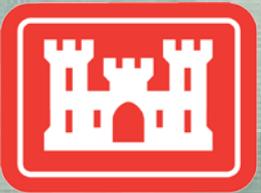
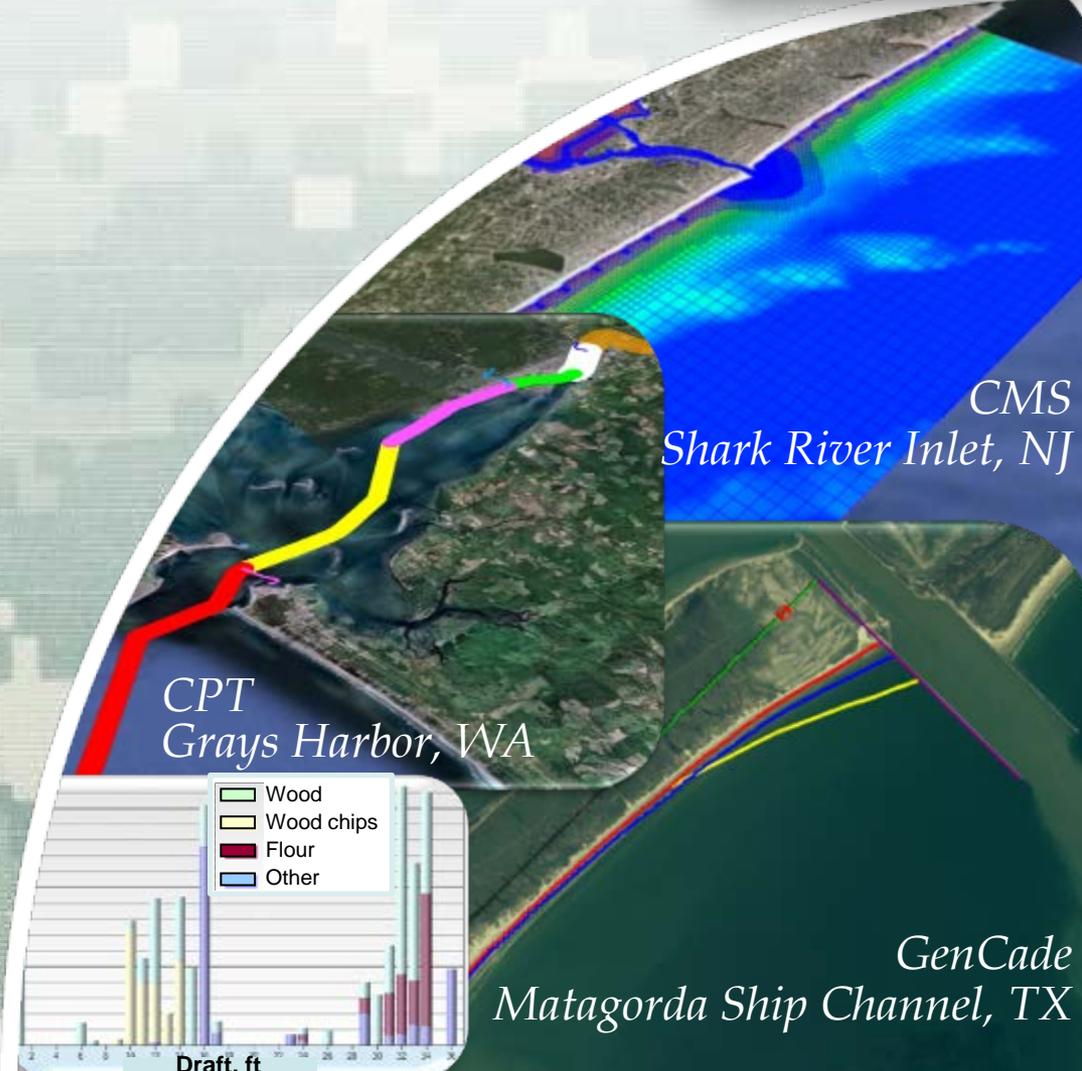


Overview of the SMS (v11.0), Coastal Modeling System, and User Resources



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June 11-15, 2012



US Army Corps of Engineers
BUILDING STRONG



GenCade
Matagorda Ship Channel, TX

Report Documentation Page

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1. REPORT DATE JUN 2012		2. REPORT TYPE		3. DATES COVERED 00-00-2012 to 00-00-2012	
4. TITLE AND SUBTITLE Overview of the SMS (v11.0), Coastal Modeling System, and User Resources				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) U.S. Army Corps of Engineers, U.S. Army Engineer Research and Development Center, 3909 Halls Ferry Road, Vicksburg, MS, 39180-6199				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 1st CMS Webinar, Coastal Inlets Research Program, June 11-15, 2012.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	unclassified	unclassified	Same as Report (SAR)	23	



Overview of Presentation



- Introduction to the Coastal Modeling System (CMS)
 - CMS-Flow – Hydrodynamics, Sediment Transport, Morphology Change
 - CMS-Wave – Half-plane waves and Full-plane wind forcing.





Objective

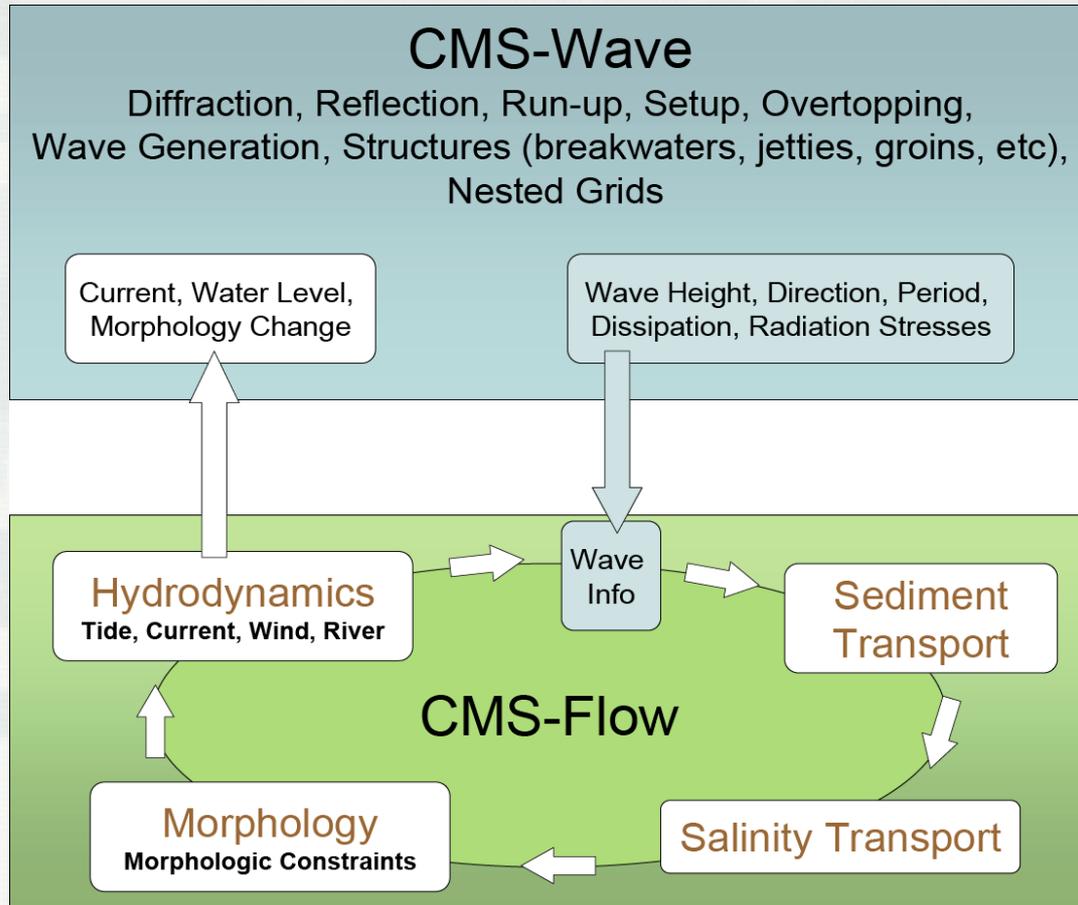


- **Deliver** to engineers' desktops **integrated** advanced models that can be used as **practical** engineering tools for **coastal** inlet and adjacent beach studies.
 - Integrated: All relevant processes, models efficiently coupled together
 - Practical: PC-based, user-friendly interface, fast, robust and accurate
 - Deliver: Manuals, tech reports, journal papers, Wiki, workshops, phone help, etc.





CMS Overview



Since 1997...

- **2 webinars**
- **38 workshops**
- Districts can independently run the CMS!

Advantages...

- Robust
- Physics-based
- Integrated SYSTEM
- In SMS
- User-friendly

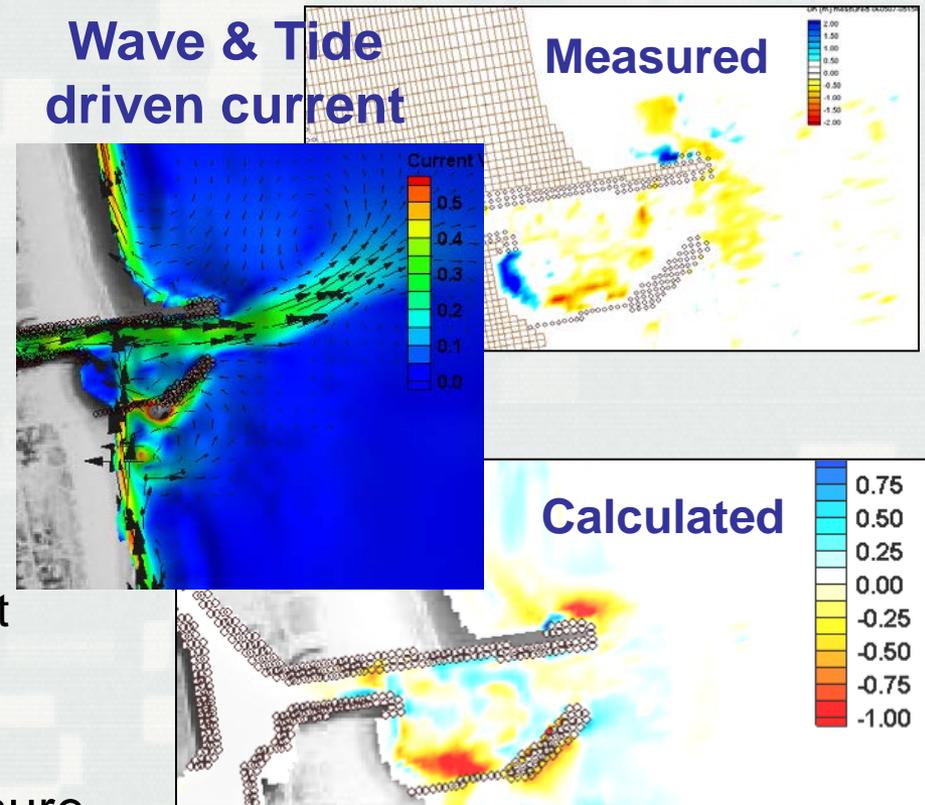




CMS-Flow Key Features



- Finite Volume Method
 - Conserves mass
 - Stable
 - Accessible
- Coupled with spectral wave model (CMS-Wave)
 - Wave-current interactions
- Inline sediment transport and morphology change
 - Non-equilibrium sediment Transport model (NET)
- Nesting capability
- WSE, river, wind/atmospheric pressure forcing
- Tidal constituent forcing (**NEW**)



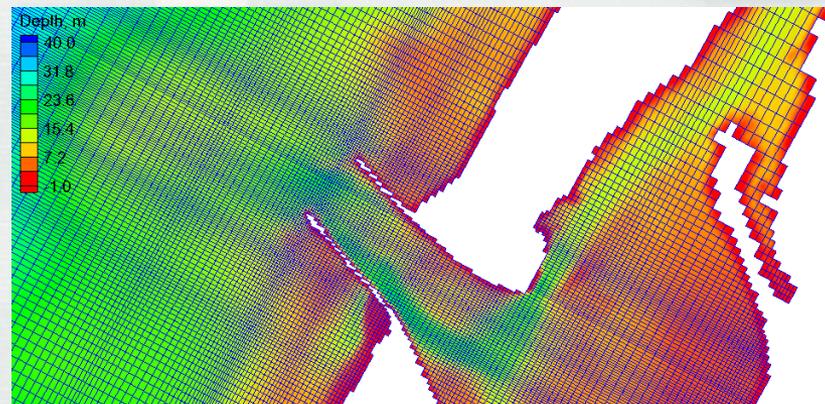


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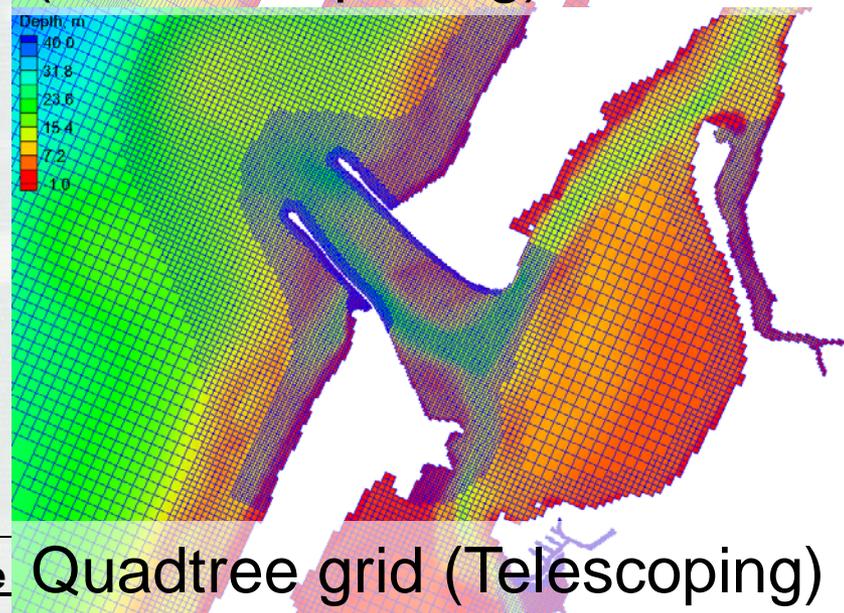
CMS-Flow Key Features



- Grid options
 - Non-uniform Cartesian grid: Easy to setup
 - Quadtree (telescoping) grid: Efficient, flexible (presently, only available for Implicit model)
- Solver options
 - Implicit: Tidal flow, long-term morphology change, parallel processing.
~5 - 30 minute time step
 - Explicit: Flooding, breaching, super-critical flow. ~1 second time step, parallel processing



Non-uniform Cartesian grid
(Variable spacing)



Quadtree grid (Telescoping)



Hydrodynamics



Included terms for the depth-averaged shallow water equations in Cartesian coordinates

Depth - averaged current velocity

Total water depth

Still water depth

Water surface elevation

Gravity

Atmospheric Pressure

Precipitation / Evaporation

Coriolis

Turbulent eddy viscosity

Bottom stress (including waves)

Wave stress (forcing)

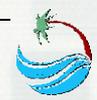
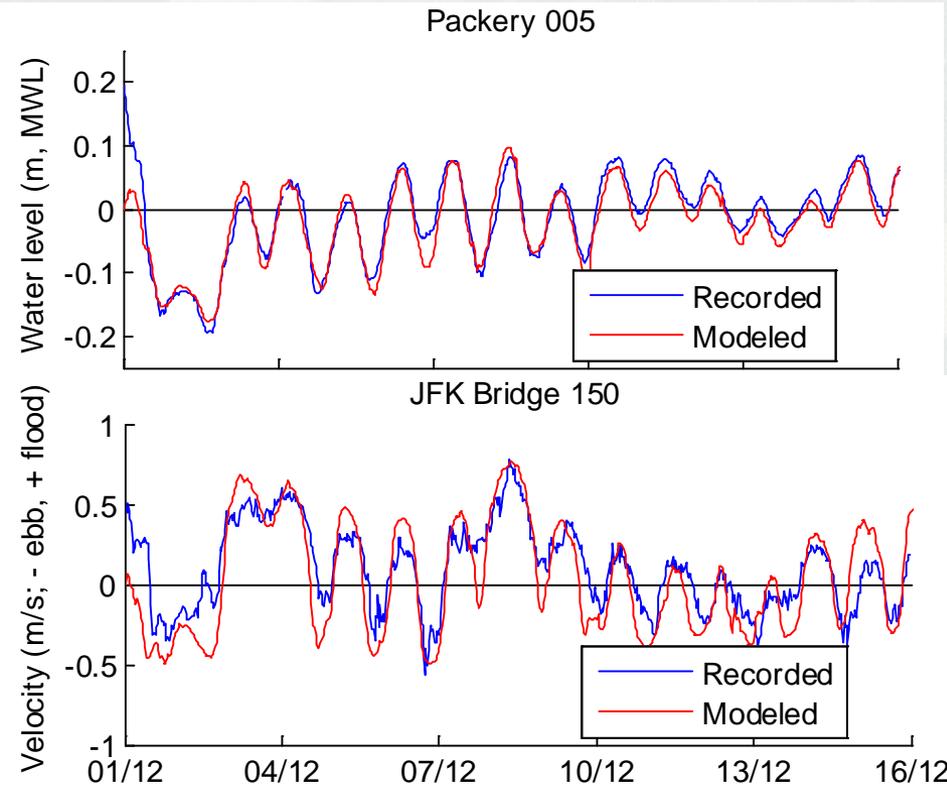
Wind stress





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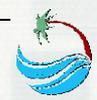
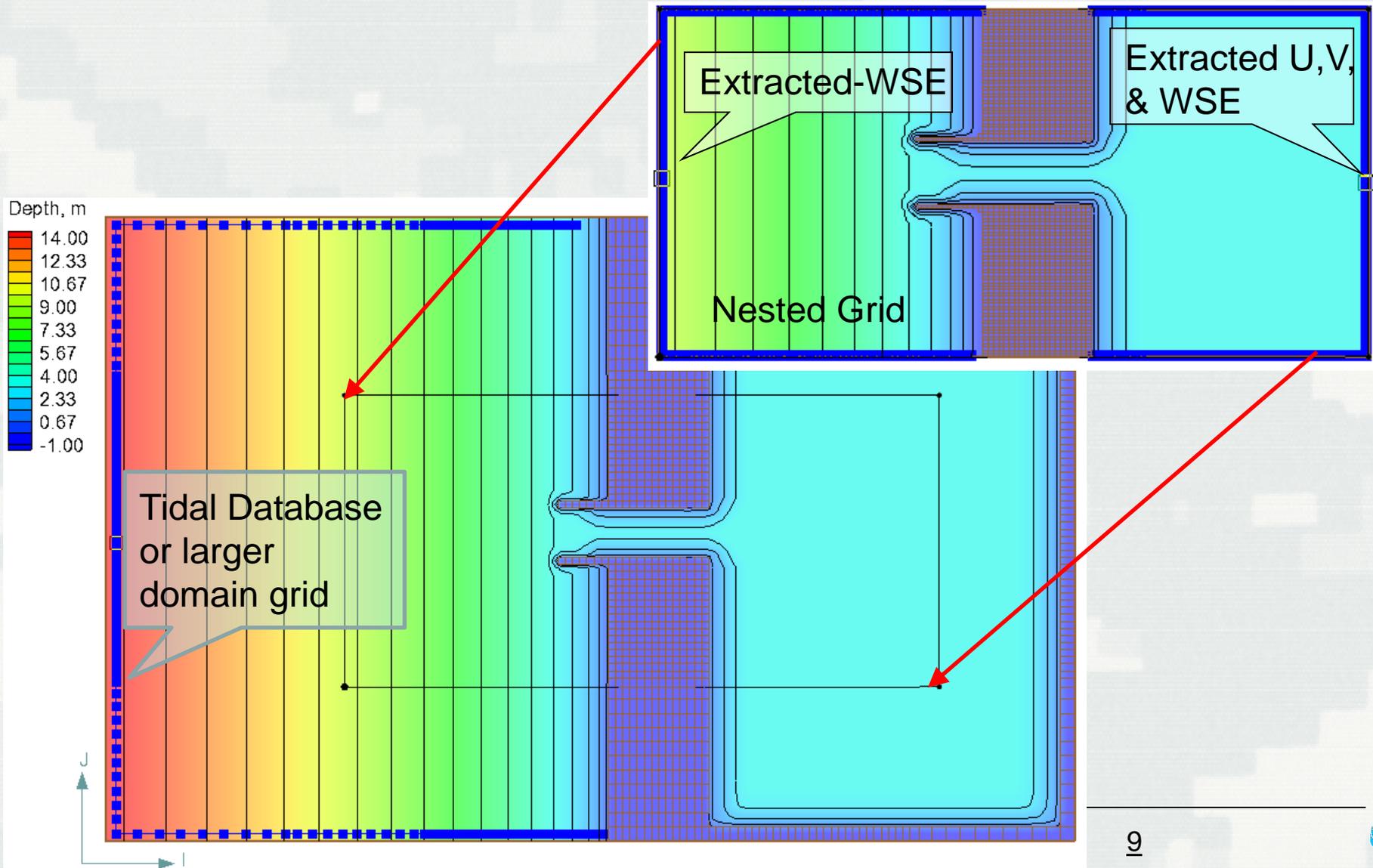
Packery Channel, TX





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Nested Grid Capability

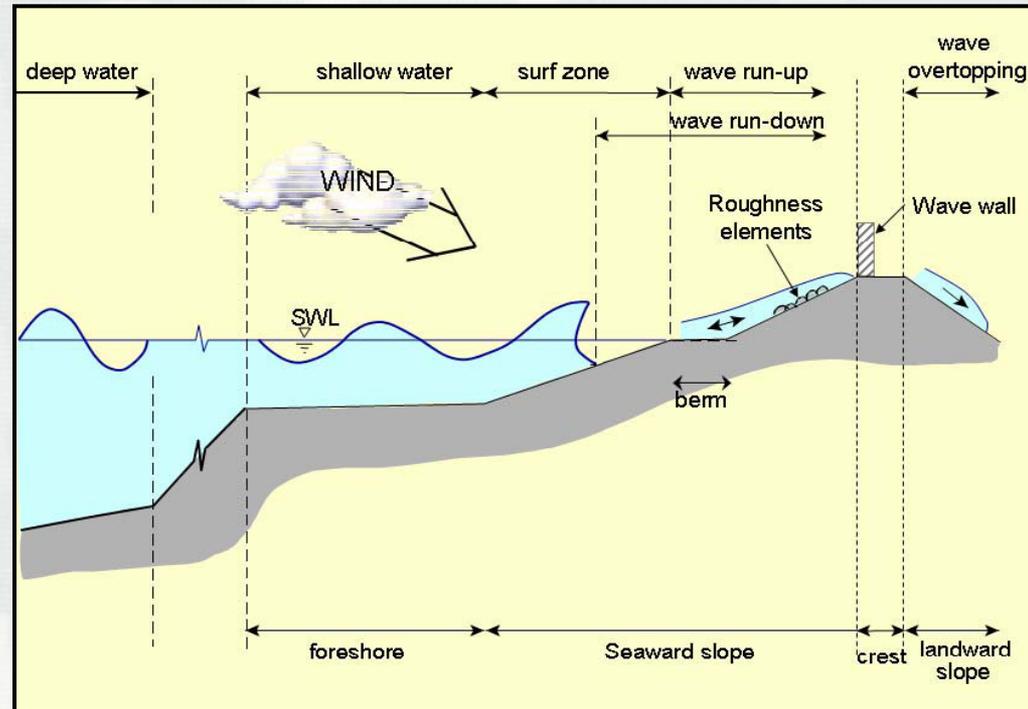




CMS-Wave: Key Features

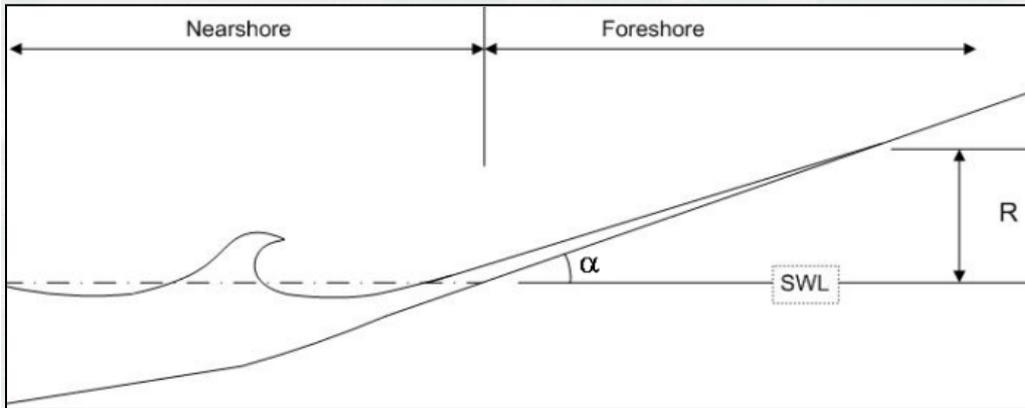


- Shoaling, refraction, diffraction, reflection
- Bottom friction
- White capping
- Wave breaking (4 options)
- Wind generation
- Wave-current, and wave-wave interactions
- Transmission, runup and overtopping
- Muddy bottom
- Automatic grid rotation
- Non-uniform Cartesian grid with nesting capability
- “Fast Mode”





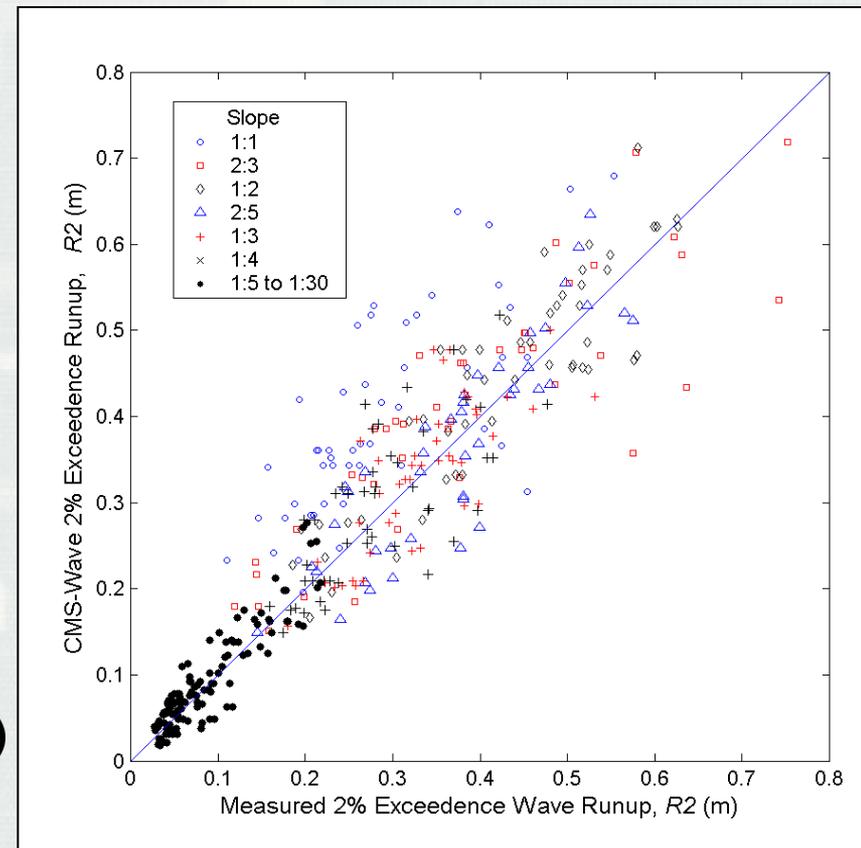
Wave Run-up



Wave run-up: rush of waves up a slope or structure

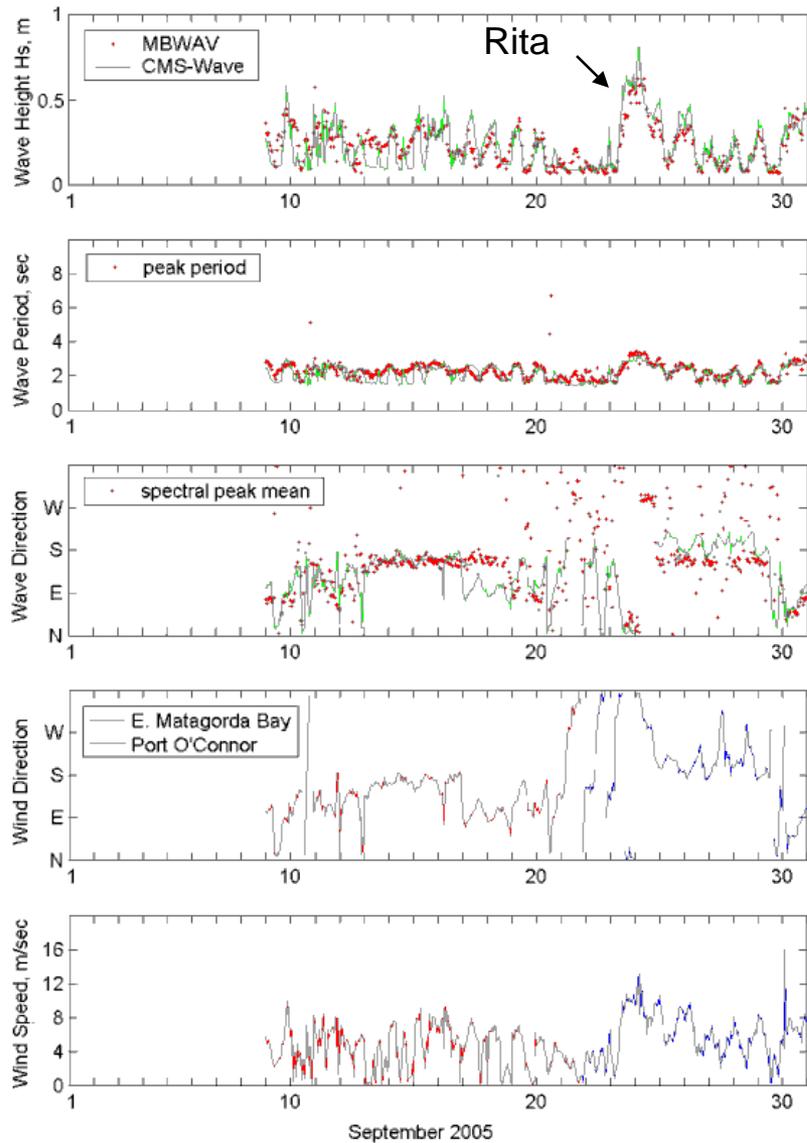
Two-percent run-up, R_2 : the vertical up-rush level exceeded by 2-percent of the larger run-up height

**Ahrens & Titus (1981), Mase & Iwagaki (1984)
~ 400 laboratory experiments**

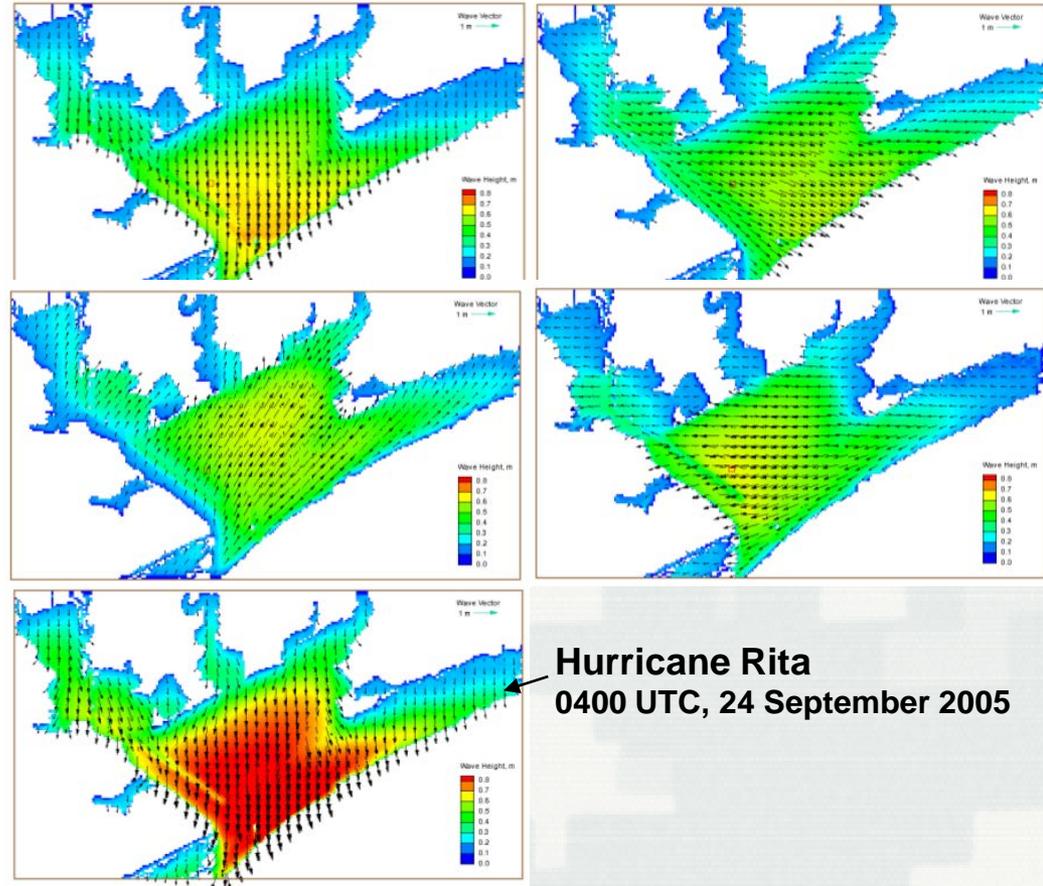




Wave Generation



Matagorda Bay, TX

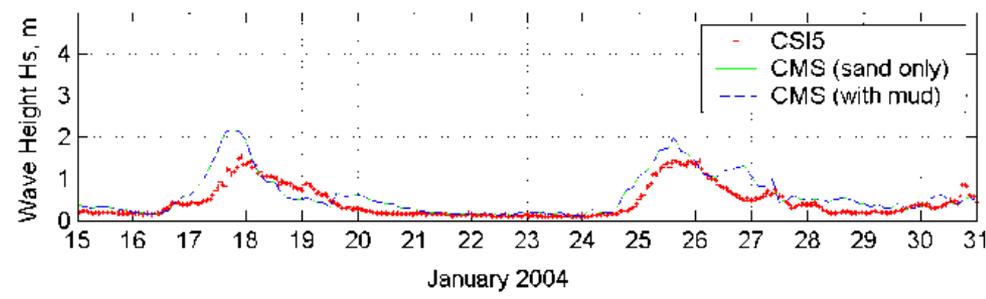
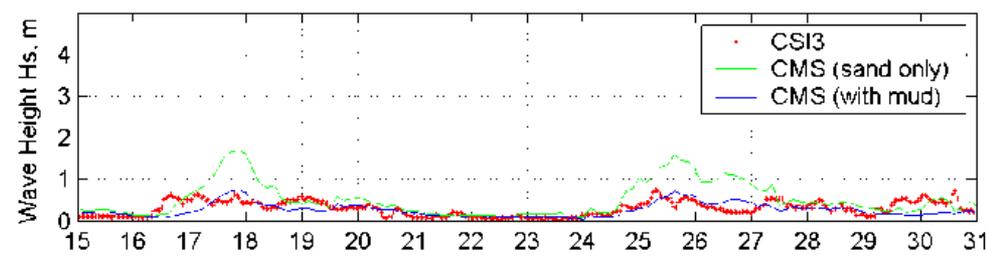
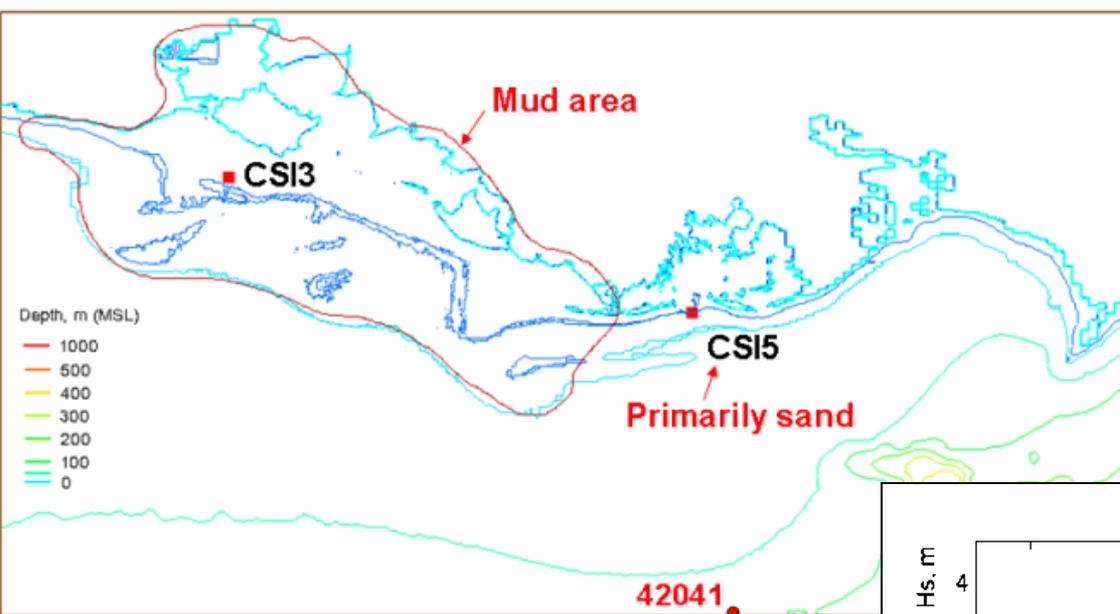


Hurricane Rita
0400 UTC, 24 September 2005





Wave Dissipation over Muddy Coast

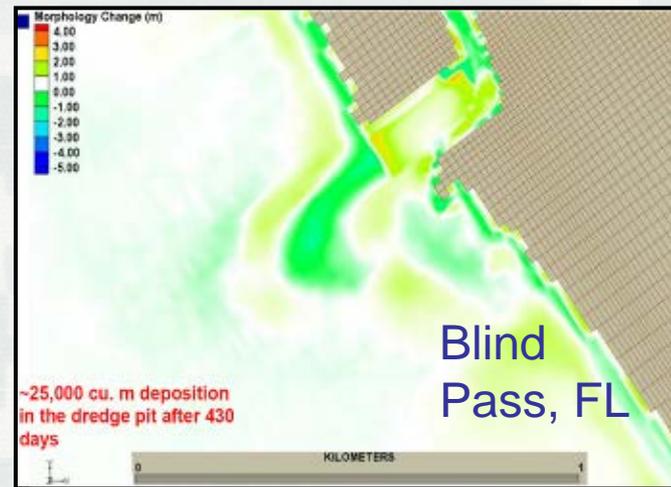
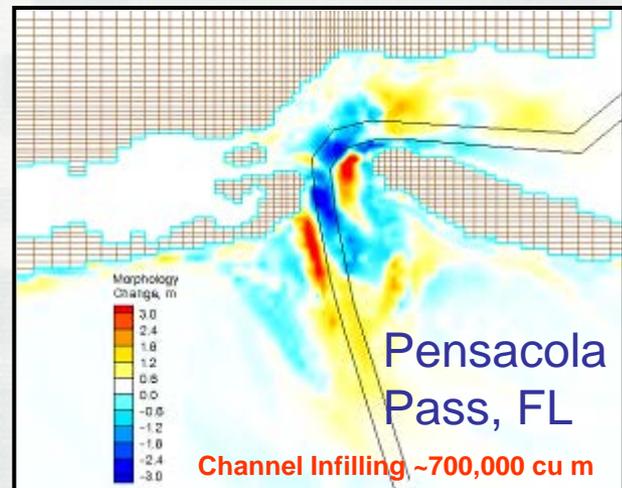




Sediment Transport: Key features

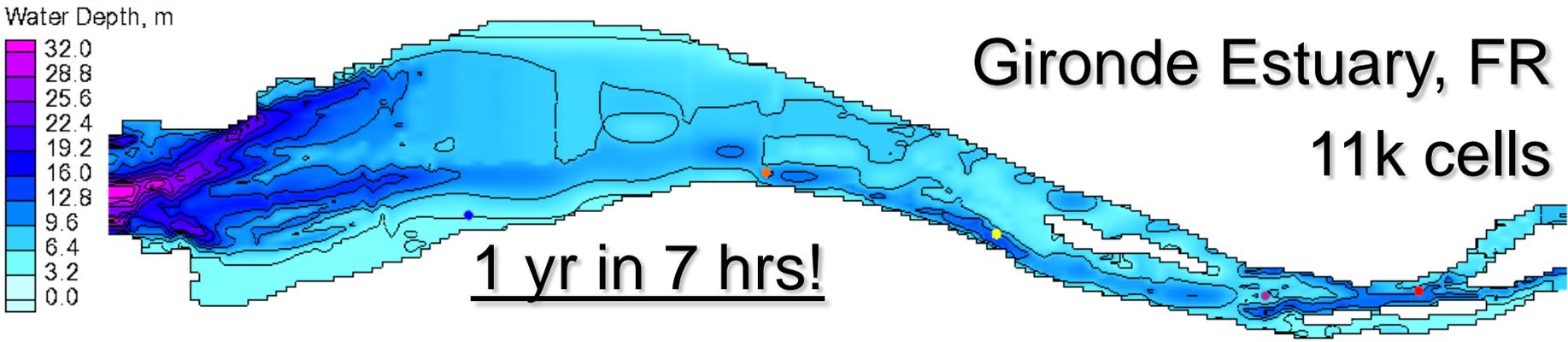
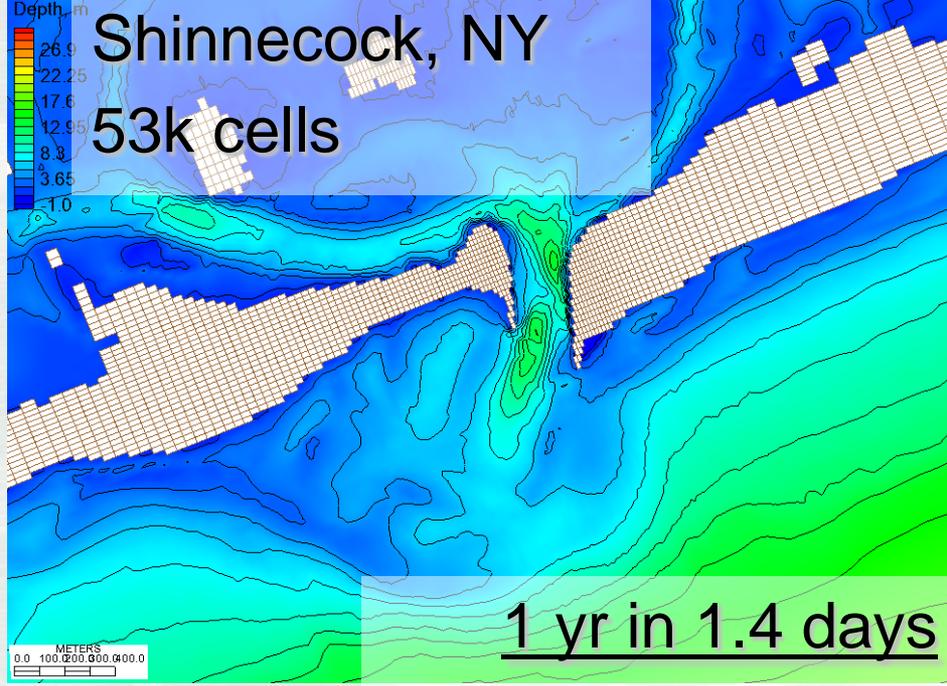
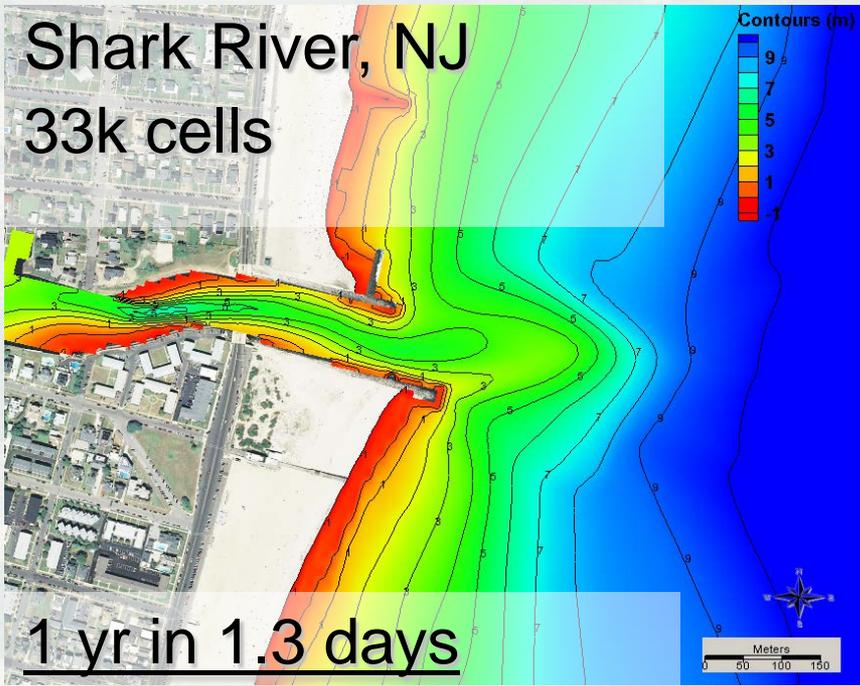


- Sediment transport models
 - Equilibrium Total Load (Exner equation)
 - Eq. Bed Load + Advection-Diffusion (AD) Suspended Load
 - Non-Eq. (AD Total Load)
- Sediment transport formulas
 - Lund-CIRP
 - Van Rijn
 - Watanabe
 - Soulsby
- Hard-bottom
- Avalanching
- Bed slope influence on bed load
- Multiple-sized sed. transport (**NEW**)





Computational Speed (Implicit)





Documentation



■ CIRP website

■ CIRP Wiki

The screenshot shows the CIRP website home page. At the top left is the U.S. Army logo. The main header features the text "US Army Corps of Engineers" and "CIRP - Coastal Inlets Research Program" next to the castle logo. Below this is a navigation bar with links for Home, Products, Publications, Workshops, Wiki, and CIRP, along with a "Find us on Facebook" button. A secondary navigation bar lists various products: CMS, CPT / CSMART, GenCode, Inlet Reservoir Model, RMAP, SBAS, Shoaling Toolbox, SMS, and Other Products. The main content area has tabs for "Explicit" and "Implicit (beta)". The "Explicit" tab is selected, showing the "Coastal Modeling System (CMS) Explicit Solution Scheme" section. The text describes the CMS as an integrated 2D numerical modeling system for simulating waves, current, water level, sediment transport, and morphology change at coastal inlets and entrances. It mentions the development, testing, and transfer of the CMS to Corps Districts and industry for use on specific engineering studies. Below the text are tabs for "CMS-Flow", "CMS-Wave", and "Other Tools". At the bottom, there is a link for "Version Release (chronological, latest first)".

The screenshot shows the CIRP Wiki main page. The browser address bar indicates the URL "http://cirpwiki.usace.army.mil/Main Page - CIRPwiki". The page has a "Page" tab selected, with "Discussion" also visible. The main heading is "Main Page" with sub-links for "Read", "View source", and "View his...". Below the heading is a welcome message: "Welcome to the CIRP Wiki" with a sub-link for "Information on CIRP and online help for all CIRP/CMS products." The page is divided into two main sections: "CIRP Products" and "Other Links". The "CIRP Products" section lists several products with bullet points: Coastal Modeling System (CMS), Channel Prioritization Tool (CPT), Coastal Structures Management, Analysis, and Ranking Tool (CSMART), GenCode, Sediment Budget Analysis System (SBAS), and Other Products. A note states that executables, publications, and additional information can be found at <http://cirp.usace.army.mil/products>. The "Other Links" section lists: CIRP Publications, CIRP Website, CIRP Event Horizon, Aquaveo, and Surface-water Modeling System (SMS) Wiki. A left sidebar contains a "CIRP" logo and a list of links: Main page, CIRP publications, CIRP products, CMS main page, CMS Doc Portal, Help, links, wiki resources, Toolbox, and Forum Menu.

<http://cirp.usace.army.mil/>

<http://cirp.usace.army.mil/wiki/>



Documentation Website



■ Products

- CMS
- GenCade
- Others

■ Publications

- Technical Reports
- CHETNS
- Journal Articles
- Others

■ Tech Transfer

- Upcoming
- Recent

US Army Corps of Engineers
CIRP - Coastal Inlets Research Program

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Webinars
Workshops
Meetings

US Army Corps of Engineers
CIRP
Research & Development

13th Annual
CIRP Technology-Transfer Workshop (#38)
6-8 March 2012
Philadelphia District
US Army Corps of Engineers

The 13th Annual Coastal Inlets Research Program (CIRP) Technology Transfer Workshop (38th overall) will be held in March 2012. The workshop will be held using facilities at the Philadelphia District. Workshop attendees will be provided Laptops or PCs with pre-loaded software, a bound notebook with presentations, and a link to download all software and data sets prior to the conference. A temporary 60-day license* for the Surface-Water Modeling System (SMS) including the Coastal Modeling System (CMS), and GenCade.

NEW - Webinar Information

Most of the Workshop will also be set up as a Webinar (call-in and connection information below). If you are interested in participating in the workshop via webinar, please email Julie.D.Rosati@usace.army.mil so we can let you know where workshop materials are posted beforehand and add your name to our list. You are welcome to participate for any portions of the workshop in which you have interest.

It is likely to be difficult for us to respond to individual off-site questions during the workshop, but we will respond to you each as time allows, so please use the webinar "participant chat" option for questions as these arise. Or, as always, feel free to email workshop instructors anytime.

Webinar access and call-in information:
Toll-Free #: 888-273-3658
Participant Code: 6760180

Webinar: <https://www.webmeeting.att.com> (Internet Explorer works best). The Meeting Number is the same at the phone number as listed above. The Participant Code is the same as above.





Documentation Wiki



- **CMS**
 - Documentation Portal
 - Tutorials
 - Technical Info (Equations)
 - Validation Cases

- **Gencade**
 - Information
 - User Guide

- **CPT/CSMART**
 - Information and Guidance

Channel Portfolio Tool (CPT)

POC: Dr. Kenneth Ned Mitchell
 Kenneth.n.mitchell@usace.army.mil
 601-634-2022

US Army Engineer Research and Development Center (ERDC)
 Coastal and Hydraulics Lab (CHL)

Active URL (Corps machines only): <https://itlgis01.usace.army.mil/CPTWeb/>

CPT is developmental software that is updated frequently.

CPT general layout

Setting the level of analysis (Reach, Project, District, Division)

CPT is designed to enable analysis of commercial utilization of the Corps-maintained waterway infrastructure at a variety of coverage levels. At the most detailed level, individual channel sub-reaches may be chosen for analysis and compared to other sub-reaches in the USACE portfolio of navigation projects. However, in order to provide decision support to personnel at all levels of Corps management, CPT can also be used to analyze and compare commercial usage figures at the Project, District, and Division levels. For example, a District program manager might want to see which navigation project under his or her control handles the most exports of a particular commodity. CPT pulls from a large database that is maintained by the Corps' Waterborne Commerce Statistics Center (WCSC). Setting the desired level of analysis is done through the CPT Home screen: <https://itlgis01.usace.army.mil/CPTWeb/> . Figure 1 shows the four levels of analysis provided by CPT; the desired level is chosen by simply clicking on the respective link.





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Questions?

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