



U.S. ARMY

# IMPACT OF MORPHOLOGY ON SEDIMENT DYNAMICS AT COASTAL INLETS

## INLET GEOMORPHOLOGY WU

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## COASTAL INLETS RESEARCH PROGRAM

FY21 IN PROGRESS REVIEW

**Tiffany Burroughs**

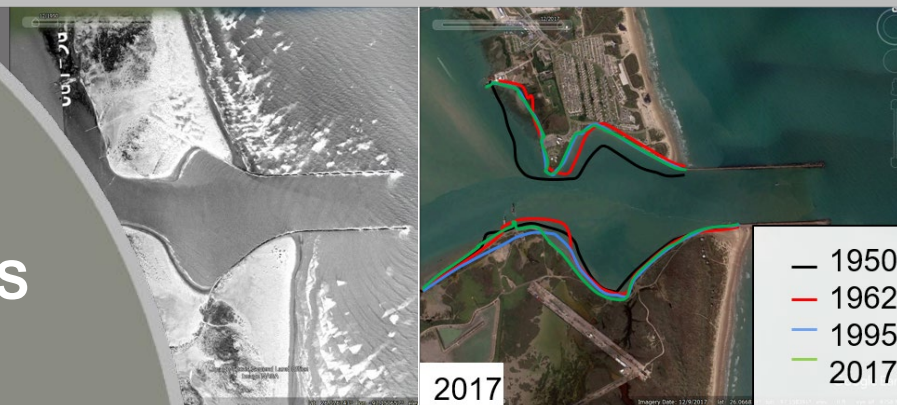
HQ Navigation Business Line Manager

**Eddie Wiggins**

Technical Director, Navigation

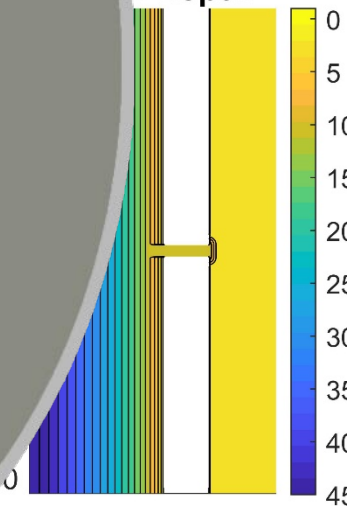
**Morgan Johnston**

Acting Associate Technical Director, Navigation

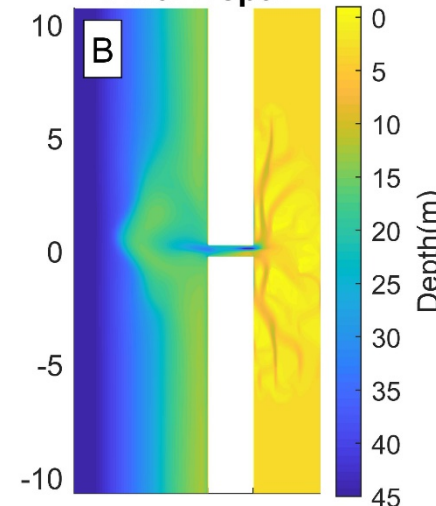


HC4

Initial Depth



Final Depth



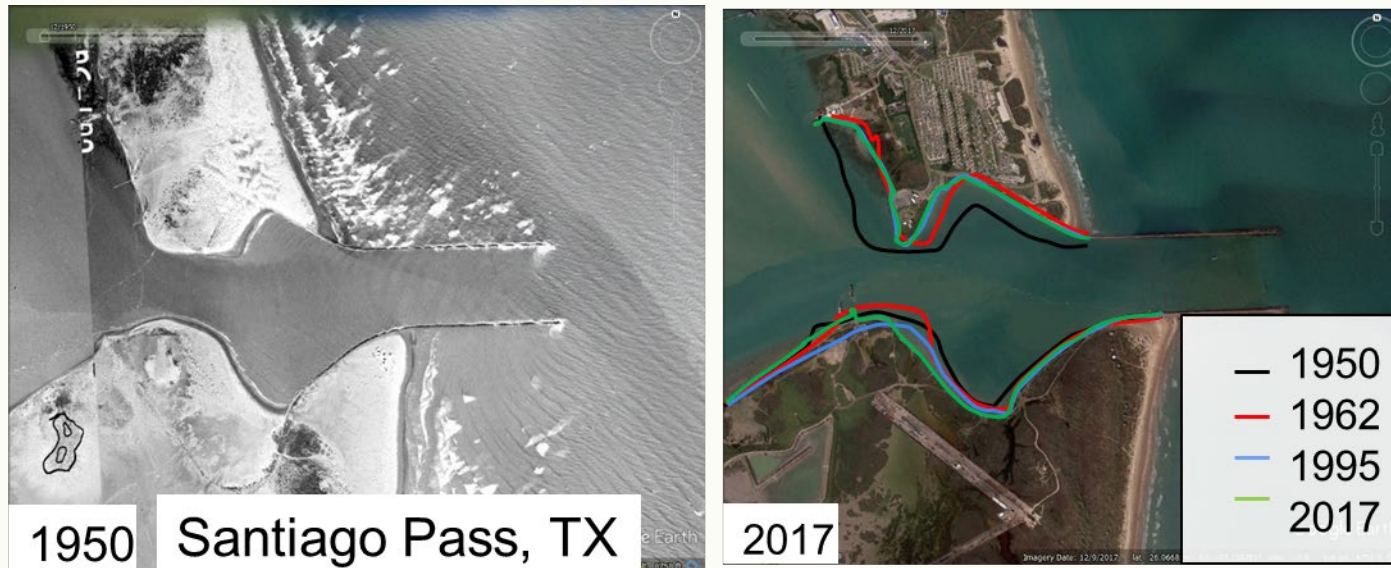
US Army Corps of Engineers



**ERDC**  
ENGINEER RESEARCH & DEVELOPMENT CENTER

# Problem Statement

- Existing theory suggests a primary factor controlling hydrodynamics and, by extension, sediment transport is basin morphology
- One factor not previously explored is sediment availability, which can alter bay morphology leading to potential feedbacks that could modify hydrodynamics of the system.
- Continuing evolution of land use practices (armoring, island construction, reclamation) and sea level change will alter coastal inlets/bays from present day configurations and associated sediment transport characteristics.
- Need to develop approaches to assess inlet/bay system likelihood of undergoing fundamental shifts in sediment transport patterns due to these influences (anthropogenic, sea level rise)



## SONs

FY19 1356 (Long-term Modeling of Barrier Island Tidal Inlets)

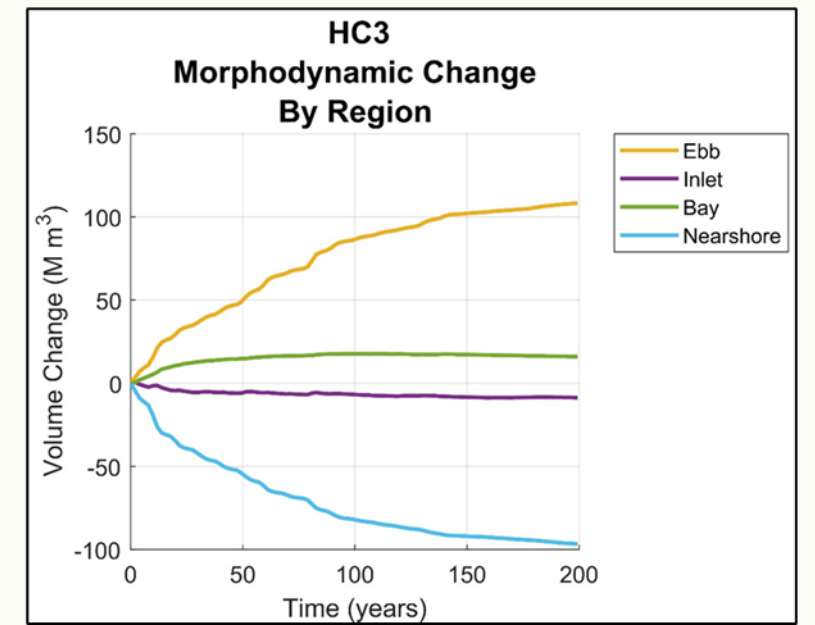
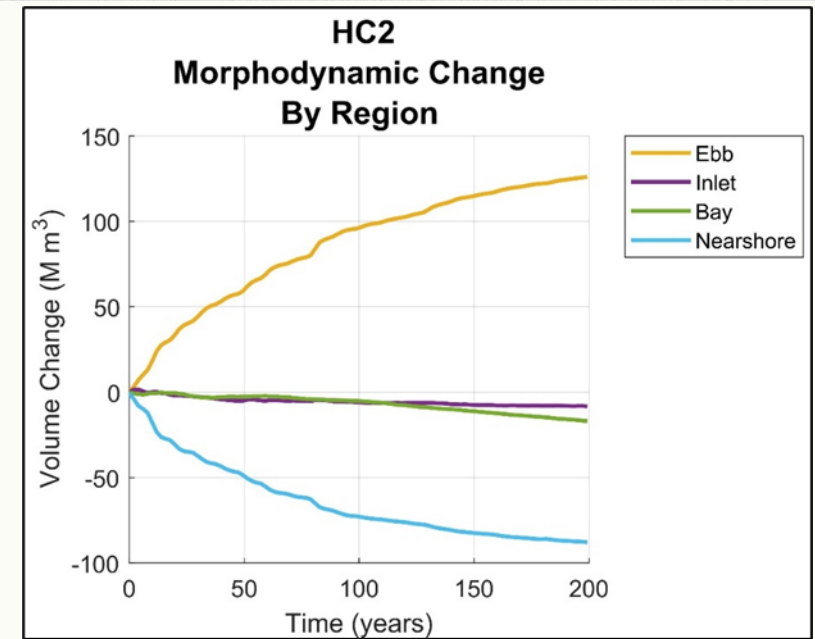
FY19 1370 (Testing and Evaluation of USACE Coastal Numerical Models)

17-N-71 (Modeling Effects of Sea Level Change at Tidal Inlets)

# Capability and Strategic Impact Statement

Develop methodology to determine the likelihood of an inlet system to shift from import/export due to modification in land use and engineering practices (channel modification, wetland restoration, inundation due to sea level rise)

Use this information to inform planners & stakeholders of possible impacts to navigation.



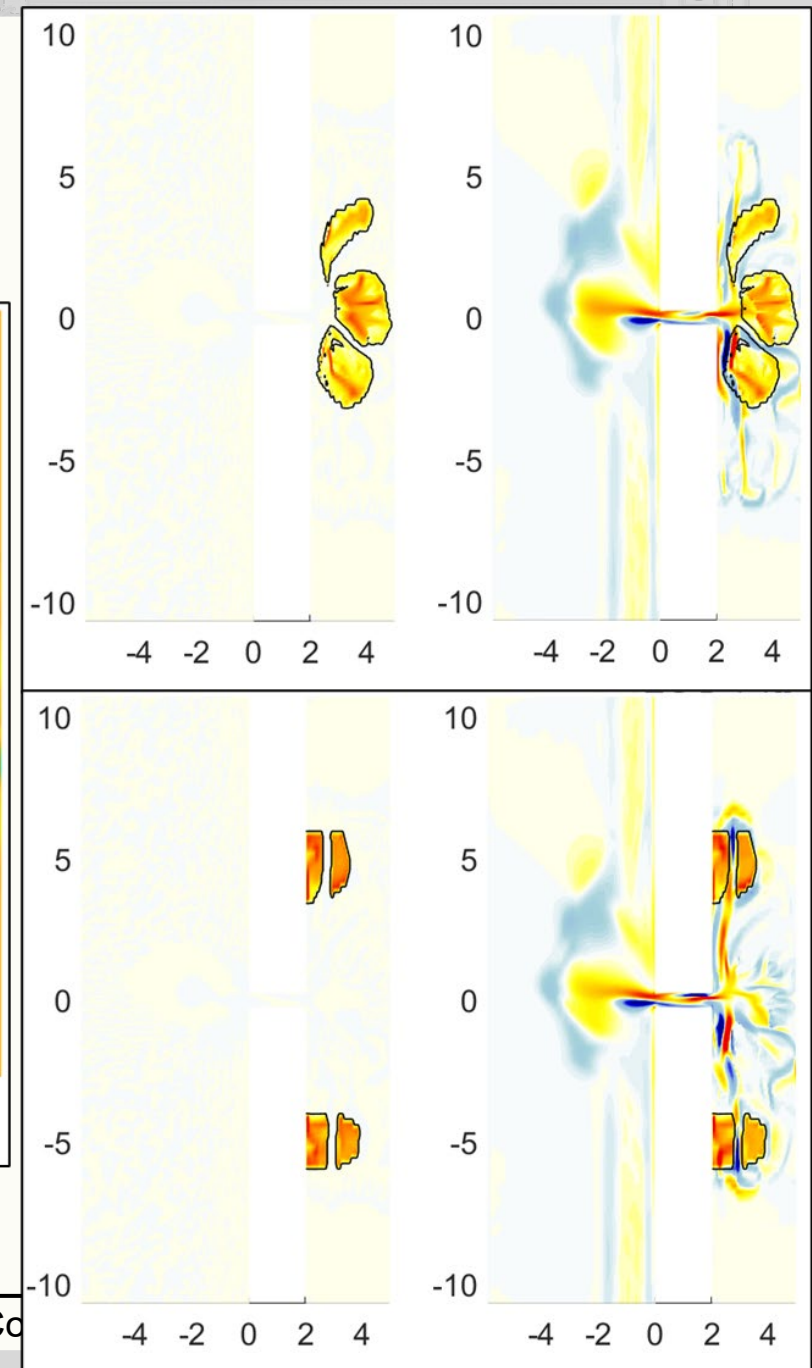
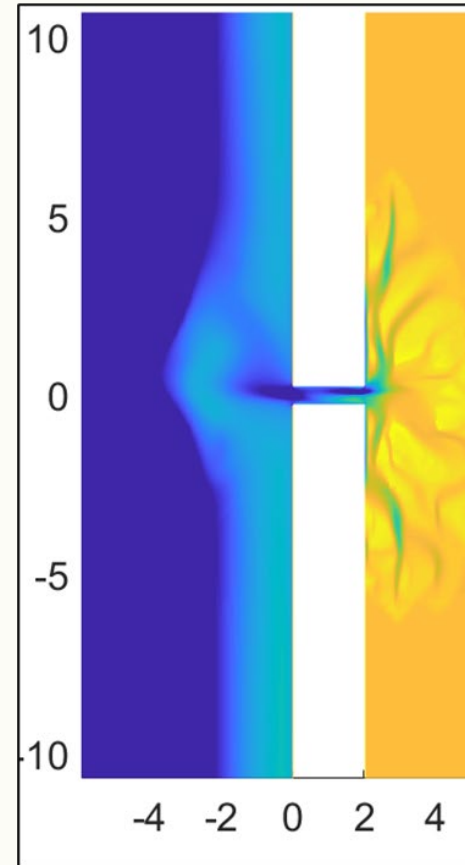


# Impact of Horizontal Sediment Distribution

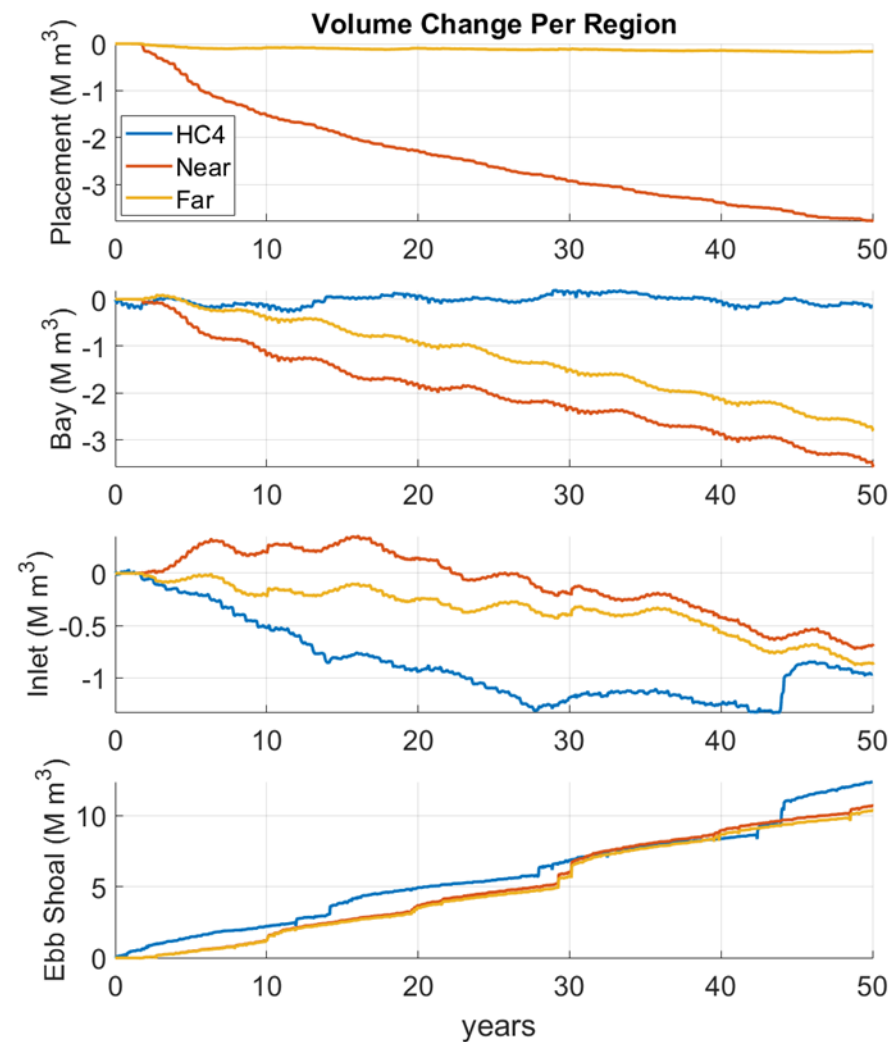
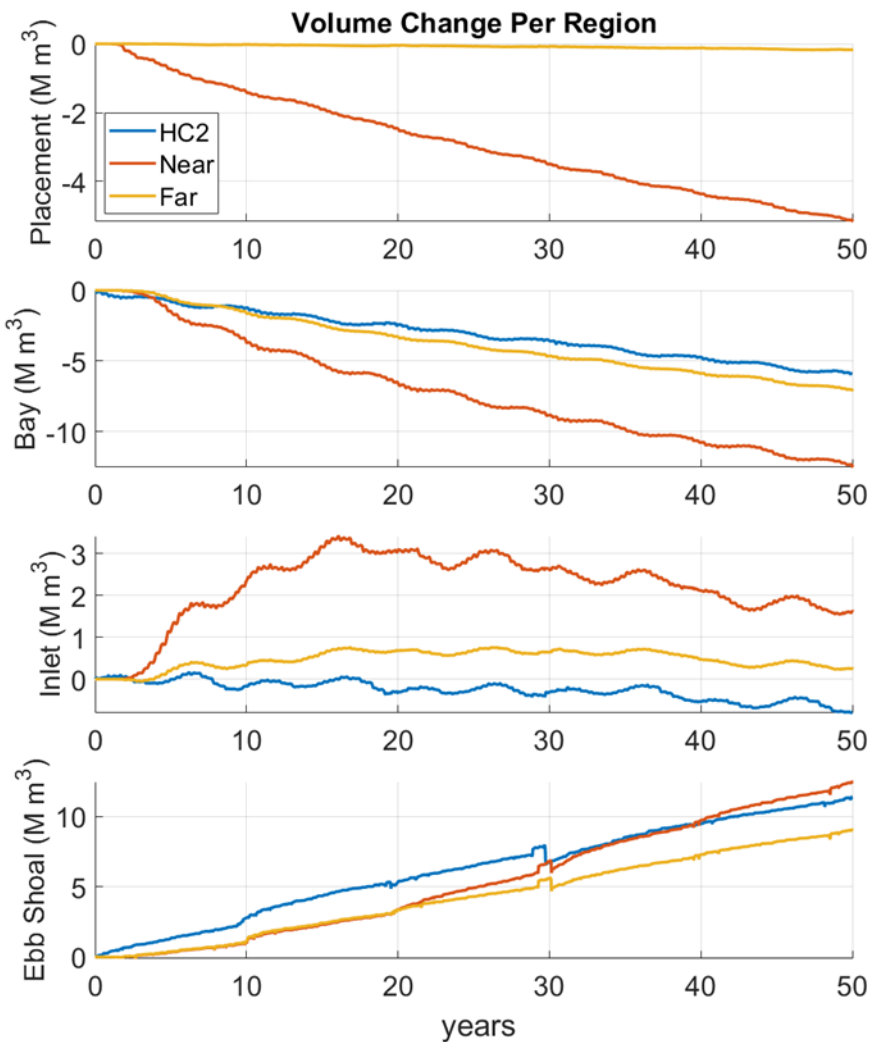
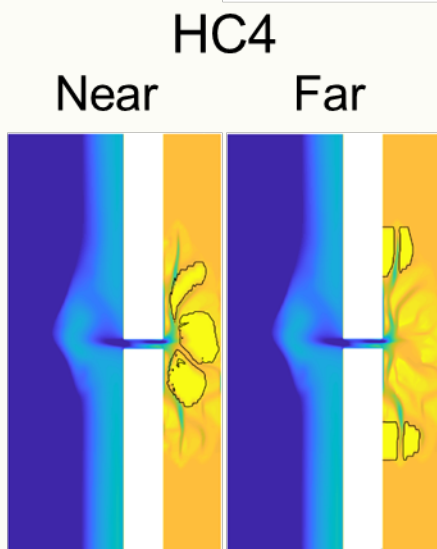
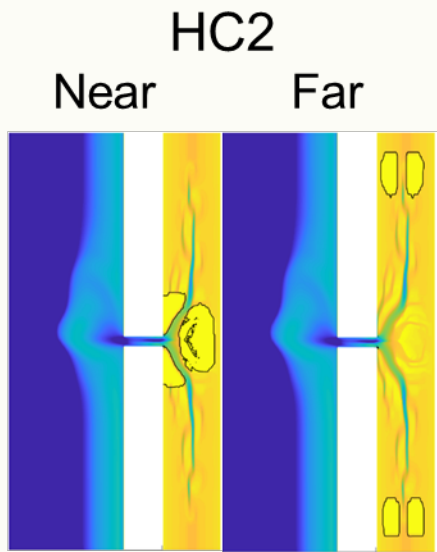
- ✓ Series of idealized CMS simulations representative of Humboldt, CA, modeled **200 years** of effective morphology change corresponding to a range of hypsometries
- ✓ Sediment import vs export
- ✓ Add to stable configurations near the end of 200-year simulations and run for 50 years.
- ✓ Vary placement position

## MODEL RESULTS

- Placements closer to inlet erode faster
- Placements farther from inlet contribute to export, but do not erode



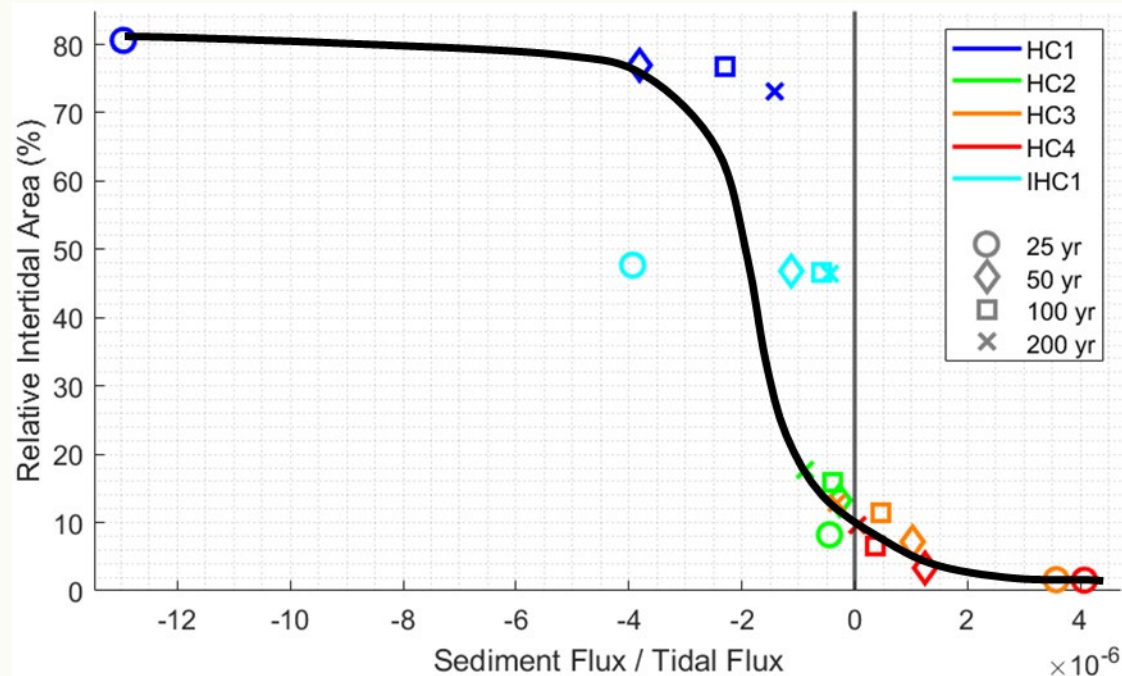
# SEDIMENT EXPORT RATE



# Summary

## FY21 Products/Advances

- Hypsometry gives VERTICAL distribution but what about HORIZONTAL distribution?
- Quantify the effect of land distribution to inlet import/export
- Prepare JP
- Publish TR



## FY21 Major Final Products & Collaborations

- Effect of Basin Hypsometry on Long-term Inlet Hydrodynamics and Sediment Transport TR (In review)
- CIRP TD (March 2021)
- Leverage new start on wetland nourishment
- Abstract submitted for the Estuarine Coastal Modeling session at the Coastal Estuarine Research Federation Conference

What about real systems?

Can we populate a database using real inlets?

Use information to inform inlet/channel shoaling patterns