



COASTAL MODELING SYSTEM TECH TRANSFER, VV/UQ, USER MANUAL, AND CODING

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COASTAL INLETS RESEARCH PROGRAM

FY21 IN PROGRESS REVIEW

Tiffany Burroughs

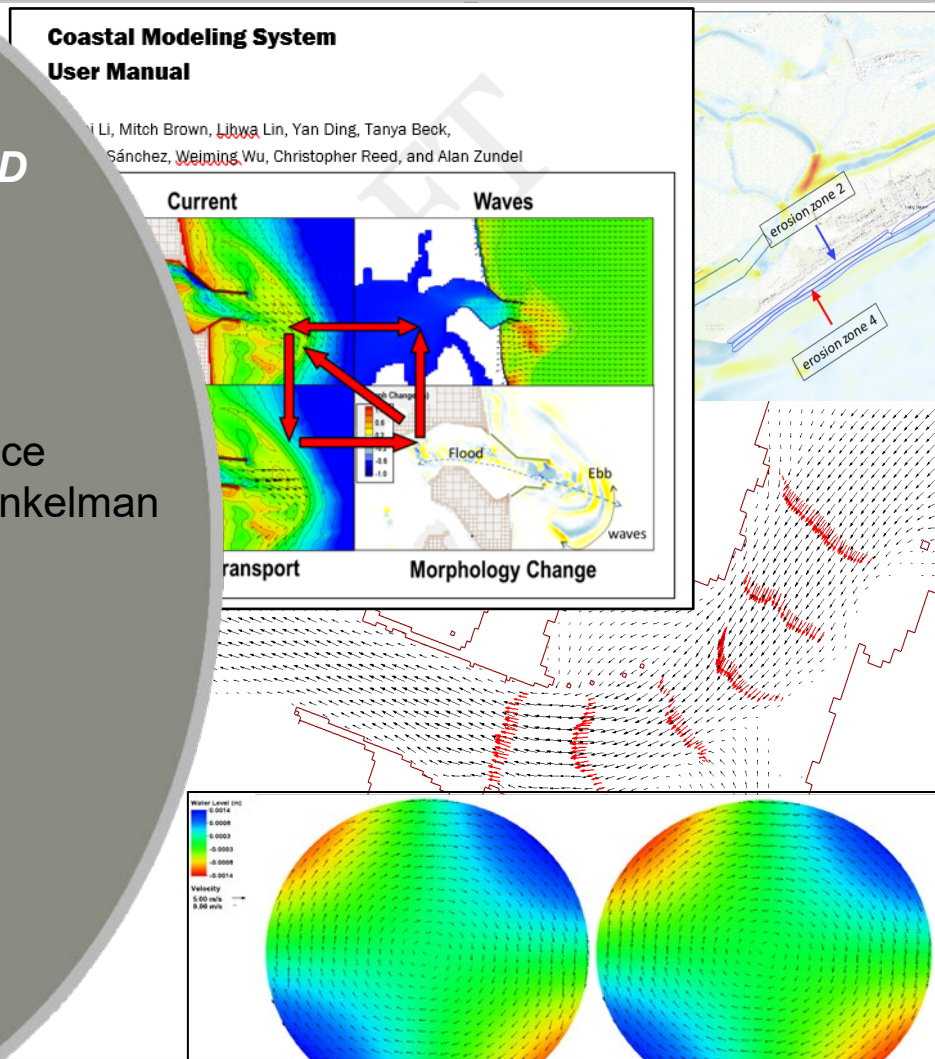
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Eddie Wiggins

Technical Director, Navigation

Morgan Johnston

Acting Associate Technical Director, Navigation



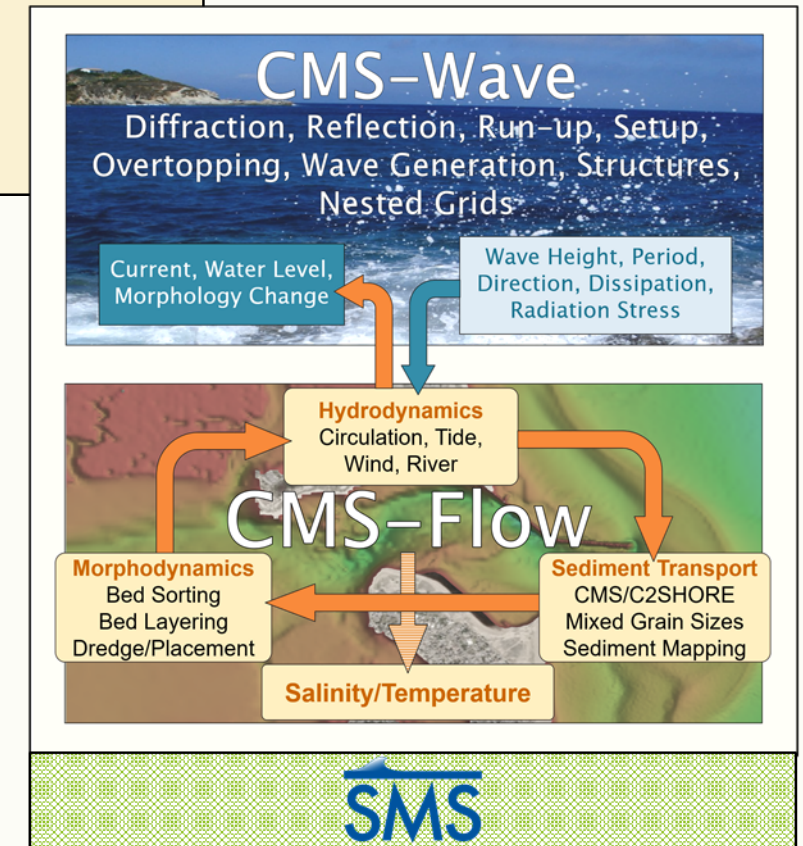
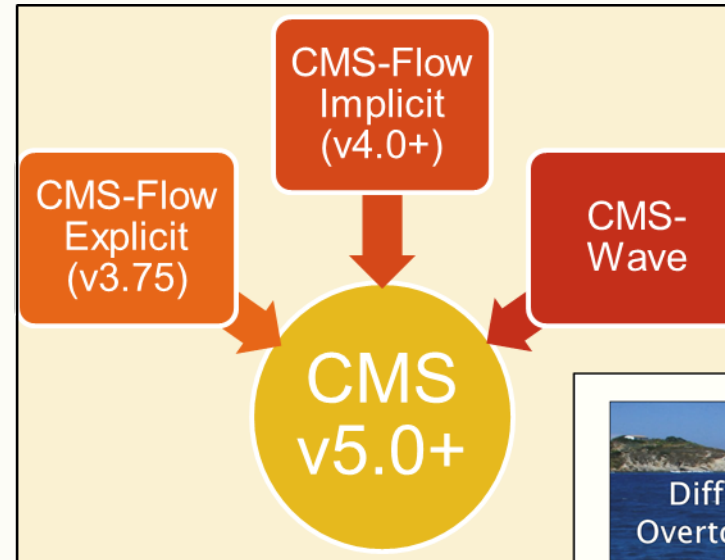
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Problem Statement

- The Coastal Modeling System has evolved from three separate models into one merged code (CMS 5.2).
- GUI releases - SMS11, SMS12, to SMS13.1 (dynamic interface)
- A model user guide is necessary for USACE-wide tech transfer and user support.
- Model verification/validation needs to be updated using merged CMS under the newly released GUI environment

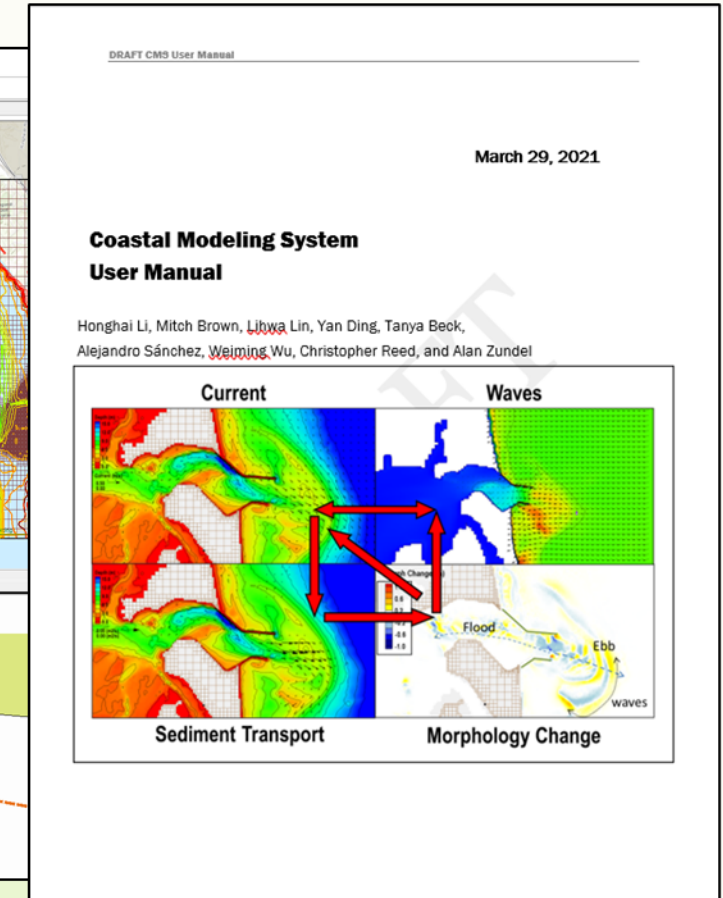
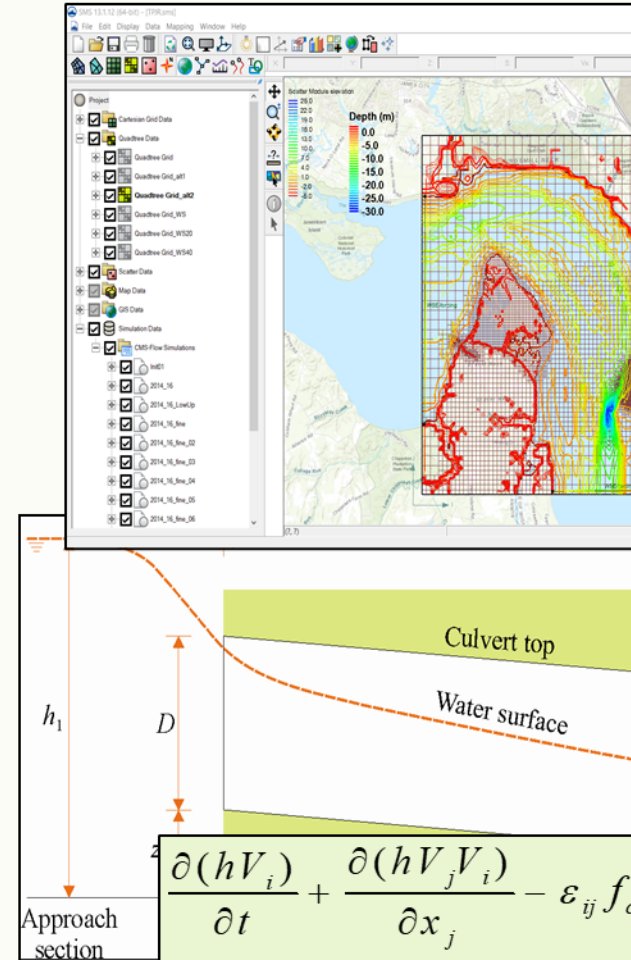


Navigation Statements of Need

- 2019-N-1370: Testing and Evaluation of USACE Coastal Numerical Models.

CMS User Guide

- Hydrodynamics, wave transformation, sediment transport and bed changes
- Governing equations and numerical methods
- Graphical user interface for model setup and result post-processing
- Features
 - Surf zone process (longshore, cross-shore sediment transport)
 - Salinity/temperature calculations
 - Coastal structures (rubble mound, culvert, weir, tidal gate)
 - Sediment mapping (Eulerian sediment tracer simulation)
 - Sea level change
 - Dredge/placement module

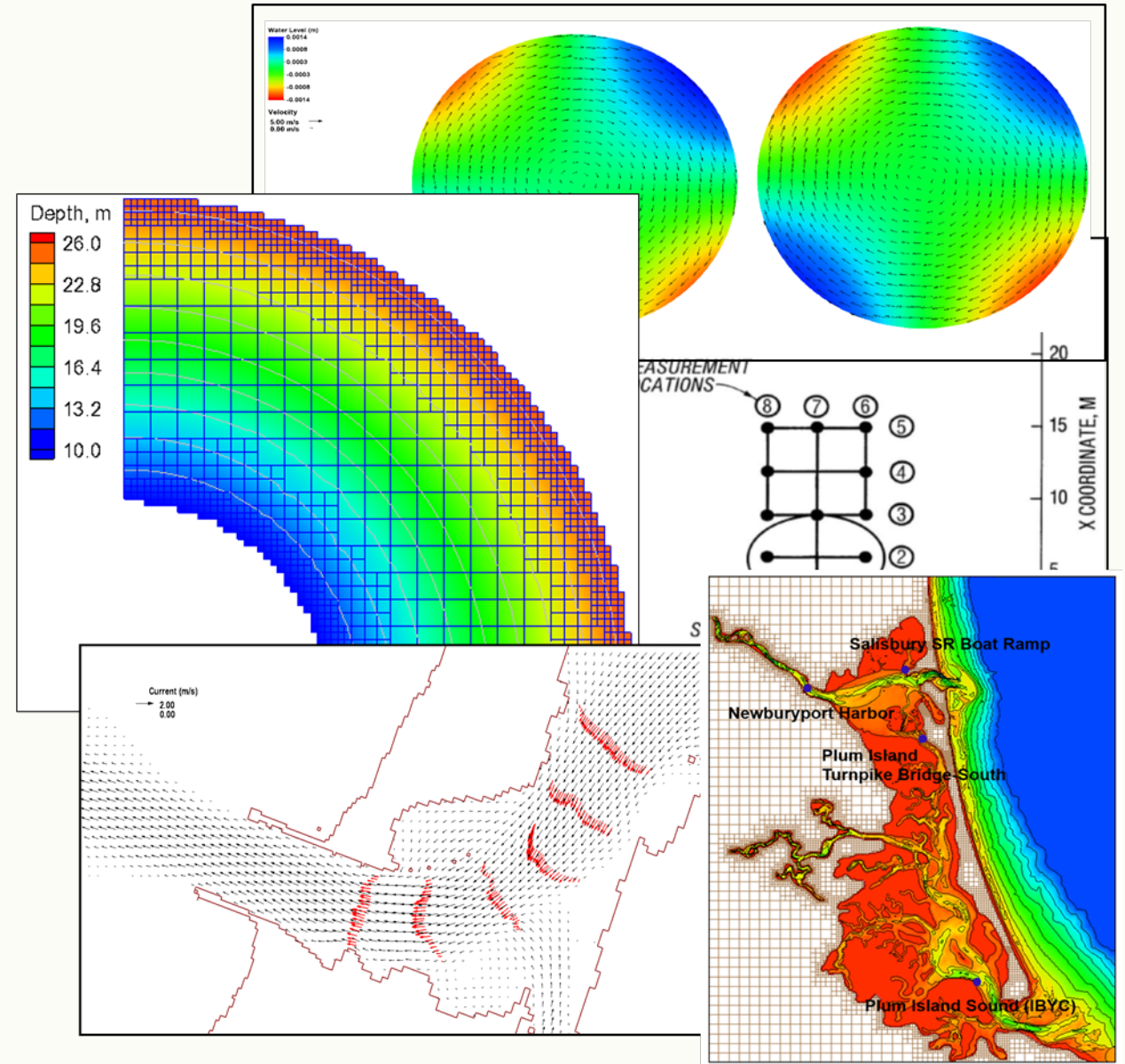


$$\frac{\partial (hV_i)}{\partial t} + \frac{\partial (hV_j V_i)}{\partial x_j} - \varepsilon_{ij} f_c h V_j = -gh \frac{\partial \eta}{\partial x_i} - \frac{n}{\rho} \frac{\partial p_a}{\partial x_i}$$

$$+ \frac{\partial}{\partial x_j} \left(v_t h \frac{\partial V_i}{\partial x_j} \right) - \frac{1}{\rho} \frac{\partial}{\partial x_j} (S_{ij} + R_{ij} - \rho h U_{wi} U_{wj}) + \frac{\tau_{si}}{\rho} - m_b \frac{\tau_{bi}}{\rho}$$

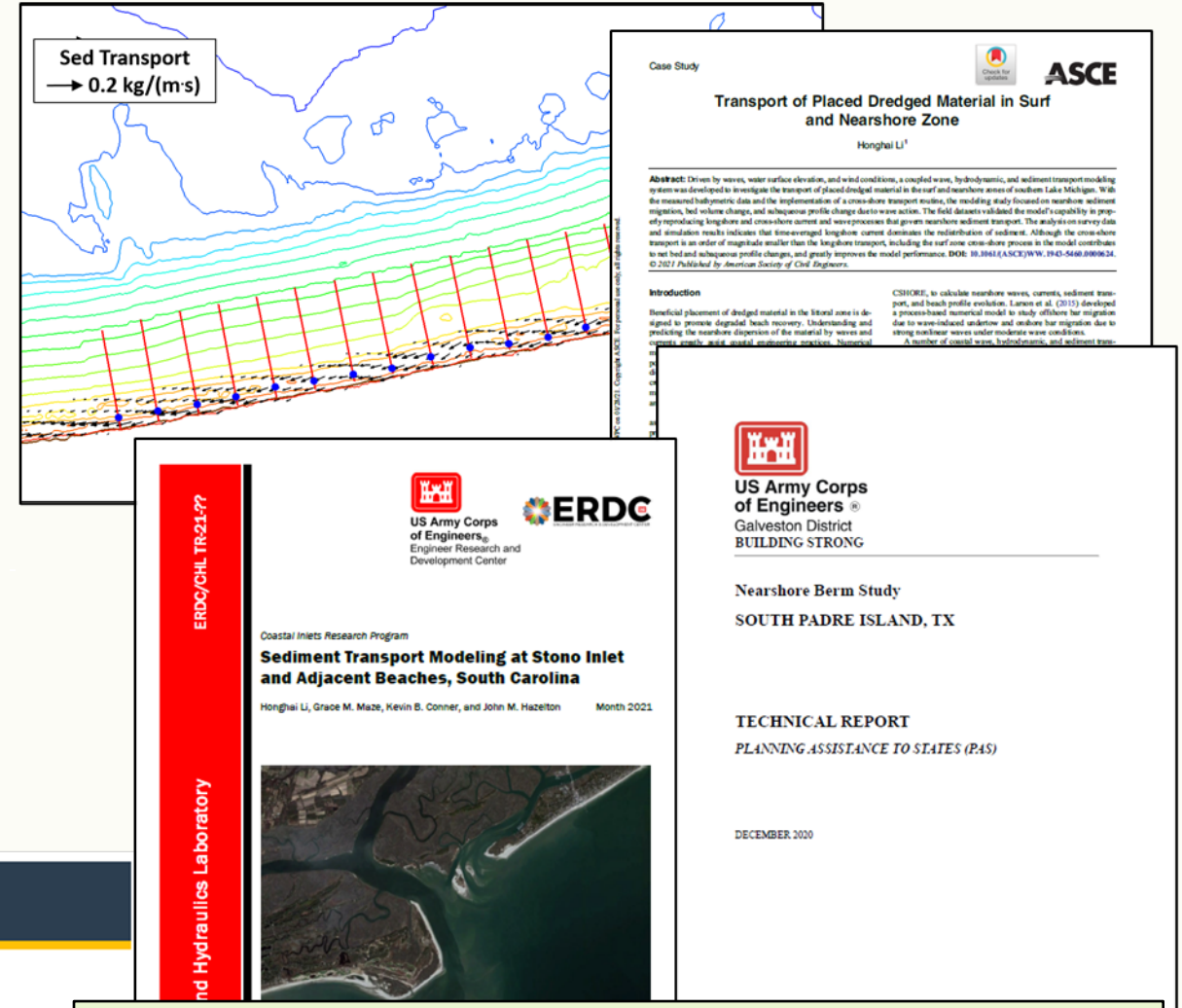
CMS: VVUQ

- Eight analytical cases
 - Wind driven flow, tidal propagation, flow over a bump
 - Long-wave runup over slope, wave generation and growth, non-linear wave-wave interaction, wave diffraction
- Eight laboratory/experimental cases
 - Steady flow in rectangular flume
 - Planar beach and idealized jettied inlet with incident waves (wave breaking and runup)
 - Cleveland Harbor experiments
- Seven field cases
 - West coast, East coast, Great Lakes
 - Coastal Model Test Bed (FRF)



CMS: Tech Transfer

- Assist USACE users in CMS applications
- Support districts in projects on sediment management, dredge/placement operations, beach nourishment, coastal structure design (NAE, NAN, NAP, NAB, NAO, SAW, SAJ, NWS, SPN, SWG, LRB, LRE)
- Maintain WaveNet and TideNet
- Updated CIRP Wiki pages
- Documentation (tech reports, tech note, letter report, JP, SOWs)



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Coastal Inlets Research Program

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WaveNet: <http://140.194.110.113/WaveNet>

TideNet: <http://140.194.110.113/TideNet>

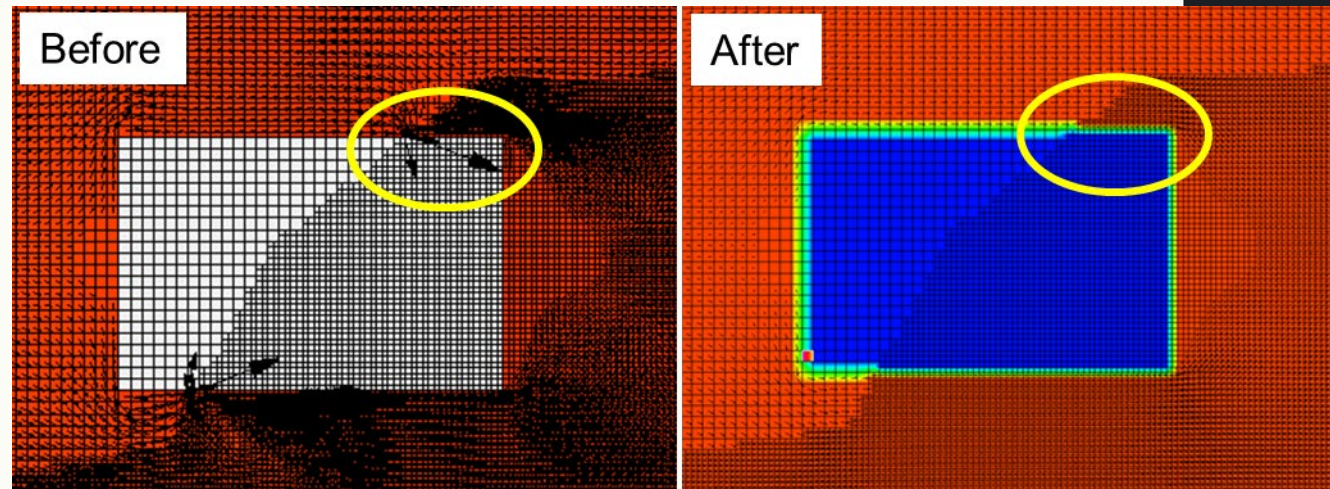
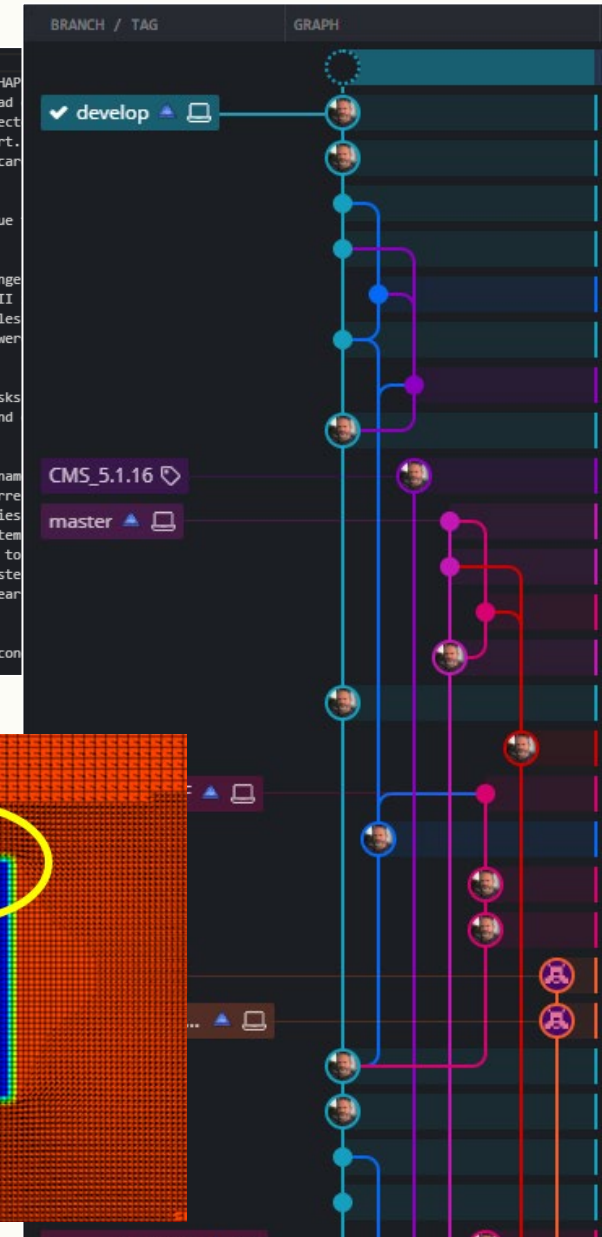
CMS: Coding

- Release of CMS v5.2 for working with SMS 13.1 interface.
- ~45+ edits for bug-fixes or improved features (Brown, Li)
- Bug fixes relating to the explicit solution scheme (Reed)
- Major change for inline steering correcting behavior of the wave model integration (Lin)
- Maintain CMS code in Git repository for accessing and interacting within and coworkers outside the group

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1 == Version 5.2.6 (6/25/2021) ==
2 * Bug fix: Fixed error if FALL_VELOCITY, CRITICAL_SHEAR, and COREY_SHAP
3 * Minor: Added descriptive print statements to structure types instead
4 * Minor: Added error message when the Wind file format is not an expect
5 * Bug fix: Small fix unset the TELFILE name when a GRID_FILE of '.cart.
6 * Added function to parse through a cardfile looking for a specific car
7
8 == Version 5.2.5 (6/10/2021) ==
9 * Bug fix: Hot start with multiple sediment grain sizes was broken due
10 * Bug fix: Using ASCII input files wasn't working for salinity.
11 * Bug fix: Small logic error in boundary condition corrected.
12 * Bug fix: Corrected sign error which resulted in a sediment bed-change
13 * Bug fix: Initialization was missing for initial condition with ASCII
14 * Minor: Added capability to write out both XMD and ASCII output files
15 * Minor: Ensured both cards for running CMS with initial conditions wer
16 * Minor: Removed fix for ILUTP solver which caused other issues.
17 * Minor: Clearer error messages in reading from input files.
18 * Added: Command line option 'Tools' to perform a few independent tasks
19 ** Added two routines - one to convert an actual date to a REFTIME and
20
21 == Version 5.2.4 (06/10/2021) ==
22 * Bug fix: When using single wave condition, CMS now stores the gridnam
23 * Bug fix: CMS now stores ADCIRC Parent grid and path information corre
24 * Bug fix: Divide by zero during normalization of river flux boundaries
25 * Bug fix: CMS was looking for a ZONE when Geographic coordinate system
26 * Bug fix: CMS only recognized NAD83/NAD27/LOCAL for Datum. Modified to
27 * Bug fix: ADCIRC fort.64 file now uses -9.9999e+04 for dry cells inste
28 * Bug fix: STARTING_JDATE uses a 2-digit year. Fixed logic to make year
29
30 == Version 5.2.3 (09/10/2020) ==
31 * Minor: added optional argument to 'time_sec2str' for outputting secon
32

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Summary

■ FY21 Major Advances in Capability

- CMS User Guide (TR, draft)
- VVUQ Part I: Hydrodynamics and Waves (TR, draft)
- Evaluation of wave-induced sediment transport in surf zone

■ FY22 Products/Advances

- VVUQ Part II: Sediment Transport and Morphology Change
- Publish CMS User Guide and VVUQ Part I TRs

Starting in FY22, the NMSP funding for CMS is increasing to 145K (previously ~20 - 40K/year). The extra funding will offset some tech transfer activities, coding, VVUQ, and support aspects previously funded by CIRP through this WU.

■ FY21 Major Products & Collaborations

- JP (JWPCOE)
- Tech reports
- SOWs

