



Estimating turbidity and suspended sediment concentrations using an unmanned surface vehicle

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WEDA DREDGING SUMMIT & EXPO

June 4-7, 2019



US Army Corps of Engineers



Why use an unmanned surface vehicle (USV)?

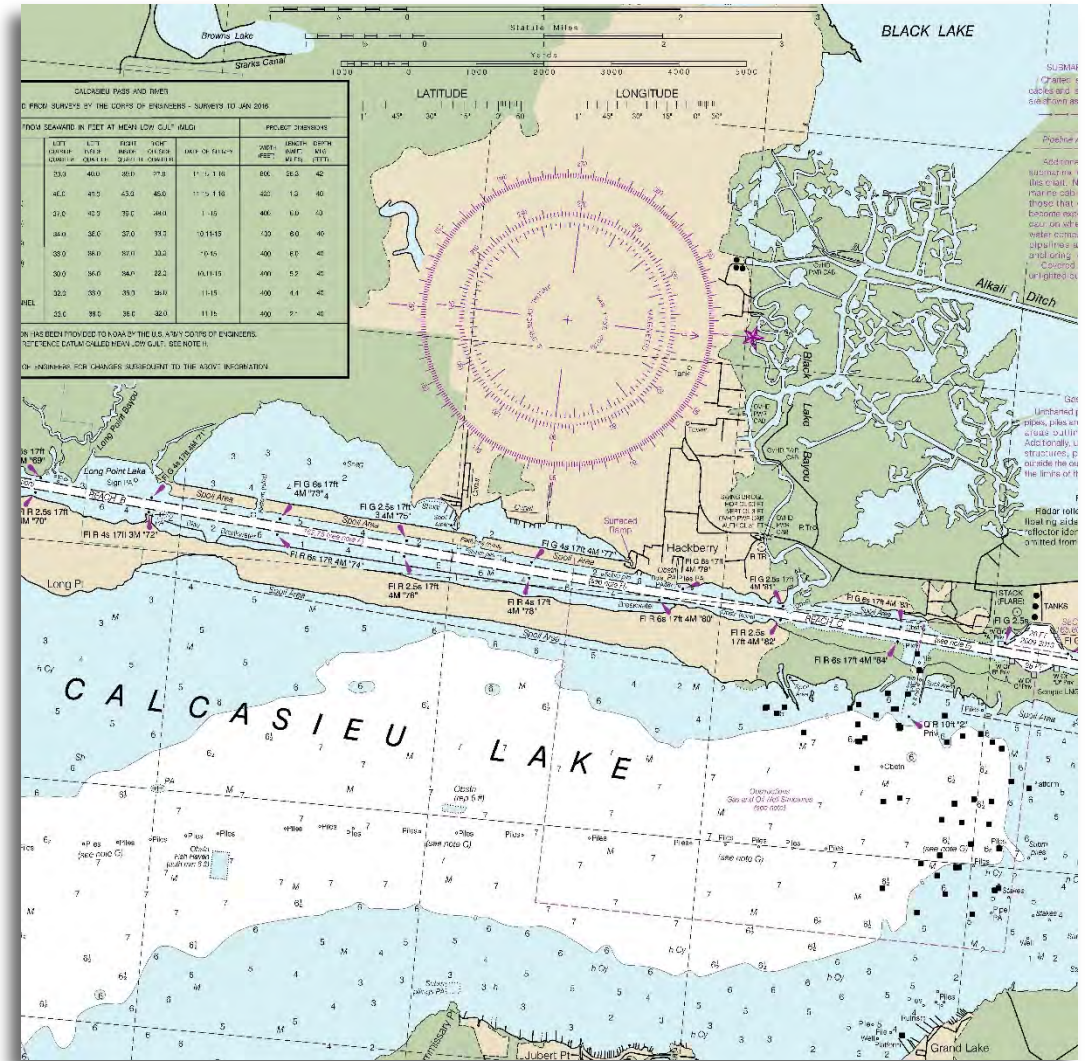
Potential for USVs to perform routine monitoring
and survey missions autonomously

Potential to reduce equipment procurement and operating
costs while maintaining capability levels and
in some cases increasing them

The purchase and deployment of
USVs within the USACE is growing.

Introduction

Inland and intracoastal waterways, and coastal channels occur in relatively shallow waters.



Introduction

Monitoring



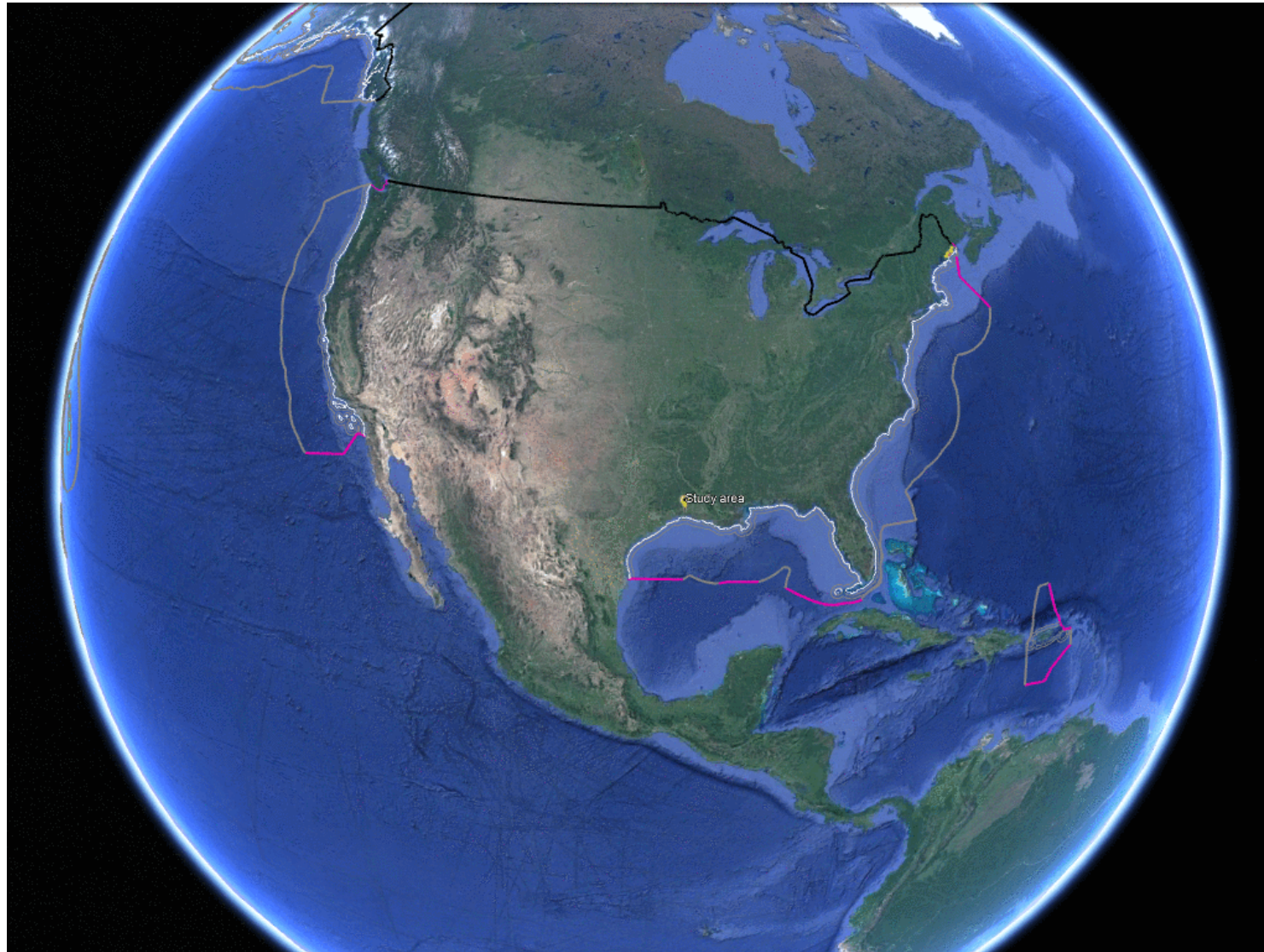
Study Goal

What are the characteristics of using a USV to measure water quality in shallow water?

- 1) Measure influence of vessel wake on re-suspension of sediments
- 2) Measure relationship between vessel type and sediment disturbances
- 3) Application for dredge plume monitoring



Study Area



meet MARV

Twin hull boat, 256 kg capacity



Photo credit: Freedom Electronic Marine

Propulsion and 360° turn

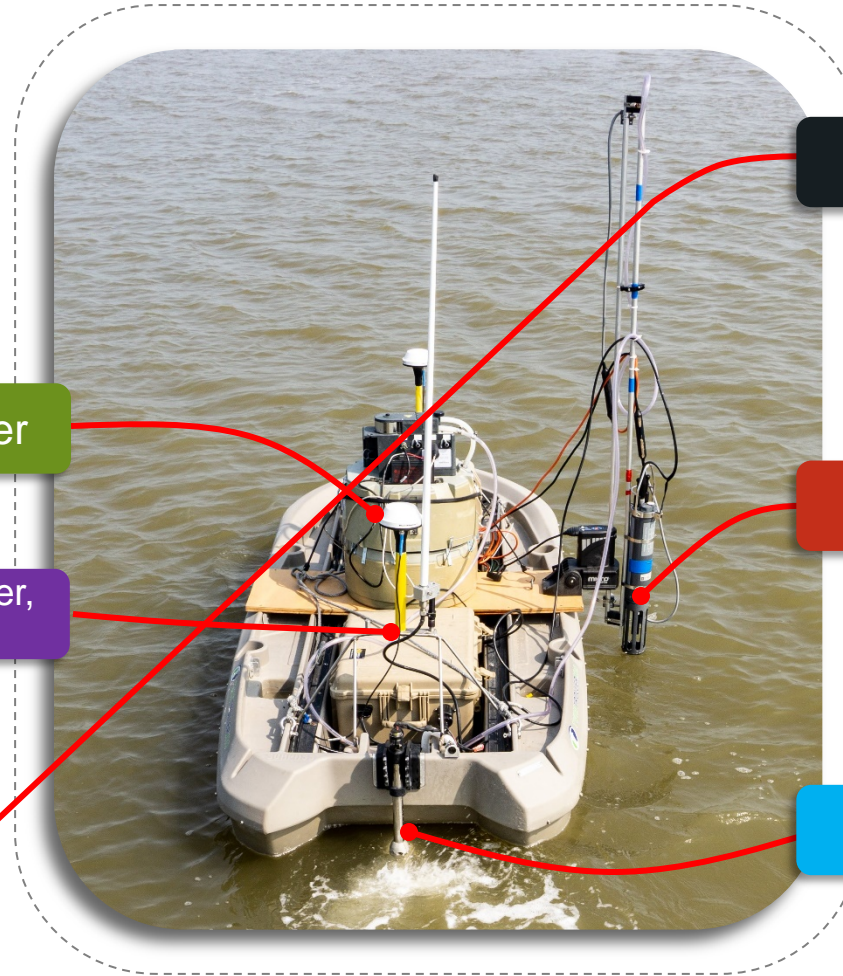


MARV



water sampler

ADCP, computer,
power bank



anchor pole

water quality
sensor

trolling motor

Monitoring



Monitoring



Results

oil/chemical tanker



bulk carrier cargo



pusher tug tanker

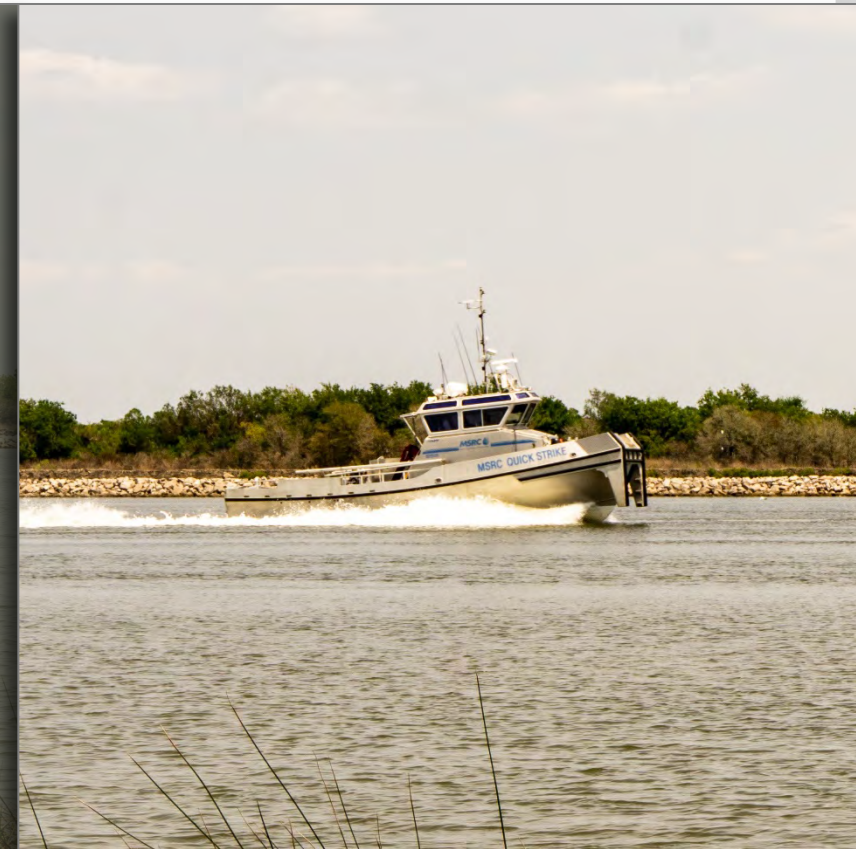


Results

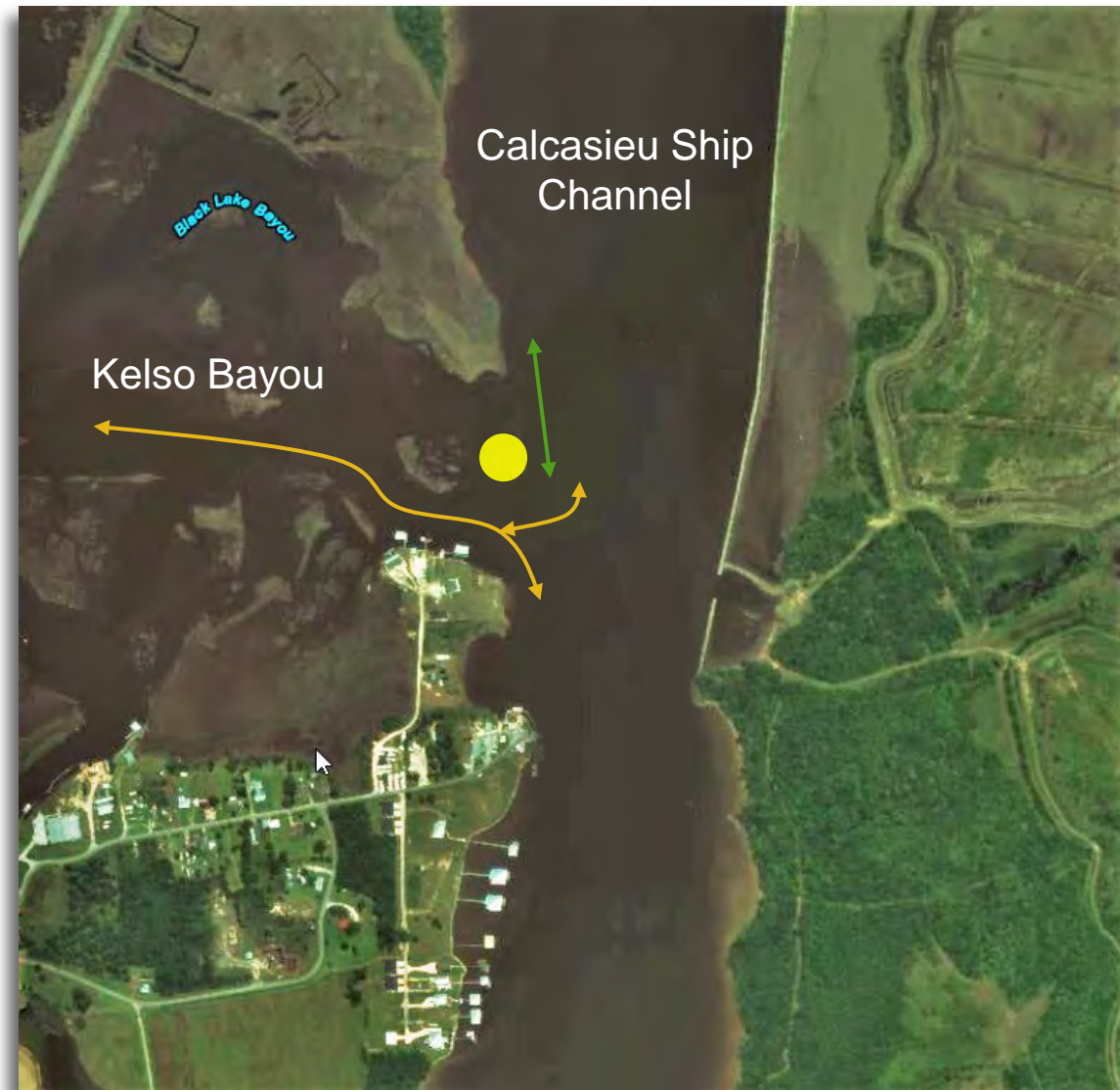
fishing (n=5)

recreational (n=11)

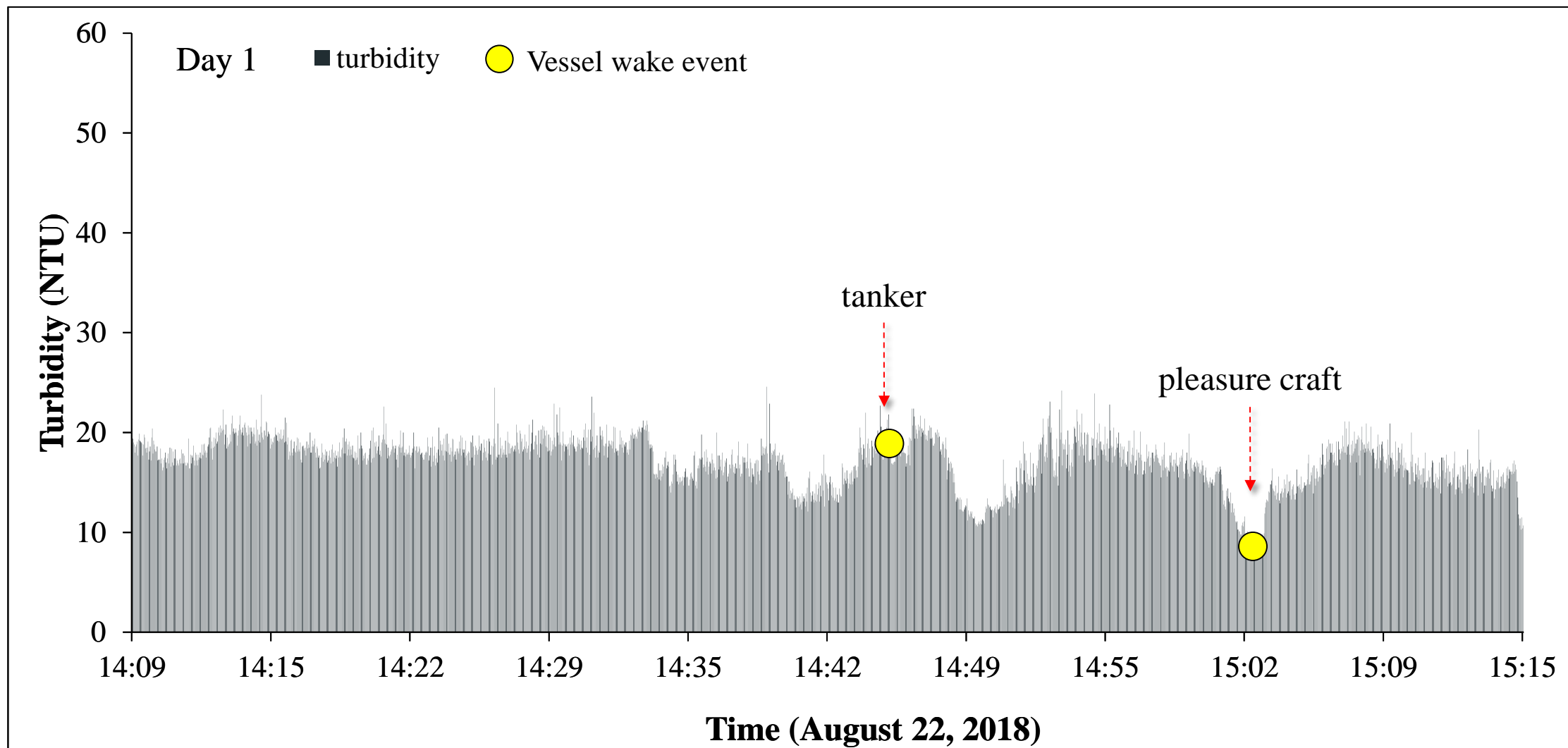
fast response vessel (n= 2)



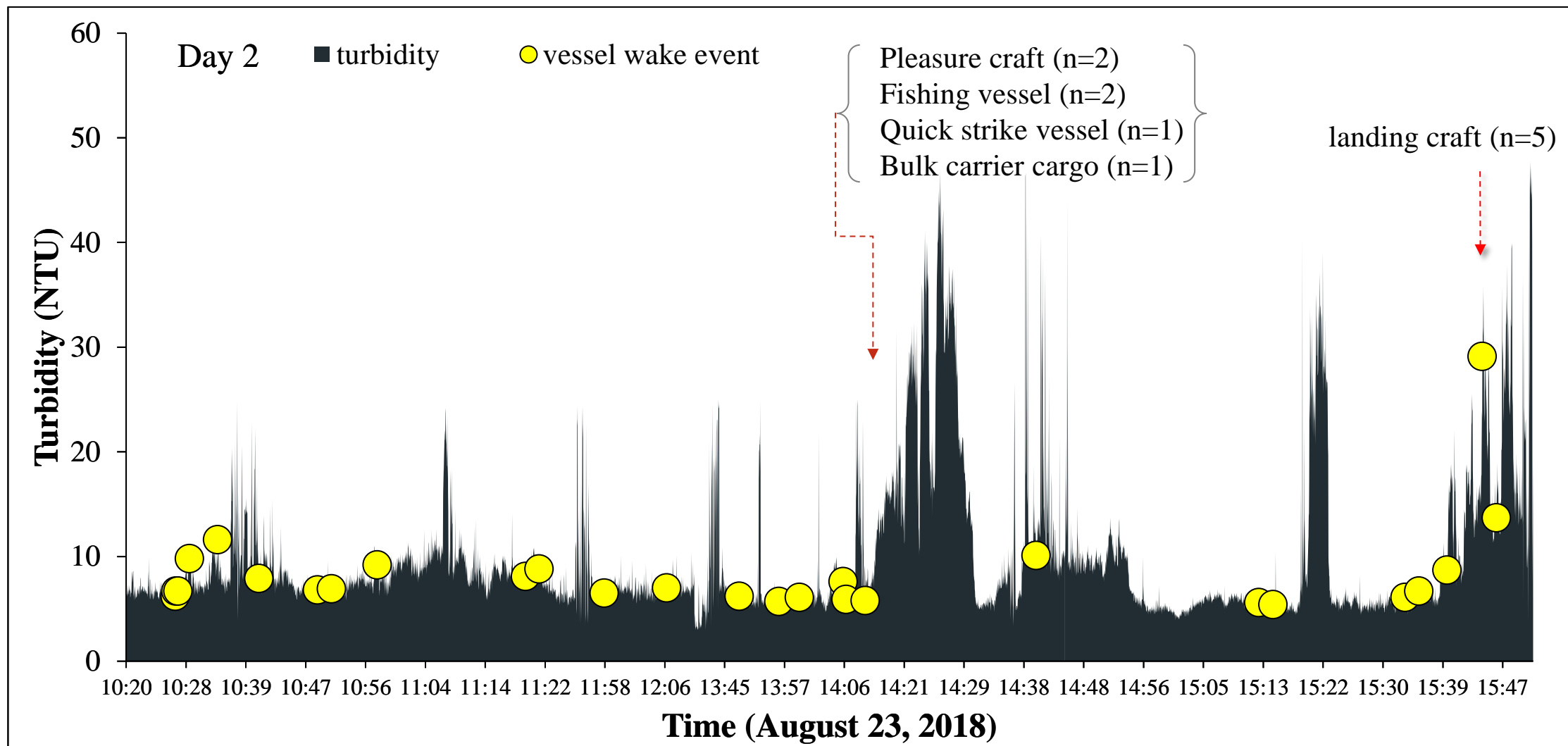
Results



Results



Results



Conclusions

Main Takeaway

USVs provide a flexible approach to monitoring suspended sediments in shallow water areas.

USVs near dredging operations

Cannot compete with the spatial coverage of manned vessels...

BUT can provide previously inaccessible high spatial and temporal resolution in small shallow water areas.

Path Forward

Use USVs and other unmanned technologies to facilitate communication with regulatory agencies to inform dredge operation and management decisions.

Acknowledgements

Thanks to

ERDC Coastal and Hydraulics Laboratory, USACE New Orleans District, and the Lake Charles Pilot Organization.

This research was funded by

The Dredging Operations and Environmental Research Program, Todd Bridges, Director.
<https://doer.el.erdcdren.mil/>

WEDA Proceedings Paper

Wilkins, J.L., McQueen, A.D., and Suedel, B.C. “Estimating turbidity and suspended sediment concentrations using an unmanned surface vehicle.” *Proceedings of the Western Dredging Association Dredging Summit & Expo '19, Chicago, IL, USA, June 4-7, 2019.*