

Nearshore Field Study at Grays Harbor, WA

Irene Watts¹, Alejandro Sanchez², Ken Connell³ and Phillip Osborne³, Dr. Nicholas Kraus²



¹U.S. Army Corps of Engineers, New England District
stationed at Coastal and Hydraulics Laboratory, Vicksburg, MS

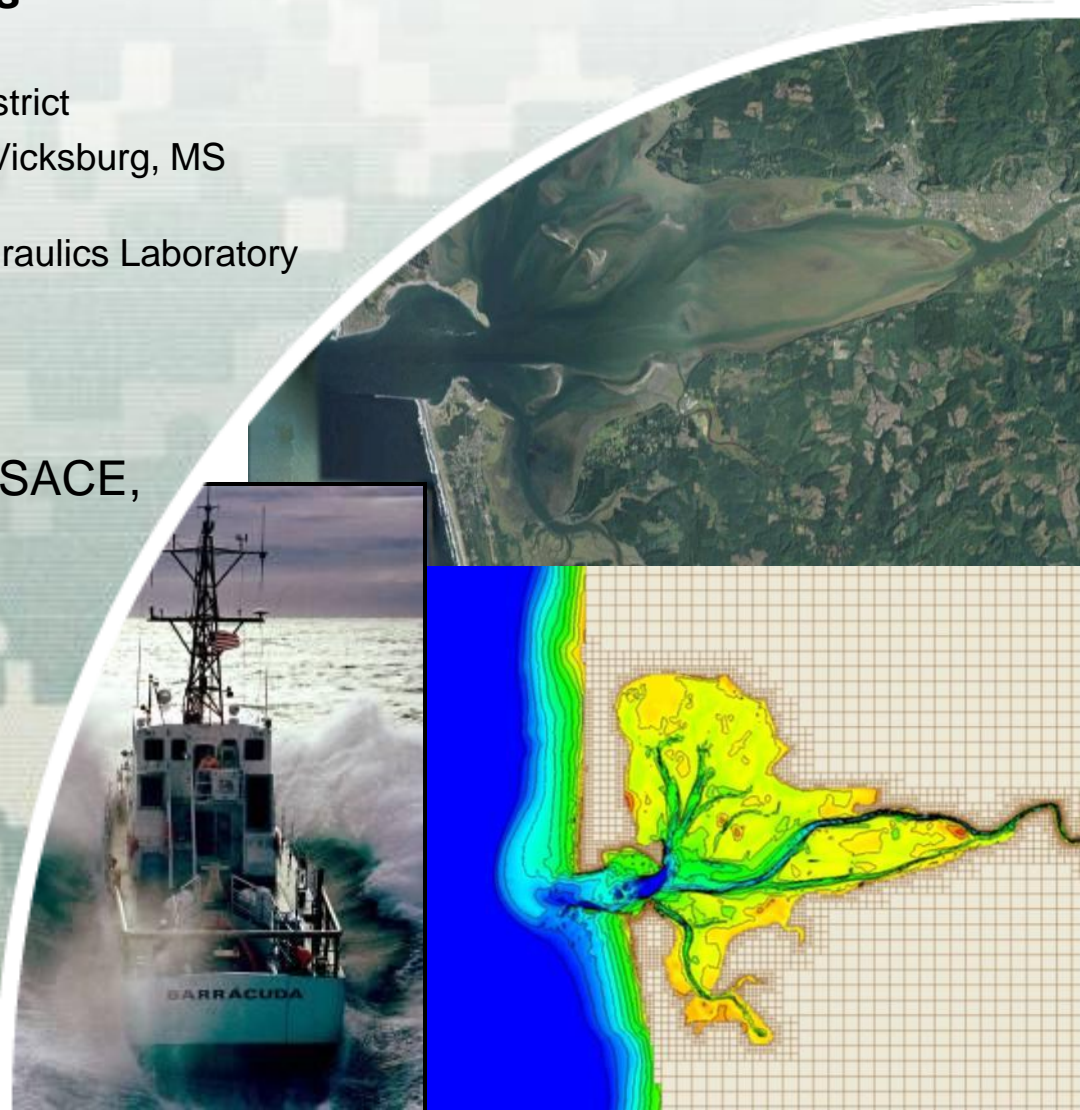
²U.S. Army Corps of Engineers, Coastal and Hydraulics Laboratory
Vicksburg, MS

³Golder Associates, Inc. Redmond, WA

In cooperation with: Seattle District USACE,
Dave Michalsen



US Army Corps of Engineers
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- Site Overview
- Field Data Collection on Damon Point
- Evolution of Damon Point (1862 – 2009)
- Application of the Coastal Modeling System (CMS)





Site Overview



- Grays Harbor estuary is one of the largest in the continental United States (Kraus, 2003)
- Damon Point is a spit inside the entrance that is encroaching on the navigation channel
- Field study designed to capture the inner surf zone and swash zone sediment transport at Damon Point to support morphodynamic modeling
- Study goal is to develop recommendations to reduce channel shoaling and increase channel reliability



Google, 2010



Site Considerations



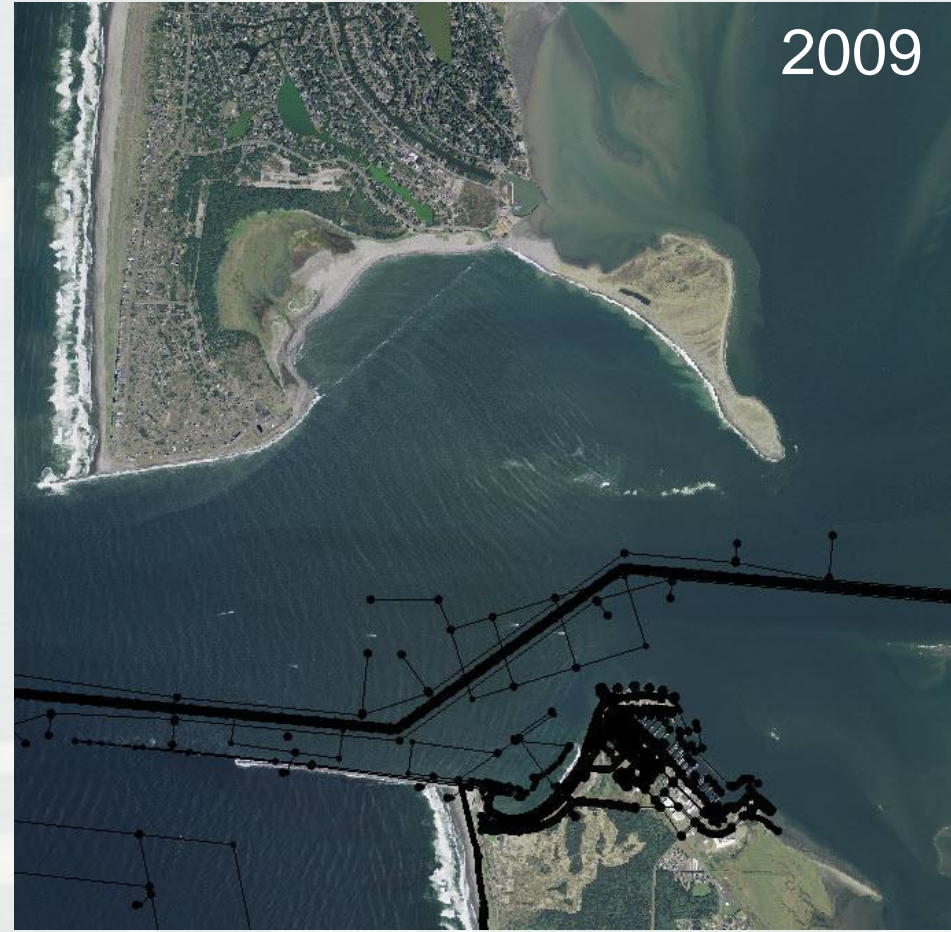
- As Damon Spit has grown
 - ▶ Wave heights have increased
 - ▶ Structural damage to Pt. Chehalis Revetment
 - ▶ Flooding from wave overtopping at Westport
- Channel re-alignment at the Entrance is currently being considered
- Better understanding of long-term shoaling is needed to estimate future O&M costs



(WA GIS, 2009)



Site Overview: Damon Point





- Bottom mounted ADP in nearshore for currents and waves
- Instrumented Beach Pods for 3D wave, current and suspended sediment monitoring
- Sediment Characterization
- Nearshore bathymetry and beach topography survey
- July – September 2010
 - ▶ Approx 2 weeks
 - ▶ Covers spring-neap cycle

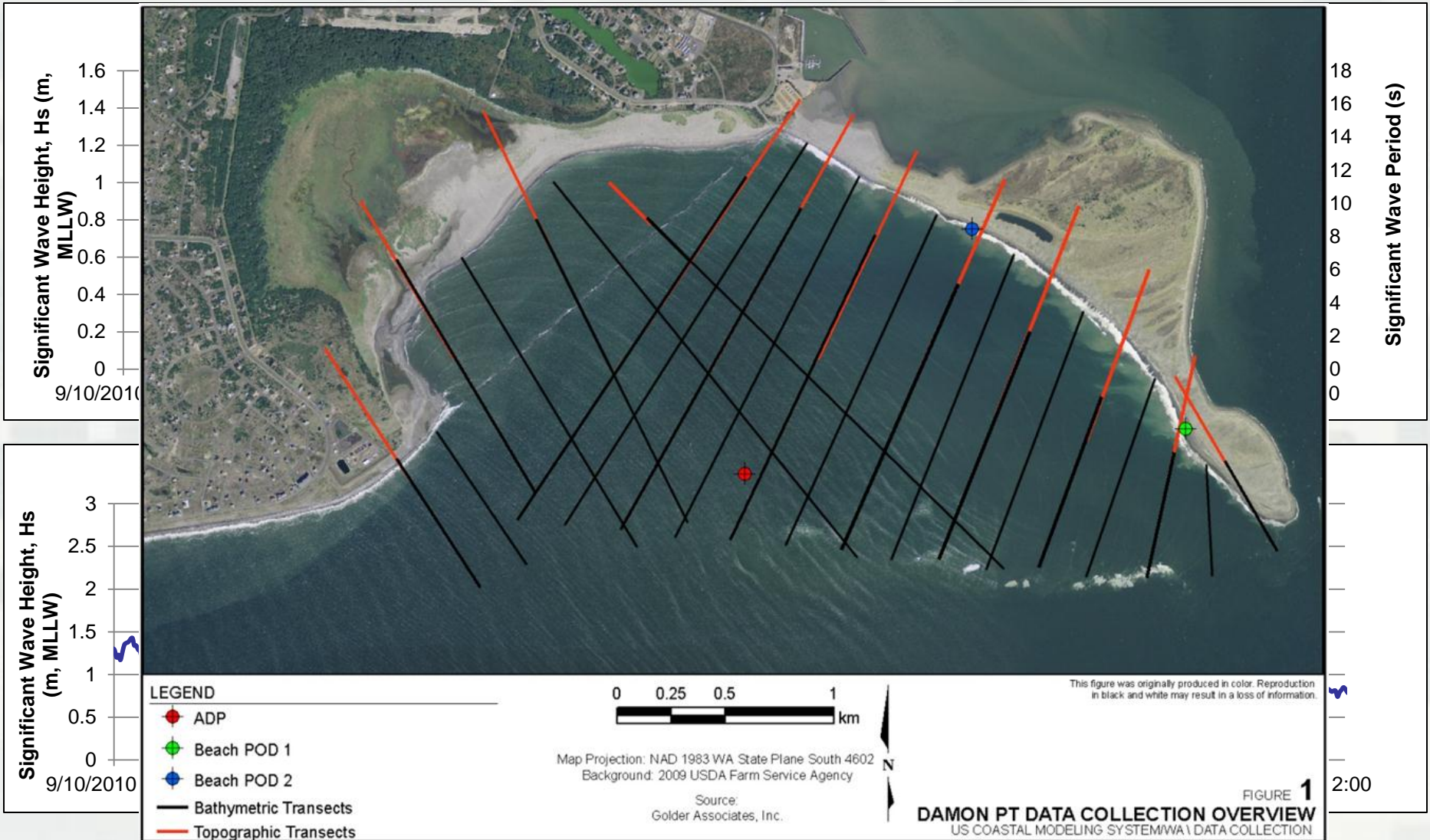


Field Data Collection on Damon Point





ADP Waves





ADP Currents

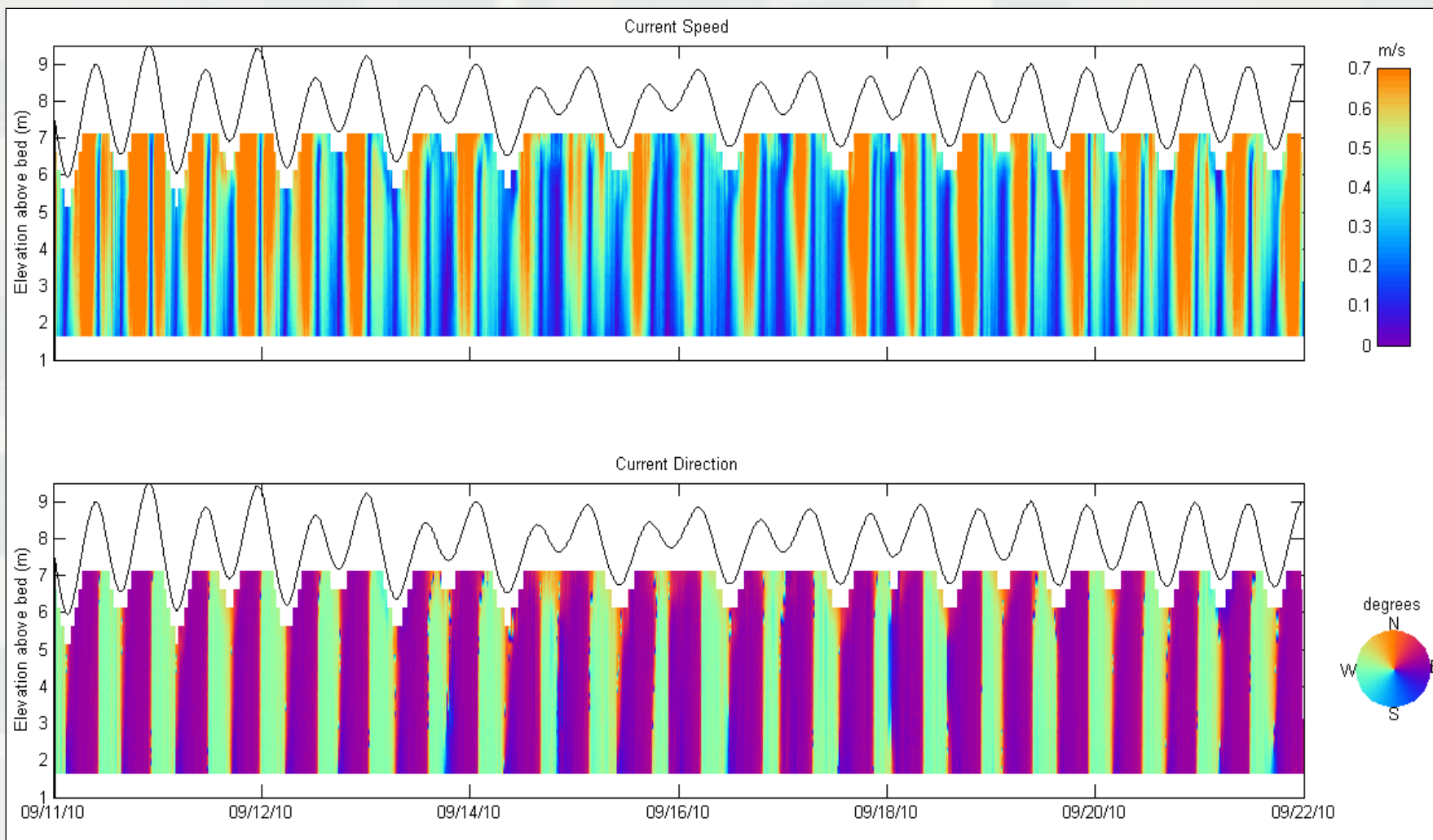
- Bottom mounted unit
- Maximum current magnitudes = 1.31 m/s
- Current patterns represent tidal flow in the estuary
- Magnitudes are stronger on the flood than on ebb





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ADP Currents



Measured current and tide data from ADP nearshore to Damon Point (Golder, 2010)



Surf and Intertidal Dynamics Sensor Platforms (*Beach Pods*)



- W
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LEGEND

- ADP
- Beach POD 1
- Beach POD 2
- Bathymetric Transects
- Topographic Transects



Map Projection: NAD 1983 WA State Plane South 4602
 Background: 2009 USDA Farm Service Agency
 Source:
 Golder Associates, Inc.

This figure was originally produced in color. Reproduction in black and white may result in a loss of information.

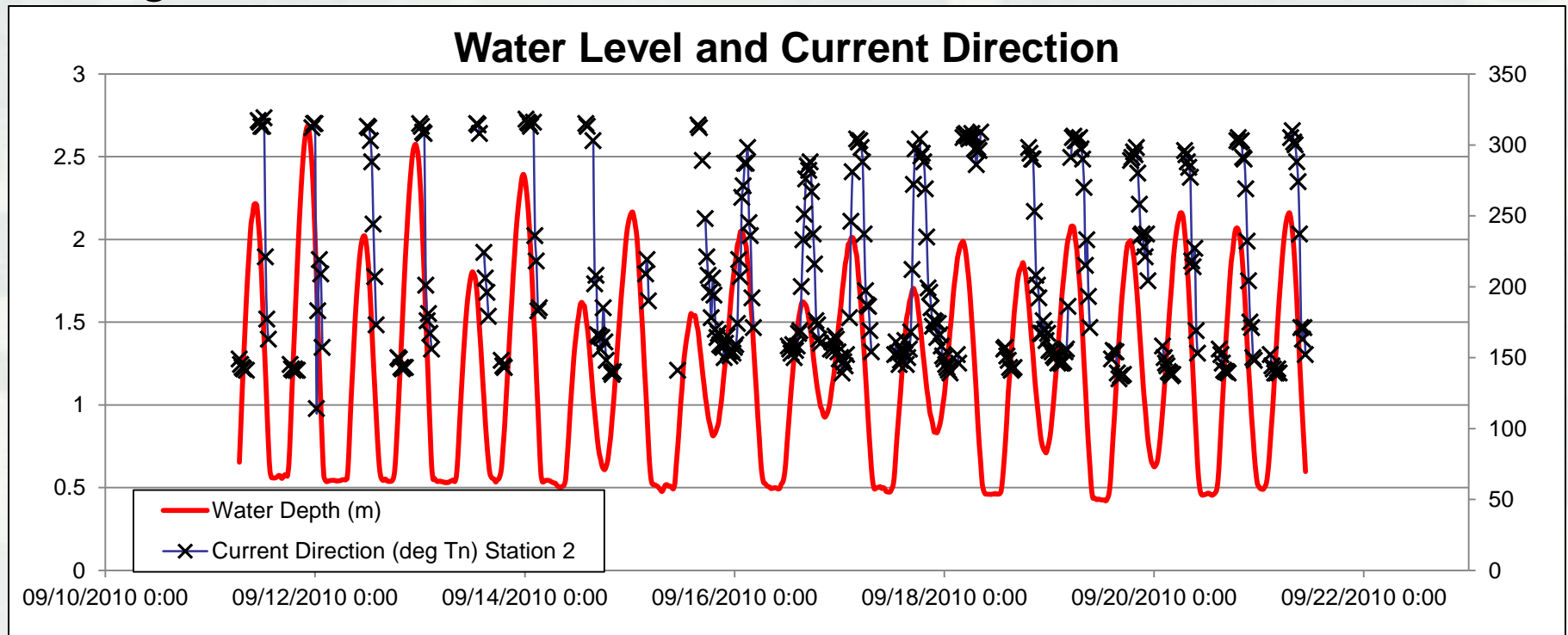
FIGURE 1
DAMON PT DATA COLLECTION OVERVIEW
 US COASTAL MODELING SYSTEM\WA\ DATA COLLECTION



BeachPod Currents

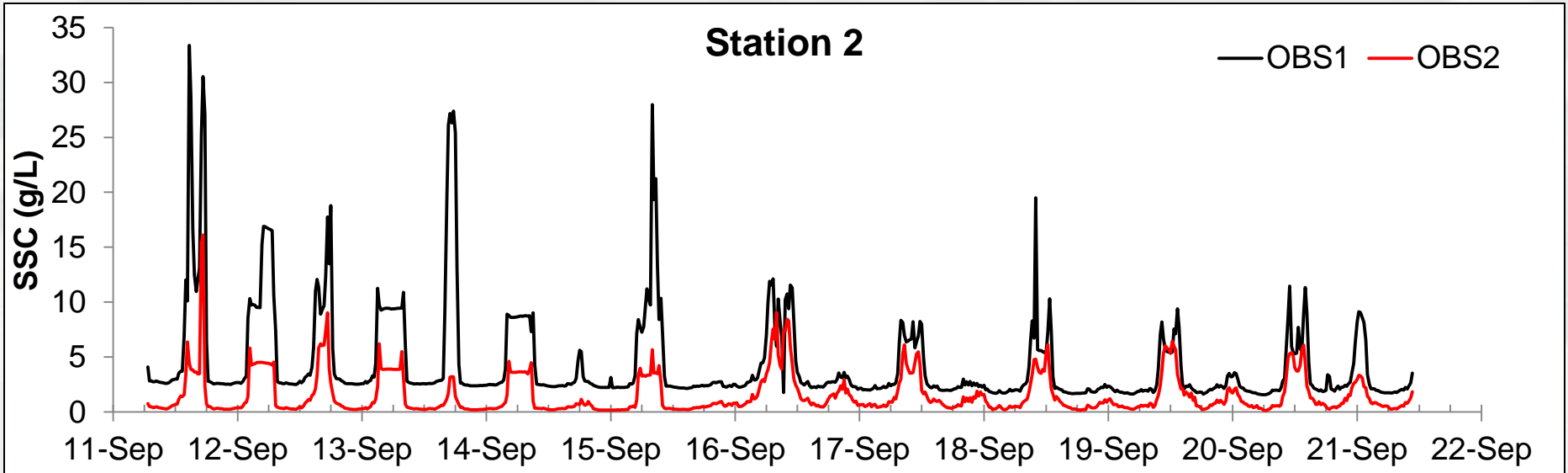
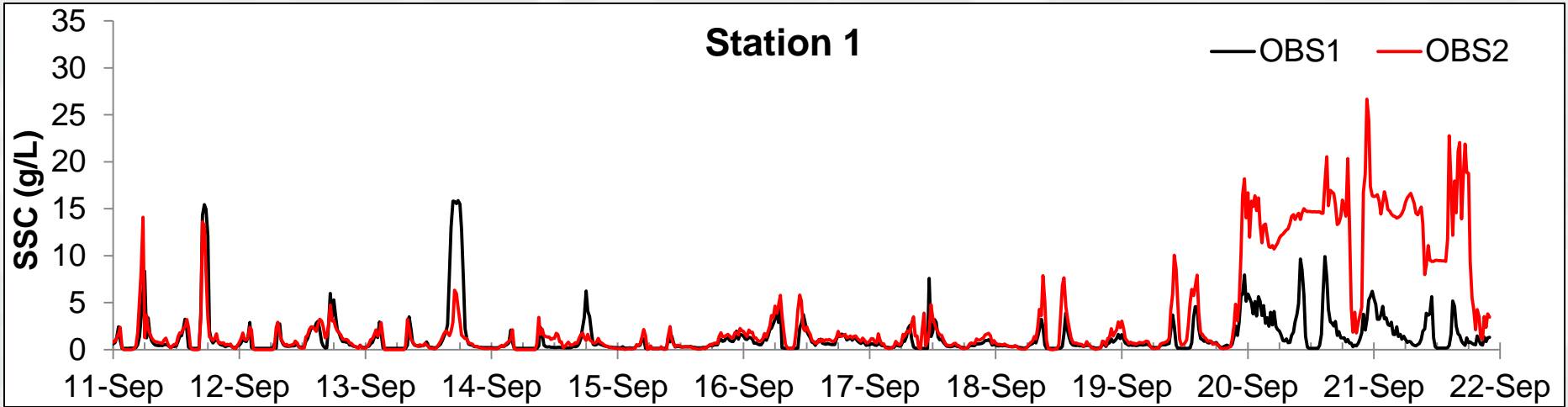


- Station 1: Maximum magnitude = 75 cm/s
- Station 2: Maximum magnitude = 40 cm/s
- Strong tidally induced variation in current direction and tide range variation





BeachPod Suspended Sediment Concentration (SSC)

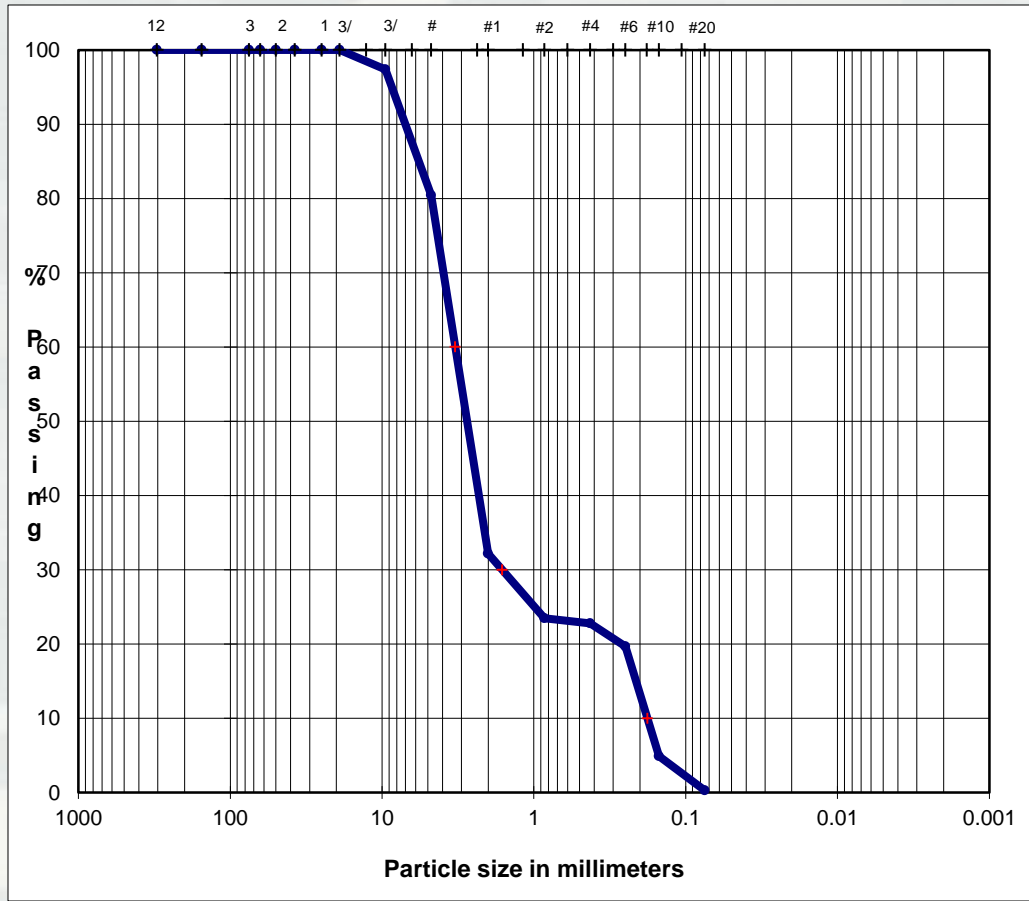




Sediment Characterization



- Poorly sorted, well graded
- Coarse and fine sand with some gravel
- Station 1: $D_{50} = 3.02$ mm, St. Dev = 0.2 mm
- Station 2: $D_{50} = 2.03$ mm, St. Dev = 0.2 mm
- Used for OBS calibration and non-uniform sediment transport in CMS model





Bathymetry and Topography Survey (2010)



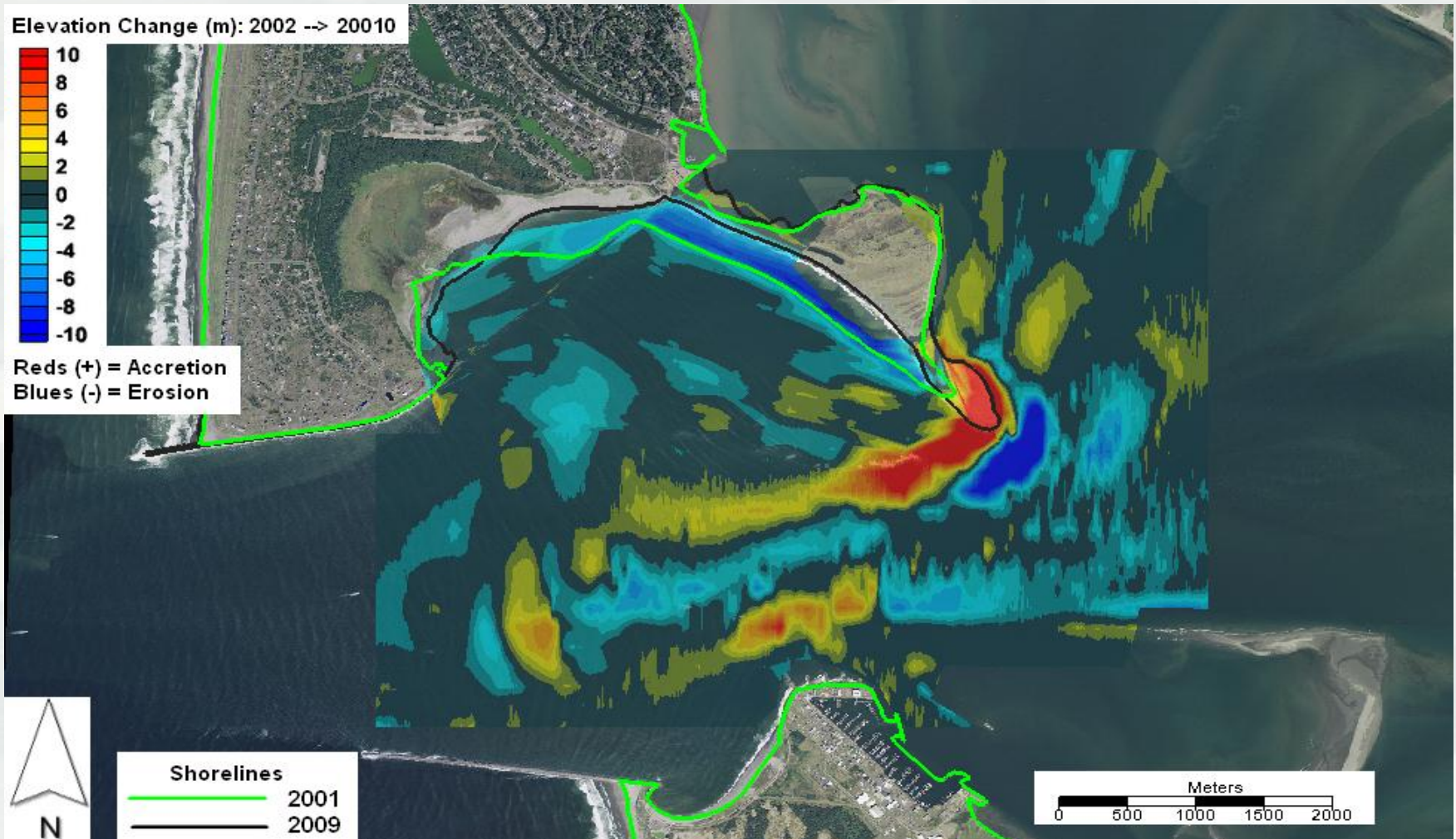


Bathymetry and Topography Survey (2003)





Measured Morphology Change: 2002-2010





Evolution of Damon Point



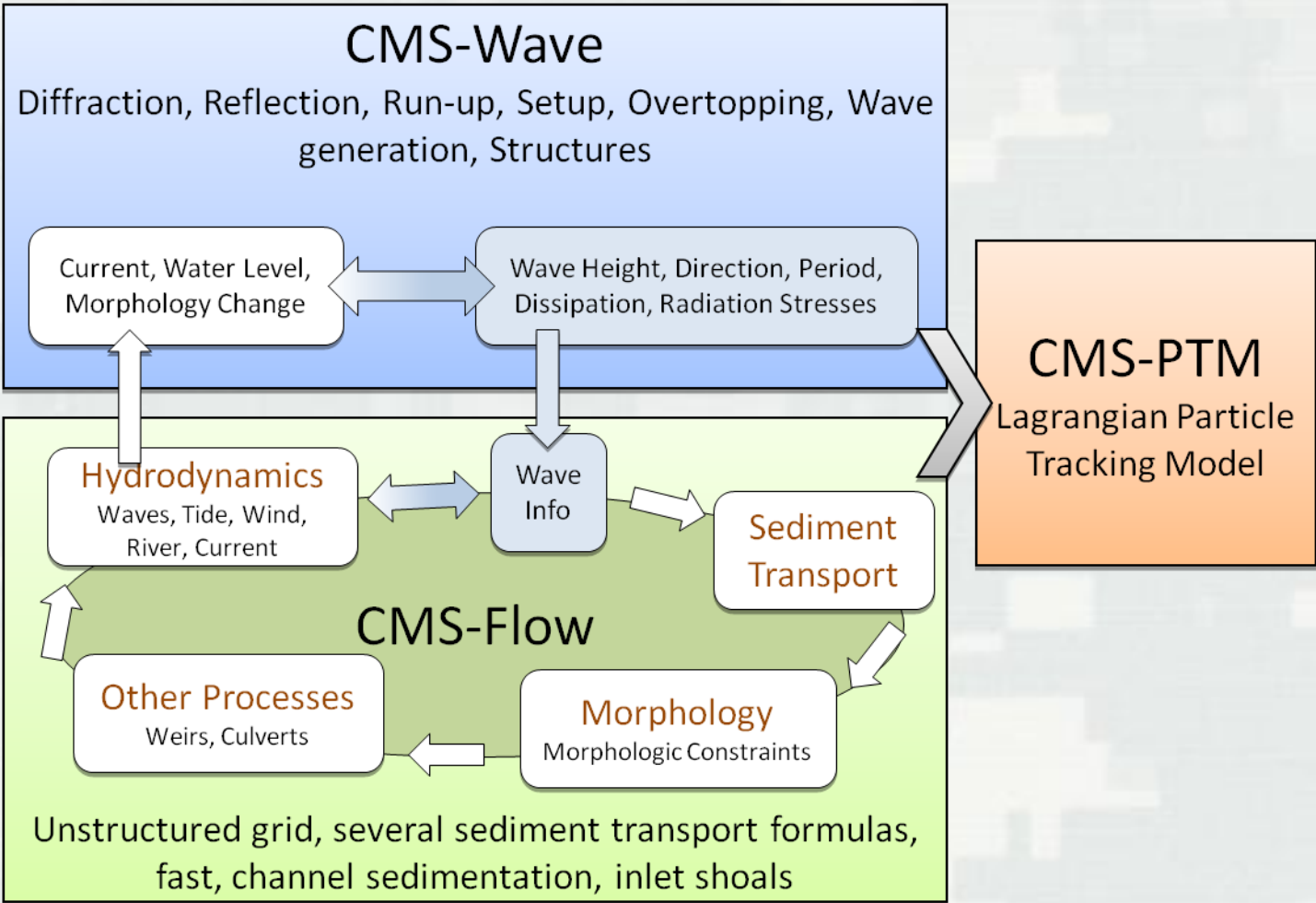
2001 -
2009



Basemap:
2009



Coastal Modeling System (CMS)

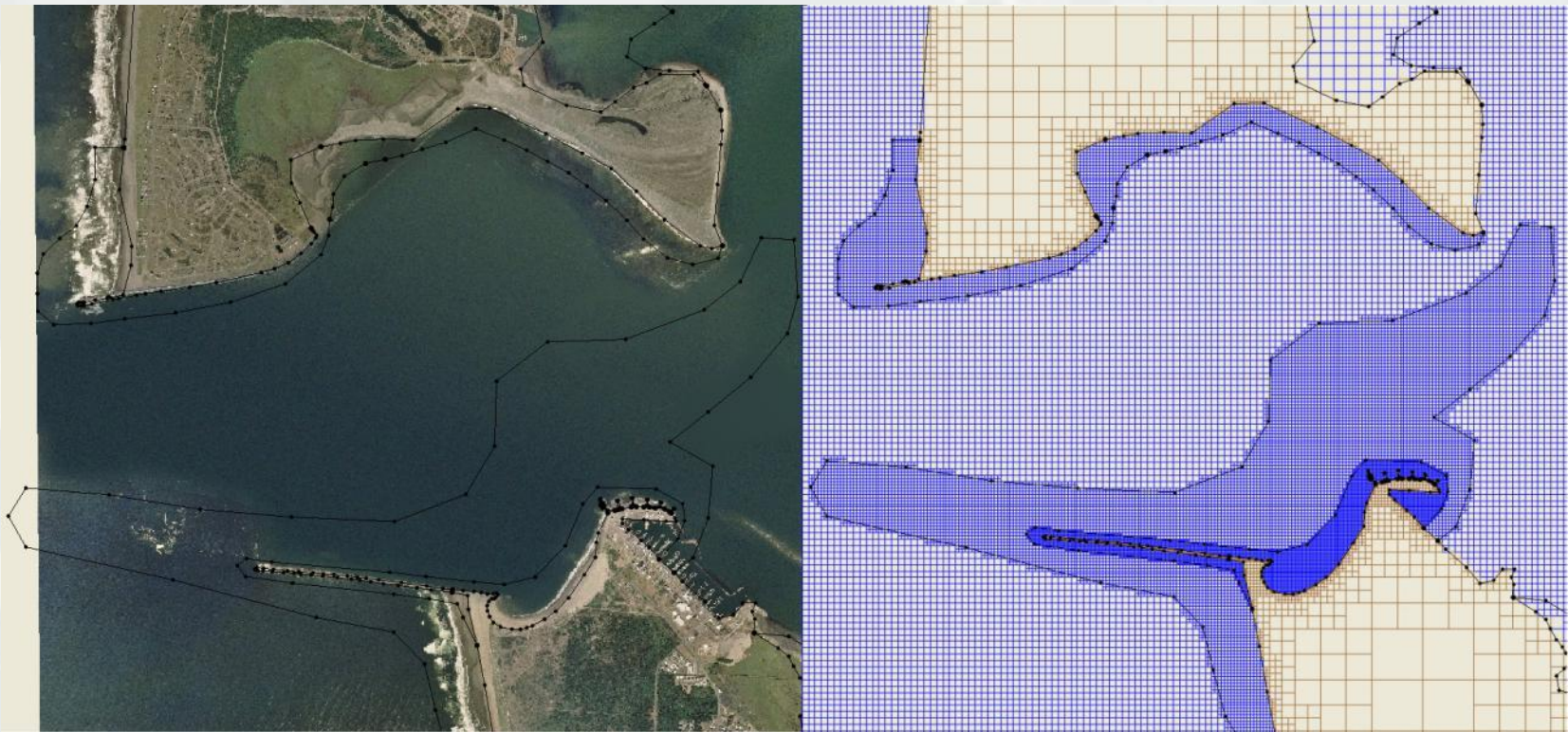




CMS Modeling Approach



1999 Grid Configuration

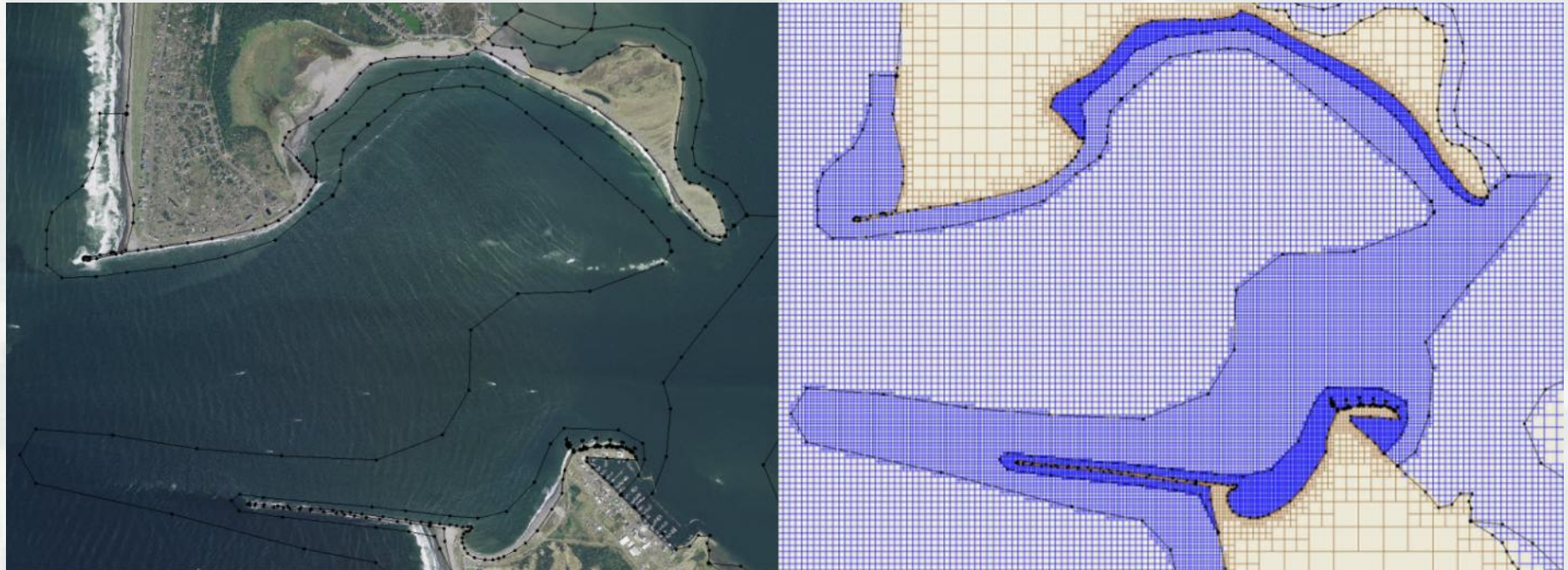




CMS Modeling Approach cont.

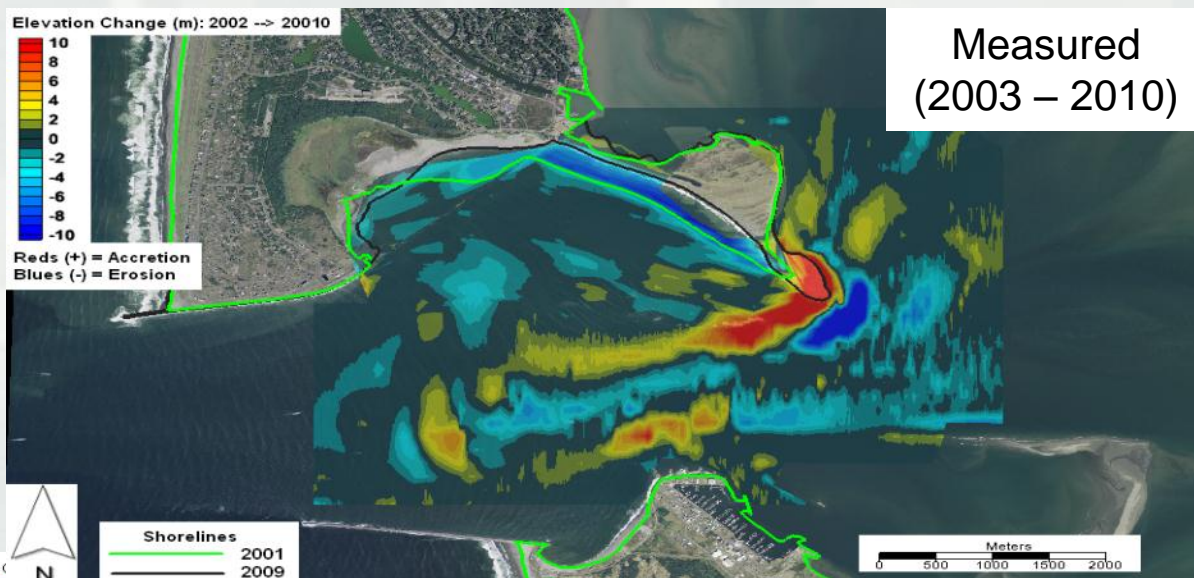


2009 Grid Configuration





Preliminary CMS Model Results: Morphology Change



Measured
(2003 – 2010)



Forcing Boundary Condition	Water Level, offshore winds
Duration	1 month
Transport	Lund-CIRP
D50	0.28 mm



Synthesis of Results and Next Steps



- Captured swash zone processes along Damon Point
- Morphology and current/tide measurements from ADP indicate a flood dominated system
- Include Non-uniform sediment transport from sediment samples





Discussion



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- Smith, E., Wang, P., Zhang, J., (2003). "Evaluation of the CERC formula using large-scale model data". Proceedings Coastal Sediments, ASCE, pp. 1-13.



Dedicated to Nick Kraus



Leader, Visionary, Mentor
and Friend.