



TRB  **2020**
ANNUAL MEETING

99TH Annual Meeting
Washington, D.C.
January 12–16, 2020

**DIVISION OF
MULTIMODAL SERVICES**

**OFFICE OF MARITIME
RESOURCES**

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Introduction

- Work in the Office of Maritime Resources
- Our main focus was to find classes directly related to transportation through waterways
- Attended seminars covering the following topics:
 - Current Research in Marine Environmental Issues
 - Inland Water Transportation
 - Concrete pH Profiles in Marine & Freshwater Environments
 - Utilizing Agent-based Modelling to Evaluate Operational Impacts of an Incident & Possible Alternatives on U.S. Waterways

The logo for the TRBAM 2020 Annual Meeting. It features the letters "TRBAM" in a large, bold, blue font. A small "2020" is positioned above the right side of the "M". Below "TRBAM" is the text "ANNUALMEETING" in a smaller, blue, all-caps font.

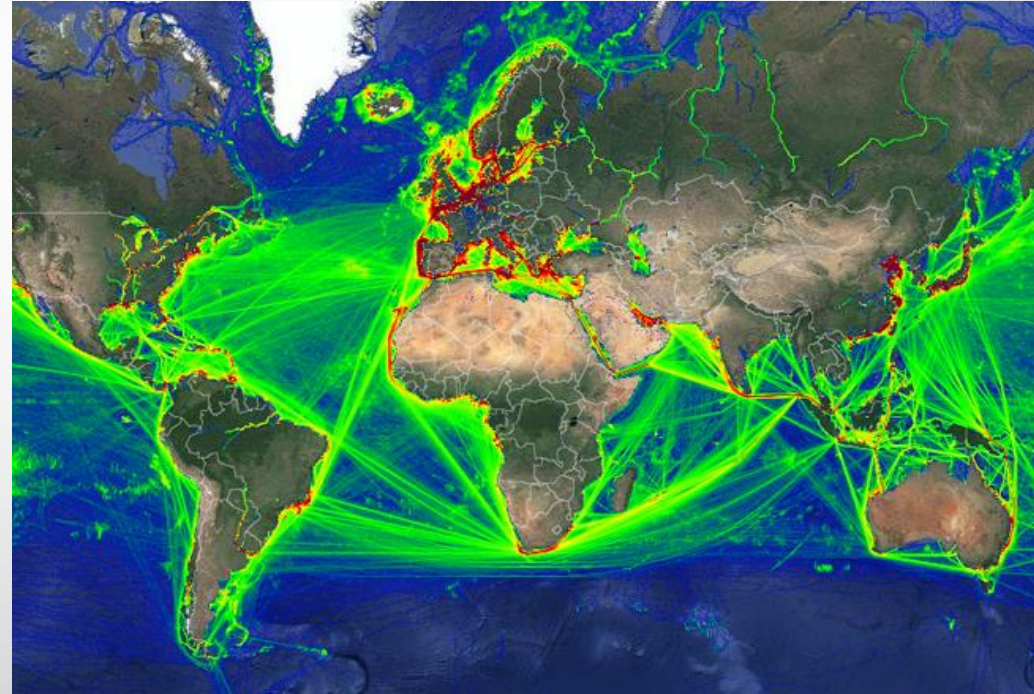
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**Transportation
Research Board**

January 12–16, 2020 > Washington, D.C.

Uses of AIS Data

- AIS = Automated Identification System
- Consists of two data sets :
 - Vessel attributes: name, type, dimension etc.
 - Spatial-temporal information: the vessels coordinates at any given time
- Tracking travel time from origin to destination
 - Allows us to quantify traffic congestion and identify delays / problem areas
- Can be plugged into Agent based models in order to predict effects that different parameters may have on vessel traffic congestion
- Enables us to evaluate vessel safety / efficiency and identify potential risks



Aids to Navigation (ATON) Strikes

Jonathon Hsieh of U.S. Coast Guard created a ATON Strike risk index based off a trend of ATON strikes

- All strikes on federal channel markers were recorded
 - 1,528 strikes on gulf coast
 - 306 strikes on east coast
 - 36 strikes on west coast
- Most strikes are related to freight vessels, but other instances include construction, and personal vehicles.
- Potential variables
 - Waterway Dimension (Width, Depth)
 - Environmental Factors
 - Cargo/Vessel Type
 - Interaction between vessels
 - Types of Aids to Navigation being used
 - Repeated Strikes (Aids hit multiple times)
 - Casualty Data
- Highlights specific problem areas where ATON markers could be improved or revised to avoid future strikes



SEAHIVE Seawall

- PhD students at the University of Miami have been working on a project to design an ecofriendly modular shoreline protection system
- Testing facility can simulate Category 5 hurricane conditions in a 75' x 19' x 6.5' tank
- This structure was designed to allow wave energy to dissipate within the elements of the structure
- The design consists of interlocking hexagonal structures creating a system more effective at dissipating high energy tidal flow than a typical solid seawall.
- With an increasing amount of storms on the east coast, this could potentially be a more resilient system as well as create a ecofriendly environment for marine life.



Example of a seawall similar to SEAHIVE concept. The students results found a hexagonal shape for the SEAHIVE Seawall was most effective at dissipating wave energy

Concrete pH Profiles in Marine and Freshwater Environments

- Experimental study considering how concrete in artificial reefs, piers etc. can impact the marine environment
- The experiment consisted of two tanks, one salt water one fresh water left uncovered with fresh concrete suspended within
- pH cloud forms in close proximity to concrete in both water tanks, however, the freshwater pH was raised much more drastically than the salt water tank.
- pH in freshwater needs to be carefully monitored because there are no minerals present to buffer the concrete carbonation.
- Important because freshwater fish like Salmon are very sensitive to varying pH.
- Conclusion: Artificial wetlands and oyster reefs out of concrete should be monitored to ensure proper pH for marine habitat.

Concentration of Hydrogen ions compared to distilled water		Examples
10,000,000	pH 0	Battery acid
1,000,000	pH 1	Hydrochloric acid
100,000	pH 2	Lemon juice, vinegar
10,000	pH 3	Grapefruit, soft drink
1,000	pH 4	Tomato juice, acid rain
100	pH 5	Black coffee
10	pH 6	Urine, saliva
1	pH 7	"Pure" water
1/10	pH 8	Sea water
1/100	pH 9	Baking soda,
1/1,000	pH 10	Great Salt Lake
1/10,000	pH 11	Ammonia solution
1/100,000	pH 12	Soapy water
1/1,000,000	pH 13	Bleach
1/10,000,000	pH 14	Liquid drain cleaner

References

- Jonathan Hsieh; U.S Coast Guard : “An Evaluation of Variables, Data Sets and Risk Indexing Methodologies for Properly Evaluating Risk on Waterways in the United States utilizing Aids to Navigation data”
- Katherine Chambers, Marin Kress; U.S. Army Engineer Research and Development Center – Coastal & Hydraulics Laboratory: “ Automatic Identification System (AIS) Data: Enhancing Navigation Mission Readiness for the USACE”
- Mohammad Ghiasian; University of Miami: “Seahive – An Ecofriendly Modular Shoreline Protection System Experimentally Designed for High Energy Tidal Flow”
- Liv Haselbach; Lamar University “Concrete pH Profiles in Marine & Freshwater Environments” TRB Research Convention. 1/13/2020
- “Utilizing Agent-based Modelling to Evaluate Operational Impacts of an Incident & Possible Alternatives on U.S. Waterways” TRB Research Convention. 1/13/2020