Detection and Identification of Wastewater Tracers in the Coral Gables Waterway

Juanita Carballeira Martínez
juanita.carballeira@upr.edu
University of Puerto Rico
Mentors: Kassidy Troxell, Brian Ng
PI: Dr. Piero Gardinalli

BACKGROUND

- Natural and anthropogenic compounds such as endocrine disruptors (EDCs) and Sucralose can serve as wastewater tracers for the detection and evaluation of pollution sources in our surface waters.
- Identifying these sources will lead towards a better understanding of the wastewater treatment plant and septic tank impacts on Southeastern Florida's freshwater resources.

METHODS

- Wastewater tracers were quantified throughout 15 sampling sites from the Coral Gables waterway.
- A target analysis was made using an Online Solid Phase Extraction-Ultra High Performance Liquid Chromatography- High Resolution Mass Spectrometry Q- Exactive Orbitrap (Online SPE-UHPLC-HRMS).
- Concentrations were quantified using a 9-point calibration curve (0.5-1000ppt) (ppt=ng/L)

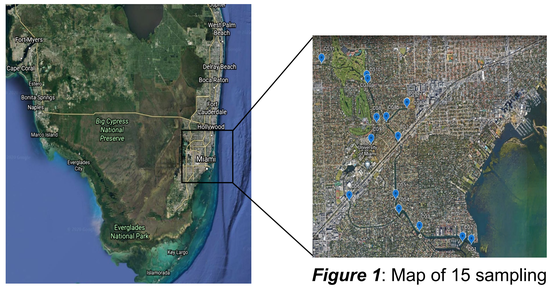

Figure 1: Map of 15 sampling sites.

Organic Contaminants	Uses
Carbamazepine	Treatment for epilepsy and bipolar disorder
Sucralose	Artificial Sweetener

Table 1: Target compounds and uses.

Figure 2: Online SPE-UHPLC-HRMS

Detecting wastewater tracers can help us identify areas affected by wastewater and to what extent in Southeastern Florida's urban water systems.

RESULTS

- Higher concentrations of both Sucralose and Carbamazepine were detected further inland (highest latitude/longitude). As latitude decreased (towards coast), so did the concentrations of both compounds.

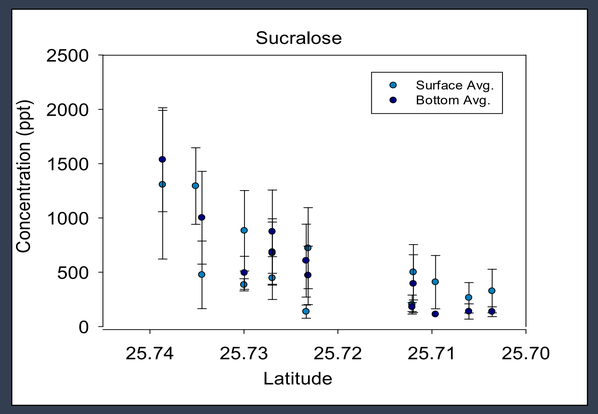

Figure 3: Sucralose concentrations based on different latitudes.

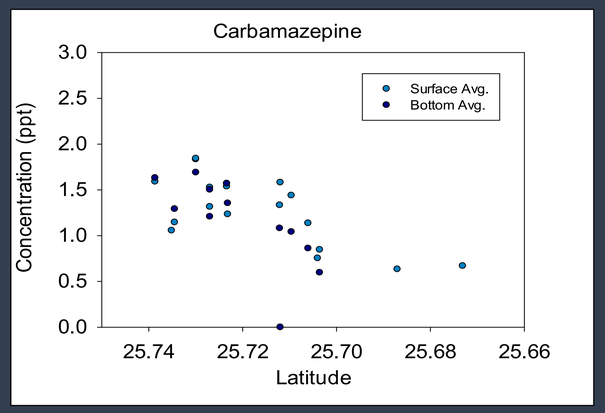

Figure 4: Carbamazepine concentrations based on different latitudes.

FIU Coastal Ecosystems REU Site

SUPPORTING RESULTS

- Total Phosphorus and Barium concentrations support our findings by showing the same downwards trend, meaning that they can potentially be attributed to human influence.

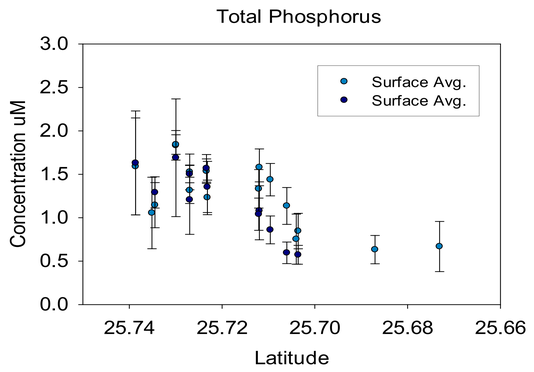

Figure 5: Total Phosphorus concentrations based on different latitudes.

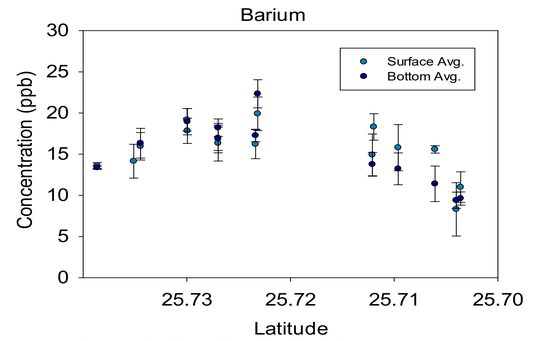

Figure 6: Total Barium concentrations based on different latitudes.

DISCUSSION

- Results show that anthropogenic pollution is affecting our urban water systems.
- Wastewater treatment plants as well as septic tanks are not doing an effective job in removing these compounds.
- This research can be applied to assess to what extent is Southeastern Florida's surface water is being influenced.

ACKNOWLEDGEMENTS

I would sincerely like to thank Dr. Gardinali, Kassidy Troxell, Brian Ng, Rita Teutonico, Todd Crowl, Ingrid Ley, and Dr. Troxler; as well as the University of Puerto Rico, Florida International University: REU Site Program, University of Miami, and National Oceanographic and Atmospheric Association.

This material is based upon work supported by the National Science Foundation under Grant No. HRD-1852123. This NSF Grant was awarded to Florida International University as part of the Research Experiences for Undergraduates (REU) Site Program. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.