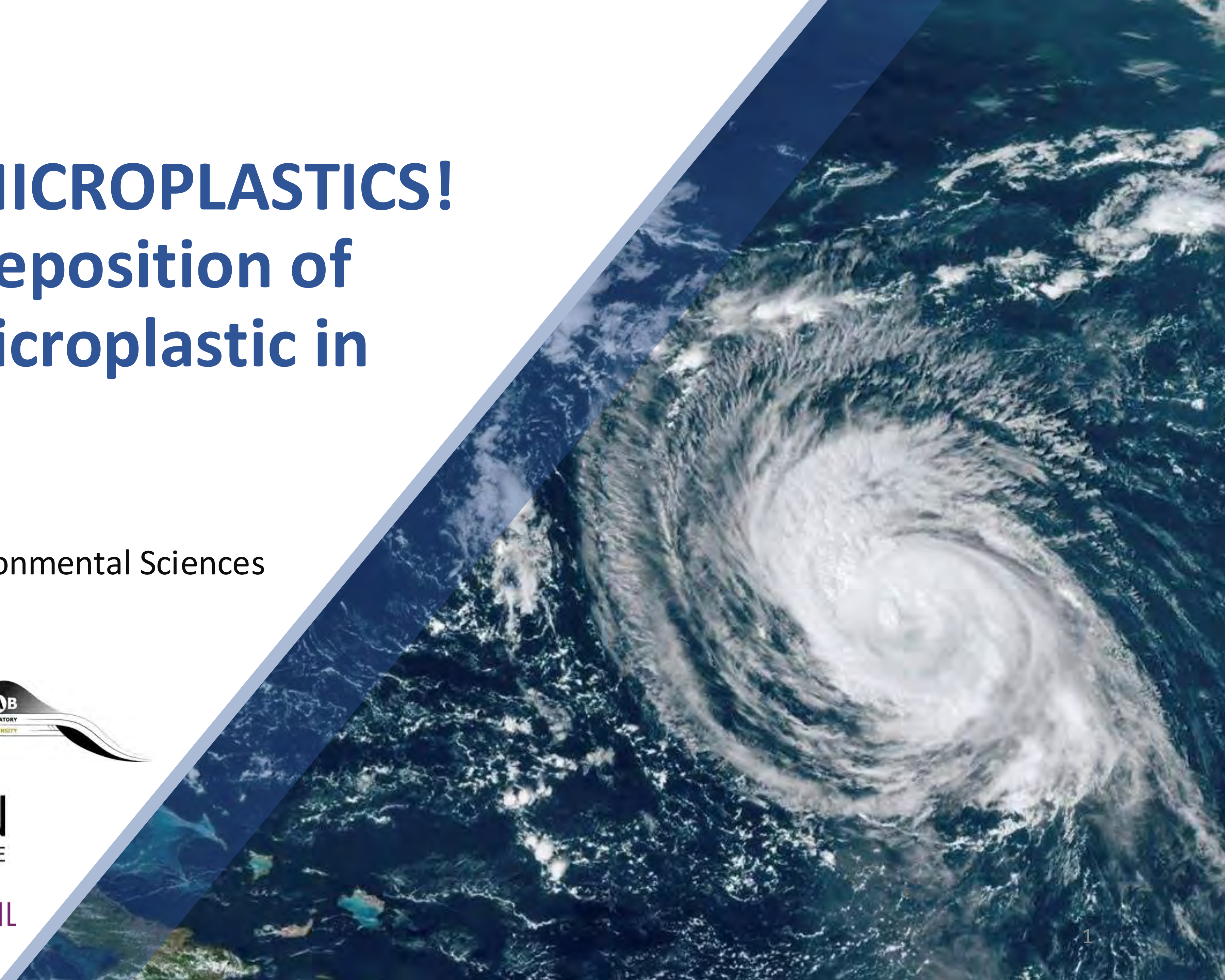
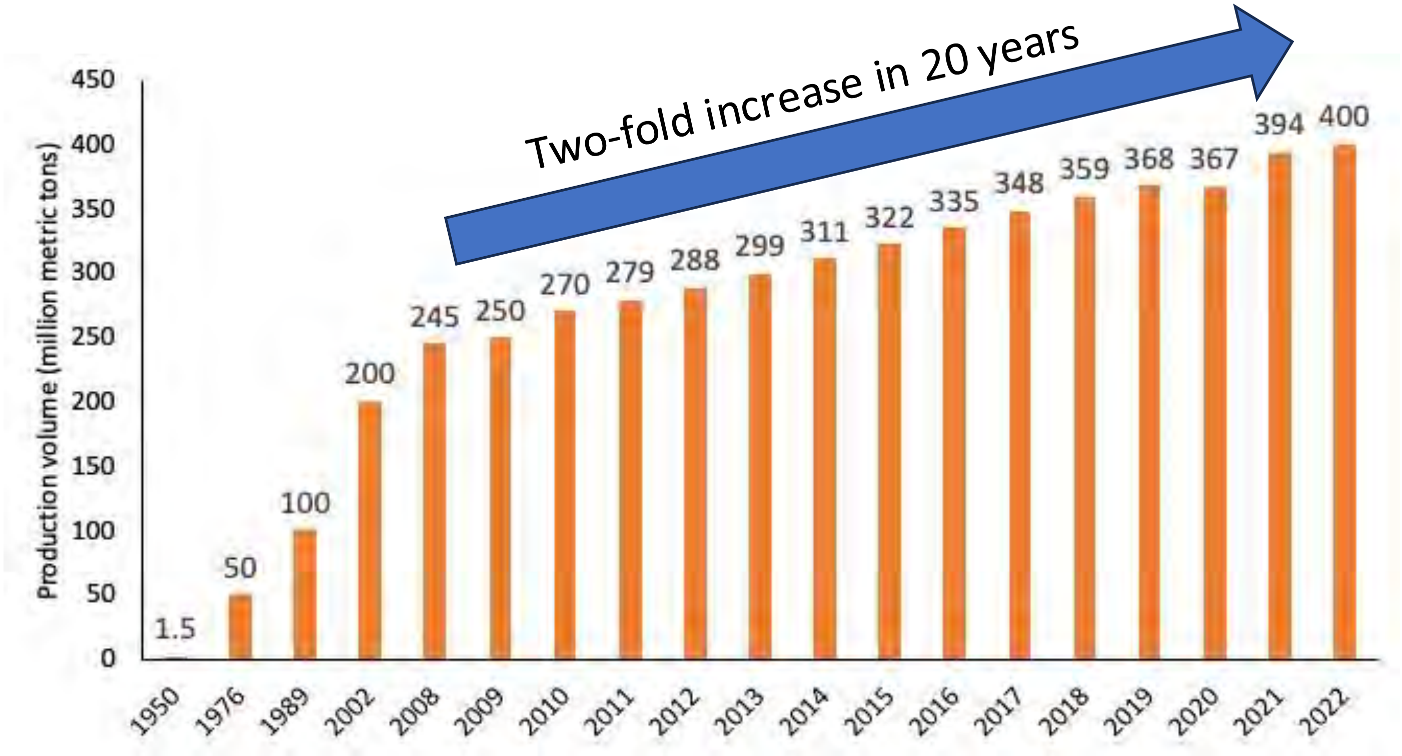


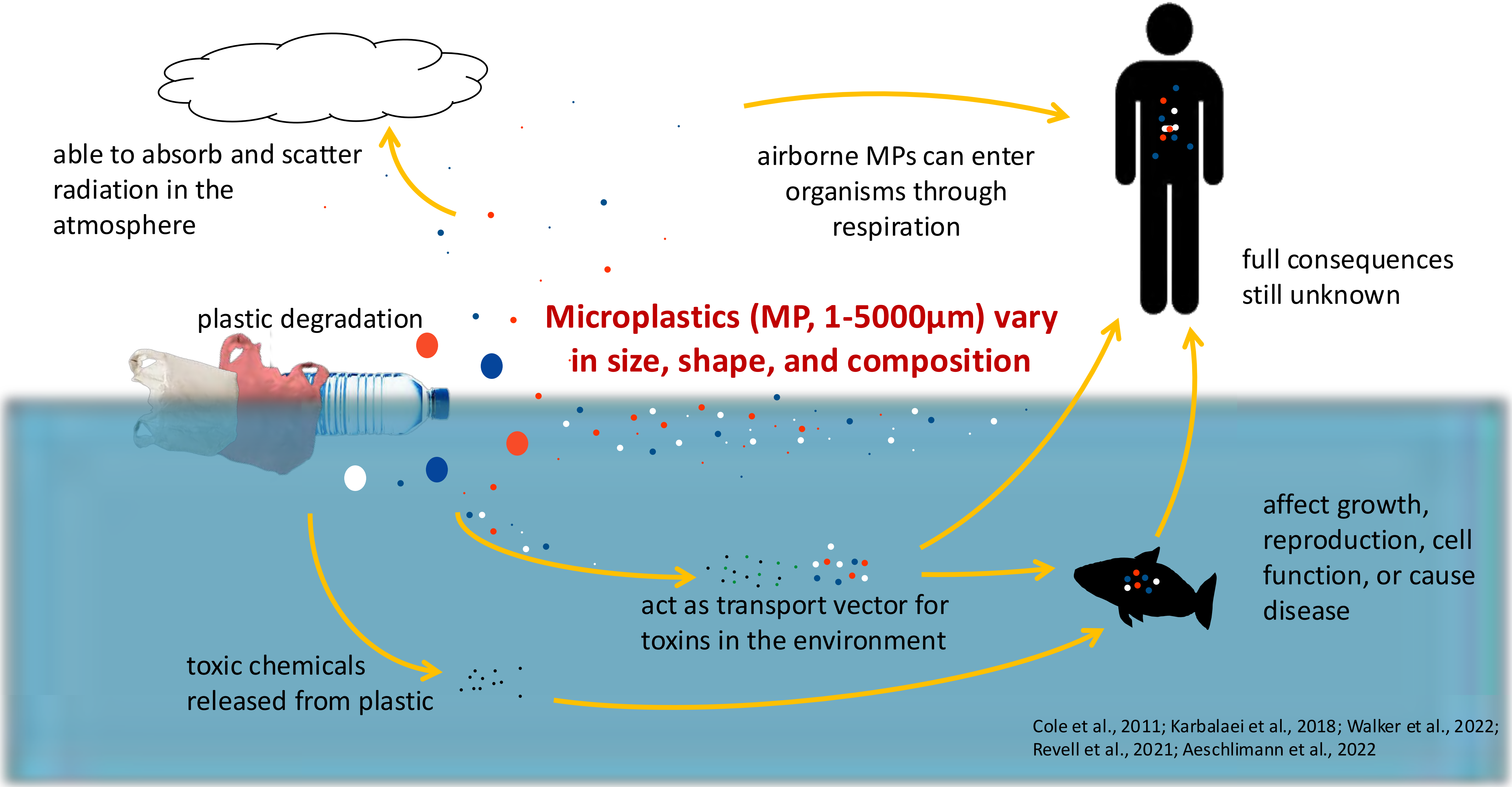
Plastic pollution is widespread around the globe

- Global plastic production has been increasing every year since the 1950s
- Most plastic escapes landfills, littered in oceans, rivers, and across landscapes all over the world
- Plastic debris are easily broken down into smaller pieces called **“MICROPLASTICS”**



Statista, 2024; Geyer et al., 2017

Microplastic pollution is a growing environmental and public health concern

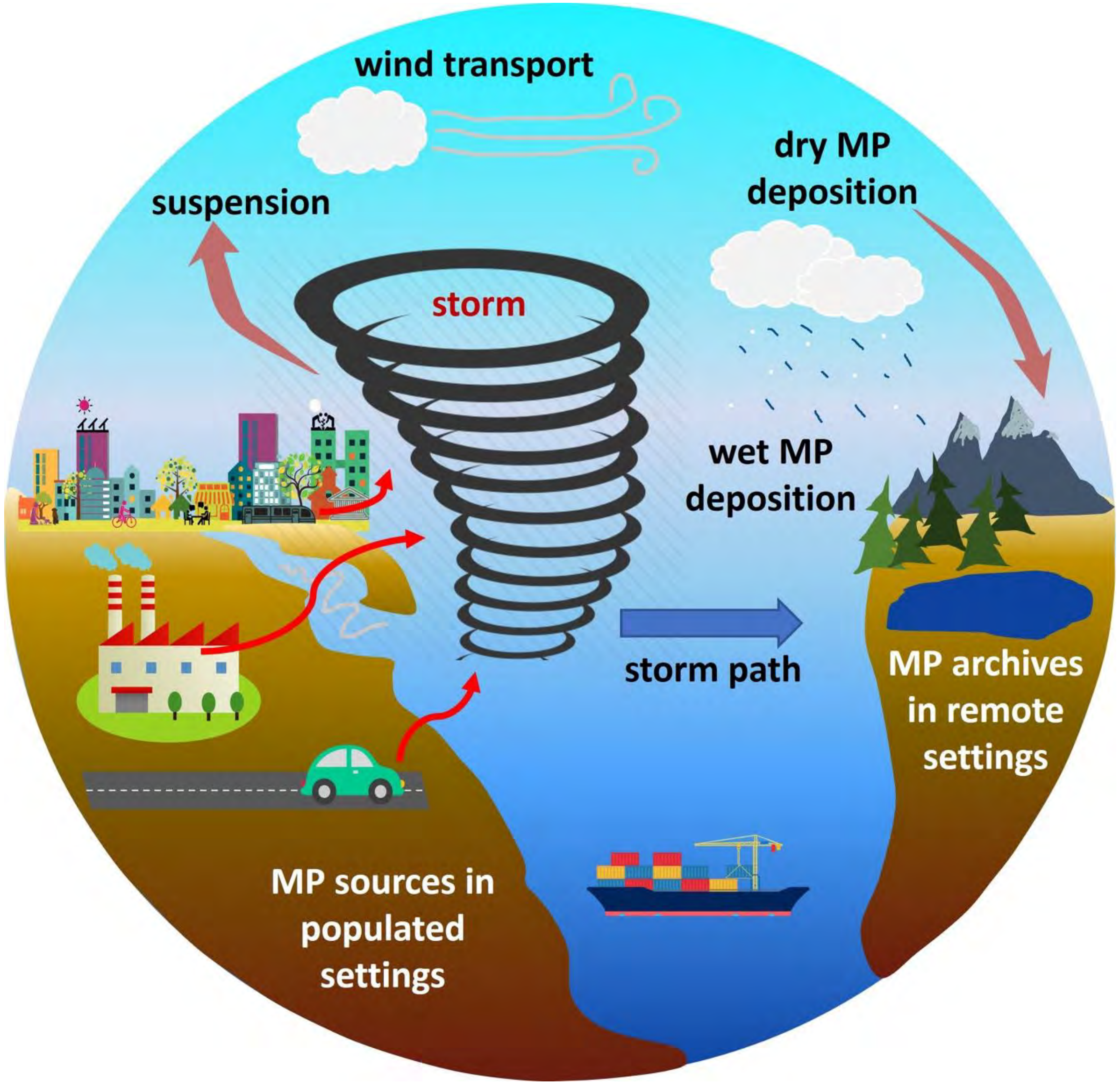


Cole et al., 2011; Karbalaei et al., 2018; Walker et al., 2022; Revell et al., 2021; Aeschlimann et al., 2022

The Problem

- Most MP research has focused on describing abundance, composition, and potential sources in continental and marine environments
- The atmosphere, so far almost neglected, has the potential to move large quantities of MPs over large distances across the globe

The atmosphere may play a key role in the transport/deposition of MPs, especially in remote regions with limited or no local sources of plastic pollution



Brahney et al., 2021

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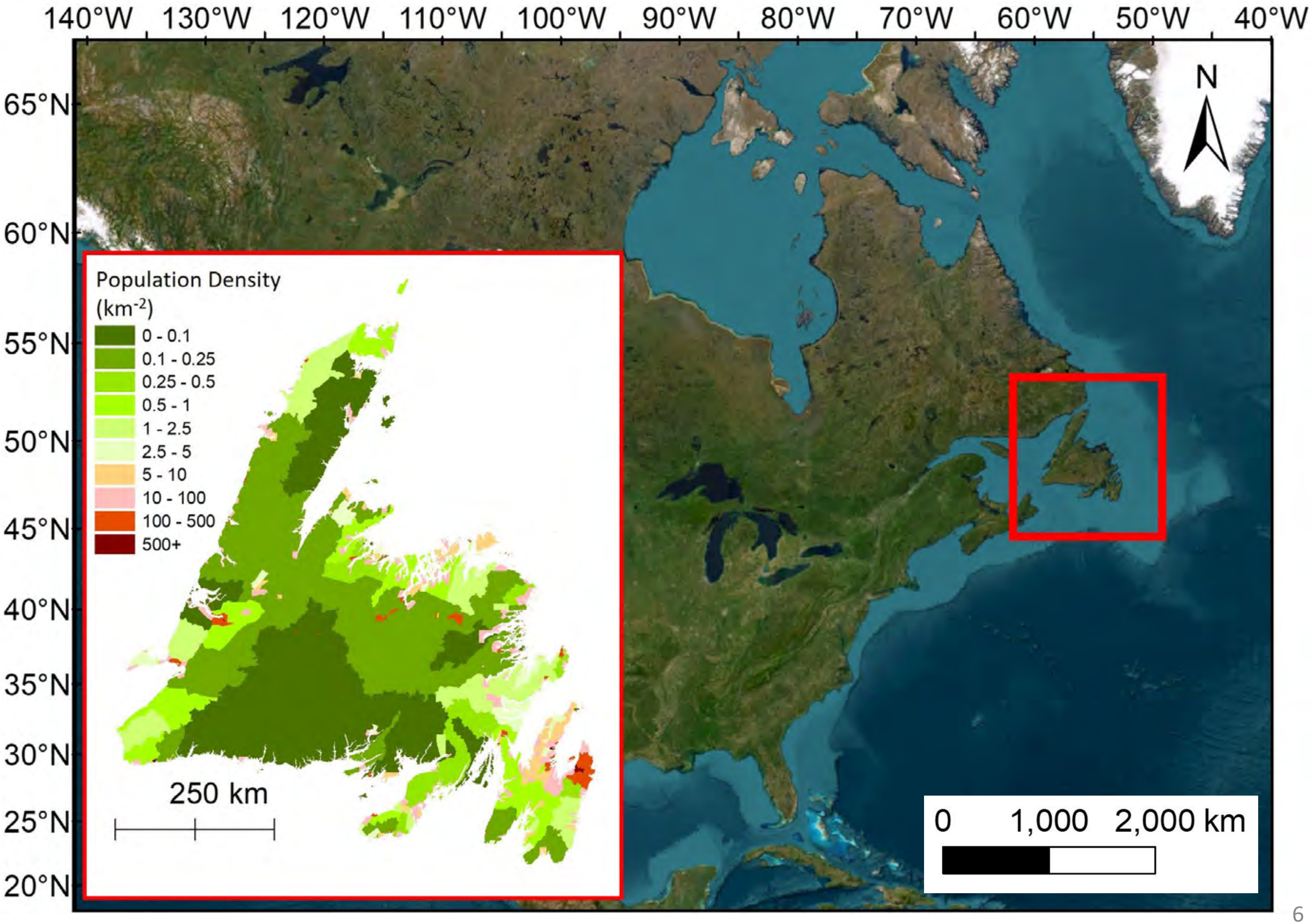
What is the impact of major atmospheric events on the transport and deposition of MP in Atlantic Canada?

What are their sources?

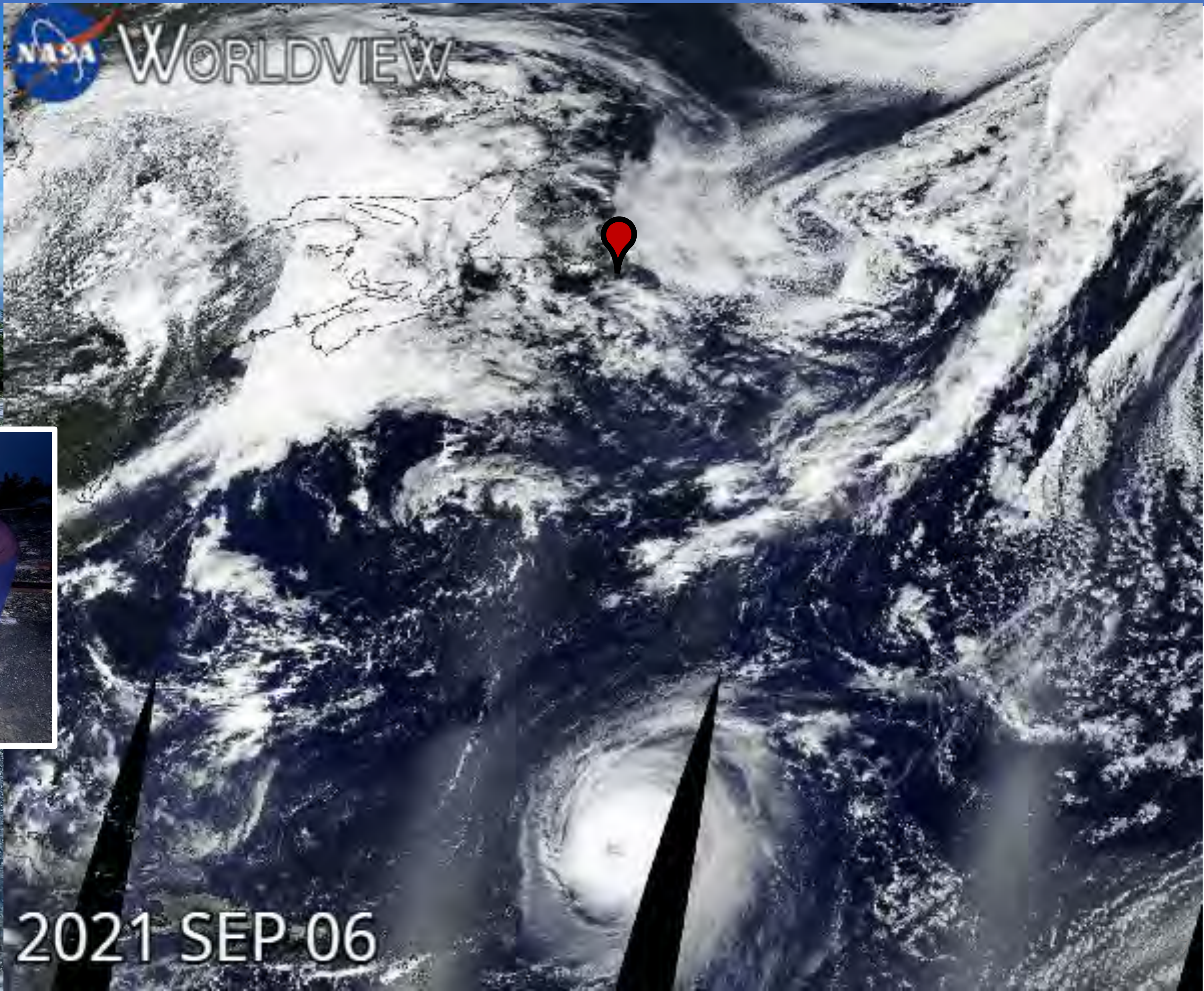
Brahney et al., 2021

Newfoundland is a unique study area for atmospheric MP research

- Susceptible to extreme weather events such as hurricanes, nor'easters, and extra-tropical cyclones
- Many small, remote lakes not connected to major river systems
- Major sources of MPs (i.e. cities) concentrated along Atlantic coastline



Government of Newfoundland and Labrador, 2024; Statistics Canada, 2021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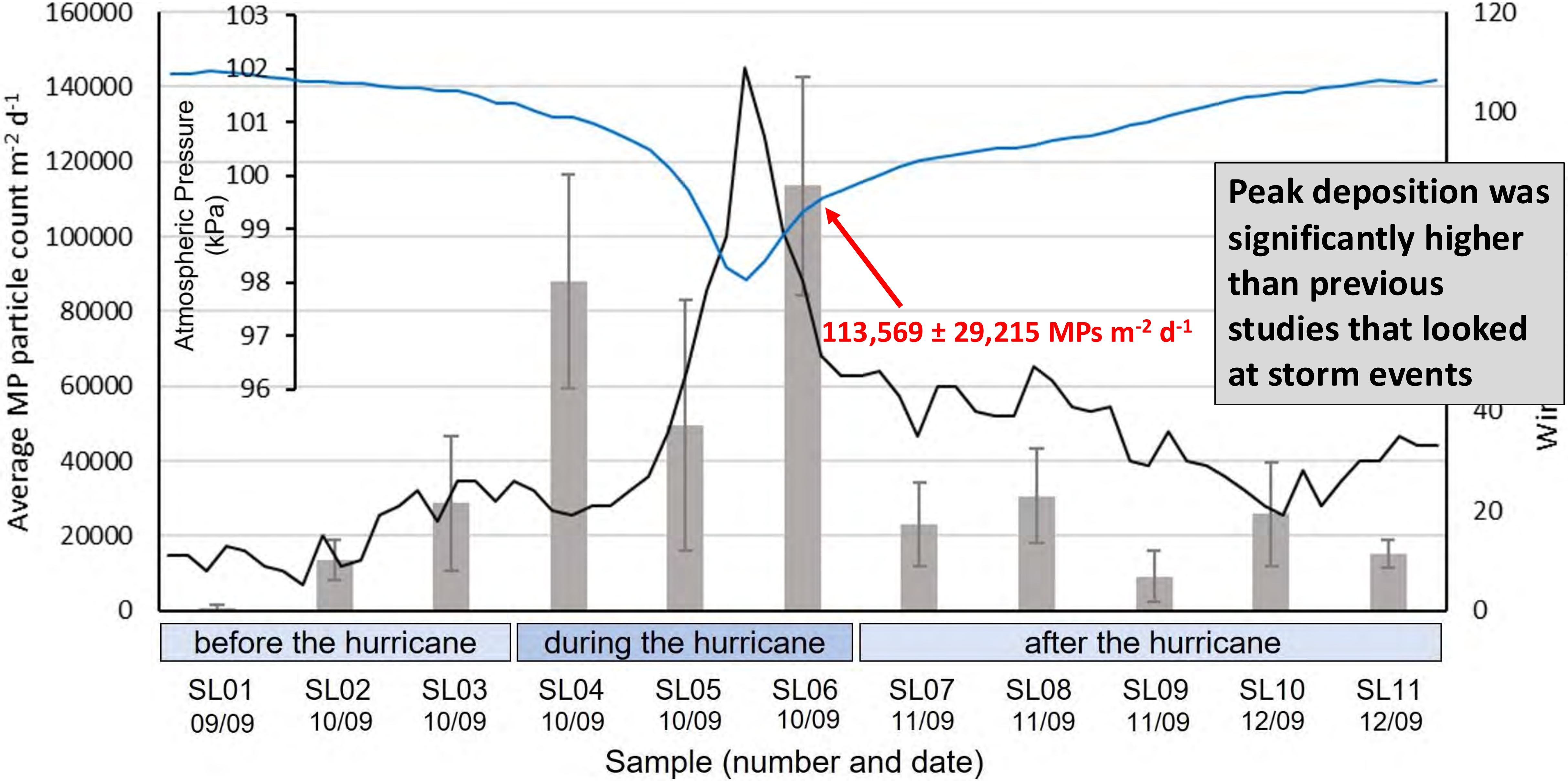
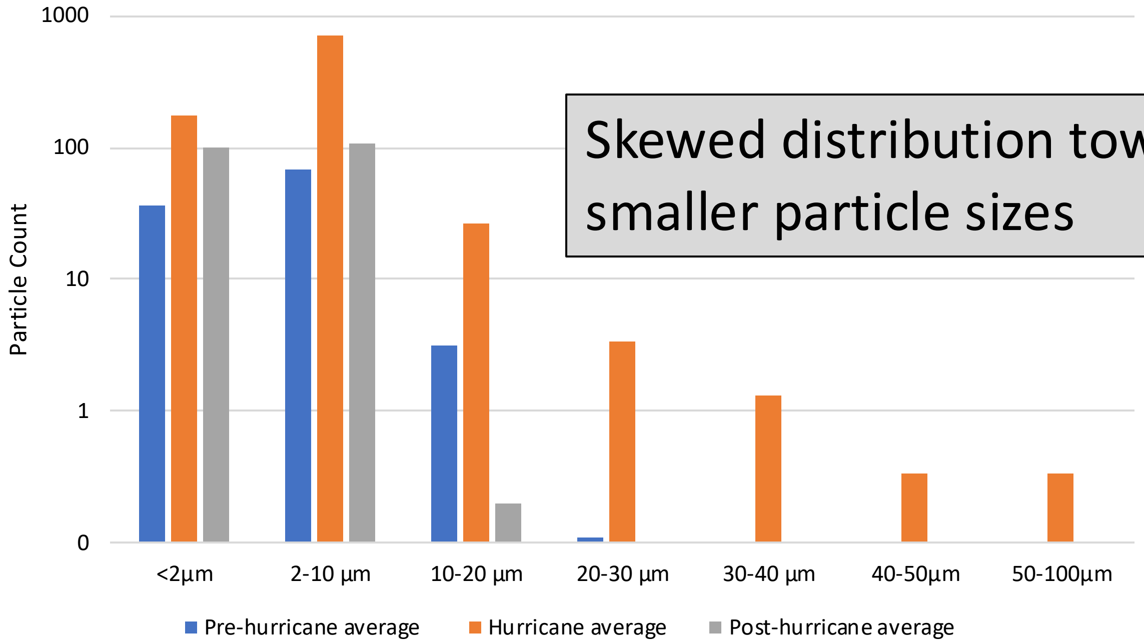


Peak deposition was significantly higher than previous studies that looked at storm events

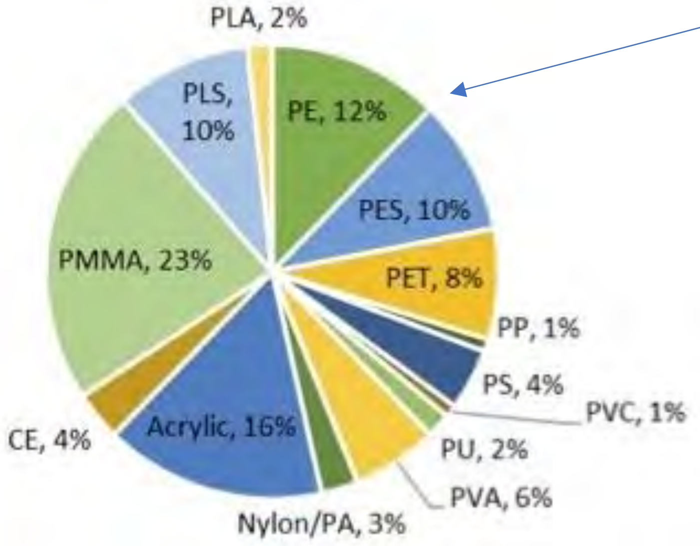
Li et al., 2022; Abbasi, 2021

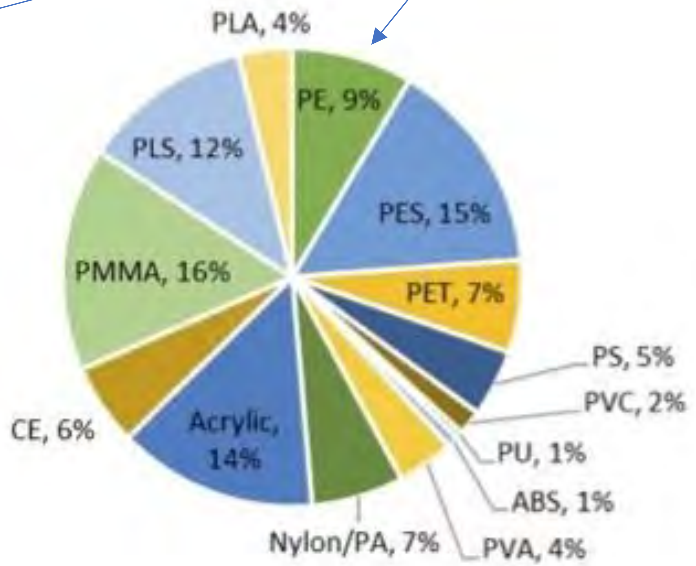
There were **no significant differences** in particle size or polymer type between samples collected before, during, and after Hurricane Larry

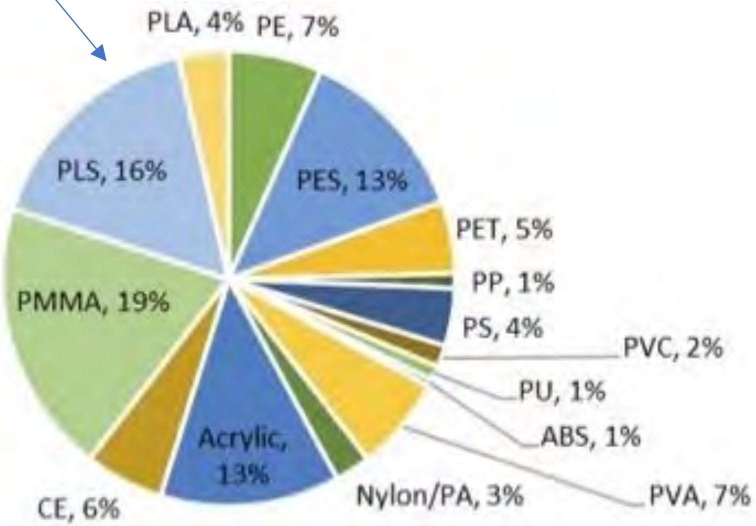


Skewed distribution toward smaller particle sizes

Most common polymers:
PMMA
Acrylic
PES
PLS





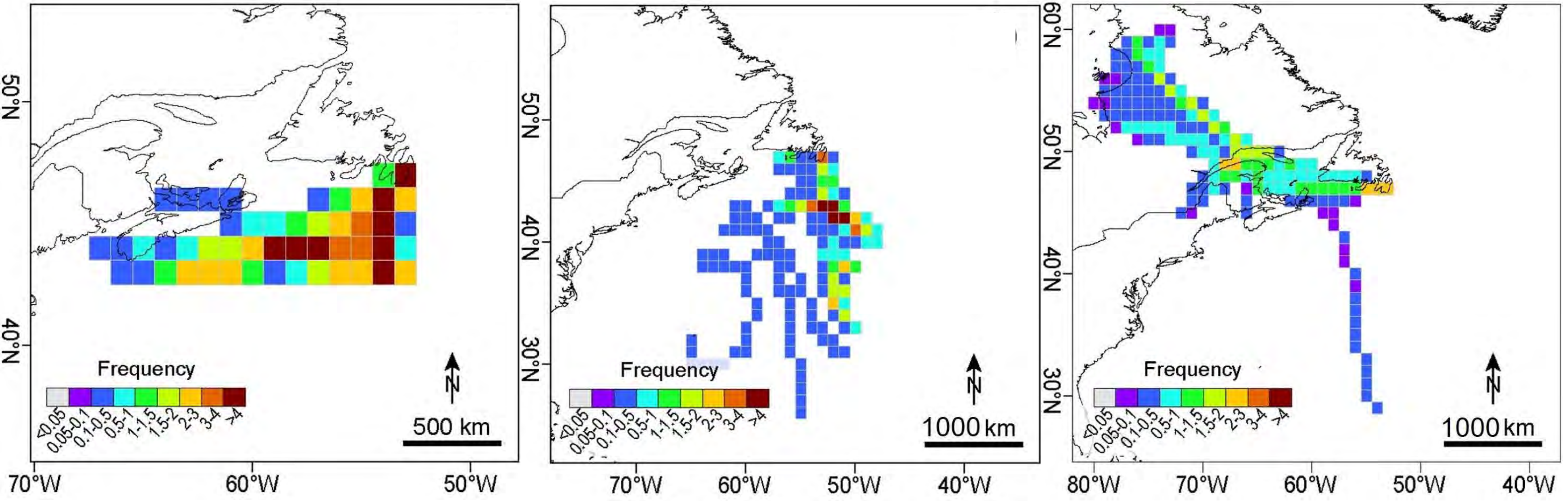


Back-trajectory models indicate possible entrainment points were concentrated over the marine environment

Before (samples 1 – 3)

During (samples 4 – 6)

After (samples 7 – 11)



Frequency distributions indicating locations of possible entrainment points of MPs for trajectories of samples collected before, during, and after Hurricane Larry (elevation **<1000m**)

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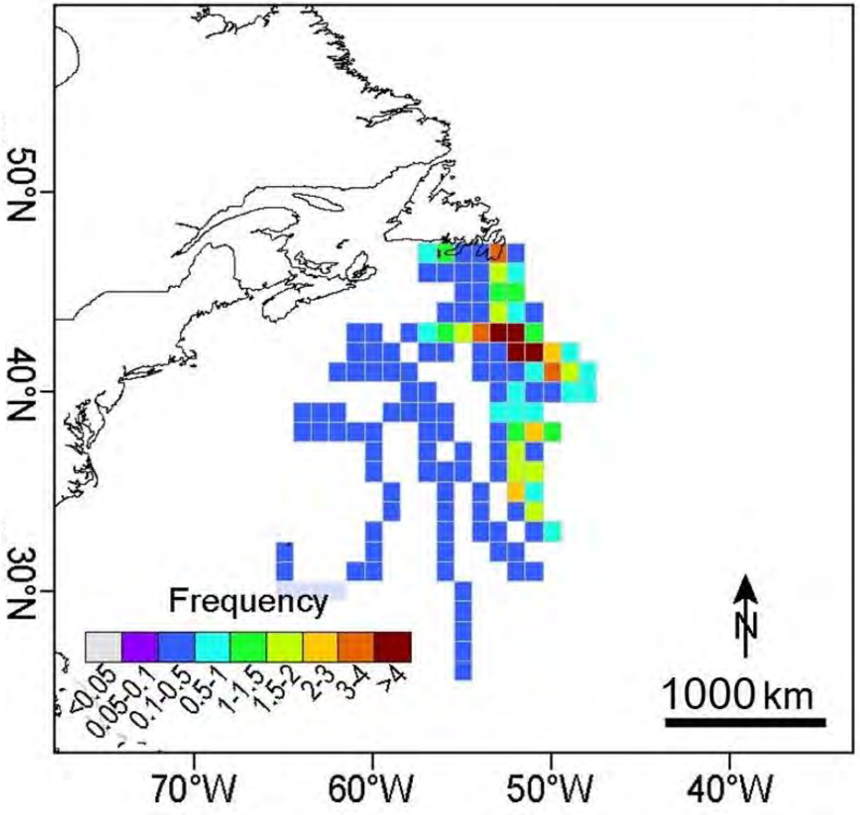
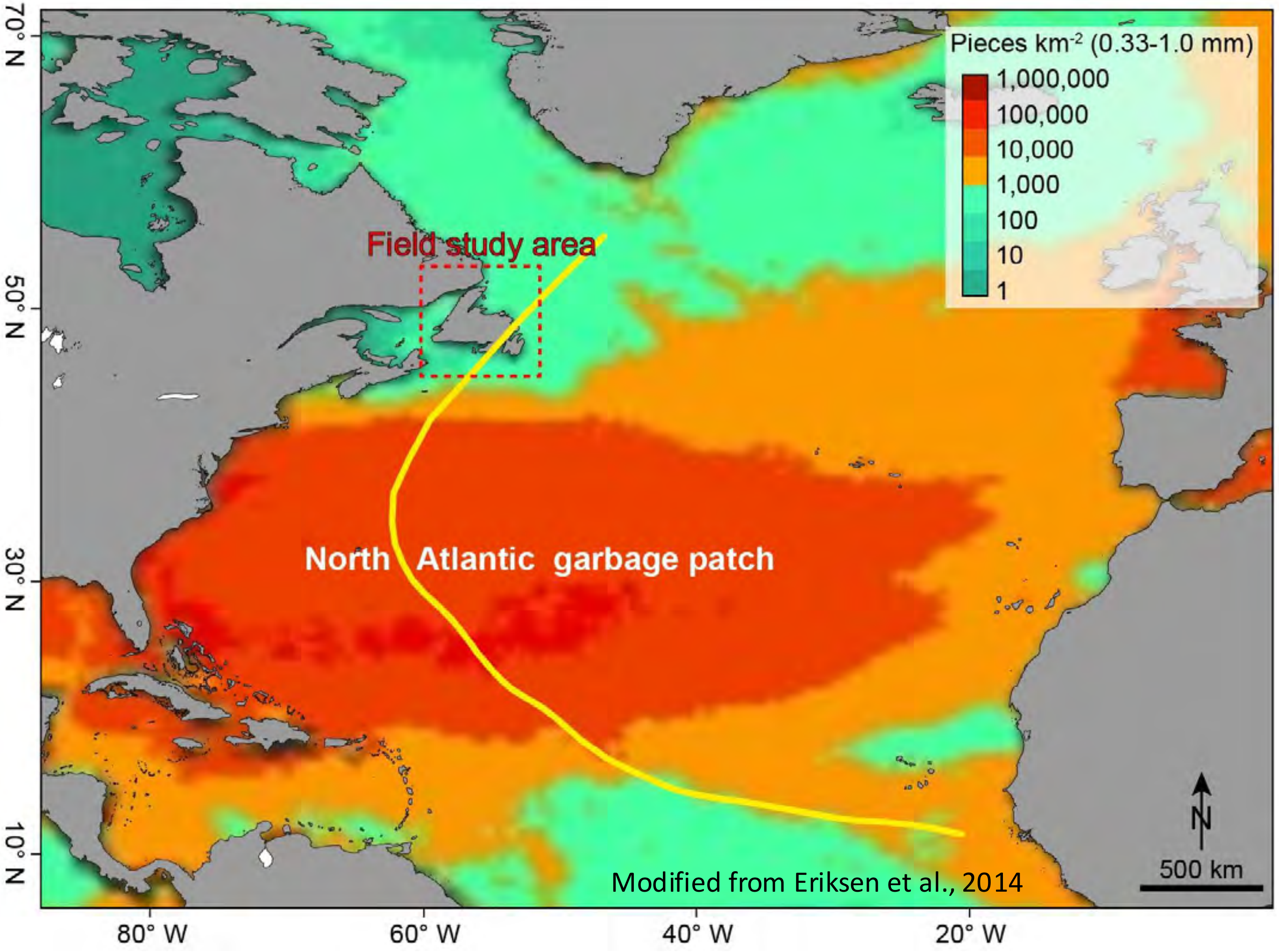
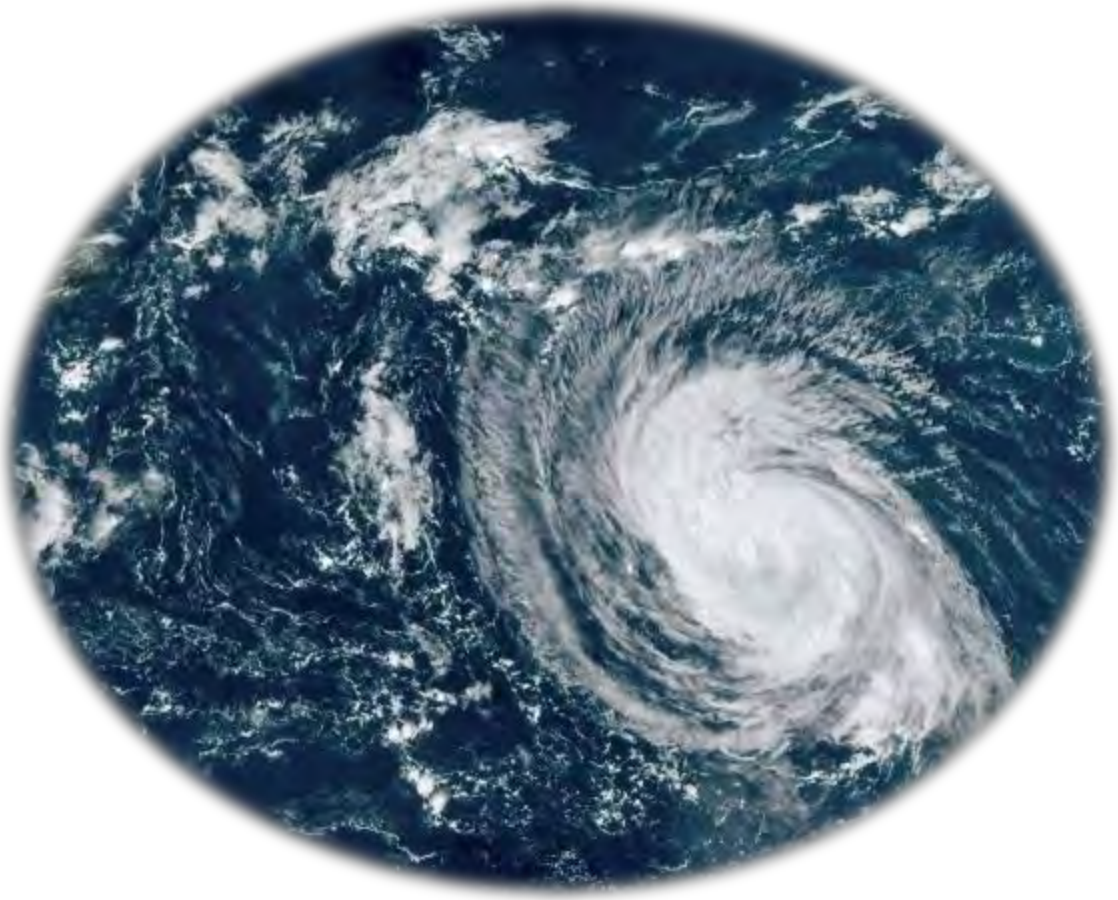
During (samples 4 – 6)





North Atlantic garbage patch may account for high amount of MP deposited during Hurricane Larry

Limitations and future work



Limitations

- ❖ Budget and personnel restrictions
- ❖ Limited warning and prep time before Hurricane Larry
- ❖ Pilot study

Future Work

- ❖ Continue monitoring hurricane events
  - ❖ Look at hurricanes formed at different latitudes with different trajectories and strengths
- ❖ Investigate MP pollution in groundwater
- ❖ Implement long-term monitoring in lakes

Why should we care?

- Storms can contribute to contamination in ecosystems otherwise considered pristine and isolated from plastic pollution
- Increased pollution increases negative health effects
- Quantifying the concentration of MPs in the atmosphere improves climate models determining the effects of atmospheric MPs

What can we do to stop microplastic pollution?

- ➢ Reduce plastic production – **stop it at the source**
- ➢ Research helps inform policy makers on where to focus mitigation and management efforts

- ➢ Invest in development of techn… …ve MPs from environment
- ➢ Use alternative sustainable materials, buy second-hand, and reuse existing plastic products to reduce plastic demand
- ➢ Spread awareness about the global MP pollution problem